Indiana's Great Lakes Water Quality Agreement (GLWQA)

DOMESTIC ACTION PLAN (DAP)

for the

WESTERN LAKE ERIE BASIN (WLEB)

February 2018

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FOREWORD

Indiana's Great Lakes Water Quality Agreement (GLWQA) Domestic Action Plan (DAP) to reduce phosphorous to the Western Lake Erie Basin (WLEB) is the product of a dedicated Advisory Committee comprised of representatives from different stakeholder sectors and led by the Indiana Department of Environmental Management (IDEM).[1] Founded on the principle of adaptive management, this DAP is a dynamic document acknowledging that phosphorous loading in particular, and nutrient pollution in general, is a very complex problem caused by point and nonpoint sources across all sectors, which requires a multi-dimensional solution.

The Advisory Committee was formed in April of 2016, met ten times in person, and held one conference call. The minutes of those meetings may be found at: Indiana's Great Lakes Water Quality Agreement (GLWQA) Domestic Action Plan (DAP) for the Western Lake Erie Basin (WLEB), http://www.in.gov/isda/3432.htm. Additionally, members who conduct surface water quality monitoring did site reconnaissance and held several meetings and conference calls to review water quality data analyses in order to prioritize watersheds and to refine the Advisory Committee's hypotheses for the basis of adaptive management.

The draft DAP was put on public notice for a 60-day comment period, from August 14-October 13, 2017. Seven public meetings were held in the following locations

- Fort Wayne, August 23rd
    - 1:00 PM session- 14 attendees (U.S. EPA attended)
    - 5:30 PM session- 16 attendees
- Auburn, August 24th (U.S.EPA attended)
    - 10:30 AM session- 30 attendees
    - 5:30 PM session- 12 attendees
- Decatur, August 28th
    - 8:00 AM session- 18 attendees
    - 5:30 PM session- 9 attendees
- Indianapolis, September 26th
    - 6:00 PM session- 8 attendees

A summary of the public comments received through Survey Monkey and the responses to them may be found in Appendix 3.

[1] Adam's Co. Soil and Water Conservation District (SWCD), Allen Co. SWCD, City of Fort Wayne, DeKalb County SWCD, Indiana Farm Bureau, Indiana Pork Producers, Indiana University Purdue University Fort Wayne, Indiana State Department of Agriculture, Indiana Department of Natural Resources, Natural Resource Conservation Service of USDA, Sierra Club, St. Joseph Watershed Alliance, Steuben Co. SWCD, The Nature Conservancy, Tri-State Watershed Alliance, United States Geological Survey. As time allows: Agribusiness Council of Indiana, Agricultural Research Service, USDA, Allen Co. MS4, City of Auburn, Hoosier Environmental Council, Purdue University, The Andersons, Inc.

This DAP will be web-based after its February 2018 release. The Action/Milestone Table found in Appendix 1 will be updated as projects and programs are implemented and new ones are initiated. If you have questions or would like to become involved, please find contact information at http://www.in.gov/isda/3432.htm. We look forward to hearing from you as we strive to reduce phosphorous to the WLEB!

The confluence of the St. Marys River (left) and the St. Joseph River (right) to form the Maumee River (bottom) in Fort Wayne, Indiana. Photo courtesy of Allen County SWCD.

BACKGROUND

Indiana has been an active member of the Nutrients Annex 4 Binational Subcommittee (Subcommittee) of the GLWQA since its establishment in 2013. The Subcommittee is charged with coordinating binational actions to manage phosphorous loadings and concentrations in the Great Lakes. The GLWQA Lake Ecosystem Objectives include the following:

- Minimize the extent of hypoxic zones in the Great Lakes due to excessive phosphorous loading with emphasis on Lake Erie.
- Maintain levels of algal biomass below nuisance level conditions.
- Maintain algal species consistent with healthy aquatic ecosystems in nearshore waters.
- Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health.
- Maintain an oligotrophic state, relative algal bio-mass, and algal species consistent with healthy aquatic ecosystems in the open waters of Lakes Superior, Michigan, Huron, and Ontario.
- Maintain mesotrophic conditions in the open waters of the western and central basins of Lake Erie, and oligotrophic conditions in the eastern basin of Lake Erie.

Commitments under the Nutrients Annex include the following:

- By February 2016, establish binational phosphorous objectives, loading targets, and allocations for the nearshore and offshore waters to achieve the Lake Ecosystem Objectives (LEOs) for each lake, starting with Lake Erie. [2]
- Assess and where necessary, develop/implement regulatory and non-regulatory programs/measures to reduce phosphorous loadings from agricultural, rural non-farm, urban, and industrial point and nonpoint sources.
- By February 2018, develop a binational phosphorous reduction strategy and *Domestic Action Plans (DAPs)* designed to meet nearshore and open water phosphorous objectives and loading targets for Lake Erie.

On February 22, 2016, the United States and Canada adopted new phosphorus reduction targets for Lake Erie. They are noted in Table 1.

[2] For more information, please see the June 2016 Progress Report of the Parties to the Great Lakes Commission.

Table 1: Binational Phosphorus Load Reduction Targets

BINATIONAL PHOSPHORUS LOAD REDUCTION TARGETS		
Lake Ecosystem Objectives Great Lakes Water Quality Agreement Annex 4, Section B	**Western Basin of Lake Erie**	**Central Basin of Lake Erie**
Minimize the extent of hypoxic zones in the Waters of the Great Lakes associated with excessive phosphorus loading, with particular emphasis on Lake Erie	40 percent reduction in total phosphorus (TP) entering the Western Basin and Central Basin of Lake Erie – from the United States and from Canada – to achieve a 600 Metric Tons (MT) Central Basin load	
Maintain algal species consistent with healthy aquatic ecosystems in the nearshore Waters of the Great Lakes	40 percent reduction spring total and dissolved reactive phosphorus (DRP) loads from the following watersheds where localized algae is a problem:	
	Thames River – Canada Maumee River – U.S. River Raisin – U.S. Portage River – U.S. Toussaint Creek – U.S. Leamington Tributaries - Canada	Sandusky River – U.S. Huron River, OH – U.S.
Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health in the Waters of the Great Lakes	40 percent reduction in spring TP = 860 MT = 0.23 mg/L Flow Weighted Mean Concentration (FWMC)] and DRP = 186 MT = 0.05 mg/L FWMC loads from the Maumee River (U.S.)	N/A

Via the Subcommittee, each state (Indiana, Michigan, New York, Ohio, and Pennsylvania) and the Province of Ontario agreed to follow a standard outline to develop DAPs by 2018 that at a minimum will:

- Identify implementation targets toward meeting Lake Erie Ecosystem objectives.
- Provide focus for allocation of resources.
- Identify actions and potential policy/program needs.
- Outline measures/methods to track progress.

Founded on the principle of adaptive management, this first iteration of Indiana's DAP to reduce phosphorus to Lake Erie is the product of a dedicated Advisory Committee comprised of representatives from different stakeholder sectors[3] and led by the Indiana Department of Environmental Management (IDEM). The DAP Advisory Committee agreed to the following standards for developing the DAP: (1) decision-making is made by consensus with all votes equal and dissenting opinions or positions noted; (2) the DAP is a dynamic document that acknowledges nutrient problems are complex, multi-faceted, and caused by point and nonpoint

[3] Adam's Co. Soil and Water Conservation District (SWCD), Allen Co. SWCD, City of Fort Wayne, DeKalb County SWCD, Indiana Farm Bureau, Indiana Pork Producers, Indiana University Purdue University Fort Wayne, Indiana State Department of Agriculture, Indiana Department of Natural Resources, Natural Resource Conservation Service of USDA, Sierra Club, St. Joseph Watershed Alliance, Steuben Co. SWCD, The Nature Conservancy, Tri-State Watershed Alliance, United States Geological Survey. As time allows: Agribusiness Council of Indiana, Agricultural Research Service, USDA, Allen Co. MS4, City of Auburn, Hoosier Environmental Council, Purdue University, The Andersons, Inc.

sources across all sectors of Indiana with the solutions being likewise; and (3) the DAP is data driven but not deterred or deferred by the inconclusive or unknown.

This document is informed by the intensive planning, research, and steadfast work that is already underway in the WLEB by individuals, non-governmental organizations, universities, professional associations, for-profit industries, and governmental entities at the town/municipal, county, state, and federal levels.[4] It is in keeping with the principles and approaches in Indiana's *State Nutrient Reduction Strategy*. This DAP identifies data, resource and research needs, as well as next steps and proposes a time-line for meeting/achieving them. It also notes challenges posed by predicted changing conditions such as climate and land use patterns. The criteria by which priorities, next steps, and the allocation of resources are evaluated include the following:

- Use existing programs and optimize partnerships.
- Effect the most change with the least cost.
- Prioritize resources to areas with the most phosphorus export and/or reduction potential.[5]
- Seek to engage citizens who are unengaged or not participating in conservation efforts.
- Make use of social indicators to guide outreach activities and best management practices (BMPs).
- Employ adaptive management.

