ALLIANCE for the GREAT LAKES

FRESHWATER FUTURE

rescuing lake erie

An Assessment of Progress

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Executive Summary

Harmful algal blooms (HABs) have plagued the shallow waters of Western Lake Erie due to a number of factors. Warming temperatures, intense storms and unpredictable thaws have caused increased water flow and runoff from agricultural and urban sources — leading to excessive phosphorus loadings. Three years ago, the city of Toledo, Ohio, lost access to water because of a harmful algal bloom. Two years ago, the Governors of Ohio and Michigan joined with the Premier of Ontario to commit to reducing the amount of runoff pollution flowing into Western Lake Erie by 40 percent. The commitment marked a promise to the people of Lake Erie — a promise of a lake nearly free of harmful algal blooms and a significant reduction in risk to people and the lake. The region's leaders knew, as did the people around the region, that the goal was ambitious but unequivocally necessary.

Commitments to Phosphorus reduction in the WLEB

Agreement	Relevant actors
Western Basin of Lake Erie Collaborative Agreement — 40 percent reduction in phosphorus loadings by 2025 and 20 percent by 2020	Governors of Ohio, Michigan and Premier of Ontario
Great Lakes Water Quality Agreement (Annex 4) — 40 percent reduction in phosphorus loadings to Western and Central basin; no timeline	Binational agreement between governments of Canada and the U.S.

As a means for advancing action and holding the Governors and Premier accountable for this lofty goal, this report establishes a baseline evaluation of state and provincial policy in three key areas to assess regional progress across three jurisdictions, Ohio, Michigan and Ontario, on development and implementation of policies for reducing phosphorus pollution. The findings in this report were compiled using a framework assessment tool developed by the Alliance for the Great Lakes and Freshwater Future. Though not exhaustive, the framework (Appendix A) attempts to define and measure what we've deemed the most significant policies for phosphorus reduction. This framework is built around three key policy areas:

1. Reducing phosphorus pollution from agricultural sources
2. Reducing phosphorus pollution from urban sources
3. Monitoring and reporting of phosphorus loadings and reductions

Consideration is given to both the existence and nature of policies intended to drive practices for reducing nutrient pollution to receiving waters, and accountability and enforcement mechanisms that support these policies.

Key Findings and the Road to 40 percent

Non-existent

*Assigned to areas that have no policy directive **or** policy directives are so narrow in scope and application they are, for all intents and purposes, nonexistent (e.g., permitted CAFO-only policies)*

Incomplete

Assigned to areas that have substantive policy directives but lack completeness due to loopholes or limited oversight or enforcement (e.g., winter spreading restrictions)

Complete

Assigned to areas that have substantial policy directives without loopholes and/or significant oversight or enforcement

Agricultural Policies

	Ohio	Ontario	Michigan
Nutrient reduction planning			
Winter spreading			
Cover crop adoption			
Wetland restoration and natural filtration			
Monitoring and enforcement			

Urban Source Policies

	Ohio	Ontario	Michigan
Wastewater treatment			
Septic system management			
Combined sewer overflows			
Green infrastructure adoption			

Watershed Monitoring and Reporting

	Ohio	Ontario	Michigan
Type of phosphorus			
Watershed scale			
Reporting			

Lakes all over the world, including Lake Erie, are suffering due to an upward trend in nutrient loadings and subsequent eutrophication, leaving the communities that surround them with toxic, unusable water and threatening ecosystems that once thrived. Excess nutrients, such as phosphorus, come from many sources, including wastewater treatment plants, combined sewer overflows, commercial fertilizer and manure. While it is important to acknowledge the contribution of both urban and agricultural sources to this problem, it has been proven that farm runoff from fertilizer and manure is the leading cause of eutrophication lakes — especially the waters of Lake Erie.

With 63 percent of the Lake Erie Basin being used for agricultural production, findings and recommendations in this report place a strong emphasis on increased requirements for agricultural operators.[1] If each jurisdiction is to follow through on its promise of a 40 percent reduction in phosphorus loadings to Lake Erie, commitments to increased agricultural requirements must be made. Without a reduction in agricultural runoff through utilization of a suite of best practices, the health of Lake Erie will continue to decline. Additionally, this report highlights the need for improved urban source pollution policies, including increased innovation and adoption of green infrastructure to mitigate the effects of climate change and aging infrastructure. Finally, a commitment to reduce phosphorus loadings by 40 percent is unachievable without concrete data to identify both progress and achievement gaps. This report underscores the need for robust monitoring and reporting programs in each jurisdiction to identify loadings at their source and take important steps to eliminate pollution.

[1] "A Balanced Diet for Lake Erie: Reducing phosphorus loadings and harmful algal blooms." 2014. http://www.ijc.org/files/publications/2014%20IJC%20LEEP%20REPORT.pdf

Immediate next steps: Winter spreading, nutrient reduction planning and water quality monitoring

Spreading on frozen and saturated ground

Ohio and Ontario each have restrictions for manure or fertilizer application on frozen and snow-covered, ground; however Ontario does not restrict application on saturated ground, while Ohio does. Additionally, both jurisdictions' policies have significant loopholes that allow spreading under these conditions to continue, including exemptions for methods such as incorporation or injections. Michigan has no comprehensive regulations, but instead has a limited policy that applies only to permitted Concentrated Animal Feeding Operations (CAFOs), which are farms with large animal herds. Policies in each jurisdiction should be improved by eliminating existing loopholes to completely ban the practice of spreading nutrients on frozen and saturated ground.

Comprehensive nutrient reduction plans

Ohio and Ontario each have policies related to nutrient reduction planning; however, requirements fall short of being comprehensive. Ohio requires nutrient reduction planning for permitted farms with large animal herds (CAFOs), but leaves nutrient reduction planning optional for all other farms. In Ontario, nutrient reduction planning is only required for livestock farms of a certain size, leaving a large portion of farms exempt from legislation, including all field crop operations. Michigan does not have an enforceable policy, and instead has a limited CAFO policy and an optional statewide program that includes nutrient reduction planning. Each jurisdiction should require comprehensive nutrient reduction planning for all agricultural producers that includes provisions for nutrient application that is based on regular soil testing and the agronomic rate, and implementation of best management practices for land stewardship. Using this combination of tools that emphasizes accuracy and waste reduction is necessary to ensure the elimination of runoff pollution.

Water quality monitoring

While Ohio, Ontario and Michigan all conduct some form of regular water quality monitoring, there is little consistency across jurisdictions. Monitoring practices vary by protocol, the watershed scale at which monitoring takes place (i.e., rivers, tributaries, streams), frequency and other factors. Current monitoring programs fail to consistently and accurately track actual reductions in phosphorus loadings and their sources. Monitoring programs should be improved across the region to effectively track and report publicly on progress toward the 40 percent reduction goal and a clean, healthy Lake Erie.

Additional gaps and priorities

In addition to the three immediate priorities across the region, the following recommendations represent additional areas for improvement in each jurisdiction.

Expand wastewater infrastructure requirements to include green infrastructure and innovation

Each jurisdiction has incorporated some policy efforts to mitigate storm and wastewater pollution and integrate requirements for green infrastructure as a feasible control measure. In Michigan, significant steps have been taken to bring awareness to and reduce storm and wastewater pollution through its statewide mandatory reporting program, green infrastructure requirements for the Detroit WWTP NPDES permit, and Solid Waste and Sustainability Advisory Panel (SWSAP). Varying degrees of reporting and innovation have been seen at the local levels in Ohio and Ontario, though jurisdiction-wide requirements have not been implemented. All three jurisdictions should expand efforts to incorporate green infrastructure and innovation into wastewater infrastructure requirements.

Jurisdiction-wide septic codes

Ohio and Ontario each have statewide and provincial septic codes, while Michigan delegates code requirements entirely to the county level. In Ohio and Ontario, installation and maintenance requirements are uniform across localities, but requirements to connect to public sewer systems — the preferred outcome — are delegated to localities, with the exception of public nuisance cases. Michigan has no uniformity in its septic system maintenance, with localities ultimately deciding what is required. Each jurisdiction should improve province and statewide policies to ensure installation, maintenance and connection to public sewers are regulated uniformly across localities.

Expand wetland restoration efforts

Each jurisdiction has taken steps toward the preservation of wetlands, which are integral to mitigating pollution of streams, rivers and lakes. Ohio has several provisions to protect wetlands written into its state law, while Michigan is one of only two states in the U.S. to be given legal authority to implement wetland protection requirements under Section 404 of the Clean Water Act, but wetlands continue to suffer. Ontario has many policies that touch on protection and restoration of wetlands, including a recently finalized Wetland Conservation Strategy for 2016-2030, but wetlands continue to diminish. Each jurisdiction should implement more aggressive approaches to wetland preservation in order to see needed impact.

Introduction and Background

Large algal blooms in rivers and lakes is one of the world's most challenging and persistent water problems. Algal blooms happen when algae — microscopic, plantlike organisms that naturally occur in water — grow out of control and form large masses that can make water unsightly and unsafe for people, fish and wildlife. While a number of forces play into the development of large algal blooms, excess nutrients (i.e., phosphorus, nitrogen) are typically the controlling factor. Solutions to addressing algal blooms must therefore focus on reducing the amount of nutrients that find their way into the water.

Lake Erie has been at the forefront of algal bloom issues for over half a century. In the 1970s, the lake was hit with massive blooms that led to a significant decline in water quality and ecosystem health. In response, governments on both sides of the border came together to identify key sources of nutrient pollution and to find ways to reduce the amount reaching the lake. Policies and programs put into place in the 1970s and 80s substantially reduced the algae problem and returned Lake Erie to health for several decades. Sadly, the problem has returned — and solving it will require a new suite of policies, programs and practices to reduce nutrient pollution.

Harmful algal blooms (HABs) have plagued the shallow waters of Western Lake Erie for much of the last decade. More frequent and intense storms, along with unpredictable thaws, are causing increased nutrient runoff from agricultural and urban sources into the streams and rivers that feed into the Lake. The resulting, almost annual recurrence of large algal blooms has led to conditions in which water has become toxic and unusable for surrounding communities. In August of 2014, a HAB led to contamination of the drinking water supply for the City of Toledo, Ohio, leaving a half-million residents without water for more than two days. Several weeks later, residents of Pelee Island, Ontario, faced a similar crisis that lasted nearly two weeks. Algal blooms are also causing significant problems for local economies that depend on a healthy lake and threaten the long-term health of the ecosystem.

Governments have again recognized the need to respond. In June 2015, the Governors of Ohio and Michigan and the Premier of Ontario signed the Western Basin of Lake Erie Collaborative Agreement[2] through which they collectively committed to reducing the amount of phosphorus flowing into Western Lake Erie by 40 percent. The commitment marked a promise to the people of Lake Erie — a promise of a lake nearly free of harmful algal blooms and a significant reduction in risk to people, livelihoods and the ecosystem. The region's leaders knew, as did the people around the region, that the goal was ambitious but unequivocally needed.

Excess phosphorus comes from many sources, including wastewater treatment plants, combined sewer overflows, commercial fertilizer and

[2] "Western Basin of Lake Erie Collaborative Agreement. June 2015," https://www.michigan.gov/documents/snyder/Western_Basin_of_Lake_Erie_Collaborative_Agreement--Lieutenant_Governor_491709_7.pdf. Accessed 11 Sep. 2017.

[3] "A Balanced Diet for Lake Erie: Reducing phosphorus loadings and harmful algal blooms."2014. http://www.ijc.org/files/publications/2014%20IJC%20LEEP%20REPORT.pdf. Accessed 11 Sep. 2017.

Government commitments to a clean Lake Erie

Commitments made by the Governors and Premier under the Western Basin of Lake Erie Collaborative Agreement includes an interim, aspirational goal of a 20 percent reduction by 2020. Similar commitments have also been made by Canada and the United States as targets under Annex 4 of the 2012 Great Lakes Water Quality Agreement (GLWQA). Specifically, the GLWQA commits the two federal governments to a "40 percent reduction in total phosphorus entering the Western and central basins of Lake Erie." Work done under the agreement also identified priority watersheds in both the U.S. and Canada, including targets for a reduction in spring total and soluble reactive phosphorus loads to maintain healthy algal species and limit production of toxins from cyanobacteria (i.e., blue-green algae). Details for achieving this target are to be outlined in Domestic Action Plans (DAPs). Canada and the United States have each released draft DAPs, though neither one have been finalized. Canada's DAP, which is being developed collaboratively with the Province of Ontario, is expected to be finalized by February 2018. The U.S. draft plan was released on August 17, 2017 and the date for finalizing it has yet to be determined.

manure. While it is important to acknowledge that both urban and agricultural sources contribute to the issues in Western Lake Erie, it is well established that farm runoff from fertilizer and manure is the leading cause of this problem. With 63 percent of the land area in the Western Lake Erie Basin used for agricultural production, it is clear that without a reduction in agricultural runoff the health of the lake will continue to decline.[3]

About the report

Assessing policies for phosphorus reduction in Western Lake Erie compares existing policy regimes across the three jurisdictions — Ohio, Ontario and Michigan — that are signatories to the Western Basin of Lake Erie Collaborative Agreement. Based on a framework developed by the Alliance for the Great Lakes and Freshwater Future, the report establishes a baseline understanding against which future progress on policy development and implementation will be assessed on a regular basis. The report is intended to inform the public on actions being taken by governments, and to hold the Governors and Premier publicly accountable for meeting their commitment to reducing loadings of total and dissolved reactive phosphorus to Western Lake Erie by 40 percent by 2025.

Findings and recommendations in this report place a strong emphasis on agricultural practices, reflecting the fact that farm runoff from fertilizer and manure is the leading cause of the problems occurring in Western Lake Erie.[4] Indeed, policies that drive reductions from agricultural sources will be critical to each jurisdiction delivering on its promise of a 40 percent reduction in phosphorus loading to Lake Erie. The report also highlights the need for improved policies to address pollution from urban sources, including those that support innovative wastewater treatment and adoption of green infrastructure to mitigate the effects of climate change and aging infrastructure. Finally, the report underscores the need for robust monitoring and reporting programs in each jurisdiction to ensure the data is in place to effectively track and report on progress toward the 40 percent reduction goal and a clean, healthy Lake Erie.

[2] "Western Basin of Lake Erie Collaborative Agreement. June 2015." https://www.michigan.gov/documents/snyder/Western_Basin_of_Lake_Erie_Collaborative_Agreement--Lieutenant_Governor_491709_7.pdf. Accessed 11 Sep. 2017.

[3] "A Balanced Diet for Lake Erie: Reducing phosphorus loadings and harmful algal blooms."2014. http://www.ijc.org/files/publications/2014%20IJC%20LEEP%20REPORT.pdf. Accessed 11 Sep. 2017.

Assessment Framework and Data Collection

The assessment framework (Appendix A) that forms the foundation of this report is built around three key policy areas:

1. Reducing phosphorus pollution from agricultural sources;
2. Reducing phosphorus pollution from urban sources; and
3. Monitoring and reporting of phosphorus loadings and reductions.

In undertaking the assessment, consideration was given to both the existence and nature of policies intended to reduce nutrient pollution to receiving waters and the accountability and enforcement mechanisms that support these policies. Information for the assessment was gathered by reviewing laws, regulations and policies, and by interviewing subject-matter experts from each of the jurisdictions. For this baseline report, policies are assessed as follows:

Nonexistent: Assigned when no policy directive is in place **or** policy directives are so narrow in scope and application they are for all intents and purposes nonexistent.

Incomplete: Assigned when substantive policy directives are in place but lack completeness due to loopholes or limited oversight or enforcement.

Complete: Assigned when substantial policy directives exist with no loopholes and / or significant oversight or enforcement is in place.

Though not exhaustive, the assessment framework highlights policies deemed to be most significant in advancing progress on phosphorus loading reductions. It is anticipated that the framework will evolve in future years to reflect changes in understanding of the issues, and as new and innovative policies are developed and implemented. As such, the Alliance for the Great Lakes and Freshwater Future invites constructive feedback on this first iteration of the assessment to ensure a well-rounded, comprehensive and informative tool for all audiences.

Areas beyond the scope of the assessment

This assessment focuses on policies enacted in each jurisdiction, with limited discussion of optional programs such as loans, grants and cost-share programs. While the authors recognize that this scope omits significant government incentive programs that contribute to phosphorus reduction efforts, we believe that without enforceable public policies, optional programs are likely to fall short of reducing phosphorus loadings to the extent needed to ensure a clean and healthy Lake Erie. What's more, financial incentive programs are subject to budget cuts and shifting political support from year to year that can lead to underfunded and overapplied to programs. For this reason, policy is a critical component of this issue and is needed to enhance the effectiveness of a multifaceted approach.