GOALS

The focus of Indiana's DAP is the Western Lake Erie Basin (WLEB) as Indiana's only tributary to Lake Erie is the Maumee River, which has its mouth in the WLEB. Thus, particularly pertinent to Indiana is the GLWQA Lake Ecosystem Objective to "maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that pose a threat to human or ecosystem health" (Table 1 highlight). From applying, cross-referencing, and analyzing seven different models, the Subcommittee concludes that spring-time (March through July) loading of phosphorus from the Maumee River is the prevailing source of phosphorus causing cyanobacteria blooms in the WLEB (Annex 4 Targets and Objectives Task Team, May 11, 2015, p. 33). Using 2008 as the base year, the Subcommittee determined that a reduction of 40 percent in spring-time loads of both total and dissolved reactive phosphorus is required to limit the formation of nuisance/harmful algal blooms in nine out of ten years. Nine out of ten years acknowledges the probability of an extremely wet year in which the goal would not be attainable. The 40 percent reduction target load is equal to 860 metric tons (MT) of total phosphorus (TP) and 186 MT of dissolved reactive phosphorus (DRP), which translate to a flow weighted mean concentration (FWMC) of 0.23 mg/L TP and 0.05 mg/L DRP. This target load is expected to produce a bloom similar to that which occurred in 2012, which marked the smallest bloom quantified by the cyanobacteria metric in the last decade.

[4] Nonpoint source pollution abatement plans and actions in progress are listed with hyperlinks under "Major Actions Since 2008."

[5] This does not preclude support to areas or activities that are not identified as top priorities.

Indiana's goal is to meet the spring-time FWMC targets of 0.23 mg/L and 0.05 mg/L for TP and DRP respectively in the Maumee River as it flows across the border into Ohio. Indiana, in concert with the U.S. Environmental Protection Action (EPA), affirms the reduction planned for the Maumee River will address Indiana's obligation for the 40% phosphorous load reductions entering the WLEB, which in turn, positively affects the Central Basin. While phosphorus is the nutrient of focus and primary driver of eutrophication in the WLEB, the addition of nitrogen significantly increases the production of algal blooms. The relationship of algal bloom size, timing and other factors, such as water temperature, to the production of algal toxins is not fully understood and the role that nitrogen plays in algal toxins is being examined. Therefore, nitrogen as well as other parameters listed in Table 3 are being collected in Indiana's current and proposed monitoring projects in the WLEB to provide data for this research and to achieve a better understanding.

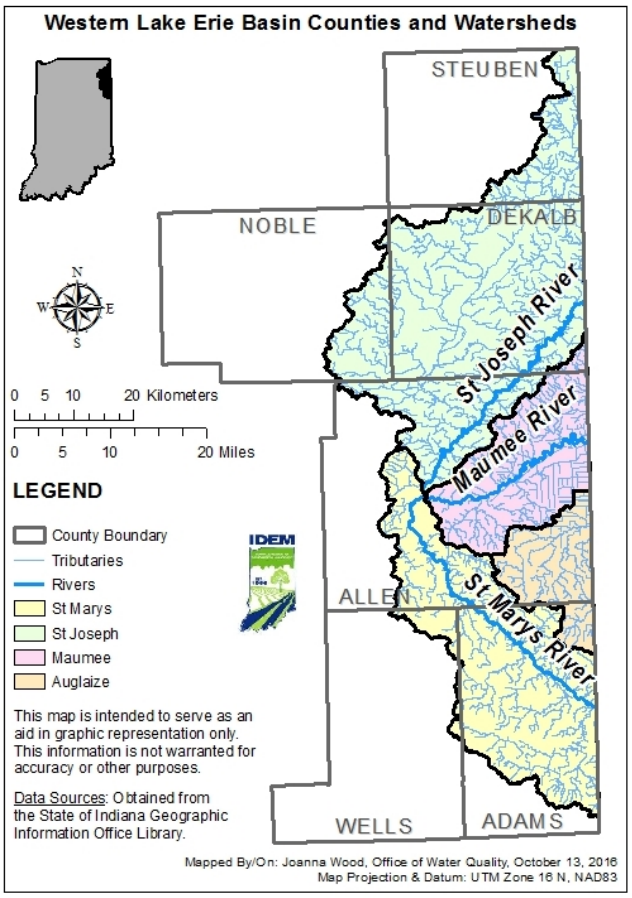
Timeframe to meet load reduction goals

The lag time between the installation of conservation or BMPs on the landscape and positive, statistically significant changes in the water quality of a large river, such as the Maumee, can take decades.[6] Reductions in phosphorus loads to smaller streams and tributaries may be manifest in improved water quality sooner, just as positive changes are realized sooner on the agricultural edge-of-field scale and at point source outfalls. Thus, Indiana will use various indicators including social indicators to track progress annually from different sectors and will use 2020 as a checkpoint to determine progress toward the target phosphorus loads on the Maumee to validate or re-evaluate the priority watersheds, programs, and practices put forth in this DAP. By that time, Indiana plans to have more baseline monitoring at the smaller, sub-watershed scale that will facilitate setting specific phosphorous target loads in the priority sub-watersheds to be met by 2025 in order to make progress in meeting the FWMC on the Maumee.

[6] Donald W. Meals and Steven A. Dressing. 2008. Lag time in water quality response to land treatment. Tech Notes 4, September 2008. Developed for U.S. Environmental Protection Agency by Tetra Tech, Inc., Fairfax, VA, 16 p. Available online at https://www.epa.gov/sites/production/files/2016-05/documents/tech_notes_4_dec2013_lag.pdf

INDIANA'S PORTION OF THE WLEB

Figure 1: Indiana's Portion of the WLEB



Indiana drains roughly 12 percent of the WLEB and is comprised of the St. Joseph, Maumee, Auglaize, and St. Marys watersheds that encompass approximately 821,300 acres in the counties of Steuben, DeKalb, Allen, Noble, Adams, and Wells[7]. The St. Joseph River and the St. Marys River enter Indiana from Ohio and, at their confluence near Fort Wayne, form the Maumee River, which flows approximately 29 miles eastward into and through Ohio for another 108 miles to its mouth at Maumee Bay in Lake Erie near Toledo.

This portion of the WLEB is home to nearly a half million people. The largest city is Fort Wayne with a population of approximately 260,000.

Land Use in the WLEB and Major Sources of Phosphorus

More than 70 percent of the WLEB is agricultural, 15 percent is developed, and the remaining 15 percent is comprised of forests, wetlands, and open water. Row crop agricultural land with corn and soybean rotation predominating, is mostly drained by subsurface tiles which, during significant rainfall events, discharge to streams transporting phosphorus, nitrogen, and in some cases suspended sediment.

Table 2: Land Use in the Indiana WLEB (USDA-NASS, Washington, DC, 2012)

Land Use	Total in Acres	Percentage of Total
Agriculture	436,100.05	53.10 %
Hay/Pasture	141,174.25	17.20%
Developed	123,604.83	15.00%
Forested	76,910.81	9.40%
Wetland	22,168.99	2.70%
Scrub/Shrub	11,743.78	1.40%
Open Water	9,594.56	1.20%
Total	821,297.26	100.00%

[7] Approximate acres by county: Steuben ≈ 50,210, Noble ≈ 52,050, DeKalb ≈ 224,520, Allen≈ 315,400, Wells ≈ 17,600, Adams ≈ 161,520

There are four major (one million gallons/day) National Pollutant Discharge Elimination System (NPDES)[8] permitted municipal wastewater treatment plants (WWTPs), each with a TP effluent limit of 1 mg/L. These include Fort Wayne, Decatur, Auburn, and Butler. These WWTPs average a discharge concentration below the 1mg/L TP limit. There are three minor municipal WWTPs and an additional seven industrial/other minor dischargers.

Within the developed areas, there are seven combined sewer overflow (CSO)[9] communities including Auburn, Berne, Butler, Decatur, Fort Wayne, New Haven, and Waterloo, each with an approved Long Term Control Plan (LTCP) or consent decree with compliance schedules. There are 13 designated municipal separate storm sewer systems (MS4s)[10] with approved Storm Water Quality Management Plans (SWQMPs) including one in Adams County, 11 in Allen County, and one in DeKalb County. Like nonpoint source (NPS) pollution associated with precipitation events, these regulatory point sources have their pollutant signatures during precipitation events.

Confined feeding operations (CFOs) as defined by Indiana Code (IC 13-18-10) mean any confined feeding of at least 300 cattle; 600 swine or sheep; 30,000 fowl; or 500 horses.[11] There are 78 active CFOs in the WLEB with 50 in Adams County, 12 in Allen County, 12 in DeKalb County, one in Steuben, and three in Wells County[12]. Approximately 8.3% or 36,000 of the 436,100 acres used for agriculture within the Indiana WLEB are used for application of manure generated by CFOs. This does not account for the numerous livestock operations that fall below the threshold of regulation under the CFO rule. The density of those operations and the acres of land used for application of manure from them will be documented during 2018. A map of state permitted livestock facilities as well as WWTP (NPDES) facilities is found in Figure 2.

[8] NPDES permits are issued by IDEM to control direct discharges to waters of the State. These permits place limits on the amount of pollutants that may be discharged to waters of the State by each discharger. These limits are set at levels protective of both the aquatic life in the waters which receive the discharge and of human health. For more information see http://www.in.gov/legislative/iac/T03270/A00030.PDF

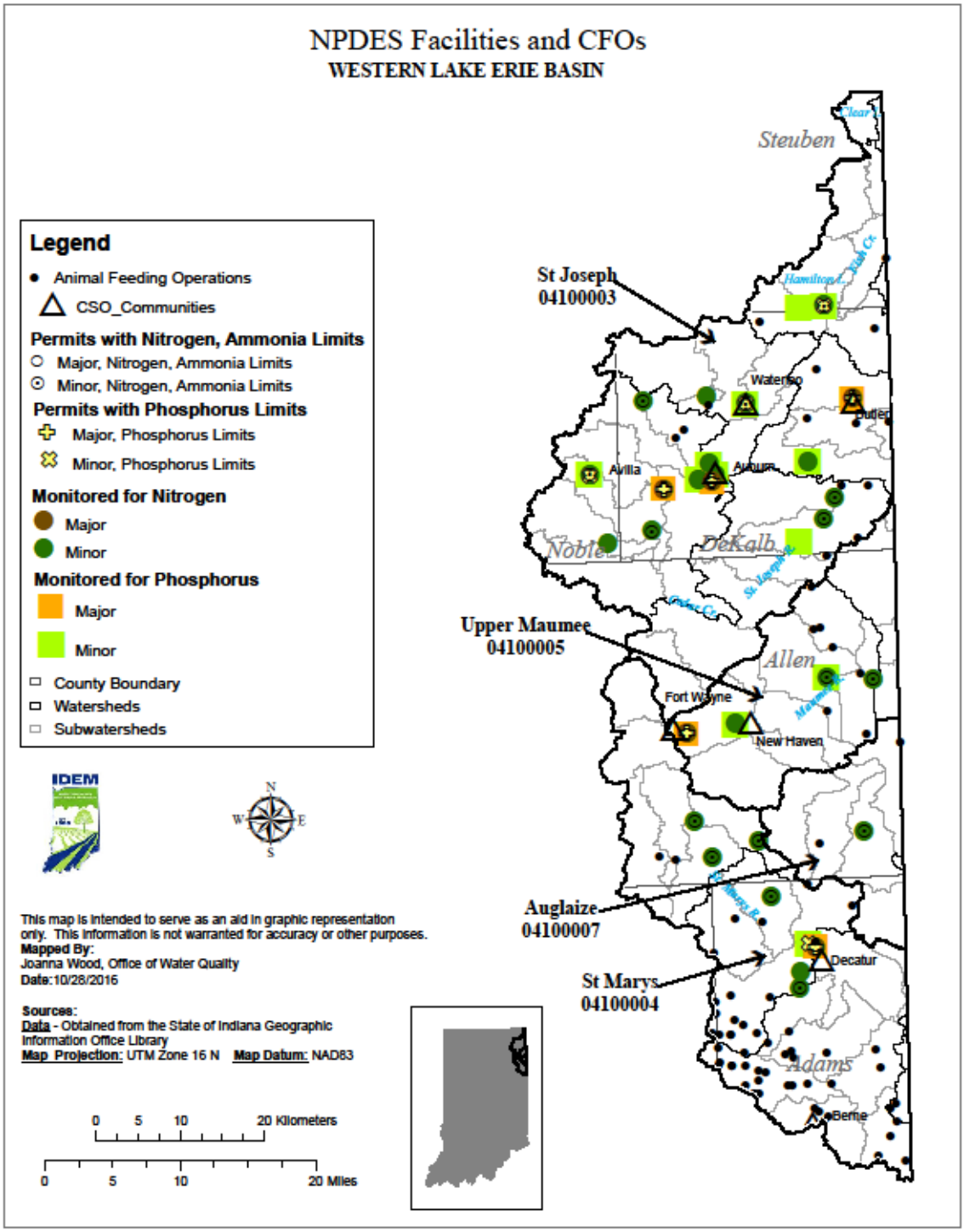
[9] CSOs are wastewater collection systems that convey sanitary wastewaters (domestic, commercial, and industrial wastewaters) and storm water through a single-pipe system to a Publicly Owned Treatment Works (POTW). A CSO is the discharge from a combined sewer system at a point prior to the POTW. CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality-based requirements of the Clean Water Act (CWA).

[10] MS4s are defined as a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water. Regulated conveyance systems include roads with drains, municipal streets, catch basins, curbs, gutters, storm drains, piping, channels, ditches, tunnels, and conduits. It does not include CSOs and POTWs.

[11] Additionally, a CFO is any animal feeding operation electing to be subject to IC 13-18-10; or any animal feeding operation that is causing a violation of water pollution control laws, any rules of the board; or of IC 13-18-10.

[12] There are many livestock and poultry farms located in the WLEB that do not meet the definition of CFOs and are not specifically regulated under Indiana Code.

Figure 2: NPDES Facilities and CFOs



WATERSHED PRIORITIZATION

At the 8-digit hydrologic unit code (HUC)[13] scale, the watershed contributing the most TP to the Maumee River is the St. Marys.[14] This determination is based on an analysis of water quality monitoring data from IDEM's 12 WLEB fixed station sites for the period 2008 through 2015 and is corroborated by subsequent analyses of vetted water quality monitoring data collected more frequently by local entities. Various models show the highest TP concentrations and loads in the St. Marys watershed; DRP was not collected at the IDEM fixed station sites during that period[15]. Additionally, using the FWMC of 0.23 mg/L as a target, the load duration curves show the results from most of the sampling events exceed the target for TP across all flow conditions signifying both point sources and nonpoint sources of TP. Point sources such as WWTPs (or sources that behave as point sources, such as septic systems) discharge regularly, regardless of weather. Thus, during normal or low-flow conditions, nutrients and other pollutants associated with point sources are present in the stream. Whereas, in precipitation driven, high-flow conditions, including storms and snow-melt, nonpoint pollution sources predominate. (Appendix 2 includes a description of the analysis as well as station-by-station results). Figure 3 depicts the FWMC at each of IDEM's fixed station sites.

Prioritizing at the 12-digit HUC watershed scale is important because ambient water quality changes occur more quickly at a smaller watershed scale in response to targeted land-based BMPs and reductions in point source discharges. The process employed by the DAP Advisory Committee to prioritize at the sub-watershed scale included mapping critical areas from watershed management plans (WMPs) along with NRCS modeled areas of greatest phosphorus export potential, and then overlaying them with vetted water quality data to identify the intersections (see Figure 4). The water quality data from the Allen County SWCD, City of Fort Wayne, and the Tri-State Watershed Alliance were grab samples collected weekly as opposed to monthly by IDEM; thus, these data are more likely to capture storm events. The intersections are ranked as the top priorities and the hypotheses and actions proposed to address them serve as the basis of the adaptive management plan included in this DAP. Only those 12-digit HUCs where there are monitoring data are priority ranked. Those watersheds identified by either the NRCS prioritization tool or the critical areas in the WMPs are identified as alternative groups one through three and are colored in different shades of grey on the map to indicate areas where additional monitoring will be prioritized in the future.