Reducing Phosphorus Pollution from Agricultural Sources

Agricultural runoff is the most significant contributor of phosphorus loading into Western Lake Erie. Many of the policies and practices for phosphorus loadings from agricultural sources provide added benefits to the agricultural community, such as cost savings on fertilizer and improved yield through targeted fertilization methods. While not a comprehensive list, several of the most effective policies and practices for reducing nutrient runoff from agricultural sources are reviewed below.

Nutrient reduction planning and application practices

Nutrient reduction planning focuses on comprehensive planning and strategic implementation of best management practices (BMPs) associated with nutrient use and the prevention of runoff and is thus essential to the goal of reducing phosphorus runoff. Though terminology and requirements differ in each jurisdiction, in this report, nutrient reduction planning includes (but is not limited to): nutrient / manure storage; application practices (including timing and rate); regular soil testing; and, other land management practices known to reduce runoff. In addition to improving farm-wide conservation efforts, nutrient reduction planning can provide economic benefits to farmers through more accurate application of nutrients and efficient use of costly commercial fertilizer.

Ohio

The state of Ohio has two different approaches to nutrient reduction planning; their application depends on the type of farm operation. The first approach, which is optional but open to all agricultural operators, involves the development of an optional Nutrient Management Plan (NMP). The incentive to participate is that the NMPs may be used as affirmative defense in cases of nuisance lawsuits.[5] Operators may either develop the NMP on their own, or have one developed on their behalf by a third-party expert, such as the supervisors of the applicable soil and water conservation district. NMPs may apply to both commercial fertilizer and manure. In Ohio, an optional NMP is defined specifically as:

- A nutrient management plan that is in the form of the Ohio Nutrient Management Workbook made available by The Ohio State University (OSU)[6] ;
- A comprehensive nutrient management plan developed by

5 "Senate Bill 150 - Summary | The Ohio Legislature." https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA132-SB-150. Accessed 23 Aug. 2017.

6 "Nutrient Management Workbook | Agronomic Crops Network." https://agcrops.osu.edu/NMW. Accessed 7 Sep. 2017.

7 Ibid.

8 Ibid.

9 Ibid.

10 "Soil and Water Conservation - Ohio Department of Agriculture - Ohio.gov." http://www.agri.ohio.gov/divs/SWC/SWC.aspx. Accessed 23 Aug. 2017.

11 Ibid.

12 "Chapter 901:10-1 General Requirements - Ohio Revised Code." http://codes.ohio.gov/oac/901%3A10-1. Accessed 23 Aug. 2017.

the Natural Resources Conservation Service in the U.S. Department of Agriculture or persons authorized by the Conservation Service to develop a plan; or

- A document that is equivalent to either of the above documents and that contains specified information, including identification of all nutrients applied[7].

Details in approved NMPs include manure production and storage, initial soil testing and crop planning, number of acres for spreading manure and fertilizer, and anticipated manure and commercial fertilizer use.[8] Approved NMPs are meant to reduce the risk of nutrient pollution reaching nearby waterways through forecasting nutrient need and advanced planning for application. Senate Bill 150 (2014) establishes requirements and procedures for approval of these optional NMPs by the Director of Agriculture, their designee, or supervisors of applicable soil and water conservation districts.[9]

Additionally, the Ohio Department of Agriculture administers the Agricultural Pollution Abatement Program, codified by section 901 of the Ohio Administrative Code and section 939 of the Ohio Revised Code. These rules give power to the Director of Agriculture to designate watersheds as "distressed" and to require completion of NMPs for farmlands located in such watersheds.[10] Currently, the Lake Erie watershed in Ohio has not been designated as distressed; thus nutrient management plans remain optional for this geographic region.[11]

The second approach to nutrient reduction planning applies to Ohio's large livestock farms, otherwise known as Concentrated Animal Feeding Facilities (CAFFs). These operations are referred to as Concentrated Animal Feeding Operations (CAFOs) in federal language, and the term is commonly used in other jurisdictions. Ohio Revised Code Chapter 903 and Ohio Administrative Code 901:10 require that CAFF owners obtain permits through the Ohio Department of Agriculture Division of Livestock Environmental Permitting (ODA) to install and operate facilities.[12]

The permit to operate requires CAFF operators to submit a Manure Management Plan that outlines a summary of best management practices (BMPs) intended for use. Permits are required for operations that reach or exceed the following:

- 700 mature dairy cows
- 2,500 hogs over 55 pounds
- 10,000 baby pigs under 55 pounds
- 82,000 laying hens
- 125,000 pullets or broilers
- 1,000 head of beef animals of any size
- 500 horses
- 10,000 sheep or lambs
- 55,000 turkeys

The minimum best management practice requirements in each MMP include:

- A nutrient budget
- Manure and soil characterizations
- Manure distribution and utilization methods
- Methods for minimizing odor
- Inspection, maintenance and monitoring practices
- Land application methods

Applicator training and certification – Ohio only

In an effort to further educate those applying fertilizers to agricultural lands in the state of Ohio, Senate Bill 150 (2014) mandates that all fertilizer applicators obtain Agricultural Fertilizer Applicator Certification by September 30, 2017.[13]

For commercial fertilizer, all applicators applying fertilizer to 50+ acres of land must obtain an Agricultural Fertilizer Applicator Certification under provisions laid out in Senate Bill 150 (2014), effective September 30, 2017.[14] Certification training covers the following BMPs for fertilizer application:

- Proper time to apply (i.e., time of day, time of season)
- Proper place to apply
- Proper form to apply
- Storage and handling
- Proper fertilizer application techniques

In addition to those operating CAFFs / CAFOs, persons who use manure from these facilities (the applicator) in quantities at or above 4,500 dry tons per year or 25 million gallons of liquid manure per year must hold either a Certified Livestock Manager license **or** certification under Ohio's Fertilizer Applicator Certification program.[15] For use of smaller quantities of manure from a permitted CAFF, the licensed CAFF owner / operator must provide the applicator with the Ohio Department of Agriculture's application requirements and current manure test. The applicator must certify when and how much manure was taken, and subsequently falls under the jurisdiction of the Agricultural Pollution Abatement Program (APAP).[16] The APAP, as covered under Ohio Revised Code 1511 and Ohio Administrative Code 1501:15-5, establishes recommendations for BMPs for livestock operators.[17]

Ontario

The Province of Ontario requires nutrient reduction planning, but only under certain well-defined circumstances. The requirements, which are outlined in the Nutrient Management Act (2002) (NMA), are only applicable to livestock farms of a certain size, leaving crop farms and farms under the size threshold exempt from nutrient reduction planning requirements. [18] Ontario's policy regime includes three types of nutrient reduction plans: Nutrient Management Strategy (NMS), Nutrient Management Plan (NMP) and Non-agricultural Source Material plan (NASMP). Their applicability depends on several factors, including size of the farm. Nutrients, as defined by the Act, refers to manure and commercial fertilizer, as well as Non-agricultural Source Material (NASM), including compost, sewage biosolids, pulp and paper biosolids, and leaf and yard waste and residual materials from food processors. [19]

The size of a farm is defined by Nutrient Units (NUs), which is based on the amount of manure that could be generated by livestock farm operations. One

[13] "Agricultural Fertilizer Applicator Certification - Ohio Department of Agriculture." http://www.agri.ohio.gov/apps/odaprs/pestfert-PRS-index.aspx?ols=AgriculturalFertilizerCert.htm. Accessed 23 Aug. 2017.

[14] Ibid.

[15] "Ohio Department of Agriculture | Livestock Environmental Permitting." http://www.agri.ohio.gov/divs/DLEP/dlep.aspx. Accessed 23 Aug. 2017.

[16] "Manure regulation in Ohio | Ohio Ag Net | Ohio's Country Journal." 14 Oct. 2014, http://ocj.com/2014/10/manure-regulation-in-ohio/. Accessed 23 Aug. 2017.

[17] Ibid.

[18] "O. Reg. 267/03: GENERAL - Ontario.ca." https://www.ontario.ca/laws/regulation/030267. Accessed 23 Aug. 2017.

[19] Ibid.

(1) NU is the amount of manure or commercial fertilizer that is equivalent to either 43 KG of nitrogen or 55 KG of phosphate — whichever of the two is lower. For example, 300 NUs is equivalent to approximately 300 cows. Farms are categorized into the following sizes, based on their NU:

- 300 NU or more
- 150 NU or more, but less than 300 NU
- Greater than 5 NU but less than 150 NU
- 5 NU or less

Based on size, anticipated expansion and fertilizer use, a farm may be required to have an NMS, NMP and / or NASM. The key differences between these forms of nutrient reduction plans are as follows:

- An NMS covers issues such as manure generation from livestock, adequate storage capacity and acceptable runoff management from livestock yards.
- An NMP covers issues pertaining to nutrient application in farm fields, crop rotation and other BMPs to "optimize the utilization of nutrients by crops."
- An NASMP similarly covers issues pertaining to nutrient application in farm fields, with the addition of non-agricultural source materials, including storage of said materials.[20]

For example, farms that are over five (5) NU and existing farms expanding to 300 NU must complete an NMS. The latter are referred to as "Phased In" farms. An NMP must be completed when a NMS-required farm applies nutrients to agricultural land. When a farm is 150 NU or more, or an existing farm expands to 300 NU or more, both the NMS and NMP must be approved by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). If a farm uses NASM, the owner / operator must complete an NASMP. Required details in an NMS, NMP and NASMP are outlined in Appendix B. For both NMPs and NASMPs, details regarding the actual application of nutrients and safeguards for nearby waterways and sources, such as wells, are required.

Michigan

The Michigan Agriculture Environmental Assurance Program (MAEAP) is the primary nutrient reduction planning and application program in the state. Codified into law by Senate Bill 122 (2011) and House Bill 4212 (2011) and operated by the Michigan Department of Agriculture and Rural Development (MDARD), enrollment in MAEAP has several requirements for nutrient reduction planning and application. However, it is

important to recognize that the program is entirely optional.[21] In order to become a MAEAP-verified farm, owner / operators must fulfill certain education requirements, develop one or more department-approved conservation plans, and ultimately pass an on-site evaluation by the MDARD.[22] MAEAP verification is valid for three years, at which point owner / operators must reenroll in the program by requesting a visit from the MDARD.[23] Enrollment is incentivized by the fact that MAEAP-verified farms are not subject to civil fines for discharges into waterways if incidents are reported to Michigan Department of Environmental Quality (MDEQ) and action is taken to correct conditions within 24 hours of discovery.[24]

MAEAP farmers fall under one of three systems:

- Livestock — focus on environmental issues, including:
  - > Manure handling, storage and field application
  - > Conservation to protect water and prevent soil erosion
  - > Concentration on production and conservation practice, equipment, structures and management activities
- Farmstead — addresses environmental risks on farmstead, including:
  - > Safe fuel handling, proper storage of fertilizers and pesticides
  - > Focus on protection of surface and groundwater
  - > Only one applicable to every size and kind of operation
- Cropping — focus on environmental issues related to cropping activities, including:
  - > Irrigation and water use
  - > Soil conservation
  - > Nutrient and pest management
  - > Focus on environmental issues related to diverse commodities

Within these three systems, three phases of activity must be followed:

1. Education: attendance at qualified MAEAP education session, where farmers are introduced to MAEAP, and updated on new and emerging regulations and opportunities affecting agriculture;
2. On-farm risk assessment: "focus on evaluating environmental risks and devising farm-specific and economically viable solutions" using unique risk assessment tools to address environmental impacts of each system (i.e., livestock, farmstead, cropping); and
3. Third-party verification: MDARD verifies the farm after requirements of Phase 1 and are 2 met, the state's GAAMPs are followed (see below) and the farm has implemented practices specific to system requirements.

In addition to MAEAP, the Right to Farm Act (1981) authorizes the MDARD to identify and adopt the Generally Accepted Agricultural and Management Practices (GAAMPs), which promote environmental stewardship,

[20] Ibid.

[21] "MDARD - Michigan Agriculture Environmental Assurance Program" http://www.michigan.gov/mdard/0,4610,7-125-1599-12819--,00.html. Accessed 23 Aug. 2017.

[22] Ibid.

[23] Ibid.

[24] Ibid.

BMPs in manure and commercial fertilizer utilization, and a reduction in the incidence of nuisance lawsuits as they may be used as affirmative defense in such cases.[25] While use of the GAAMPs is recommended for all farmers in the state of Michigan, they are optional unless the farm has been verified by MDARD through MAEAP (which, as noted above, is also an optional program).

MAEAP verification requirements and the GAAMPs touch on a wide range of BMPs related to nutrient reduction planning, including the initial soil testing, nutrient storage and application, and other practices. However, the GAAMPs are limited by their optional nature, meaning they are not required or enforced on a comprehensive, statewide basis. This leaves each of these tools with significant limitations for ensuring reductions in nutrient pollution.

Finally, large-scale CAFOs require permits that establish regulatory provisions for livestock operations. Authorized under the National Pollutant Discharge Elimination System (NPDES), the Michigan DEQ administers and establishes standards for the discharge permit, which all CAFOs must apply for and adhere to.[26] Under the NPDES general permit or Certificate of Coverage (COC), CAFOs are not allowed to spread manure on frozen or snow-covered grounds, with the exception of "very strict, limited circumstances."[27] Because this program is required at the federal level under the Clean Water Act, Michigan's implementation follows many of the same requirements for its CAFOs, including a Comprehensive Nutrient Management Plan (CNMP), monitoring and inspection, and recordkeeping. The CNMP must be developed by certified personnel, and a manure storage evaluation plan must be developed by a professional engineer. Permitting for CAFOs is valid for five years.[28]

Application on frozen, snow-covered and saturated ground (winter spreading)

Eliminating application of manure and fertilizer on frozen, snow-covered and saturated ground is a recognized practice for reducing runoff and contamination of nearby waterways. Reducing runoff through elimination of application on frozen or saturated ground promotes improved outcomes from both economic and environmental perspectives, particularly when considering the cost of commercial fertilizer and the cost of under- or over-fertilizing crops. Moreover, application of manure on frozen, snow-covered or saturated ground is often driven by the need to dispose of excess manure from livestock and is therefore an issue of limited storage capacity (and related costs) rather than soil enrichment. Each jurisdiction has made some progress toward restricting this practice; however much more needs to be done.

[25] "MDARD - Michigan Right to Farm - State of Michigan." http://www.michigan.gov/mdard/0,4610,7-125-1599_1605---,00.html. Accessed 23 Aug. 2017.

[26] "Michigan's Concentrated Animal Feeding Operation (CAFO) Program." http://www.deq.state.mi.us/documents/deq-whm-eac-attach3-CAFOProgram.pdf. Accessed 23 Aug. 2017.

[27] "DEQ announces CAFO permit change to protect Michigan waters - State of Michigan." 4 May. 2015, http://www.michigan.gov/deq/0,4561,7-135--353812--,00.html. Accessed 23 Aug. 2017.

[28] "Michigan regulations for manure, and contaminated wash and storm water on livestock farms - MSU Extension." 2 Dec. 2011,

Ohio

Passed in 2015, Senate Bill 1 (Clean Lake Erie Act of 2015) prohibits application of manure and commercial fertilizer on frozen, snow-covered and saturated ground in the Lake Erie watershed.[29] Separate but similar provisions affect both manure and commercial fertilizer as follows:

Commercial fertilizer:

- No application on snow-covered or frozen soil
- No application when top 2 inches of soil are saturated from precipitation
- No application of fertilizer in granular form when weather forecast indicates greater than 50 percent chance of precipitation exceeding 1 inch in a 12-hour period unless fertilizer injected into ground, incorporated within 24 hours of surface or applied to growing crop [30]

Manure:

- No application on snow-covered or frozen soil
- No application when top 2 inches of soil are saturated from precipitation
- No application when weather forecast indicates greater than 50 percent chance of precipitation exceeding half an inch in a 24-hour period, unless manure is injected into ground, incorporated within 24 hours of surface application, applied to growing crop, or in emergency — Chief of Division of Soil and Water Resources or the Chief's designee provides written consent and manure application made in accordance with procedures established in USDA NRCS practice standard Code 590 prepared for state [31]

While the above provisions apply broadly, small and medium farms may apply for temporary exemptions from this restriction. Exemptions are granted by the Chief of the Division of Soil and Water Resources and last up to one year for medium-sized farms and up to two years for small operations. Exempted farms must be "working toward compliance" in order to be eligible.[32] The size of the farm is determined by the animal height and weight, multiplied by the number of animals on the farm. The temporary exemption applies to both commercial fertilizer and manure.

The Agricultural Pollution Abatement Program also outlines restrictions for farmlands in distressed watersheds, similar to requirements for nutrient management plans discussed in the previous section. Under this provision, manure may not be surface-applied to land between December 15 and March 1.[34] Prior to December 15, and after March 1, applicators may apply manure to frozen or saturated ground if injection or incorporation methods are used. [35] To date, only St. Mary's Lake has been designated as distressed in the state of Ohio. [36]

[29] "Senate Bill 1 - Summary | The Ohio Legislature." https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA131-SB-1. Accessed 23 Aug. 2017.