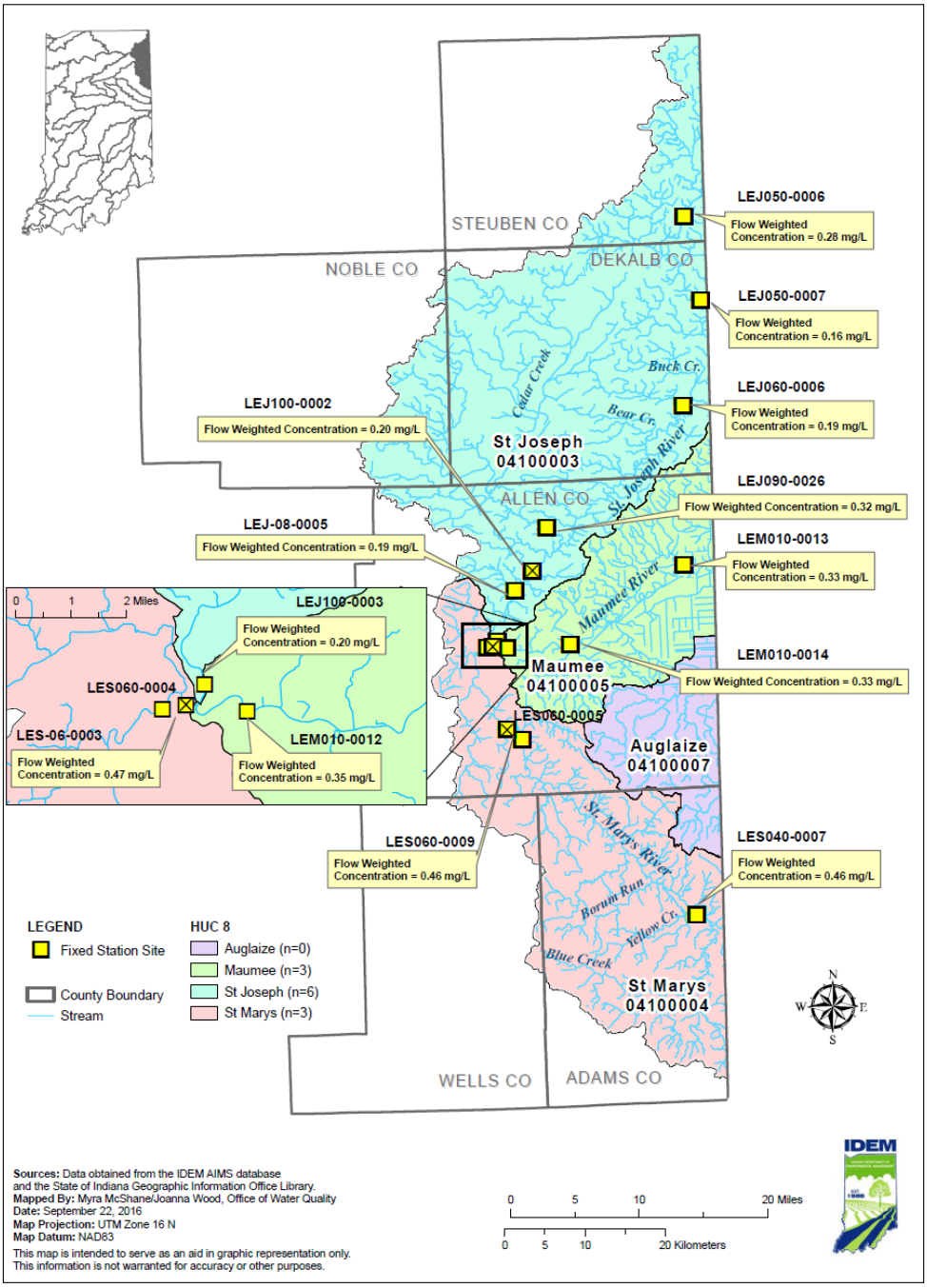
[13] Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (Regions) to smallest (Cataloging Units). The term watershed is often used in place of drainage basin. The smaller the HUC number, the larger the drainage area. For example, a HUC 8 watershed is larger than a HUC 12.

[14] Albeit the St. Marys watershed is identified as the major exporter of TP requiring attention, many efforts are underway and are being planned for all of the 8-digit HUC watersheds within the WLEB.

[15] Sampling for DRP at the IDEM fixed station sites will commence in 2018.

Figure 3

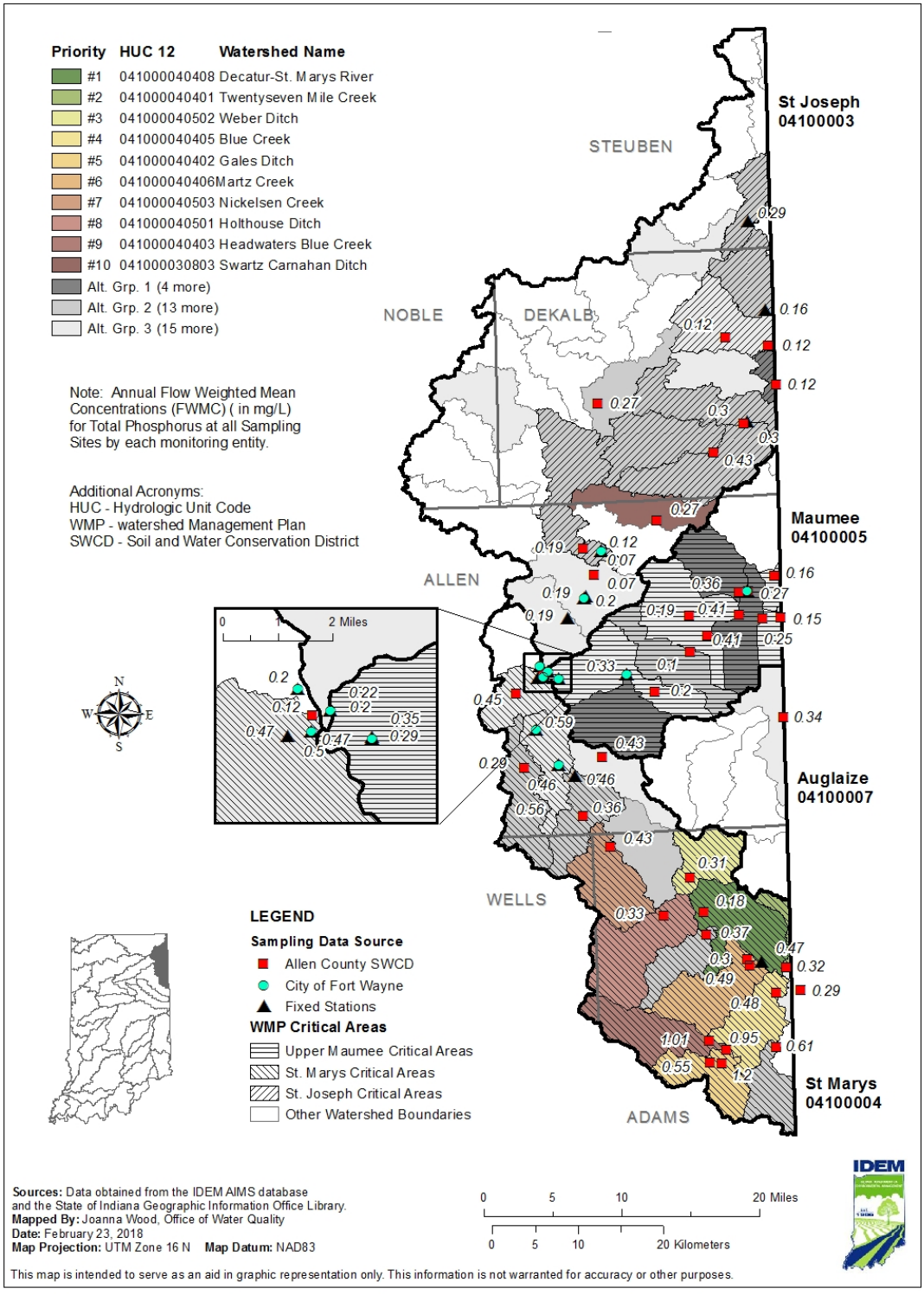
Total Phosphorus Loading at Fixed Station Sites
of the Western Lake Erie Basin



Sources: Data obtained from the IDEM AIMS database and the State of Indiana Geographic Information Office Library.
Mapped By: Myra McShane/Joanna Wood, Office of Water Quality
Date: September 22, 2016
Map Projection: UTM Zone 16 N
Map Datum: NAD83
This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Figure 4

Priority Watersheds in the Western Lake Erie Basin in Indiana



GUIDING PRINCIPLES FOR ACHIEVING WATER QUALITY IMPROVEMENTS

Opportunities exist to reduce nutrient inputs from both urban and rural landscapes, including both point and nonpoint sources. Emphasis is on using existing regulatory instruments and implementing voluntary BMPs.

Point Sources/Regulated

Urban Rural

- WWTPs and POTWs will employ optimization techniques by analyzing their current operation and maintenance processes to seek better nutrient removal.
- CSO communities will implement their LTCPs and associated compliance schedules and track progress. Nutrient load reductions will be quantified via modeling and, where possible, by ambient water quality monitoring as projects and practices are implemented.
- Storm water management:
  - MS4 communities will implement their SWQMPs and track progress.
  - Construction site sediment runoff controls will be implemented according to the Notice of Intent (NOI)[16] and living stabilization covers will be used that minimize nutrient inputs.
  - Industrial site runoff controls will be implemented according to the NOI.
- Extend sewers to communities with failing septic systems by putting infrastructure in place.
- Septic system installation, operation, maintenance, and repair:
  - Will follow the site specific design regulations.
  - Will utilize existing county outreach programs in the WLEB as a model.
  - Will provide additional outreach and education on design and repair requirements.

Agriculture

- Ensure compliance with the CFO and Fertilizer Certification rules via routine inspections.
- Timely investigate reports of nutrient mismanagement or runoff from regulated farms and spills from unregulated farms.

Nonpoint Sources

The overall goals will be to enhance nutrient management, promote soil health practices, and restore more natural hydrology and ecological functions by promoting drainage water management (rather than moving water off the landscape quickly) and emphasizing the importance of allowing water to infiltrate where it falls.

Hydromodification is the alteration of the natural flow of water through a landscape that reduces precipitation infiltration and changes drainage patterns causing rainfall to discharge into streams more quickly with higher energy. Large flow events occur more frequently and local drought and flood cycles may be exacerbated. The United States Environmental Protection Agency (U.S. EPA) indicates that hydromodification is one of the leading sources of water

[16] The application for a Construction Site Run-off general permit is called a Notice of Intent, or NOI, because the "applicant" or "project site owner" is notifying IDEM of his or her intent to operate their proposed construction project in a manner consistent with the Rule. The applicant follows all guidelines and requirements for submittal of the general permit.

quality degradation in our nation's waters.[17] Examples of hydromodification include channelization and dredging; streambank denuding; removal of riparian corridors, wetlands, and floodplains; stream relocation; dams; streambank and shoreline hardscapes; subsurface drainage (agricultural and residential); and conversion of open landscape to roads, buildings, parking lots, and other impervious surfaces. These changes to flow result in higher sedimentation and nutrient loading to our waterways as well as higher water temperatures, lower dissolved oxygen, degradation of aquatic habitat structure, and declines in biological communities.

Opportunities for mitigation include but are not limited to the following approaches:

Urban landscapes: create a green infrastructure (GI) paradigm by seeking incentives and opportunities for it.[18]

- Support practices that promote infiltration, bio-retention, and slow or more natural water release.
- Seek the installation of larger, regional or multipurpose GI practices that are often more cost-effective.
- Ensure that the maintenance of GI practices is included in cost estimates and budgets.
- Provide technical and financial support to install rain gardens, green roofs, rain barrels, and porous pavement in industrial, commercial, and residential settings.

Rural landscapes:

- Restore stream sinuosity and riparian buffers.
- Restore and reconnect riparian wetlands and floodplains.
- Employ practices from the *Indiana Drainage Handbook* for the maintenance of legal drains such as retaining native vegetation on one streambank while staging maintenance equipment on the side with easier drain access.
- Install 2-stage ditches where feasible on both regulated and non-regulated drains.
- Install drainage water management BMPs and saturated buffers on working lands.

Agricultural landscapes:

- **Promote nutrient management**:
    - Optimize inputs and uptake by crops through employing the "4 Rs" namely, applying the right nutrient source at the right rate at the right time in the right place.
    - Increase outreach on manure management to livestock farms.
- **Emphasize soil health**: Healthy soil with a higher organic content reduces erosion, requires less nutrient inputs, ameliorates the effects of flood and drought, and reduces nutrient and sediment loading to streams and rivers. The four key principles to increasing organic matter and building healthy soils are:
    - Minimize disturbance through no till or conservation tillage practices.

[17] National Management Measures to Control Nonpoint Source Pollution from Hydromodification, EPA 841-B-07-002, July 2007.
[18] U.S. EPA's website for Green Infrastructure is a great resource for design and implementation measures as well as funding sources, and Indiana's manual entitled the *Planning and Specification Guide for Effective Erosion and Sediment Control and Post-Construction Water Quality* shows pollutant removal expectations for the various BMPs.

- Maximize soil cover.
- Keep living roots growing as long as possible.
- Grow a variety of plants.

MAJOR ACTIONS FROM 2008-2016

Since 2008, the base year from which progress is being measured, policies, and various programs and practices have been implemented to reduce nutrients from entering Indiana's waters. An excellent overview of many of the past and ongoing activities is provided in the Western Lake Erie Basin Story Map, and the current and planned activities to address the issues outlined in this DAP are enumerated in the Action/Milestone Table at the end of this document. A listing of a few key major actions follow.

Regulatory

- 2010 (readopted 2016) - 355 IAC Article 7: Certification for Distributors and Users of Fertilizer Material
  - Rule administered by the Indiana Office of the State Chemist (IOSC) to ensure fertilizer materials are applied, handled, and transported effectively and safely in a manner that protects water quality.
  - Pertains to:
    - Application of manure from an IDEM regulated CFO and out-of-state farms that meet IDEM regulatory thresholds.
    - For-hire applications of commercial fertilizer and manure.
- 2012 - 355 IAC Article 8: Fertilizer Material Use, Distribution, and Recordkeeping.
  - Requires routine soil sampling.
  - Requires nutrient application based on agronomic needs of crops grown.
  - Contains limits for manure application from all farms based upon volume of manure production with limited exceptions for farms with less than 10 cubic yards or 4,000 gallons of manure.
- 2012 - Confined Feeding Operation Rule 327 IAC 19: The program has three main areas of focus to protect ground and surface water:
  - Design, construction, and capacity requirements for confinement buildings, manure storage structures, and other waste management structures.
  - Operation and maintenance requirements including self-inspections, record keeping, and spill response.
  - Land application requirements including setbacks, application at agronomic rates, and avoiding weather conditions that could lead to contaminated runoff, such as restrictions on application to frozen and snow-covered ground.
  - Soil P is not to exceed 200 parts per million (PPM) by 2018.
- 2012 - Concentrated Animal Feeding Operation Rule 327 IAC 15-16.
  - Adopted federal rule by reference which applies to livestock operations that discharge to waters.
  - As of October 2017, no regulated farms in Indiana are discharging from the production site so none require a discharge permit of this type.

- 2015 - Satellite Manure Storage Structures Rule 227 IAC 20.
    - IDEM Regulates manure storage structures not located at the site of a livestock or poultry production area if they will store:
        - At least one million gallons of manure; or
        - At least 5000 cubic yards of manure.
    - The same construction standards apply as if the structure were located at aCFO.
    - Operational requirements are similar to those established for manure storage structures located at a CFO.
- 2015 - All CSO communities have an approved LTCP or other state or federal enforceable mechanism in place.

Non-regulatory

- 2010 - Indiana Department of Natural Resources (IDNR) and IDEM became official members in the Indiana Conservation Partnership (ICP).[19]
- The Indiana Nutrient Management/Soil Health Strategy, developed by representatives of the agricultural commodities' organizations, was incorporated into *Indiana's State Nutrient Reduction Strategy* as the action plan for agriculture.
- InField Advantage (formerly On Farm Network) was established at the Indiana State Department of Agriculture (ISDA).
- 2016 - Version 4 of *Indiana's State Nutrient Reduction Strategy* was put on the ISDA website and is being converted into a story map.

Watershed Planning

- 2015/2016 - *Indiana Western Lake Erie Action Plan*.
- March 2016 - Western Lake Erie Basin Partnership Strategic Plan and Western Lake Erie Basin Initiative Strategy, Years 2016-2018.

Approved CWA §319 Watershed Management Plans[20]

- 2008 - *St. Joseph River (Lower)-Bear Creek WMP*.
- 2009 - *St. Mary's River WMP*.
- 2013 - *St. Joseph River (Middle) WMP*.
- 2014 - Maumee River (Upper) WMP.
- 2015 - *St. Joseph River (Upper) WMP*.

[19] The ICP is comprised of eight Indiana agencies and organizations who share a common goal of promoting conservation. To that end, its mission is to provide technical, financial and educational assistance needed to implement economically and environmentally compatible land and water stewardship decisions, practices and technologies. The eight entities include: Indiana Association of Soil and Water Conservation Districts (IASWCD) and the 92 SWCDs, State Soil Conservation Board, Indiana State Department of Agriculture (ISDA) Division of Soil Conservation, IDNR, IDEM, Purdue University Extension Service, USDA Farm Services Agency (FSA) and USDA Natural Resources Conservation Service (NRCS).

[20] WMPs for Cedar Creek and St. Joseph River (Maumee) WMP (including Ohio and Michigan portions) were approved prior to 2008 as was a TMDL for the St. Marys and Maumee rivers.

PARTNERS AND AREAS OF AUTHORITY/RESPONSIBILITY AND PROGRAMS TO ADDRESS NUTRIENT REDUCTION

The federal, state, county, and municipal regulatory authorities are outlined in this section along with funding mechanisms ranging from cost-share programs, grants, and loans to storm water utility fees. Technical, financial, and managerial assistance is available for the implementation of programs and projects from all levels of government, academia, nongovernmental organizations (NGOs), businesses, and concerned citizens. Implementation occurs at the local community level on both public and private lands with subsequent watershed and regional water quality benefits for the WLEB.