[30] Ibid.

[31] Ibid.

[32] "Senate Bill 1 | Agronomic Crops Network." https://agcrops.osu.edu/newsletter/corn-newsletter/2015-07/senate-bill-1. Accessed 23 Aug. 2017.

[33] Ibid.

[34] "Soil and Water Conservation - Ohio Department of Agriculture - Ohio.gov." http://www.agri.ohio.gov/divs/SWC/SWC.aspx. Accessed 23 Aug. 2017.

[35] Ibid.

[36] Ibid.

Ontario

In addition to land application requirements covered in Ontario's nutrient reduction planning requirements, the *Nutrient Management Act* also restricts application of manure or other Agricultural Source Materials (ASM) during two periods — December 1 to March 31 ("winter") and/or any other time when the soil is frozen or snow-covered. Frozen soil is defined as any 5 cm (~2 in) layer of frozen moisture in the top 15 cm (~6 in) of soil, while snow-covered soil is covered with a layer of snow on the surface with an average minimum depth of 5 cm (~2 in). [37]

There are several exceptions to these restrictions. Farmers are still allowed to spread manure during the winter, with recommendations for proper site selection and injection or incorporation. For example, during the "winter" months when the ground is neither frozen nor snow-covered, injection or incorporation methods are still allowed. [38] Additionally, when the ground ***is*** frozen, injection or incorporation is required within six hours of application. This provision does not apply to saturated ground, another time when farms are highly susceptible to nutrient loss through runoff.

Michigan

Michigan has no comprehensive policy dealing with the application of nutrients on frozen, snow-covered and saturated ground. However, the Generally Accepted Agricultural and Management Practices (GAAMPs) do discourage these practices, and include specific instructions for application under these circumstances, including definitions of saturated ground and instruction for injection or incorporation. Michigan ***does*** regulate application of manure on frozen, snow-covered or saturated ground for CAFOs through the National Pollutant Discharge Elimination System (NPDES) permitting process, under which owner / operators may only apply manure under very specific circumstances. [39]

The Michigan DEQ administers and establishes standards for discharge permits, which all CAFO owner / operators must apply for and adhere to. Under the NPDES general permit or Certificate of Coverage (COC), CAFOs are not allowed to spread manure on frozen or snow-covered grounds, with the exception of "very strict, limited circumstances."

Land management — cover crops

Cover crops are another well-known, effective mechanism for reducing agricultural runoff and phosphorus loadings to nearby waterways. Cover crops absorb and recycle excess nutrients in soils, preventing them from polluting waterways and keeping them on the land and available for future crop production. [40]

Ohio

While Ohio does not have a specific statewide cover crop policy, Senate Bill 1 (2012) provides for a portion of the Healthy Lake Erie Funding

[37] "Winter Application of Manure and Other Agricultural Source Materials." http://www.omafra.gov.on.ca/english/engineer/facts/10-073.htm. Accessed 23 Aug. 2017.

[38] Ibid.

[39] "DEQ - DEQ announces CAFO permit change to protect Michigan waters." http://www.michigan.gov/deq/0,4561,7-135-3308-353812--,00.html. Accessed 23 Aug. 2017.

[40] "Nutrient Management with Cover Crops." http://www.nacaa.com/journal/index.php?jid=45. Accessed 23 Aug. 2017.

Assistance to be allocated to conservation techniques, including promotion of cover crop use.[41] Administered by the Ohio Department of Natural Resources (ODNR) along with local soil and water conservation districts through the Ohio Clean Lakes Initiative, funding has been provided for education and promotion of conservation practices, including cover crops.[42] Allocating funding toward on-the-ground programming that promotes conservation practices such as cover crops is a positive step for Ohio. However, there is plenty of potential for scale-up by bringing larger groups of agricultural producers on board with cover crop adoption.

Ontario

Currently, Ontario has no known provincial policy requiring the use of cover crops. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) does provide technical information intended to support agricultural producers in choosing cover crops and common practices for use. OMAFRA also recently created and funded a steering committee to develop and release a provincial Cover Crops Strategy (April 2017).[43, 44] The Steering Committee is composed primarily of representatives from across the agricultural community, including the Ontario Federation of Agriculture (OFA) and the Ontario Agri-Business Association (OBA), as well as a representative from the Upper Thames River Conservation Authority (a quasi-government watershed-based organization). The Cover Crops Strategy points to public policy as key to increasing cover crop adoption, and highlights the need for robust research and education of decision makers in order to develop informed policies. Convening of the Steering Committee and the development of a Cover Crops Strategy are steps in the right direction; however, success will ultimately be determined by the extent to which these steps translate into increased use of cover crops and reductions in the amount of phosphorus entering waterways.

Michigan

The state of Michigan has no statewide policy for scaling up the use of cover crops. The state does plan to use funding under the Environmental Quality Incentives Program (EQIP) for technical assistance to farmers in the Western Lake Erie Basin for scaling up conservation practices, including use of cover crops.[45] EQIP is a federally funded program available to states to incentivize conservation practices among farmers. While it is positive that Michigan is utilizing this funding source, the program remains entirely optional and thus not comprehensive in its reach to all farmers in the state.

Ecological restoration and stewardship

Practices such as preservation and restoration of wetlands and riparian buffers and creating setbacks serve as another line of defense against nutrient runoff making its way into local waterways. Protecting and restoring natural filtration systems such as wetlands

41 "LSC Analysis of House Bill - The Ohio Legislature." 18 Feb. 2015, https://www.legislature.ohio.gov/download?key=2902&format=pdf. Accessed 11 Sep. 2017.

42 "Ohio Clean Lakes Initiative." http://cleanlakes.ohiodnr.gov/. Accessed 11 Sep. 2017.

43 "Ontario Cover Crops Strategy - Ontario Soil and Crop Improvement" http://www.ontariosoilcrop.org/wp-content/uploads/2017/06/Ontario-Cover-Crop-Strategy_May-3_Final-v3compressed.pdf. Accessed 11 Sep. 2017.

44 "Cover Crops: Choosing a Cover Crop." 4 Jan. 2016, http://www.omafra.gov.on.ca/english/crops/facts/cover_crops01/choosing.htm. Accessed 11 Sep. 2017.

45 "EQIP Initiatives in Michigan - NRCS - USDA." https://www.nrcs.usda.gov/wps/portal/nrcs/detail/mi/programs/financial/eqip/?cid=stelprdb1268715. Accessed 11 Sep. 2017.

substantially reduces the amount of nutrients reaching streams, rivers and other waterways. Riparian buffers allow plants along rivers and streams to absorb nutrients before they reach the water. Setback requirements promote conscientious planning by providing an allotted space of separation when operating near waterways and added protection from runoff when combined with BMPs and natural filtration systems.

Ohio

Ohio's Wetland Water Quality Policy and Standards (OAC Sec 3745-1-50 through 1-54) include several provisions to support water quality in Ohio's wetlands, as well as preservation of integral wetland functions, such as nutrient removal and / or transformation and sediment and / or contaminant retention. Section 1-54 provides for specific wetland antidegradation protections, authorizing the Ohio EPA to assign each wetland a category to inform parameters for future projects in and around protected wetlands.[46]

Ohio has no statewide setback legislation, but several counties and municipalities throughout the state have set local riparian and wetland setback policies, many of them within the Lake Erie basin. A summary of policies can be found in Appendix C.[47]

Ontario

Ontario has several policies in place that relate to ecological restoration and stewardship. In early 2017, the province released a Draft Wetland Strategy for 2016-2030, which included two overarching targets: identify and conserve Ontario's significant wetlands to sustain essential ecosystem services by 2025 and halt net loss of wetlands where it has been greatest by 2030.[48] The final strategy was released on July 20, 2017. According to the summary, "priority actions include improving Ontario's wetland inventory and mapping, developing policy approaches and tools to prevent the net loss of Ontario's wetlands and improving guidance for evaluating the significance of Ontario's wetlands."[49] Goals include increasing public awareness, building partnerships and improving policy. Specific actions to achieve policy goals include acting on policy windows for increased preservation of wetlands, streamlining definitions of wetlands across policies, and expansion of wetland protection into related policies and projects, including development of best management practices for work within wetland regions.

In addition to the Wetland Strategy, Ontario provides for wetland protection through other policies, including the Planning Act and the Conservation Land Act, which protect against development in wetlands and coastal wetlands, and conservation easements on private land. Several of these laws pertain to setback requirements, including the Planning Act.[50] Similar to wetland protection policies like the Conservation Land Act, requirements depend on the type and ecological function of

[46] "Wetland antidegradation- Ohio EPA." http://www.epa.ohio.gov/portals/35/rules/01-54.pdf. Accessed 23 Aug. 2017.

[47] "Summary of Riparian and Wetland Setback Regulations in Ohio." http://crwp.org/files/Riparian_Wetland_Regulation_summary_November2013.pdf. Accessed 23 Aug. 2017.

[48] "Draft: A Wetland Conservation Strategy for Ontario - Meetings." http://nr-escribe.esolutionsgroup.ca/filestream.ashx?DocumentId=4173. Accessed 23 Aug. 2017.

[49] Ibid.

[50] "Planning Act, RSO 1990, c. P.13 - Ontario.ca." https://www.ontario.ca/laws/statute/90p13. Accessed 23 Aug. 2017.

the wetland, rather than applying province-wide. The Provincial Policy Statement also protects Provincially Significant Wetlands.[51] See Appendix D for details of these policies and additional policies related to wetland preservation and restoration in Ontario.

Michigan

Michigan's Natural Resources and Environmental Protection Act of 1994 (NREPA) provides for protection and preservation of wetlands (Part 303) and shorelands (Part 323).[52] Under this act, wetlands are regulated if they meet the following criteria:

- Connected to one of the Great Lakes or Lake St. Clair;
- Located within 1,000 feet of one of the Great Lakes or Lake St. Clair;
- Connected to an inland lake, pond, river or stream;
- Located within 500 feet of an inland lake, pond, river or stream;
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream or river, but are more than 5 acres in size and,
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, and less than 5 acres in size, but the DEQ has determined that these wetlands are essential to the preservation of the state's natural resources and has notified the property owner.[53]

The regulation requires that planned activities around protected wetlands be permitted by the MDEQ. Because this process has been authorized under section 404 of the Clean Water Act, the U.S. EPA maintains the right to deny permitting if there is federal objection to any particular project. To date, Michigan is only one of two states to assume the responsibility of permitting under section 404 (the other state is New Jersey).[54]

Despite Michigan's proactive approach to developing statewide policy for wetland protection, there is concern from the EPA and conservation advocates that the policy has not been sufficiently implemented, and is thus not truly compliant with EPA standards. The most recent formal review of the policy by EPA Region V (2008) concluded that there are significant deficiencies in need of corrective action, but the program does not require withdrawal for noncompliance. Corrections requested by Region V include issues related to farmland and drainage exemptions, the permitting process, and overall protection of threatened and endangered species.[55]

Monitoring and enforcement

Robust monitoring and enforcement are vital to ensuring policies are being implemented and to understanding their effectiveness. Below are details on monitoring programs and enforcement mechanisms to support policies for reducing phosphorus loading to Lake Erie.

[51] "Wetland conservation | Ontario.ca." 6 Oct. 2015, https://www.ontario.ca/page/wetland-conservation. Accessed 23 Aug. 2017.

[52] "DEQ - State and Federal Wetland Regulations - State of Michigan." http://www.michigan.gov/deq/0,4561,7-135-3313_3687-10801--,00.html. Accessed 23 Aug. 2017.

[53] Ibid.

[54] "State or Tribal Assumption of the Section 404 Permit Program | Section 404 Permit Program." https://www.epa.gov/cwa-404/state-or-tribal-assumption-section-404-permit-program. Accessed 25 Aug. 2017.

[55] "Results of the US EPA Region 5 Review of MDEQ's Section 404 Program - State of Michigan." http://www.michigan.gov/documents/deq/wrd-epa-mi_558424_7.pdf. Accessed 23 Aug. 2017.

Ohio

Under Ohio's fertilizer applicator certification policy, individuals must maintain records of their fertilizer application for three years.[56] Each application of fertilizer must have a record that includes the following information:

- Date of application
- Place of application
- Rate of application
- Analysis of fertilizer applied
- Name of person who applied fertilizer
- Name of certificate holder
- Soil conditions at time of application
- Type of application method (soil injected, incorporated, surface)
- Weather at time of application, including temperature and precipitation
- Weather forecast for day following application
- Surface only: whether land at time of application was frozen / snow covered
- Non-certificate holders: transmit info to certificate holder within 10 days of application[57]

These records are not routinely collected for review by regulators, but are subject to random record audit throughout the three years they are maintained. Penalties follow for those found in noncompliance of Senate Bill 1 (2012) and Senate Bill 150 (2014) requirements. Penalties are categorized as minor or major, depending on the severity of the risk posed to public health and / or the environment. For example, a case is categorized as minor if the fertilizer application did not result in any discharge to the water of the state, while a major violation is one which ***does*** result in discharge entering the water of the state.[58] The maximum penalty for minor violations is $2,000 per day of noncompliance; the maximum penalty for major violations is $10,000 for each day of noncompliance.[59] Money collected from noncompliance goes directly to the Agricultural Pollution Abatement Fund, which is administered by the Chief of the Division of Soil and Water Resources, which has the authority to "investigate, mitigate, minimize, remove and abate" pollution from agriculture.[60]

In addition to fines for noncompliance, certification can also be denied, suspended or revoked if users:

- Provide false or misleading information on the application for or renewal application of the fertilizer applicator certificate;
- Fail to provide the fee as required in paragraph (D) of rule **901:5-4-02** of the Administrative Code;
- Fail to complete the fertilizer applicator education course as outlined in rule **901:5-4-03** of the Administrative Code;
- Recklessly applied fertilizer in such a manner that an emergency exists that presents a clear and present danger to human

[56] "Chapter 901:5-4 Fertilizer Applicators - Ohio Revised Code." http://codes.ohio.gov/oac/901:5-4. Accessed 23 Aug. 2017.

[57] Ibid.

[58] Ibid.

[59] Ibid.

[60] "Lawriter - ORC - 1511.071 Agricultural pollution abatement fund." http://codes.ohio.gov/orc/1511.071v1. Accessed 7 Sep. 2017.

[61] Ibid.

or animal health;

- Fail to maintain records as required in rule **901:5-4-04** of the Administrative Code; and
- Have a history of similar violations.[61]

Finally, several levels of action can be taken by regulators to bring farmers into compliance if they are found to be in violation of the policy. These actions include issuing a formal warning, refusal to license or certify the applicant, and initiation of litigation and / or criminal charges.[62] Data on monitoring and subsequent enforcement are not available from regulatory agencies, and requirements under Senate Bill 150 are not legally enforceable until September 2017.

Ontario

Monitoring and enforcement requirements under Ontario's NMA are the responsibility of Agricultural Environmental Officers (AEOs) with the Ministry of Environment and Climate Change (MOECC) — provincial officers who work with farmers to encourage compliance. AEOs are given broad authority to inspect farms for any one of the following reasons:

- Ensuring a farm meets legislative requirements and conditions of regulatory approvals
- Responding to a complaint, referral, spill or environmental incident
- As follow-up on previous violations[63]

There are several levels of action an AEO may take when farms are found to be in noncompliance with the NMA. These range from a request for an optional abatement program to correct the farm's non-compliance issues to legal action that can include trials and significant fines. However, audits indicate that monitoring and subsequent legal action are rare. For example, in the year 2013-14, the Ministry inspected only 3 percent of farms known to have to adhere to NMA's regulations.[64] With inspections taking 1-2 days and a total of 17 AEOs in place, this amounts to less than one farm audited every two weeks.

Michigan

Since Michigan relies on agricultural operators' optional enrollment in MAEAP rather than regulatory requirements, monitoring and enforcement are limited. Farms enrolled in MAEAP are required to be inspected by program regulators for verification purposes, but it is unclear how frequently follow-up inspections actually occur. MAEAP verification lasts for three years, at which time farm owner / operators must submit to inspection again if they wish to maintain their status.

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62 Ibid.

63 "O. Reg. 267/03: GENERAL - Ontario.ca." https://www.ontario.ca/laws/regulation/030267. Accessed 23 Aug. 2017.

64 "3.12: Source Water Protection - Office of the Auditor General of Ontario." http://www.auditor.on.ca/en/content/annualreports/arreports/en14/312en14.pdf. Accessed 23 Aug. 2017.

Urban Source Pollution

Increased urbanization and the subsequent expansions in buildings, pavement and compacted landscapes directly impact the amount of pollutants carried into nearby waterways. Nutrient pollution from urban areas is exacerbated by the limited capacity of existing infrastructure to deal with severe precipitation and rapid snowmelt events due to changes in weather patterns, and the increase in impermeable surfaces that cannot absorb rainfall and snowmelt.

Wastewater treatment

According to the U.S. EPA, "wastewater contains phosphorus from human waste, food and certain soaps and detergents," which must be filtered for use.[65] For this reason, managing discharges from WWTPs is an important element of reducing phosphorus loadings to Lake Erie, and their effectiveness depends in part on the policies in place to limit pollution. For example, policies that promote or require incorporation of innovative technologies, such as nutrient recovery, can have a significant impact reducing pollution associated with wastewater discharges.

Ohio

Effluent limit requirements for WWTPs in the state of Ohio fall under two regulatory frameworks — Senate Bill 1 (2012) and the NPDES permitting process.[66] Senate Bill 1 requires monthly testing of publicly owned treatment works (POTWs) (effective 12/2016), while NPDES permit holders are either currently subject to a phosphorus effluent limit of 1 mg/L or, for those who are not currently held to this standard, a requirement to submit plans for reduction to a 1 mg/L phosphorus effluent limit by 12/2017 exists. Senate Bill 1 (Ohio Revised Code 6111.03) requires monthly monitoring of dissolved orthophosphate, taken via grab sample, similar to current monitoring practices used, such as in-stream monitoring. Starting in December 2016, Senate Bill 1 asserts "dissolved orthophosphate shall be monitored on a monthly basis without limits," indicating monitoring efforts shall be carried out indefinitely.[67]

Though innovative practices for wastewater treatment have not been mandated by the state, certain funding programs have promoted the benefits of things like nutrient recovery and improved wastewater treatment facilities through their loan programs. This includes the Ohio EPA's Point Source and Urban Runoff Workgroup and the

[65] "The Sources and Solutions: Wastewater | Nutrient Pollution | US EPA." 10 Mar. 2017, https://www.epa.gov/nutrientpollution/sources-and-solutions-wastewater. Accessed 23 Aug. 2017.

[66] "LSC Analysis of House Bill - The Ohio Legislature." 18 Feb. 2015, https://www.legislature.ohio.gov/download?key=2902&format=pdf. Accessed 23 Aug. 2017.

[67] "National Pollutant Discharge Elimination System (NPDES) - Ohio EPA." 2 Apr. 2015, http://web.epa.state.oh.us/dsw/permits/doc/3PD00043.fs.pdf. Accessed 11 Sep. 2017.

Water Pollution Control Loan Fund (WPCLF), which provides financial and technical assistance and is administered under Section 6111.036 of the Ohio Revised Code.[68, 69] The WPCLF administers several programs related to water quality, including technical assistance related to improving wastewater collection and treatment.

Ontario

Phosphorus effluent limits for wastewater treatment plants discharging to waters in the Western Lake Erie Basin are regulated under the Ontario Water Resources Act (OWRA). Phosphorus effluent limits throughout the province are determined based on the "attenuating capacity of the receiving water body."[70] A maximum phosphorus limit of 1 mg/L applies generally across WWTPs, with potential for more "stringent" requirements to be determined on a case-by-case basis.[71] Of note, the recently released draft Canada-Ontario DAP for Lake Erie discusses bringing requirements for larger WWTPs (those with a flow capacity greater than 3.78 million L/day in the Western Lake Erie basin) down to a legal limit of 0.5 mg/L. Additional improvements to wastewater treatment beyond reduced effluent limits for phosphorus are not mandated province-wide. However, the Water Opportunities and Conservation Act (2010) is intended to foster innovation in water, wastewater and stormwater technologies, services and practices , but does not require specific investments.

Michigan

Michigan's wastewater treatment and phosphorus effluent limit standards fall under the jurisdiction of the MDEQ. Effluent limits are set by the NPDES permitting system, and each permit is individualized with specific requirements for each WWTP. In this process, MDEQ operates under the rule that phosphorus "shall be controlled from point source discharges to achieve 1 mg/L of total phosphorus as a maximum monthly average effluent concentration unless other limits, either higher or lower, are deemed necessary and appropriate by the department."[72] In practice, this means that the MDEQ sets an exact discharge limit for each individual point source.

Improvements through innovation in wastewater treatment is mostly encouraged through participation in certain federal loan programs, such as the Green Project Reserve, which is meant to further the goals of the Clean Water Act, and the Water Pollution Control Revolving Fund loan program.[73] Additionally, the state sponsors loan programs to develop improved wastewater treatment infrastructure through the Strategic Water Quality Initiative and the Storm water, Asset Management and Wastewater Grants and Loans.[74] Finally, Governor Snyder convened a Solid Waste and Sustainability Advisory Panel in 2016, which worked to set goals to increase the amount of biosolids and phosphorus captured from wastewater and made available for other uses.[75]

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68 "Water Pollution Control Loan Fund - Ohio EPA - Ohio.gov." http://epa.ohio.gov/defa/ofa.aspx. Accessed 23 Aug. 2017.

69 "Point Source & Urban Runoff Nutrient Workgroup - Ohio EPA." 8 Aug. 2012, http://www.epa.ohio.gov/portals/35/documents/point_source_workgroup_report.pdf. Accessed 23 Aug. 2017.

70 "F-8 Provision And Operation Of Phosphorus Removal and Municipal, Institutional and Private - Ontario.ca." 31 Mar. 2016, https://www.ontario.ca/page/f-8-provision-and-operation-phosphorus-removal-facilities-municipal-institutional-and-private. Accessed 23 Aug. 2017.

71 Ibid.

72 "Part 4. Water Quality Standards - State of Michigan." https://www.michigan.gov/documents/deq/wrd-rules-part4_521508_7.pdf. Accessed 24 Aug. 2017.

73 "DEQ - Clean Water Revolving Funds - State of Michigan." http://www.michigan.gov/deq/0,4561,7-135-3307_3515_4143---,00.html. Accessed 24 Aug. 2017.

Septic system management

While it is generally acknowledged that public wastewater systems are preferred to private septic systems, septic systems remain the most technically and economically viable approach in very low population density and rural areas. Pollution from septic systems, similar to WWTPs, have the potential to carry phosphorus from human waste and other water uses (i.e., bathing, laundry, cleaning, etc.) to local waterways if the proper precautions are not taken. Several factors contribute to a fully functioning septic system, including proper site selection, adequate installation and regular maintenance. Without clearly defined requirements for septic systems, system failure can occur, creating a nuisance and health hazard for both the owner and the public. [76]

Ohio

Septic systems are regulated at the state level in Ohio under Revised Code Section 6117-51, which establishes requirements for permitting, installation and proper, continued maintenance. In addition to inspection at installation, Ohio requires follow-up inspection after 12 months and "as needed" for failing and "suspected failing" systems. [77] The Department of Public Health may initiate inspections at any time, and public health officials may create service, repair or replacement plans for problem or failing systems that include periodic or annual inspections where necessary. [78]

For those homes not connected to the public sewer system, the state delegates authority to local governments to require homes to connect if their septic system is within 200 feet of the foundation of their home. Additionally, counties are able to require connection in instances of distances greater than 200 feet if there is proof that failure to do so would create a public nuisance. [79] For private businesses, authority falls under the OEPA, which retains the authority to require them to connect to a public sewer system. [80]

Ontario

Similar to Ohio, septic system installation and inspection are regulated at the provincial level, while requirements for connection to public sewer systems are left to municipalities. Province-wide regulation of septic system installation and maintenance is covered under Section 8 of the Ontario Building Code. Standard private septic systems require inspection as they are being built to ensure it meets Code rules and regulations. Beyond that, there are no provincial rules requiring regular maintenance and inspections, but municipalities may choose to implement additional rules. [81] For septic systems with tertiary sewage treatment (e.g., filters that treat the effluent), the Ontario Building Code requires that someone who has been certified conduct inspections and maintenance every 12 months. [82] In those cases, annual sampling of the

74 "Financing Green Infrastructure in Michigan - State of Michigan." http://www.michigan.gov/documents/deq/Financing_Green_Infrastructure_in_Michigan_455013_7.pdf. Accessed 24 Aug. 2017.

75 "Financing Green Infrastructure in Michigan - State of Michigan." http://www.michigan.gov/documents/deq/Financing_Green_Infrastructure_in_Michigan_455013_7.pdf. Accessed 24 Aug. 2017.

76 "Pollution Prevention Fact Sheet: Septic System Controls." https://www.h-gac.com/community/water/ossf/Pollution-Prevention-Septic-System.pdf. Accessed 23 Aug. 2017.

77 "Lawriter - ORC - 6117.51 New public sewer construction projects.." http://codes.ohio.gov/orc/6117.51. Accessed 23 Aug. 2017.

78 Ibid.

79 Ibid.

80 "Connecting to a sanitary sewer when your existing sewage system is still working." http://ohioepa.custhelp.com/app/answers/detail/a_id/326/~/connecting-to-a-sanitary-sewer-when-your-existing-sewage-system-is-still-working. Accessed 23 Aug. 2017.

effluent is also required to ensure the system is working properly. Many larger homes or properties that have high water tables opt for this type of septic system. Additional regulations may apply to septic systems depending on their location. For instance, updates to the Ontario Building Code in 2011 require mandatory maintenance inspections every five years in areas where sewage systems are identified as a significant drinking water threat (i.e., are within 100 meters of a municipal well).[84] Unlike Ohio, however, there is no standard across municipalities for when septic systems should be connected. Some agencies offer funding to pay for connections when applicable, some local governments require connection as soon as it becomes "feasible," and others have no requirement or some other variation of requirements.[85]

Michigan

Michigan is the only state in the U.S. that does not have a statewide septic code. Instead, septic systems are regulated entirely at the county level, including requirements for inspection, maintenance and connection to public sewer systems.

The Michigan Public Health Code does acknowledge preference for public sewer systems over septic tanks, stating "public sanitary sewer systems are essential to the health, safety and welfare of the people of the state," and acknowledging that septic tanks are "subject to failure due to soil conditions or other reasons."[86] The Public Health Code thus encourages early connection to public sewers whenever possible. Certain localities have required connection to public sewers, though instances are rare.[87]

Requirements for installation, operation and maintenance are set by local health departments, meaning regulations vary widely throughout the state. All counties require inspection upon installation, and several require inspection when a property is sold. However, there are no requirements for maintenance beyond preventing nuisance or further inspection / maintenance. See Appendix E for a list of requirements in counties in the Lake Erie watershed.

Combined sewer overflow management

Combined sewer systems (CSSs), a relic of early infrastructure development, are designed to collect both stormwater runoff and sewage in the same pipe, typically transporting it to a wastewater treatment plant. During heavy rainfall or snowmelt events, the amount of combined waste and stormwater can exceed the capacity of sewer pipes and / or the receiving treatment plant. Under such conditions, which are commonly known as combined sewer overflows (CSOs), the combined storm and untreated wastewater discharges directly into local waterways. CSOs are a significant source of phosphorus loadings to waterways and pose a public health threat. Several communities are making progress to address the problem, but without policy and guidance, progress is limited.

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81 "O. Reg. 332/12: BUILDING CODE - Ontario.ca." https://www.ontario.ca/laws/regulation/120332. Accessed 15 Sep. 2017.

82 Ibid.

83 Ibid.

84 Ibid.

85 See for example Town of Markham, Ontario By-Law 436-86 (Dec. 15, 2009).

86 "Michigan Legislature - 368-1978-15-182." http://www.legislature.mi.gov/(S(fv5q3b52ko2tirugypwdcoqr))/mileg.aspx?page=getObject&objectName=mcl-368-1978-15-182. Accessed 23 Aug. 2017.

87 See for example Duverney v. Big Creek-Mentor Utility Authority, 677 N.W.2d 836 (Mich. 2004)

Ohio

Control measures for CSOs are implemented under the Ohio EPA NPDES permitting process. This process requires facilities to implement nine minimum control measures, which include elimination of CSOs during dry weather, regular monitoring, and development and implementation of a Long-Term Control Plan (LTCP) "where appropriate." [88] While there is no state requirement for public reporting, several localities have devised regular, optional public reporting systems. For example, the city of Toledo and the Northeast Ohio Regional Sewer District have a system of regular updates on CSOs delivered by text or email to residents in the surrounding areas, as well as mapping projects of their work to reduce CSO events. Additionally, the Water Pollution Control Loan Fund's wastewater collection and treatment program facilitates technical assistance related to the reduction and control of CSOs. [89]

Ontario

Ontario does not have a province-wide requirement for public reporting of CSO events. However, certain municipalities, such as the cities of London, Kingston, Ottawa and Sudbury, have developed their own system for public reporting. In the cases of Kingston and Ottawa, public reporting is a result of legal action taken against them, while Sudbury and London voluntarily adopted their systems. Each of these communities reports on the following details of each CSO event:

- Date
- Volume
- Duration
- Location
- Start time
- End time
- Reason

At the provincial level, Procedure F-5 under Guideline F-5-5 mandates several steps and planning practices geared toward the elimination of CSOs. [90] F-5-5 is a technical procedure intended to explain how municipalities can comply with regulations under the Ontario Water Resources Act (1990). Requirements for this procedure include elimination of dry weather overflows and long-term pollution control planning. [91]

Michigan

CSOs are regulated by the Michigan Department of Environmental Quality (MDEQ) as required by the Natural Resources and Environmental Protection Act (1994) (NREPA). [92] Disclosure of any CSO event must happen within 24 hours of the start of the event and after the event has ceased, and must be reported directly to the DEQ, local county health department and a local daily newspaper. Disclosure must cover the following details:

- Volume
- Quality
- Reason
- Location
- Surface waters impacted
- Lands impacted
- Start time

88 "Combined Sewer Overflow Program - Ohio EPA - Ohio.gov." http://www.epa.ohio.gov/dsw/cso/csoindex.aspx. Accessed 23 Aug. 2017.

89 "Water Pollution Control Loan Fund - Ohio EPA - Ohio.gov." http://epa.ohio.gov/defa/ofa.aspx. Accessed 23 Aug. 2017.

90 "F-5-5 Determination of treatment requirements for municipal and and private combined" 9 Mar. 2016, https://www.ontario.ca/page/f-5-5-determination-treatment-requirements-municipal-and-private-combined. Accessed 23 Aug. 2017.

91 Ibid.

92 "Natural Resources and Environmental Protection Act. 1994." http://www.legislature.mi.gov/documents/mcl/pdf/mcl-451-1994-ii-1-31.pdf. Accessed 23 Aug. 2017.

- End time
- Compliance of combined sewer operator
- Initial notification procedures followed
- Precipitation
- Normal wastewater treatment facility
- Whether fecal coliform meets limitations
- Actions to mitigate discharge
- Actions to mitigate effect
- Actions to prevent reoccurrence
- E. coli testing
- Type of discharge (accidental, treated in compliance, partially treated, etc.)

Green infrastructure promotion

Green infrastructure (GI) plays an important role in controlling stormwater runoff in urban localities, where impermeable surfaces such as concrete or "gray infrastructure" prevail. By absorbing rainfall, incorporation of green spaces mimics natural drainage systems and reduces the burden on the limited capacity of wastewater and stormwater collection and treatment infrastructure.

Ohio

There are currently no policy requirements related to the promotion of GI specifically in Ohio. There are certain funding sources available to incentivize the use of GI, such as Ohio EPA's Surface Water Improvement Fund (SWIF). However, there are no funding opportunities available at the time of this report.[93]

Additionally, federal requirements mandate stormwater control programs and permitting be implemented for municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. Under these regulations, stormwater management plans must be outlined and implemented as part of NPDES permitting or a Stormwater General Permit, under which the U.S. EPA recognizes GI as a valuable approach to reducing polluted runoff.[94, 95]

Ontario

Similar to Ohio, Ontario does not have any formal, province-wide policy requirements that promote the development of green infrastructure. The 2014 Provincial Policy Statement does make recommendations for inclusion of GI as a tool for stormwater management, but ultimately delegates authority to regulate and promote development at the municipal level.[96]

Additionally, the Ministry of Environment and Climate Change is currently developing the "Low Impact Development Stormwater Guidance Document," which was posted for review in fall 2017.[97] This document will emphasize "managing rain where it falls," including use of control measures such as green roofs and other permeable surfaces to mimic the natural hydraulic environment, and will "clarify the ministry's expectations

93 "Surface Water Improvement Fund (SWIF) Grants Program - Ohio EPA." http://www.epa.ohio.gov/dsw/nps/swif.aspx. Accessed 11 Sep. 2017.

94 "Community Solutions for Stormwater Management - USEPA" https://www.epa.gov/sites/production/files/2016-10/documents/draftlongtermstormwaterguide_508.pdf. Accessed 24 Aug. 2017.

95 "Storm Water Program - Ohio EPA - Ohio.gov." http://epa.ohio.gov/dsw/storm/index.aspx. Accessed 24 Aug. 2017.