Cities and Towns (taxation and utility fee authority)

- Comprehensive planning.
- Zoning ordinances.
- Building permits.
- Infrastructure.
    - Transportation.
    - Drinking water.
    - Wastewater.
    - Storm water.
- Parks and Recreation.
    - Management of city owned public lands.
- Surface water quality monitoring (some).

Counties (taxation and drainage assessment authority)

- Comprehensive planning.
- Drainage board.
    - Legal drains.
    - Some with MS4 oversight.
- Storm water (some with MS4 oversight).
    - Public outreach and education program.
    - Illicit discharge detection and elimination program.
    - Construction and post construction storm water run-off control program.
    - Pollution prevention and good housekeeping program.
    - Storm water pollution prevention plans.
- Wellhead protection.
- Source water protection.
- Parks and Recreation.
    - Management of county owned public lands.
- Health Departments.
    - Septic system permitting.

    - Some with surface water quality oversight.
    - Some with hazardous materials spill response.
- Soil and Water Conservation Districts.
    - Construction storm water control plan review and inspection program (327 IAC 15-5).
    - Education and outreach.
    - Technical assistance with conservation planning and practices.
    - Some provide surface water quality monitoring.
    - Funding sources include local, state, and federal grant opportunities as well as partnering with non-governmental organizations for watershed planning and BMP installation.

Indiana Department of Environmental Management

- National Pollutant Discharge Elimination System (NPDES) permitting and compliance (327 IAC 5-2-2).
    - Municipal, semi-public, state, or federal (sanitary-type discharger).
    - Industrial.
    - Pre-treatment.
    - Constructed wetland (non-rule policy).
    - Stormwater.
        - Municipal.
        - Industrial.
        - Construction.
- Wetland CWA §401 water quality certifications and State isolated wetland permitting.
- CFOs and concentrated animal feeding operations (CAFO).
    - Design and construction standards for manure storage structures.
    - Land application requirements.
    - Operational requirements for the facility.
- Surface water and ground water quality monitoring.
- Drinking water oversight, wellhead, and source water protection plans.
- Natural resource damage program.
- Watershed programs.
    - Total maximum daily load (TMDL): Section 303(d) of the CWA established authority for the TMDL program designed to determine the extent of impaired waters[21] and develop reports that identify the causes of the impairment, the reductions of pollutants needed, and the actions needed to improve water quality. The 303(d) List of Impaired Waters is used by IDEM and other ICP cost-share programs to help prioritize watershed restoration activities.

[21] Impaired waters do need meet designated water quality standards and do not support one or more designated uses, such as recreational, protection of aquatic life, drinking water, and fish consumption.

- Nonpoint source program § 319(h) and 205(j) grant administration: Named for the portion of the CWA that authorizes each of these programs, they are federal pass-through grant programs aimed at improving water quality in the state.
  - § 319(h): Provides funding for various types of projects that work to reduce NPS water pollution. Funds may be used to conduct assessments, develop and implement TMDLs and WMPs, provide technical assistance, demonstrate new technology, and provide education and outreach. Organizations eligible for funding include nonprofit organizations, universities, and local, State or Federal government agencies. A 40 percent (non-federal) in-kind or cash match of the total project cost must be provided.
  - 205(j): Provides for projects that gather and map information on nonpoint and point source water pollution, develop recommendations for increasing the involvement of environmental and civic organizations in watershed planning and implementation activities, and to develop watershed management plans.

Indiana Department of Natural Resources

- Flood control and floodway management (312 IAC 10).
  - Dams, dikes, and levees.
  - Logjam removal.
- Construction on a public freshwater public lake (IC 14-26-2, 312 IAC 11).
- Construction in a navigable waterway (IC 14-29-4).
- Mineral extraction from a navigable waterway (IC 14-29-3).
- Well construction and withdrawal (IC 25-39, 312 IAC 13).
- Invasive species control.
- Lake and River Enhancement Grant program (IC 6-6-11-12.5): The goal of the Division of Fish and Wildlife's Lake and River Enhancement (LARE) Program is to protect and enhance aquatic habitat for fish and wildlife, and to insure the continued viability of Indiana's publicly accessible lakes and streams for multiple uses, including recreational opportunities. This is accomplished through measures that reduce nonpoint sediment and nutrient pollution of surface waters to a level that meets or surpasses state water quality standards.

Indiana State Department of Agriculture

- InField Advantage (INFA) program: The INFA program is a collaborative opportunity for farmers to collect and understand personalized, on-farm data to optimize their management practices and to ultimately improve their bottom line while benefitting the environment. Participating farmers use precision agricultural tools and technologies such as aerial imagery and the corn stalk nitrate test, to conduct research on their own farms to determine nitrogen use efficiency in each field that they enroll.

- Clean Water Indiana (CWI) grant program: Administered by ISDA under the direction of the State Soil Conservation Board, the CWI is supported through the Indiana cigarette tax revenue on a biannual basis to provide financial assistance to landowners and conservation groups. The financial assistance supports the implementation of conservation practices that reduce NPS of water pollution through education, technical assistance, training, and cost-share programs. The program is responsible for providing local matching funds, as well as competitive grants for sediment and nutrient reduction projects through Indiana's SWCDs.
- Phosphorus soil sampling program through a U.S. EPA grant.
- Through ICP data sharing, tracking of sediment and nutrient load reductions on all assisted (cost-share) conservation practices/BMPs using the U.S. EPA Region 5 model.
- In cooperation with the Indiana Association of Soil and Water Conservation Districts (IASWCD), the Conservation Cropping Systems Initiative (CCSI) focuses on a management system approach to crop production that results in improved soil and water quality as well as profitability on Indiana cropland.

Natural Resource Conservation Service (the Agricultural Act of 2014 - financial and technical assistance for conservation planning and practice implementation)

- Environmental Quality Incentives Program (EQIP): The EQIP is a voluntary conservation program that helps agricultural producers in a manner that promotes agricultural production and environmental quality as compatible goals. Through EQIP, farmers and ranchers receive financial and technical assistance to implement structural and management conservation practices that optimize environmental benefits on working agricultural land. EQIP is open to all eligible agricultural producers without discrimination or bias.
- Conservation Stewardship Program (CSP): CSP helps farmers build on their existing conservation efforts while strengthening their operations. NRCS can custom design a CSP plan to help farmers looking to improve grazing conditions, increases crop yields, or develop wildlife habitat. NRCS helps farmers schedule timely planting of cover crops, develop a grazing plan that will improve their forage base, implement no-till to reduce erosion, or manage forested areas in a way that benefits wildlife habitat.
- Great Lakes Restoration Initiative (GLRI): GLRI helps NRCS accelerate conservation efforts on private lands located in the WLEB. Through GLRI, NRCS works with farmers and landowners to combat invasive species, protect watersheds and shorelines from nonpoint source pollution and restore wetlands and other habitat areas.
- Wetland Reserve Easements (WRE): The Agricultural Conservation Easement Program (ACEP) provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Under the WRE component, NRCS helps to restore, protect and enhance enrolled wetlands.

- Western Lake Erie Basin Initiative (WLEB): The WLEB was made a priority area by USDA as agricultural land was determined to be one of the sources of increased phosphorus in surface water due to water and wind erosion.
- Regional Conservation Partnership Program (RCCP): The RCPP promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements. Indiana's priorities are: water quality, soil quality, and at-risk species habitat.
- Conservation Technical Assistance (CTA): The CTA program provides voluntary conservation technical assistance to landowners, communities, tribes, units of state and local government, and other federal agencies in planning and implementing conservation systems. This assistance is for planning and implementing conservation practices that address natural resource issues. It helps people voluntarily conserve, improve and sustain natural resources.

Agricultural Research Service

- Research and edge-of-field monitoring.

United States Geological Survey

- Stream flow gage operation and maintenance.
- Stream monitoring.
- Edge-of- field monitoring.

Indiana Conservation Partnership

- ICP Accomplishment Reporting: In 2013, members of the ICP adopted the U.S. EPA Region 5 Nutrient Load Reduction Model that determines the sediment, nitrogen, and phosphorus load reductions achieved through conservation practices funded through the afore-mentioned state programs (ISDA's Clean Water Indiana Program and the IDNR Lake and River Enhancement Program), and the federally funded programs including the IDEM administered Section 319 Program and USDA's Farm Bill Programs.
- Tillage and cover crop transects.
- Annual Work Plan to bolster collaboration among the partners and leverage resources.