96 "2014 Provincial Policy Statement, Under the Planning Act - Ontario.ca." http://www.mah.gov.on.ca/AssetFactory.aspx?did=10463. Accessed 7 Sep. 2017.

with regard to LID stormwater management, and related runoff volume and water quality control expectations." [98]

Michigan

While no statewide green infrastructure policy exists, the city of Detroit has turned to green infrastructure as part of its CSO reduction plan under the requirements of its NPDES permit. [99] This goes along with Michigan's process of phosphorus effluent limit controls being linked to NPDES permitting, making approaches to wastewater and stormwater flexible and dependent on the locality and its current situation. Under the Detroit WWTP NPDES permit, implementation of the required long-term control plan for CSOs was proving costly and economically burdensome for Detroit residents. [100] As part of a comprehensive plan to address this issue, MDEQ required implementation of GI projects in several areas of the WWTPs purview, including the Upper Rouge area of the Rouge District, and the near-east side of the central district. [101]

Additionally, federal requirements mandate stormwater control programs and permitting be implemented for municipal separate storm sewer systems (MS4s), construction activities and industrial activities. Under these regulations, stormwater management plans must be outlined and implemented as part of NPDES permitting or a stormwater general permit, under which the U.S. EPA recognizes GI as a valuable approach to reducing pollutant runoff. [102, 103]

97 "Policy Proposal Notice - Environmental Registry." 15 Jun. 2017, https://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTMwOTcz&statusId=MTk4NDg3. Accessed 24 Aug. 2017.

98 Ibid.

99 "Detroit WWTP NPDES Fact Sheet - State of Michigan." http://www.michigan.gov/documents/deq/deq-wrd-npdes-DetroitWWTP_FS_415425_7.pdf. Accessed 24 Aug. 2017.

100 Ibid.

101 Ibid.

Watershed Monitoring and Reporting

The goal of reducing phosphorus loadings to Lake Erie by 40 percent will require knowledge about current loadings to the watershed in order to identify sources of nutrient pollution, and ongoing information to assess the impacts of actions taken to reduce loadings. Thus, it is essential that watershed monitoring in the surrounding jurisdictions be robust in order to accurately track progress and necessary revisions to approaches.

Ohio

The state of Ohio regularly monitors phosphorus discharge into Lake Erie at several points within the watershed (details in Appendix F). The OLEC, the OEPA and the ODA lead this work, while the ODNR, U.S. Geological Survey and Heidelberg University provide supporting monitoring. Additionally, the Ohio Lake Erie Phosphorus Task Force has been convened twice to provide a more in-depth report on phosphorus.

Charged with ensuring "the coordination of state and local policies and programs pertaining to Lake Erie water quality, toxic pollution control and resource protection," the Commission publishes annual reports on pollutants, including phosphorus. The annual report contains data gathered from testing stations along rivers that feed into Lake Erie; testing stations are monitored collaboratively by the OEPA, ODNR and Heidelberg University.

Twice, in 2010 and 2013, the Ohio EPA and Ohio Department of Agriculture have deemed it necessary to create a special task force to monitor and investigate phosphorous in the Lake Erie watershed. The Ohio Lake Erie Phosphorus Task Force was charged with generating a report to: "1) develop reduction targets for total and dissolved reactive phosphorus that can be used to track future progress, and 2) develop policy and management recommendations based upon new and emerging data and information." The report contains separate summaries of both nonpoint source, agricultural phosphorus pollution, and point source, urban phosphorous pollution.

Ontario

Canada's Ministry of Environment and Climate Change (ECCC) holds the federal responsibility to monitor water quality in Lake Erie and works with Ontario's Ministry of the Environment and Climate Change to do so.[108, 109] The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) also monitors phosphorus through administration of the Nutrient Management Act. The Ontario Ministry of Environment and Climate Change maintains an extensive network of monitoring

stations in Lake Erie and the tributaries that feed into it. The Ministry monitors data and issues annual reports, aggregating data on various streams that feed into tributaries of the Lake and using that information to issue water quality ratings for individual tributaries. Data on tributaries is then aggregated to issue a water quality rating for the entire Lake.

Data is collected for parameters including TP, SRP and sediments, none of which are attributed to any specific source. However, Ontario does publish land use information for the areas surrounding the monitored watersheds, but makes no attempt to establish a causal relationship between land use and water quality. Though Ontario's monitoring network is significant, recent reports indicate that 35 percent of watersheds in the province are not currently being monitored under this system, including areas within the Lake Erie watershed.

Michigan

Phosphorus monitoring in the watershed falls under the purview of the MDEQ. The MDEQ monitors 26 river mouths in Michigan annually for phosphorus. Regarding Lake Erie specifically, the MDEQ monitors the Raisin River Basin, the Detroit River Basin and tributaries of the Maumee River. It also conducts a routine study of 250 additional sites, monitoring 50 randomly selected sites each year in five-year cycles. The MDEQ uses standard U.S. EPA monitoring techniques and makes the results available to the public. Other phosphorus monitoring funded through the DEQ includes: "(a) volunteers through the Cooperative Lakes Monitoring Program; (b) the Department of Natural Resources Fisheries Division; and (c) local governments, organizations, and universities." The MDEQ attempts to monitor total phosphorus, soluble reactive phosphorus and sediments. It creates separate divisions for point and nonpoint sources. Additionally, the DEQ requires reporting of untreated and partially untreated sewage spills which it then publishes online.

Conclusion and Recommendations

While jurisdictions across the Western Lake Erie basin have taken steps toward reducing nutrient pollution into surrounding waters, much more will need to be done to reach the goal of a 40 percent reduction in phosphorus loadings to Lake Erie. Agriculture occupies a large portion of land in this region, and ultimately contributes greatly to eutrophication of Lake Erie. Urban sources of pollution, including CSOs, WWTPs and septic systems, also contribute significantly due to changing weather patterns and aging infrastructure not well-equipped to handle the volume of water they receive. Finally, water quality monitoring in the region is limited in terms of tracking phosphorus loading sources and reductions, which is critical for effective adaptive management and for targeting policies and practices for reducing nutrient loading.

Several key areas for improvement have been identified based on the policies reviewed in this report. First, recommendations for three immediate areas for policy action across the region are identified, including comprehensive nutrient reduction planning for all farms, a complete ban on winter spreading or fertilizer and manure, and improved water quality monitoring. Next, recommendations for longer-term but still pressing policy improvements in all three jurisdictions are identified, including improvements to wastewater infrastructure, septic codes, and wetland preservation and restoration. Each of the following recommendations represents important steps that are necessary to reach the goal of a 40 percent reduction in phosphorus loadings to Lake Erie.

Immediate next steps: Winter spreading, nutrient reduction planning and water quality monitoring

The following three priorities are by no means a cure-all for this issue, but do represent areas where significant progress can be made in the next 12 months to begin advancing toward the goal of a 40 percent reduction in phosphorus loadings to Lake Erie:

- Completely ban manure and fertilizer spreading on frozen or saturated ground
- Require comprehensive nutrient reduction plans by all farms in the Lake Erie basin and

- Improve water quality monitoring of the waterways flowing into Lake Erie.

Spreading on frozen and saturated ground

Ohio and Ontario each have restrictions for manure or fertilizer application on frozen and snow-covered, ground; however, Ontario does not restrict application on saturated ground, while Ohio does. Additionally, both jurisdictions' policies have significant loopholes that allow spreading under these conditions to continue, including exemptions for methods such as incorporation or injections. Michigan has no comprehensive regulations, but instead has a limited policy that applies only to permitted concentrated animal feeding operations (CAFOs), which are farms with large animal herds. Policies in each jurisdiction should be improved by eliminating existing loopholes to completely ban the practice of spreading nutrients on frozen and saturated ground.

Comprehensive nutrient reduction plans

Ohio and Ontario each have policies related to nutrient reduction planning; however, requirements fall short of being comprehensive. Ohio requires nutrient reduction planning for permitted farms with large animal herds (CAFOs), but leaves nutrient reduction planning optional for all other farms. In Ontario, nutrient reduction planning is only required for livestock farms of a certain size, leaving a large portion of farms exempt from legislation, including all field crop operations. Michigan does not have an enforceable policy, and instead has a limited CAFO policy and an optional statewide program that includes nutrient reduction planning. Each jurisdiction should require comprehensive nutrient reduction planning for all agricultural producers that includes provisions for nutrient application based on regular soil testing and the agronomic rate, and implementation of best management practices for land stewardship. Using this combination of tools that emphasizes accuracy and waste reduction are necessary to ensure the elimination of runoff pollution.

Water quality monitoring

While Ohio, Ontario and Michigan all conduct some form of regular water quality monitoring, there is little consistency across jurisdictions. Monitoring practices vary by protocol, the watershed scale at which monitoring takes place (i.e., rivers, tributaries, streams), frequency and other factors. Current monitoring programs fail to consistently and accurately track actual reductions in phosphorus loadings and their sources. Monitoring programs should be improved across the region to effectively track and report publicly on progress toward the 40 percent reduction goal and a clean, healthy Lake Erie.

Additional gaps and priorities

In addition to the three immediate priorities across the region, the following recommendations represent additional areas for improvement in each jurisdiction.

Expand wastewater infrastructure requirements to include green infrastructure and innovation

Each jurisdiction has incorporated some policy efforts to mitigate storm and wastewater pollution and integrate requirements for green

infrastructure as a feasible control measure. In Michigan, significant steps have been taken to bring awareness to and reduce storm and wastewater pollution through its statewide mandatory reporting program, green infrastructure requirements for the Detroit WWTP NPDES permit, and Solid Waste and Sustainability Advisory Panel (SWSAP). Varying degrees of reporting and innovation have been seen at the local levels in Ohio and Ontario, though jurisdiction-wide requirements have not been implemented. All three jurisdictions should expand efforts to incorporate green infrastructure and innovation into wastewater infrastructure requirements.

Jurisdiction-wide septic codes

Ohio and Ontario each have statewide and provincial septic codes, while Michigan delegates code requirements entirely to the county level. In Ohio and Ontario, installation and maintenance requirements are uniform across localities, but requirements to connect to public sewer systems — the preferred outcome — are delegated to localities, with the exception of public nuisance cases. Michigan has no uniformity in its septic system maintenance, with localities ultimately deciding what is required. Each jurisdiction should improve province and statewide policies to ensure installation, maintenance and connection to public sewers are regulated uniformly across localities.

Expand wetland restoration efforts

Each jurisdiction has taken steps toward the preservation of wetlands, which are integral to mitigating pollution of streams, rivers and lakes. Ohio has several provisions to protect wetlands written into its state law, while Michigan is one of only two states in the U.S. to be given legal authority to implement wetland protection requirements under section 404 of the Clean Water Act, but wetlands continue to suffer. Ontario has many policies that touch on protection and restoration of wetlands, including a recently finalized Wetland Conservation Strategy for 2016-2030, but wetlands continue to diminish. Each jurisdiction should implement more aggressive approaches to wetland preservation in order to see needed impact.

Appendix A: WLEB Policy Report Framework

1. Agricultural source pollution

1.1 Nutrient management planning

Key questions:

- Are policies in place to advance / scale-up nutrient management planning for agricultural lands?
  - > Are they optional, incentive-based or regulatory policies?
  - > Do they establish targets and timelines?

- To what do the policies apply?
  - > Livestock operations?
    - – All sizes? Other parameters?
  - > Crop operations
    - – All sizes? Which commodities? Other parameters?

- Manure and commercial fertilizers?

What enforcement and accountability mechanisms are in place?

- Landowner implementation self-reporting mechanism(s)?
- Established penalties such as fines, disqualification for cost-sharing programs, etc.?
- Established government enforcement program (i.e., # spot checks / year)?

1.2 Nutrient application practices

1.2.1 Application of frozen and saturated ground

Key questions:

- Are policies in place to limit or prohibit application of nutrients on frozen or saturated ground?
  - > Are they optional, incentive-based or regulatory policies?

- To what the policies apply?
  - > All agricultural lands? (e.g., crop lands, pasture lands, etc.)
  - > Specified periods (winter, X hours / days prior to forecast heavy precipitation events)
  - > Manure and commercial fertilizers?
    - – Liquid and solid manure?
  - > Are there other loopholes or exemptions to be aware of?

- What enforcement and accountability mechanisms are in place?
  - > Citizen complaint mechanism(s)?
  - > Landowner / producer self-reporting mechanism(s)?
  - > Established penalties such as fines, disqualification from cost-sharing programs, etc.?
  - > Established government enforcement program?

1.2.2 Subsurface application of fertilizers

Key questions:

- Are policies in place to advance / scale-up subsurface application of nutrients on agricultural lands?
  - > Are they optional, incentive-based, technical guidance or regulatory policies?
  - > What is the nature of the policies?
- What enforcement and accountability mechanisms are in place?
  - > Citizen complaint mechanism(s)?
  - > Landowner reporting mechanism(s)?
  - > Established penalties such as fines, disqualification for cost-sharing programs, etc.?
  - > Established government enforcement program?

1.2.3 Agronomic rate

- Are polices in place to advance application of nutrients (phosphorus) according to agronomic rate information?
  - > Is soil testing required to support such policies?
    - – What approach to soil testing (i.e., size of grid of testing)?
  - > Are they optional, incentive-based or regulatory policies?

1.3 Land management practices

1.3.1 Cover crops

Key questions:

- Are policies in place to advance / scale-up use of cover crops on agricultural lands?
  - > Are they optional, incentive-based or regulatory policies?
  - > What is the nature of the policies?
- What enforcement and accountability mechanisms are in place?
  - > Citizen reporting mechanism(s)?
  - > Landowner reporting mechanism(s)?
  - > Established penalties such as fines, disqualification for cost-sharing programs, etc.?
  - > Established government enforcement program?

1.3.2 Ecological restoration and stewardship

Key questions:

- What is the scope of the policies?
  - > Construction of wetlands and retention ponds
  - > Riparian buffers and setbacks
    - – Size standard (i.e., defined width / distance)
  - > Grasslands and reforestation
- What enforcement and accountability mechanisms are in place?
  - > Citizen reporting mechanism(s)?
  - > Landowner reporting mechanism(s)?
  - > Established penalties such as fines, disqualification for cost-sharing programs, etc., for noncompliance?
  - > Established government enforcement program?

2. Urban source pollution

2.1 Wastewater management

2.1.1 Municipal wastewater systems

Key Questions:

- Are policies in place that establish maximum allowable phosphorus effluent limits for municipal wastewater systems?
  - > What are the limits?
  - > What size of systems do they apply to?
  - > Are penalties or other enforcement mechanisms in place?
- Are policies in place to advance innovative wastewater treatment practices such as nutrient recovery?
  - > Are they optional, incentive-based or regulatory policies?
- Are policies or programs in place to connect privately owned septic systems to public systems where density demands such action?

2.1.2 Septic systems

Key Questions:

- Are policies in place regarding inspection and maintenance of septic systems or home sewage treatment systems?
  - > Are they optional, technical guidance, incentive-based or regulatory policies?
  - > What is the frequency of inspection?
  - > Are incentives in place to upgrade failing systems?
  - > Are there penalties for failure to upgrade failing systems?

2.2 Stormwater management

2.2.1 Combined sewer overflows (CSO)

Key Questions:

- Are policies in place regarding public reporting by municipalities on CSO events?
  - > Are they optional, incentive-based or regulatory policies?
  - > When is the municipality required to report? (e.g., anticipated event, after event)
  - > What is the municipality required to report? (e.g., volume, duration, locations)
- Are poilices in place to reduce the impact / number of CSO events?
  - > Are they optional, technical guidance, incentive-based or regulatory policies?

2.2.2 Green infrastructure

Key questions:

- Are policies in place to promote green infrastructure solutions to manage impacts of urban runoff?
  - > Are they fiscal, optional, technical guidance, incentive-based or regulatory policies? (e.g., design standards)
  - > How do they work?
  - > Are there enforcement, reporting or other accountability mechanisms in place?
- Are policies in place that act as disincentives to uptake of green infrastructure solutions? (e.g., policies that disallow tax rebates or incentive programs)

3. Monitoring and reporting

3.1 Monitoring and reporting of phosphorus loadings

Key questions:

- Are policies in place to ensure regular public reporting on annual and spring loadings of phosphorus to the Lake?
  - > Does it include loadings for total phosphorus (TP), soluble reactive phosphorus (SRP) and sediments?
  - > Does it break down loadings to identify relative contributions of various sectors / sources? (i.e., point, nonpoint; urban, agricultural, etc.)
  - > At what watershed scale are loadings reported?
    - – Are loadings reported at the sub-watershed scale for the eight priority watersheds identified in DAP documentation? Others?
  - > Are monitoring and reporting protocols consistent across jurisdictions?

3.2 Monitoring and reporting of management activities

Key question:

- Are policies in place to ensure regular public reporting on uptake / implementation and effectiveness of agricultural best management practices?
- Are policies in place to ensure regular public reporting on uptake / implementation and effectiveness of green infrastructure practices?

Appendix B: Nutrient Reduction Planning Requirements (Ontario) [119]

	Component	Included in a Strategy	Included in an NMP	Included in an NASM Plan
Operation Information	Description of the Operation	Y	Y	Y
	Agreements	Y	Y	Y
For Farm Units	Farm Unit Declaration Form	Y	Y	Y
	Farm Unit Sketch	Y	Y	Y
Inventory and Description of Prescribed Materials	List of Prescribed Materials (generated and received)	Y	Y	Y
	Analysis of Nutrient Content or use of Table 2 Information*	N	Y	Y
Destination and Storage	Destinations	Y	N	N
	Agricultural Source Material Storage Facilities	Y	Y	N
NASM Plan	NASM Storage Facilities	Y	Y	Y
Contingency Plan	Contingency Plan	Y	Y	Y
Sign-off form	Sign-off Form	Y	Y	Y
Field Information	Field Properties	N	Y	Y
	Field Sketches	N	Y	Y
	Soil Samples and Analysis	N	Y	Y
Crop Information	Crop Rotation and Yields	N	Y	Y
	Tillage Practices	N	Y	Y
Nutrient Application Information	Commercial Fertilizer Application	N	Y	Y
	Application of Prescribed Materials	N	Y	Y
	Agronomic and Crop Removal Balance for Nitrogen	N	Y	Y
	Agronomic and Crop Removal Balance for Phosphorous	N	Y	Y
	Common Land Application Setbacks/Limits	N	Y	Y
	Demonstration of Adequate Land base	N	Y	Y
	Information on a Regulated Mixed Anaerobic Digestion ("AD") facility	Y	N	N

* *From the Nutrient Management Tables document as amended from time to time, prepared by the Ministry of Agriculture, Food and Rural Affairs and the Ministry of the Environment for the purposes of the NASM Odour Guide and the Nutrient Management Protocol*

http://www.omafra.gov.on.ca/english/nm/regs/nmpro/nmpro04-09.htm

[119] "Part 4 - Introduction to Nutrient Management Strategies, Plans and NASM Plans." http://www.omafra.gov.on.ca/english/nm/regs/nmpro/nmpro04-09.htm. Accessed 13 Sep. 2017.

Appendix C: Riparian Policies (Ohio) [120]

Summary of Riparian and Wetland Setback Regulations in Ohio

County Governments

Butler County

Special flood areas identified on the FEMA FIRMs and all second order and greater waterways shown as blue line streams on USGS Quadrangles receive stream buffer areas of at least 75 feet on each side of the stream. These stream buffer areas should be maintained in an undisturbed state. No building or structures other than roads, bridges, paths, stormwater management facilities, levees, and utilities should be built within the buffer areas.

Adopted: November 2010, Flood Damage Prevention Regulations Section 6

Contact: Butler County Planning Department, (513) 887-3413

Hamilton County

Streams draining 100-250 acres have a 25 foot building setback. Streams draining 251-500 acres have a setback of 35 feet or the 100-year floodway, whichever is narrower. Streams draining 501-750 acres have a setback of 45 feet or the 100-year floodway, whichever is narrower. Streams draining 751-1,200 acres have a setback of 55 feet or the 100-year floodway, whichever is narrower. Streams draining more than 1,200 acres have a setback of 65 feet or the 100-year floodway, whichever is narrower. Setbacks are extended for sleep slopes and to the edge of the wetland.

Adopted: April 2009, Article IV of the Rules and Regulations of the Hamilton County Storm Water District issued by the Board of County Commissioners

Contact: Hamilton County Board of County Commissioners (513) 946-4400

[120] "Summary of Riparian and Wetland Setback Regulations in Ohio." http://crwp.org/files/Riparian_Wetland_Regulation_summary_November2013.pdf. Accessed 13 Sep. 2017.

Knox County

Where a subdivision is traversed by a water course, acceptable drainage way, channel, or stream, there shall be provided a storm water easement or drainage right of way not less than 20 feet in width, conforming substantially with the lines of such water course.

Adopted: January 2005, Subdivision Code Chapter 5.

Contact: Knox County Regional Planning Commission, (740) 393-6718.

Lake County

New subdivisions in unincorporated areas must maintain the following riparian setbacks: a minimum setback of 25 feet for streams draining less than 2.5 square miles, 40 feet for streams draining 2.5 to 5 square miles, 50 feet for streams draining 5-10 square miles, 75 feet for streams draining 10-20 square miles, 100 feet for streams draining 20-50 square miles, and 120 feet for streams draining 50 square miles or more. Minimum setbacks are extended to the 100-year floodplain.

Adopted: December 17, 2002, Subdivision Regulations Article IV, Section 8.

Contact: Lake County Planning Commission, 1-440-918-2740.

Licking County

Stream bank buffers located within the delineated 100-year floodplain areas shall be kept in a natural or scenic condition within subdivisions and major developments. Stream bank buffer width varies with drainage area. Buffers are a minimum of 100 feet on each side of all streams draining an area greater than 20 square miles. A minimum of 75 feet on each side of all streams draining an area of greater than 0.5 square miles and up to 20 square miles. A minimum of 50 feet on each side of all streams draining an area of greater than 0.05 square miles and up to 0.5 square miles. A minimum of 30 feet on each side of all streams draining an area of less than 0.05 square miles. Stream buffers are extended to the 100-year floodplain.

Adopted: December 2006, Flood Damage Prevention Regulations for Licking County, Ohio Section 5.2 - 6

Contact: Licking County Planning Commission, (740) 670-5200

Madison County

The sections of the Big Darby and Little Darby Creeks which flow through the unincorporated area of Madison County have been designated State Scenic Rivers. Minimum riparian setback of 120 feet shall be maintained along both sides of stream channels which are designated as components of the State Scenic River system. No structure shall be constructed within the one hundred and twenty (120) foot buffer zone. Uses shall be permitted within the buffer area only to the extent that the use is permitted within the zoning district controlling the use of said land and provided that said uses do not require structures, fill, or storage of materials or equipment, or the cutting of natural vegetation.

Adopted: May 1991, Madison County Zoning Resolution, Section 21.12

Contact: Madison County, (740) 852-2833.

Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile (320 acres) and up to 20 square miles. Minimum of 50 feet on each side of all streams

draining an area greater than 0.05 square mile (32 acres) and up to 0.5 square mile (320 acres). Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile (32 acres). Extended to outer edge of 100-year floodplain where 100-year floodplain is wider than riparian setback. Where wetlands occur within the riparian setback, Category 3 wetlands will receive an additional 50 foot setback and Category 2 wetlands will receive an additional 30 foot setback. No additional setback will be required adjacent to Category 1 wetlands. Setbacks are also extended for areas with steep streambanks.

Adopted: April 29, 2002, Summit County Ohio Riparian and Wetland Setbacks, Revised March 2008 Summit County Subdivision Regulations, Appendix N, Summit County Riparian Ordinance.

Contact: Summit County Soil & Water Conservation District, (330) 929-2871.

Municipal Governments

City of Amherst, Lorain County

Under the erosion and sediment control and stormwater regulations, construction activities must maintain a 25 foot buffer surrounding all waters of the state except for crossings and other impacts approved by the City Engineer.

Adopted: July 2011, Streets and Public Services Code Chapter 916.

Contact: Safety Services Director (440) 988-3726

City of Aurora, Portage County

Minimum 75 feet riparian setback from the Aurora Branch of the Chagrin River and any other watercourses draining more than ½ square mile. Minimum 25 feet riparian setback from all watercourses, regardless of drainage area. Extended to outer edge of 100-year floodplain where 100-year floodplain is wider than riparian setback.120 foot setback extending beyond the outer boundary of a Category 3 Wetland. Minimum 75 foot setback extending beyond the outer boundary of a Category 2 Wetland.

Adopted: June 2000, revised June 2006, Zoning Ordinances Chapter 1157.

Contact: Director of Planning and Zoning, (330) 995-5334.

City of Avon Lake, Lorain County

Under the erosion and sediment control and stormwater regulations, construction activities must maintain a 25 foot buffer surrounding all waters of the state except for crossings and other impacts approved by the City Engineer.

Adopted: July 2007, Streets, Utilities, and Public Services Code Chapter 1060.05.

Contact: Engineering Department, (440) 933-6141 x 1200

City of Bay Village, Cuyahoga County

Minimum setback of 25 feet on each side of all designated watercourses. Extended to outer edge of 100-year floodplain where 100-year floodplain and to the edge of wetlands within the setback.

Adopted: March 2011, Building Code Chapter 1308

Contact: Bay Village Building Department, (440)871-2200

City of Beachwood, Cuyahoga County

Minimum of 75 feet on each side of all designated watercourses draining an area equal to or

greater than one-half (0.5) square mile. Minimum of 25 feet on each side of all designated watercourses draining an area less than one half (0.5) square mile and having a defined bed and bank. Extended to outer edge of 100-year floodplain. 50 feet extending beyond the outermost boundary of a Category 3 wetland. 30 feet extending beyond the outermost boundary of a Category 2 wetland.

Adopted: July 2008, Planning and Zoning Code Chapter 1157.

Contact: Building Department, (216) 464-1070.

Village of Bentleyville, Cuyahoga County

Minimum of 120 feet on either side of all watercourses draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank.

Adopted: August 2007, revised November 2009 Chapter 1271.05

Contact: Village Engineer, (440) 439-1999

City of Berea, Cuyahoga County

Minimum of 300 feet on all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on watercourses draining an area greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on all watercourses draining an area greater than one-half square mile and up to 20 square miles. Minimum of 25 feet on all watercourses draining an area less than one-half square mile and having a defined bed and bank. Extended to outer edge of 100-year floodplain and to the outer edge of wetlands in the setback. Minimum setbacks of 120 for Category 3 wetlands and 75 feet for Category 2 wetlands.

Adopted: October 2006, Codified Ordinances Chapter 320C

Contact: City of Berea, (440) 826-5800.

Village of Boston Heights, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile. Minimum setbacks are extended to the 100-year floodplain and to include riparian wetlands. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes > 20-25%, and 100 feet are added where slopes are > 25%. Additional setbacks of 50 feet for Category 3 and 30 feet for Category 2 wetlands within the riparian setback.

Adopted: May 2006, Chapter 1181 of Planning and Zoning Code

Contact: Village of Boston Heights, (330) 650-4111

City of Broadview Heights, Cuyahoga County

Minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on both sides of all watercourses draining an area

greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one-half square mile and up to and including 20 square miles. Minimum of 50 feet on both sides of all watercourses draining an area less than one-half square mile and having a defined bed and bank. Extended to the outer edge of the 100-year floodplain.120 feet setback extending beyond the outer boundary of a Category 3 wetland. 75 foot setback extending beyond the outer boundary of a Category 2 wetland.

Adopted: April 2004; Codified Ordinances Chapter 1334

Contact: City Engineer, (440) 838-4705.

City of Brook Park, Cuyahoga County

Minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one-half square mile and up to and including 20 square miles. Minimum of 25 feet on both sides of all watercourses draining an area less than one-half square mile and having a defined bed and bank. Extended to the outer edge of the 100-year floodplain. 120 feet setback extending beyond the outer boundary of a Category 3 wetland. 75 feet setback extending beyond the outer boundary of a Category 2 wetland.

Adopted: Passed May 2008, Chapter 920

Contact: City Engineer, (440) 260-1555.

City of Brunswick, Medina County

Minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one-half square mile and up to and including 20 square miles. Minimum of 25 feet on both sides of all watercourses draining an area less than one-half square mile and having a defined bed and bank. Minimum setback extended to the 100-year floodplain and the outer boundary of wetlands within the riparian zone.

Adopted: April 2006, Chapter 1238

Contact: City Engineer, (330) 558-6880.

Village of Buckeye Lake, Licking County

Within subdivisions, a thirty foot watercourse easement shall be provided along every watercourse, drainage channel, stream, or other environmentally sensitive area. Structures and fill are not permitted in the easement unless approved in writing by the Licking County Planning Commission. All perennial streams shown on USGS Quad Maps shall receive a 50 foot natural buffer that should not be disturbed without prior approval of the Buckeye Lake Planning Commission. Impervious surfaces including septic tanks and drainfields are prohibited within 75 feet of streams shown on USGS Quad Maps.

Adopted: Subdivision Regulations, Sections 42 & 44

Contact: Village of Buckeye Lake 740-928-7100

Village of Chagrin Falls, Cuyahoga County

Minimum 120 feet riparian setback from either side of designated watercourses 10 feet wide or greater and extends to include floodplains, wetlands, steep slopes and wooded areas

Adopted: 1997, Revised June 2013, Planning and Zoning Code Chapter 1151

Contact: Village Administrator, (440) 247-6106.

City of Cuyahoga Falls, Summit County

Within the Northampton Planning Area and other areas designated by City Council, streams draining 300 square miles should have buildings setback at least 100 feet, with development limited 100-300 feet from the stream. Streams draining 20 to 300 square miles should have buildings setback at least 75 feet, with development limited 75-100 feet from the stream. Streams draining 0.5 to 20 square miles should have buildings setback at least 50 feet, with development limited 50-75 feet from the stream. Streams draining 32 acres to 0.5 square mile should have buildings setback at least 50 feet. Streams draining up to 32 acres should have buildings setback at least 30 feet. Setbacks extended for steep slopes and wetlands.

Adopted: 2009, Chapter 1125

Contact: Development Department, (330) 971-8135

City of Euclid, Cuyahoga County

Minimum of 25 feet on each side of watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum of 75 feet on each side of watercourses draining an area greater than or equal to ½ square mile and up to 20 square miles. Minimum of 120 feet on each side of watercourses draining an area greater than or equal to 20 square miles. 120 foot setback extending beyond the outer boundary of a Category 3 wetland. 75 foot setback extending beyond the outer boundary of a Category 2 wetland. No additional setback will be required adjacent to Category 1 wetlands.

Adopted: June 2007, Chapter 150-2007 Codified Ordinances

Contact: Public Service Department, (216) 289-2701.

City of Fairview Park, Cuyahoga County

Minimum of 50 feet on each side of all streams draining an area greater than 20 square miles. Minimum of 25 feet on each side of all streams draining an area up to 20 square miles. Minimum setbacks extended to the 100 -year floodplain and the outer boundary of wetlands within the setback. Mitigation required for variances. 120 foot setback extending beyond the outer boundary of a Category 3 wetland. 75 foot setback extending beyond the outer boundary of a Category 2 wetland. Wetland setbacks need not be the same length in all directions if the same amount of area is included in the buffer, flexing the buffer does not reduce the wetland's function, and the width is not reduced less than 75% the standard width.

Adopted: March 2008, Building Code Chapter 1339

Contact: Building Commissioner, (440) 356-4403.

City of Green, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 30 feet on each

side of all streams draining an area less than 0.05 square mile. Extended to the outer edge of the 100-year floodplain. . Additional setback of 25 feet on riparian slopes of 15-20% grade, 50 feet on slopes 21-25%, and 100 feet on slopes greater than 25%. Additional 50 foot setback for Category 3 wetlands and additional 30 foot setback for Category 2 wetlands occurring in the riparian setback.

Adopted: November 2003, Building & Housing Code Chapter 1468

Contact: City of Green Zoning Department, (330) 896-6605

Village of Hebron, Licking County, Ohio

Within subdivisions and major developments, stream buffers should be maintained along waterways. The buffer size varies with drainage area. A minimum of 100 feet on both sides of the stream is required for all streams draining greater than 20 square miles. A minimum of 75 feet on both sides of the stream is required for all streams draining greater than 0.5 square miles and up to 20 square miles. A minimum of 50 feet on both sides of the stream is required for all streams draining greater than 0.05 square miles and up to 0.5 square miles. A minimum of 30 feet on both sides of the stream is required for all streams draining less than 0.5 square miles. Buffers are extended to the 100-year floodplain. Buffers should be maintained in a natural or scenic condition.

Adopted: March 2007; Codified Ordinances 1327.04

Contact: Village of Hebron (740) 928-2261

City of Hudson, Summit County

Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile. Minimum 50 feet from the delineated edge of a wetland.

Adopted: September 2003, Planning and Zoning Code Chapter 1207

Contact: Planning Director, (330) 650-1799.

Village of Hunting Valley, Cuyahoga County

Regulation of construction of structures and other activities within 300 feet of the Chagrin River or 100 feet of the 100-year floodplain, whichever distance is greater. Regulation of construction of structures and other activities within 75 feet of streams with drainage areas greater than 0.5 square miles and up to 20 square miles and within 25 feet of streams with drainage areas less than 0.5 square miles.

Adopted: October 2000 initially on Chagrin River and large tributaries, Revised January 2009, Planning and Zoning Code Chapter 1155.

Contact: Building Commissioner, (440) 247-6464.