The Nature Conservancy (funding activities through a combination of public and private grants and donations)

- TNC Western Lake Erie Basin Agriculture Project (tristate).
    - 4R Nutrient Stewardship Certification Program.
    - Education and outreach.
    - Implementation and monitoring work on three miles of two-stage ditch.

- Support water quality sampling in the St. Joseph watershed.
- Efforts on two-stage ditches led to first cost-share and NRCS practice.

Agriculture Organizations

- Nutrient Management/Soil Health Strategy adopted in 2012 through collaboration of agriculture organizations, TNC, Purdue, and government agencies.
- Support addressing nutrient loss from agricultural lands through enhancements like improved awareness by farmers, bolstering research and monitoring, more widespread education and implementation of practices to reduce nutrient loss, improving soil health, and increasing edge-of-field water management.

WATER QUALITY MONITORING

To track Indiana's progress in meeting its P target loads on the Maumee River, the Advisory Committee determined that the most representative site is at Antwerp, Ohio, which is 7.6 river miles downstream of the Indiana border. The USGS operates both a stream-flow gage and an auto-sampler there, and follows the recommended Annex 4 protocol with collection of the necessary parameters (See Table 3). Originally, the Advisory Committee proposed using the IDEM, Allen County SWCD, and the City of Fort Wayne fixed station site on State Road 101, which is 5.6 river miles upstream of the border; however, this site misses some of Indiana's pollution contribution as interceptor ditches on each side of the Maumee River discharge downstream of this location. Field reconnaissance revealed that there is no safe, accessible site directly on the Indiana border and that land use from the border to Antwerp is consistent with land use from State Road 101 to the border making it the best site.

Results for TP at the Antwerp site calculated by the Ohio USGS show that the FWMC has been two to three times higher than the value calculated from the IDEM fixed station site at SR 101 over the Maumee.[22] While a difference is not surprising given the greater frequency of collection at the Antwerp site which captures high-flow events, the magnitude is significant. Further analysis of the Allen County SWCD and Fort Wayne weekly grab sample data show a pattern, albeit much lower, consistent with the Antwerp data. While it is highly probable that the difference between the two sites is due to grab sampling missing peak and high flows at SR 101, to verify this and validate that using the Antwerp site is the best choice for Indiana, the USGS will install and operate an auto-sampler at SR 101 for a period of not less than 12 months. By so doing, an "apples to apples" comparison of the two sites can be made so that there is no question or concern regarding using the Antwerp site to measure Indiana's progress.

To optimize resources and establish a regional network, IDEM, Indiana USGS, Ohio Environmental Protection Agency (OEPA), Ohio Department of Natural Resources (ODNR), Ohio USGS, and U.S. EPA Region 5 are collaborating on monitoring activities. Ohio will continue to support the USGS monitoring activities at Antwerp and is supporting the addition of a USGS continuous monitoring multi-parameter sensor there that will provide real-time data via the

[22] http://lakeerie.ohio.gov/

USGS website. To characterize their respective contributions of phosphorus loads across their borders, Indiana and Ohio establish as priorities the following new monitoring sites:

- The St. Marys River at Wilshire, OH. Ohio is funding USGS auto-sampler monitoring through a U.S. EPA GLRI grant for a minimum of three years.
- On the St. Joseph River at Newville, OH. Ohio is funding USGS auto-sampler monitoring through a U.S. EPA GLRI grant for a minimum of three years.
- The St. Marys prior to its confluence with the St. Joseph to form the Maumee. Indiana is funding USGS auto-sampler monitoring through a U.S. EPA GLRI grant for a minimum of three years. The purpose of this sampling is to better characterize nutrient loading on the St. Marys within Indiana's borders. The auto-sampler will be located at the current IDEM sampling location on Ferguson Road. This site has a drainage area of less than 1 percent difference from the USGS streamgage and can be considered co-located. Water-quality samples will be collected at low-, moderate-, and high-flow conditions during routine monthly and event trips.

Table 3. Water Quality Monitoring Parameters that are/will be Collected and Frequency

Parameters	Number of samples per visit		Approximate number of samples per year at each site	Notes
Total Kjehldahl Nitrogen (mg/L-N) *[TKN]* **Total nitrogen** (mg/L-N) *[TN]* **Dissolved ammonia** (mg/L-N) *[NH4]* **Dissolved nitrate + nitrite** (mg/L-N) *[NO3+NO2]* **Orthophosphate** (mg/L-P) *[PO_4]* **Total phosphorus** (mg/L-P) *[TP]* **Suspended sediment** (mg/L-P) *[SS]* Sample Type	Equal-width increment sample	Autosampler		
Monthly samples	1 sample	1 sample	About 24	May coincide with even samples. Drought, ice, or other unfavorable conditions may impede the collection of monthly samples.
Event samples (5–8 events)	1 sample	4 – 6 samples	20 – 48	May coincide with monthly samples.
Selected baseline samples	-	1 sample	2 – 8	Autosampler triggered before an event.
Selected smaller events	-	1 – 4 samples	2 – 8	Autosampler samples picked up after a smaller event.

To better characterize sources and thereby provide a more rigorous baseline for setting nutrient loading targets in the sub-watersheds, Indiana is planning to install in the 2018-2019 period the following:

- A USGS operated and maintained auto-sampler on the Maumee River at the Landin Road bridge to help determine the influence of urban storm water;
- An auto-sampler at or near the IDEM fixed station site on the St. Marys River at Pleasant Mills to evaluate the nutrient load reductions achieved by the Adams Co. Regional Sewer District (RSD) sewer extension project; and
- Stream-flow gages in the Blue Creek Watershed and perhaps, stream flow gages on the interceptor ditches.

These additional monitoring sites will constitute a higher resolution water sampling data set from which to measure progress in reducing nutrient loads.

MEASURING AND REPORTING PROGRESS

Indiana is participating in the Great Lakes Commission (GLC) pilot project for the WLEB to develop a consistent reporting framework, entitled ErieStats, for the states and Ontario to report their progress in meeting the GLWQA lake ecosystem objectives. The first product of that pilot will be available in February of 2018. Toward that end, Indiana has provided the GLC with its current and proposed tracking tools for consideration in developing ErieStats.

In addition to participating in the domestic and binational efforts to track and report progress under the GLWQA Annex 4, such as ErieStat, Indiana will continue using the following methods for tracking and annually reporting its progress:

- Ambient water quality monitoring data for the fixed station grab sample sites operated at the state, local, and municipal levels. The reporting frequency for the USGS auto-sampler sites will be at least annually and perhaps more frequently.
- Edge-of-field (EOF) monitoring data.[23]
- Tillage and cover crop transect data.
- The nutrient load reductions calculated using the Region 5 BMP load reduction model for all ICP assisted conservation practices.
- POTW discharge monitoring reports are submitted monthly and will be graphed annually.
- Pertinent information from MS4 annual reports will be compiled and reported annually.
- LTCP pertinent progress will be reported annually.
- Cost-share program project milestones and updates.
- Social indicator survey work for farmers will be reported as available.

In addition to the monitoring and reporting noted above, the DAP Action/Milestone Table (Appendix 1) includes the various project implementation schedules and where feasible, the nutrient load reductions associated with those activities. The year 2020 will serve as a checkpoint for cross-referencing the expected rates for BMP implementation and their modeled load reductions with EOF and ambient water quality data to see how effective the programs and BMPS are. This will serve as an opportunity for adaptive management and any necessary shifting of priorities or approaches.

Challenges

1. **Precipitation Events and Temperature**

   According to the Great Lakes Integrated Sciences and Assessments Center, a joint effort of the University of Michigan and Michigan State University, anticipated increases in average temperatures and wet-season precipitation will have an adverse impact on algal

[23] EOF done for research purposes will not be available until the studies are published.

levels in the Great Lakes (http://glisa.umich.edu/media/files/GLISA_climate_change_summary.pdf).

The center reports that annual average temperatures in the Great Lakes region in the United States have increased by two degrees Fahrenheit since 1900 and are expected to increase by another 1.8 to 5.4 degrees F by 2050 and 3.6 to 11.2 degrees F by 2100. Total annual precipitation in the region has increased by 10.8 percent since 1900 and is expected to continue to increase, particularly during the spring.

The impact of higher average temperatures and increased springtime rainfall, along with other expected changes, such as increased stratification of lake water temperatures, could increase the threat of algal blooms in the lakes, particularly Lake Erie. "Stronger storms, warmer temperatures, and nutrient loading are conspiring to produce more hypoxic dead zones and toxic algal blooms," the center states.