City of Independence, Cuyahoga County

Minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one half square mile and up to and including 20

square miles. Minimum of 25 feet on both sides of all watercourses draining an area less than one half square mile and having a defined bed and bank as determined above. Extended to the outer edge of the 100-year flood plain. Wetland setback of 120 feet for Category 3 and 75 feet for Category 2 wetlands.

Adopted: December 2003, Building Code Chapter 1354

Contact: Law Director, (216) 706-3870

City of Kirtland, Lake County

Minimum of 120 feet on either side of all watercourses draining an area greater than 20 square miles. Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank as determined in 1294.05(A)(2) of this regulation. Minimum setbacks expanded to 100-year floodplain and riparian wetlands.

Adopted: July 2002, Planning and Zoning Code Chapter 1294.

Contact: City Engineer, (440) 951-9000.

City of Lorain, Lorain County

Minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one half square mile and up to and including 20 square miles. Minimum of 25 feet on both sides of all watercourses draining an area less than one half square mile and having a defined bed and bank as determined above. Minimum setbacks expanded to 100-year floodplain and riparian wetlands.

Wetland setbacks of 120 for Category 3 Wetlands and 75 feet for Category 2 Wetlands.

Adopted: July 2004, Building Code Chapter 1533

Contact: Building & Electrical Department, (440) 204-2045

City of Macedonia, Summit County

Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 30 feet on each side of streams draining less than 0.05 square mile. Minimum setbacks are extended to the 100-year floodplain. If Category 3 wetlands occur within the riparian zone, the setbacks are extended 50 feet beyond the wetland boundary. If Category 2 wetlands occur within the riparian zone, the setbacks are extended 30 feet beyond the wetland boundary. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes > 20-25%, and 100 feet are added where slopes are > 25%.

Adopted: December 2007, Public Services Code Chapter 924

Contact: City of Macedonia, 330-468-8300

Mayfield Village, Cuyahoga County

Minimum of 75 feet on either side of streams of draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 25 feet on either side of streams of draining an area less than 0.5 square miles and having a defined bed

and bank. Minimum setbacks expanded to 100-year floodplain and riparian wetlands.

Adopted: August 2013, Codified Ordinance Chapter 1127

Contact: Mayfield Village, 440-461-2210

City of Mentor, Lake County

25 foot "conservation protection zone" present on either side of streams draining greater than 100 acres within subdivisions.

Adopted: October 2010, Planning & Zoning Code Chapter 1115.09

Contact: City of Mentor, 440-255-1100

City of Mentor-on-the-Lake, Lake County

Minimum of 120 feet on each side of all watercourses draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all watercourses draining an area greater than one -half square mile and up to 20 square miles. Minimum of 25 feet on each side of all watercourses draining an area less than one-half square mile and having a defined bed and bank. Extended to include the outermost boundary of the 100-year floodplain and riparian wetlands. Setbacks are to be preserved in their natural state.

Adopted: November 2004, Planning and Zoning Code Chapter 1286.

Contact: Service Director, (440) 257-7216.

City of Middleburg Heights, Cuyahoga County

Minimum of 25 feet on each side of watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum of 75 feet on each side of watercourses draining an area greater than or equal to ½ square mile and up to 20 square miles. Minimum of 120 feet on each side of watercourses draining an area greater than or equal to 20 square miles. 120 feet setback extending beyond the outer boundary of a Category 3 wetland. 75 feet setback extending beyond the outer boundary of a Category 2 wetlands. No additional setback will be required adjacent to Category 1 wetlands.

Adopted: 2007, Chapter 1363

Contact: Building Department, (440) 234-2218

Village of Moreland Hills, Cuyahoga County

Minimum of 300 feet on either side of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on either side of all watercourses draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Extended to 100-year floodway.

Adopted: October 2006, Chapter 1131.

Contact: Village Engineer (440) 439-1999

City of Munroe Falls, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles and up to 20 square miles.

Minimum of 50 feet on each side of all streams draining greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet on each side of all streams draining less than 0.05 square miles. Extended to the outer edge of the 100-year floodplain. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes 21-25%, and 100 feet are added where slopes are > 25%. Where wetlands occur within the riparian setback, the setback is extended 50 feet from the edge of Category 3 wetlands and 30 feet for Category 2 wetlands.

Adopted: May 2008, Chapter 1142

Contact: Building and Zoning Department, (330) 688-7491

City of New Franklin, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles and up to 20 square miles.

Minimum of 50 feet on each side of all streams draining greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet on each side of all streams draining less than 0.05 square miles. Extended to the outer edge of the 100-year floodplain. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes 21-25%, and 100 feet are added where slopes are > 25%. Where wetlands occur within the riparian setback, the setback is extended 50 feet from the edge of Category 3 wetlands and 30 feet for Category 2 wetlands.

Adopted: City of New Franklin Zoning Code Article 11

Contact: Planning and Zoning Department, (330) 882-4611

City of North Olmsted, Cuyahoga County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 120 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles and up to 20 square miles.

Minimum of 25 feet on each side of all streams draining an area less than 0.5 square miles. Extended to the outer edge of the 100-year floodplain and riparian wetlands. Minimum setback of 120 feet for Category 3 wetlands. Minimum setback of 75 feet for Category 2 wetlands

Adopted: March 2006, Chapter 926 Streets, Utilities, and Public Services Code

Contact: City of North Olmsted Planning Department. (440) 716-4135.

City of North Royalton, Cuyahoga County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 120 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 25 feet on each side of all streams draining an area less than 0.5 square miles. Extended to the outer edge of the 100-year floodplain and riparian setbacks. Additional setbacks for areas with steep streambanks. Category 3 wetlands within the riparian setback receive an additional

120 foot setback, and Category 2 wetlands within the riparian setback receive an additional 75 foot setback.

Adopted: Amended December 2005, Building and Housing Code Chapter 1492.

Contact: City Engineer, (440) 582-3001.

Northfield Village, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 120 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 1.0 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.5 square mile and up to 1.0 square mile. Minimum of 25 feet on each side of all streams draining an area less than 0.5 square mile and having a defined bed and bank. Minimum setbacks are extended to the 100-year floodplain and to include riparian wetlands. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes > 20-25%, and 100 feet are added where slopes are > 25%. The following are exempt from the terms and protection of riparian setbacks: grassy swales, roadside ditches, drainage ditches created at the time of a subdivision to convey storm water to another system, tile drainage systems, and stream culverts. Wetland setbacks of 120 feet for Category 3 wetlands and 75 feet for Category 2 wetlands.

Adopted: 2007, Chapter 1252 Planning & Zoning Code

Contact: Service/Building & Zoning Department, 330-467-7139 Ext. 20

City of Norton, Summit County

Minimum of 100 feet on both sides of all watercourses draining an area greater than 20 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than one-half square mile and up to and including 20 square miles. Minimum of 50 feet on both sides of all watercourses draining an area greater than 32 square miles and up to and including one-half square mile and having a defined bed and bank. Minimum setbacks expanded to 100-year floodplain and riparian wetlands. Minimum of 50 feet surrounding and including Category 3 Wetlands. Minimum of 30 feet surrounding and including Category 2 Wetlands.

Adopted: June 2004, Building and Housing Code Chapter 1472.

Contact: City of Norton, (330) 825-7815 ext. 49

City of Oberlin, Lorain County

A minimum buffer of 50 feet on both sides shall be provided along the length of any perennial stream channel as designated by Lorain County Soil and Water Conservation District within Conservation Development Districts. Within Conservation Development Districts, minimum buffer of 50 feet of natural vegetation for wetlands required to be retained by the Army Corps of Engineers or Ohio EPA and 70 feet buffer between wetlands and pavement or buildings.

Adopted: July 2006, Chapter 1344 Planning and Zoning Code

Contact: Oberlin Planning Department, (440) 775-7250.

City of Olmsted Falls, Cuyahoga County

Minimum of 300 feet on both sides of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on both sides of all watercourses draining an area greater than 20 square miles and up to and including 300 square miles. Minimum of 75 feet on both sides of all watercourses draining an area greater than ½ square mile and up to and including 20 square miles. Minimum of 25 feet on both sides of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum setbacks expanded to 100-year floodplain and riparian wetlands.

Adopted: Adopted May 2007, Chapter 1470 of the Codified Ordinances.

Contact: City Engineer, (440) 885-8030.

Orange Village, Cuyahoga County

Minimum of 25 feet on each side of watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum of 75 feet on each side of watercourses draining an area greater than or equal to ½ square mile and up to 20 square miles. Extended to 100 year floodplain. Extended to the outermost boundary of wetlands within a minimum riparian setback.

Adopted: March 2006, Planning and Zoning Code Chapter 1176

Contact: Village Engineer, (216) 731-6255.

City of Parma, Cuyahoga County

Minimum riparian setback of 25 feet on both sides of all watercourses draining less than ½ square mile and having a defined bed and bank. Minimum riparian setback of 75 feet on both sides of Big Creek, West Creek and water courses draining an area greater than ½ square mile and up to 20 square miles. Setbacks extended to 11-year floodplain. Wetlands found within a riparian setback shall receive additional 75 foot minimum setbacks extending beyond the outer boundary of the wetland.

Adopted: December 2003, Planning and Zoning Code Chapter 1111.

Contact: City Engineer, (440) 885-8030.

City of Pepper Pike, Cuyahoga County

Minimum of 300 feet on either side of all watercourses draining an area greater than 300 square miles. Minimum of 120 feet on either side of all watercourses draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Where the 100-year floodplain is wider than a minimum riparian setback on either or both sides of a designated watercourse, the minimum riparian setback shall be extended to the outer edge of the 100-year floodplain. Where a wetland is identified within a minimum riparian setback, the minimum riparian setback width shall be extended to the outermost boundary of the wetland.

Adopted: May 2008, Planning and Zoning Code Chapter 1540

Contact: City Engineer, (440) 439-1999

Village of Plain City, Madison County

Includes streams shown on USGS topographical map, Madison County Riparian Setback map, USDA, NRCS

Soils Survey map, or Parks City Riparian Setback map. Minimum riparian setbacks of 50 feet on agricultural and roadside ditches, 100 feet on all ephemeral and intermittent streams and 300 feet on perennial streams on either side of watercourses. Wetlands setback of 100 feet for Category 3 and Category 2 wetlands.

Adopted: January 2008.

Contact: Zoning Department, (614) 873-1945.

Village of Reminderville, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 25 feet on each side of all streams draining an area less than 0.05 square mile and having a defined bed and bank as determined above. Minimum setbacks are extended to the 100-year floodplain and to include riparian wetlands. If Class 3 wetlands occur within the riparian zone, the setbacks are extended 50 feet beyond the wetland boundary. If Class 2 wetlands occur within the riparian zone, the setbacks are extended 30 feet beyond the wetland boundary. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes > 20-25%, and 100 feet are added where slopes are > 25%. The following are exempt from the terms and protection of riparian setbacks: grassy swales, roadside ditches, drainage ditches created at the time of a subdivision to convey storm water to another system, tile drainage systems, and stream culverts.

Adopted: December 2004, Planning and Zoning Code Chapter 1345

Contact: Village of Reminderville, 330-562-1234

Village of Richfield, Summit County

Minimum setbacks from streams as shown on the riparian setback map. Additional setbacks required for steep slopes.

Adopted: Zoning Code Chapter 1179

Contact: Planning and Zoning Department, (330) 659-9201

City of Richmond Heights, Cuyahoga County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 120 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Setbacks extended to include 100-year floodplain and riparian wetlands. 120 foot setback extending beyond the outer boundary of a Category 3 wetland. 75 foot setback extending beyond the outer boundary of a Category 2 wetland. No additional setback will be required adjacent to Category 1 wetlands.

Adopted: May 7, 2007, Chapter 1197 Codified Ordinances

Contact: Building Department, (216) 383-6312.

Sheffield Village, Lorain County

Minimum of 50 foot buffer from all perennial streams and 20 foot buffer from wetands within Conservation Development areas.

Adopted: April 2004, Chapter 1157, Planned Unit Development Regulations, Planning and Zoning Code

Contact: Sheffield Village, (440) 949-6325

City of Sheffield Lake, Lorain County

Minimum of 25 feet on both sides of all watercourses draining an area less than one half square miles and having a defined bed and bank. Minimum setbacks expanded to 100-year floodplain and riparian wetlands. Wetland setbacks shall be determined by Floodplain Manager using practical guidelines.

Adopted: May 2011, Streets, Utilities, and Public Services Code Chapter 944

Contact: City of Sheffield Lake, (440) 949-7141

Village of Silver Lake, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile (320 acres) and having a defined bed and bank. Minimum setbacks are extended to the 100- year floodplain. Where steep slopes exist in riparian areas, the riparian setback is extended; 25 feet are added in areas with average slopes of 15-20%, 50 feet are added in areas with average slopes 21-25%, and 100 feet are added where slopes are > 25%. Where wetlands occur within the riparian setback, the setback is extended 50 feet from the edge of Category 3 wetlands and 30 feet for Category 2 wetlands.

Adopted: November 2007, Chapter 1169

Contact: Village of Silver Lake, (330) 923-5233

City of South Euclid, Cuyahoga County

Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum setbacks expanded to 100-year floodplain and riparian wetlands. Wetland setbacks of 50 feet for Category 3 wetlands and 30 feet for Category 2 wetlands.

Adopted: June 2008, Planning and Zoning Code Chapter 780

Contact: City of South Euclid, (216) 381-0400

City of Stow, Summit County

Within the Mud Brook Watershed Stream and Wetland Overlay District, minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square

mile and up to 0.5 square mile. Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile. 50 foot setback extending beyond the outer boundary of a Category 2 wetland and 100 foot setback extending beyond the outer boundary of a Category 2.

Adopted: January 2008, Chapter 1155

Contact: City of Stow, (330) 689-2819.

City of Streetsboro, Portage County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05 square mile and up to 0.5 square mile. Minimum of 25 feet on each side of all streams draining an area less than 0.05 square mile. Minimum setbacks extended to the 100-year floodplain with additional setbacks for steep slopes. Wetland setbacks of 120 feet from Category 3, 75 feet from Category 2, and 25 from Category 1 wetlands. Mitigation required for variances resulting in loss of riparian or wetland function.

Adopted: June 2009, Chapter 1191 of Planning & Zoning Code

Contact: Planning, Zoning, and Economic Development Department, 330-626-4942

City of Tallmadge, Summit County

Minimum of 300 feet setback from streams draining an area greater than 300 square miles. Minimum of 100 feet setback from streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet setback from streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 50 feet setback from streams draining an area greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet setback from streams draining less than 0.05 square miles. Minimum setbacks extended to the 100-year floodplain. Additional setback of 25 feet on riparian slopes of 15-20% grade, 50 feet on slopes 21-25%, and 100 feet on slopes greater than 25%. Category 3 wetlands existing within the riparian setback receive additional 50 foot setbacks, and Category 2 wetlands existing within the riparian setback receive additional 30 foot setbacks.

Adopted: August 2006, Chapter 1190

Contact: Planning & Zoning Department, (330) 633-0090

City of Wadsworth, Medina County

Riparian setbacks of approximately 10 times the width of the channel as calculated using the formula from the Rainwater and Land Development Manual. Riparian zones shall be established on designated wetlands using the methods outlined in the most current version of the Rainwater and Land Development Manual developed by the Ohio Department of Natural Resources and incorporated into the city's Engineering Rules and Regulations. Riparian setbacks extended to the 100-year floodplain.

Adopted: June 2008, Codified Ordinances Chapter 154

Contact: Planning and Zoning Director, (330) 335-2752

Village of Waite Hill, Lake County

"Ecologically sensitive areas" defined as "any designated area

in the Village which, due to a unique or special topography, soil type or hydrology or other ecologically relevant feature which, if disturbed, may cause significant ecological harm to the developed property or neighboring property," may not be disturbed, built on, graded, clear cut or developed unless it can be proven that the activity or development will not adversely impact the "ecologically sensitive area" or any neighboring property. Properties designated as "ecologically sensitive areas" are shown on a map and mentioned in the ordinance.

Adopted: June 1995, Revised 2009, Codified Ordinances Chapter 1329

Contact: Planning and Zoning Commission (440) 942-1612

Village of Walton Hills, Cuyahoga County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 120 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 25 feet on each side of all streams draining an area less than 0.5 square mile and having a defined bed and bank as determined above. Minimum setbacks are extended to the 100-year floodplain and to include riparian wetlands.

Adopted: 2010, Chapter 1291 of Planning and Zoning Code

Contact: Village of Walton Hills (440) 232-7800

City of Warrensville Heights, Cuyahoga County

Riparian setbacks on designated watercourses must be a minimum of 25 feet. Riparian setbacks extended 20 feet from the edge of Category 3 and 10 feet for Category 2 wetlands located within the riparian setback. Riparian setbacks extended 15 feet for riparian slopes at a 15-20% slope and 25 feet for riparian slopes greater than 25%. Riparian setbacks extended to the 100-year floodplain.

Adopted: September 2007, Zoning Code 923

Contact: City of Warrensville Heights, (216) 587-6500

City of Willoughby Hills, Lake County

Minimum of 120 feet on either side of a watercourse draining greater than 20 square miles. Minimum of 75 feet on either side of a watercourse draining greater than ½ square miles and up to 20 square miles. Minimum of 25 feet on either side of a watercourse draining an area less than ½ square mile and having a defined bed and bank. 120 feet extending beyond the outer boundary of a Category 3 wetlands. 75 feet extending beyond the outer boundary of a Category 2 wetlands. Adopted: June 2008 in Protected Areas Code Chapter 1167 Contact: Building Commissioner, (440) 975-3550

Village of Woodmere, Cuyahoga County

Minimum riparian setback of 25 feet from streams. Setback is extended to the 100- year floodplain.

Adopted: December 2005, Chapter 1187

Contact: Village Engineer (440) 439-1999

Townships

Auburn Township, Geauga County

Minimum of 25 feet on each side of watercourses draining an area less than ½ square mile and having a defined bed and bank.

Minimum of 75 feet on each side of watercourses draining an area greater than or equal to ½ square mile and up to 20 square miles. Minimum of 120 feet on each side of watercourses draining an area greater than or equal to 20 square miles. Minimum setbacks expanded to 100-year floodplain and riparian wetlands. Category 3 wetlands occurring within the riparian setback receive an additional 50 foot setback, and Category 2 wetlands wetlands occurring within the riparian setback receive an additional 30 foot setback.

Adopted: January 2005 Zoning Resolution Article 3.06.

Contact: Zoning Inspector, (440) 543-1660.

Bainbridge Township, Geauga County

Minimum of 25 feet on each side of watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum of 75 feet on each side of watercourses draining an area greater than or equal to ½ square mile and up to 20 square miles. Minimum of 120 feet on each side of watercourses draining an area greater than or equal to 20 square miles. Minimum setbacks expanded to 100- year floodplain and riparian wetlands.

Adopted: February 2004, Zoning Resolution Chapter 160.

Contact: Zoning Inspector, (440) 543-9871.

Bath Township, Summit County

Minimum of 300 feet on each side of all streams draining an area greater than 300 square miles. Minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on each side of all streams draining an area greater than 0.5 square mile and up to 20 square miles. Minimum of 50 feet on each side of all streams draining an area greater than 0.05square mile and up to 0.5 square mile. Minimum of 30 feet on each side of all streams draining an area less than 0.05 square mile. Setbacks are extended for steeply sloping riparian corridors and to the 100 year-floodplain. In addition, where wetlands occur within the riparian setback, the riparian setback is extended to the outer edge of the wetlands plus 50 feet for Category 3 wetlands and 30 feet for Category 2 wetlands.

Adopted: May 2003, Bath Township Zoning Resolution Article IV, Section 411

Contact: Bath Township, 330-666-4007

Brimfield Township, Portage County

Minimum riparian buffer of twenty-five (25) feet on either side of a river or perennial channel, measured from the river or stream bank. Small streams without clearly defined high water marks can be measured from the centerline. This buffer may be required to be increased based upon the type of stream, slope of the stream banks, surrounding soils, vegetation, land uses, and the function of the stream, but in general shall not exceed three-hundred (300) feet. Minimum wetland buffer of twenty-five (25) feet, measured from the edge of the designated wetland. The area within this buffer shall not be disturbed and shall be retained in its natural state; and a minimum building and pavement setback of forty (40) feet, measured from the edge of the designated wetland.

Adopted: October 2007, Zoning Code Chapter 5 Section 506.06

Contact: Zoning Commission (330) 678-0739

Canfield Township, Mahoning County

Minimum of 120 feet on either side of all watercourses draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet on either side of all watercourses draining an area greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum riparian setback width shall be extended to the outermost boundary of the wetland.

Adopted: May 2005, Zoning Code Section 619

Contact: Zoning Commission (330) 678-0739

Copley Township, Summit County

Minimum of 300 feet from streams draining an area greater than 300 square miles. Minimum of 100 feet from streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet from streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 50 feet from streams draining an area greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet from streams draining less than 0.05 square miles. Minimum setbacks extended to the 100- year floodplain and riparian wetlands. Additional setback of 25 feet on riparian slopes of 15-20% grade, 50 feet on slopes 21-25%, and 100 feet on slopes greater than 25%.

Adopted: Article XV, Section 1501 of Zoning Resolution of Copley Township, Summit County, Ohio

Contact: Zoning Department, 330-666-0108

Coventry Township, Summit County

Minimum of 300 feet from streams draining an area greater than 300 square miles. Minimum of 100 feet from streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet from streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 50 feet from streams draining an area greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet from streams draining less than 0.05 square miles. Minimum setbacks extended to the 100-year floodplain and to riparian wetlands. Additional setback of 25 feet on riparian slopes of 15-20% grade, 50 feet on slopes 21-25%, and 100 feet on slopes greater than 25%. Additional 50 foot setback for Category 3 wetlands and additional 30 foot setback for Category 2 wetlands occurring in the riparian setback.

Adopted: Article 27 of Zoning Resolution of Coventry Township, Summit County, Ohio

Contact: Zoning Inspector, 330-644-0785

Franklin Township, Portage County

Minimum of 25 feet on either side of a river or perennial stream. The Zoning Commission may increase the minimum buffer up to 300 feet based on the type of stream, slope of streambanks, surrounding soils, land uses and the function of the stream.

Adopted: July 2010, Chapter 4 Township Zoning Resolution

Contact: Zoning Inspector, (330) 678-0888

Hinckley Township, Medina County

Minimum of 120 feet on each side of all designated watercourses draining an area equal to or greater than 20 square miles. Minimum of 75 feet on each side of all designated

watercourses draining an area equal to or greater than 0.5 square mile and up to 20 square miles. Minimum of 25 feet on each side of all designated watercourses draining an area less than 0.5 square mile and having a defined bed and bank as determined in these regulations. Extended to 100-year floodplain. Additional minimum setback of 50 feet extending beyond the outermost boundary of Category 3 wetlands, and minimum of 30 feet extending beyond the outermost boundary of Category 2 wetlands.

Adopted: November 2007, Zoning Code Section 18

Contact: Zoning Commission (330) 278-4181

LeRoy Township, Lake County

Minimum of 120 feet on each side of all streams draining an area equal to or greater than 20 square miles. Minimum of 75 feet on each side of all streams draining an area equal to or greater than 1 square mile and up to 20 square miles. Minimum of 25 feet on each side of all streams draining an area less than 1 square mile and having a defined bed and bank. Minimum of 50 feet on each side of all Class III primary headwater habitat streams. Minimum setbacks are extended to the 100-year floodplain. 50 foot setbacks from Category 3 wetlands, 30 foot setbacks from Category 2 wetlands, 10 foot setbacks from Category 1 wetlands.

Adopted: January 2009, Section 31 of Zoning Regulations

Contact: Zoning Inspector, (440) 220-0430

Madison Township, Lake County

Minimum of 120 feet on each side of all streams draining an area equal to or greater than 20 square miles. Minimum of 75 feet on each side of all streams draining an area equal to or greater than 1 square mile and up to 20 square miles. Minimum of 25 feet on each side of all streams draining an area less than 1 square mile and having a defined bed and bank. Minimum of 75 feet on each side of all Class III primary headwater habitat streams. Minimum setbacks are extended to the 100-year floodplain and the edge of riparian wetlands. 50 foot setbacks from Category 3 wetlands, 30 foot setbacks from Category 2 wetlands, 10 foot setbacks from Category 1 wetlands.

Adopted: Section 123 of Zoning Regulations

Contact: Zoning Inspector, (440) 428-1120

Mantua Township, Portage County

Minimum of 65 feet on each side of perennial streams. Minimum of 40 feet from wetlands. No buildings or structures within Special Flood Hazard Areas.

Adopted: Zoning Code Section 606

Contact: Zoning Inspector (330) 274-9663

Perry Township, Lake County

Minimum of 150 feet on each side of the Grand River. Minimum of 30 feet on each side of Red Mill Creek, Red Creek, and Arcola Creek. Extended to 100-year floodplain.

Adopted: June 2006, Zoning Code Section 405

Contact: Zoning Inspector (440) 259-5140

Pittsfield Township, Lorain County

All buildings, accessory structures, and parking lots shall be set back at least 100 feet from the ordinary high-water

mark of stream corridors. All buildings, accessory structures, and parking areas shall be set back at least 50 feet from the delineated edge of a wetland. Adopted: Zoning Resolution, Chapter 6,

Adopted December 2002

Contact: Pittsfield Township Zoning Department, (440) 774-7223

Russell Township, Geauga County

Minimum of 120 feet on either side of all watercourses draining an area equal or greater than 20 square miles. Minimum of 75 feet on either side of all watercourses draining an area equal or greater than ½ square mile and up to 20 square miles. Minimum of 25 feet on either side of all watercourses draining an area less than ½ square mile and having a defined bed and bank. Minimum setbacks extended to the outer edge of the 100-year floodplain. Minimum riparian setback is extended to include the outermost boundary of a wetland plus an additional minimum setback of 50 feet beyond the outermost boundary a Category 3 wetland, and 30 feet beyond the outermost boundary of a Category 2 wetland.

Adopted: November 1967 (minimum riparian setback of 30 feet on either side of all watercourses), revised February 2008, Zoning Resolution Section 4.16

Contact: Russell Township Trustees (440) 338-8912

Sagamore Hills Township, Summit County

Minimum of 300 feet setback from streams draining an area greater than 300 square miles. Minimum of 100 feet setback from streams draining an area greater than 20 square miles and up to 300 square miles. Minimum of 75 feet setback from streams draining an area greater than 0.5 square miles and up to 20 square miles. Minimum of 50 feet setback from streams draining an area greater than 0.05 square miles and up to 0.5 square miles. Minimum of 30 feet setback from streams draining less than 0.05 square miles. Minimum setbacks extended to the 100-year floodplain and riparian wetlands. Additional setback of 25 feet on riparian slopes of 15-20% grade, 50 feet on slopes 21-25%, and 100 feet on slopes greater than 25%. Additional 50 foot setback for Category 3 wetlands and additional 30 foot setback for Category 2 wetlands occurring in the riparian setback.

Adopted: Township Zoning Regulations Section 20

Contact: Zoning Inspector, 330-467-0900, Ext. 1

Thompson Township, Geauga County

Minimum of 75 feet on each side of all designated watercourses draining an area equal to or greater than 0.5 square mile and up to 20 square miles. A minimum of 25 feet on each side of all designated watercourses draining an area less than 0.5 square mile and having a defined bed and bank. Extended to 100 -year floodplain and riparian wetlands. Additional minimum setback of 50 feet extending beyond the outermost boundary of a Category 3 wetland, and (30) feet extending beyond the outermost boundary of a Category 2 wetland.

Adopted: February 2008, Zoning Code Article XV

Contact: Zoning Inspector (440) 298-1445

Appendix D: Current Wetland Policies (Ontario) [121]

Policy Instrument	Link to Wetland Conservation and Management
***Planning Act*, Provincial Policy Statement 2014**	Protects provincially significant wetlands and coastal wetlands from development and site alteration depending on where they are located within the province.
***Niagara Escarpment Planning and Development Act* & Plan**	Protects wetlands located within the Niagara Escarpment planning area from development.
***Oak Ridges Moraine Conservation Act, 2001* & Plan**	Protects wetlands located within the Oak Ridges Moraine planning area from development.
***Greenbelt Act, 2005* & Plan**	Protects wetlands in the area designated as Protected Countryside within the Greenbelt Plan in the Greater Golden Horseshoe.
***Lake Simcoe Protection Act, 2008* & Plan**	Protects wetlands located in the Lake Simcoe watershed (as defined) from development.
***Conservation Authorities Act* Regulations**	Regulates development in and around wetlands for effects on the control of natural hazards (e.g., flooding), as well as activities that may interfere with a wetland.
Renewable Energy Approvals Regulation (under the *Environmental Protection Act*)	Prohibits most activities associated with renewable energy projects from locating directly within provincially significant wetlands in southern Ontario and significant coastal wetlands, while enabling a risk-based approach to minor encroachments from infrastructure.
***Crown Forest Sustainability Act, 1994* & Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (2010)**	Provides for the long-term health of Crown Forests and for forest sustainability. Forest management guides used during the planning and implementation of operations and construction of roads contain mandatory direction and best management practices designed to protect the integrity of aquatic habitats that include permanent and seasonal wetlands (inclusive of those recognized as provincially significant).
Public Lands Act* and *enabling processes	Guides disposition of Crown land resources via a permitting process (e.g., peat, vegetation removal, etc.).
Lakes and Rivers Improvement Act* & *Water Resources Act	Requires approval for the installation and operation of water control structures used to restore or enhance wetland habitat.

[121] "Draft: A Wetland Conservation Strategy for Ontario - Meetings." http://nr-escribe.esolutionsgroup.ca/filestream.ashx?DocumentId=4173. Accessed 13 Sep. 2017.

Appendix E: Septic System Requirements by County (Michigan)

County	Requirements	Website
Monroe	• Installation inspection • Licensed contractors	http://www.co.monroe.mi.us/officials_and_departments/officials/drain_commission/septic_system.php
Wayne	• Installation inspection • Sale Inspection • Notification of failure • Licensed contractors • Voluntary inspection services	http://waynecounty.com/hhs/onsitesewage.htm
Macomb	• Installation inspection • Complaint investigation • Voluntary inspection services	http://health.macombgov.org/Health-Programs-EnvironmentalHealth-WasteManagement-OnsiteSewagesSystem
Sanilac	• Installation inspection • Renovation permitting	file:///C:/Users/cwhite/Downloads/-_Permit_Information.pdf
St. Clair	• Installation inspection • Repair permitting	http://lapeercountyweb.org/LapNew/index.php/departments/county-health-department/environmental-health-division/septic-systems
Lapeer	• Licensed contractors	http://lapeercountyweb.org/LapNew/index.php/departments/county-health-department/environmental-health-division/septic-systems
Oakland	• Installation inspection • Licensed contractors	https://www.oakgov.com/health/services/Pages/Septic.aspx
Livingston	• Installation inspection • Heightened installation requirements in special cases • Licensed contractors	https://www.livgov.com/health/eh/Documents/Sanitary%20Code%20030113.pdf
Washtenaw	• Installation inspection • Sale inspection	http://www.ewashtenaw.org/government/departments/environmental_health/wells_septic
Lenawee	• Installation inspection • Licensed contractors	http://www.lenawee.mi.us/270/Sewage-Disposal-Program
Hillsdale	• Installation inspection	https://www.bhsj.org/forms/septic%20procedures.pdf
Jackson	• Installation inspection • Renovation inspection	https://www.co.jackson.mi.us/1118/Well-Septic-Information

Appendix F: P Loading Monitoring and Reporting by Jurisdiction

	Ohio	Michigan	Ontario
Annual or Spring Load Reporting?	Annual	Annual at 26 sites 5 year cycles at 250 other sites (Michigan wide, no specific report for Lake Erie watershed)	Annual reports, no seasonal information
Loadings for total phosphorus (TP), soluble reactive phosphorus (SRP) and sediments?	Annual reports including TP, SRP, and Nitrogen Periodic reports including TP and SRP	Annual reports including TP, SRP, and Nitrogen Periodic reports including TP and SRP	TP, SRP, and other sediments included
Does it break down loadings to identify relative contributions of various sectors / sources? (i.e., point, non-point; urban, agricultural, etc.)	Annual Reports only broken down by river affected, not by source Periodic reports include information on potential sources	MDEQ makes distinctions for non-point sources and for urban/ agricultural sources.	No. Reported only as phosphorus present in the watershed.
At what watershed scale are loadings reported?	Rivers, except on the Maumee. Several tributaries of the Maumee are also available	River Basin: Raisin River Basin, Detroit River Basin, and Maumee River Basin.	Stream
What body regulates?	Lake Erie Commission Ohio EPA- point sources Ohio Department of Agriculture- non-point sources	Michigan Department of Environmental Quality Michigan Department of Agriculture (fertilizer)	Federally: Ministry of Environment and Climate Change Provincially: Ontario Ministry of Agriculture, Food and Rural Affairs; Ontario Ministry of the Environment
Relevant statutes and codes?	Ohio Rev. Code Ann. § 1506 Ohio Rev. Code Ann. § 939.07 (SB1) ANTICIPATED: SB150	Ohio Rev. Code Ann. § 1506 Ohio Rev. Code Ann. § 939.07 (SB1) ANTICIPATED: SB150	Ohio Rev. Code Ann. § 1506 Ohio Rev. Code Ann. § 939.07 (SB1) ANTICIPATED: SB150