2. **Rural Population Growth and Expansion of Unregulated Livestock Operations**

   Local accounts indicate that there has been and continues to be more farmland acquisition by nontraditional landowners for livestock operations with animal counts below the threshold for regulation by IDEM's Confined Feeding Operation Rule 327 IAC 19. *Local officials have expressed concern regarding their preclusion by State law to regulate the activities associated with livestock production.*

3. **Influx of Manure from Out-of-State**

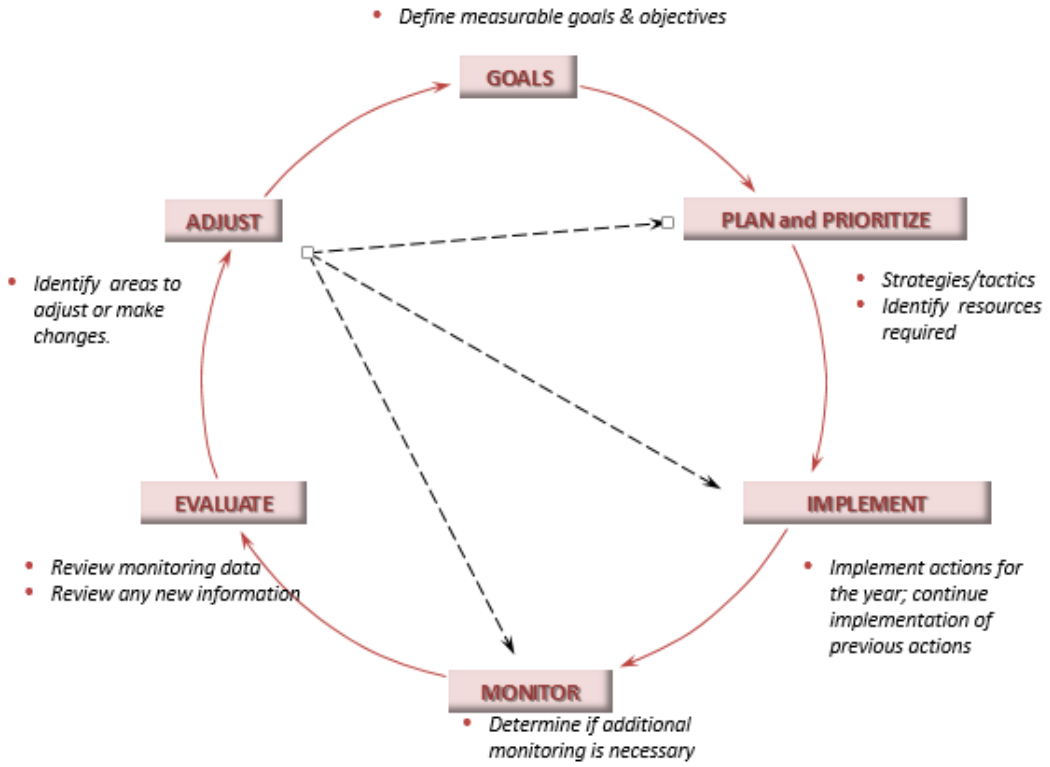
   Manure generated from farms outside of Indiana is not regulated under Indiana's land application rule, and many farmers in the WLEB own farms in both Indiana and Ohio. With the expansion of poultry farms in southwest Ohio and the passage of Ohio's ban on manure application in the Grand Lake St. Marys watershed from December 15th to March 1st, the incentive to transport manure into Indiana may increase.

Noting Indiana's WLEB baseline conditions for these issues during 2018 and then tracking trends in them, particularly issues 2 and 3 above, will help determine if changes in policy, programs, regulations and/or incentives will be required to effectively manage any associated increases in nutrients derived from them.

ADAPTIVE MANAGEMENT

Vital to Indiana's success in implementing this DAP is an adaptive management strategy that tests the hypotheses put forth in the DAP and applies the lessons learned therefrom to future management decisions.

Figure 5: Adaptive Management



Indiana will continue to participate on the Annex 4 overarching binational Subcommittee and with its related task teams and work groups to stay abreast of the evolving science, to provide input, and to seek further direction for continued efforts in addressing nutrient related problems in Lake Erie. If new data and information evaluated within the context of the current assumptions and management strategies for Lake Erie (and the WLEB in particular) determine that phosphorus or other targets need to be adjusted, Indiana will take that into account for modifying its DAP.

Hypotheses/Tactics

1. <u>Measuring Progress on the Maumee</u>
   The Advisory Committee will test its hypothesis that there is no statistical difference in the FWMC for TP between the Antwerp, OH USGS monitoring site and the Indiana SR 101 fixed station site by installing for a period of at least 12 months, the same auto-sampling protocol at SR 101 that exists at Antwerp. If this hypothesis is true, then Indiana will decommission the SR 101 auto-sampler and proceed with using the Antwerp, OH site as its site for measuring progress in meeting its commitment for TP and DRP target loads on the Maumee.

   If there is a statistical difference between the two sites, then Indiana will seek resources to maintain the auto-sampler at SR 101 and investigate for potential nutrient sources between the SR 101 site and the Antwerp site. Based on the findings, the Advisory

Committee will re-evaluate where the most representative monitoring site should be located in order to determine Indiana's progress and proceed with establishing that site.

2. Priority 8-digit HUC and 12-digit HUC Watersheds
   Based on available data and the various analyses completed by the Advisory Committee, the watershed contributing the most P to the Maumee River is the St. Marys and within it, the Blue Creek 12-digit HUCs are the top priorities. (See Appendix 2) The major sources appear to be failing septic systems in the unincorporated areas of Adams County and unregulated livestock operations.

   Major actions are underway to address these issues. The Adams County Regional Sewer District (RSD) is extending sewers to the communities of Pleasant Mills, Arcadia Village, Rivare, Linn Grove, and Monmouth/Roe Acres.

   Adams County, local producers and private landowners are constructing two emergency manure storage lagoons, one in the northern part and one in the southern part of the county to prevent manure application on frozen ground and to prevent excessive application. Further education and outreach on nutrient management is underway and a process for timely response to reports of manure mismanagement is being formalized.

These actions will be documented and monitored and additional stream data sampling will be conducted. An auto-sampler will be installed in close proximity to the IDEM fixed station site in Pleasant Mills and sampling will follow the protocol indicated in Table 3. The Advisory Committee postulates that sewering Pleasant Mills will result in decreased phosphorus loads to the receiving stream within a few years. Likewise, providing emergency manure storage lagoons should decrease land application during unfavorable conditions. Monitoring data comparing the historic and current conditions to post construction will be evaluated to see if and by how much water quality has improved. Areas of adjustment will be identified if warranted.

Outcomes will be appraised as they manifest and will be reported at least annually. In the last quarter of 2020, the Advisory Committee will evaluate the progress in meeting the goals of this DAP. Based on that evaluation, the priorities, next steps, and necessary adjustments will be implemented and included in a revised DAP within the first quarter of 2021, with a revision cycle of every five years.[24]

Future Endeavors and Resource/Research Gaps

Listed in the DAP Action/Milestone Table (Appendix 1) are specific projects or actions to be carried forth or initiated in the next few years. Listed here are concerns as well as information gaps for which data or research are needed or for which possible actions will be taken, but for which responsible parties and timelines have not been established:

[24] The DAP and the Action/Milestone Table will be web-based. Defined as "dynamic documents," they will updated as new information/data, research findings, and activities evolve. A pdf of the final DAP of February 2018 will be stored on the website to allow for comparisons.

- Use ErieStats upon its development and assess its utility for guiding Indiana's actions to reduce phosphorus to Lake Erie via the Maumee.
- Participate in the Erie P Trading pilot project for WLEB.
    - At this time, Indiana does not have an industrial discharger seeking compliance at an incremental level (meaning that an industrial discharger that is very close to achieving the 1 mg/L TP effluent limit may trade to achieve full compliance); therefore, Indiana will pursue the Stewardship - "adopt an acre" campaign.
- Map wetland and floodplain restoration opportunities.
- Convene a WLEB multi-county septic system workgroup.
- Seek establishment of a federal/binational funding source for a long-term Lake Erie monitoring network.
- Install more auto-samplers at the 12-digit HUC level.
- Implement additional edge-of-field monitoring projects.
- Support/conduct social indicators research on the adoption of BMPs, particularly drainage water management.
- Support/conduct research on drainage water management.
- Continue to support research on nitrogen's role in hazardous algal blooms.
- Research/assess the ratio of invasive species to native species in riparian corridors.

Success in the WLEB

Watershed nutrient pollution in the WLEB is a complex, multi-faceted problem caused by point and nonpoint sources across all sectors of our community. It affects not only those who live, work or recreate in the watershed, but also the ecosystem and economics of the region. To successfully address this problem, a multi-faceted approach is required that includes using existent regulatory instruments and implementing a strong system of voluntary BMPs. Hoosiers are making a positive difference by managing nutrients on their lawns and farms; building healthy soils; and restoring wetlands, floodplains, and streams. This DAP enumerates that much more needs to be done.