

Enhancing Adoption of On-Farm Conservation Measures to Improve Water Quality

Lessons Learned from Saginaw Bay and Western Lake Erie Watersheds

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Under contract to:

The Nature Conservancy

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Executive Summary

The overall goal of enhancing the adoption of permanent on-farm conservation measures and improving the water quality of Michigan's Western Lake Erie Basin has proven to be challenging. Progress has been made in the Saginaw Bay watershed with pilot-scale versions of successful on-farm conservation approaches, which are beginning to be adapted to Michigan's Western Lake Erie Basin to achieve permanent agricultural conservation and improved water quality. Likewise, Saginaw Bay programs have adapted Western Lake Erie Basin approaches, including the recent expansion of watershed monitoring facilitated by the Saginaw Bay Monitoring Consortium's efforts, coordinated by The Nature Conservancy (TNC). LimnoTech supported TNC in preparing and executing a series of three workshops to promote the exchange of effective agricultural conservation approaches among advisors and stakeholders in the Saginaw Bay watershed and the Western Lake Erie watershed to reduce nonpoint source nutrient loads and eutrophication. Findings and recommendations from the Saginaw Bay and Western Lake Erie Basin knowledge exchange effort can broadly be subdivided into three categories:

- (1) program structure, operations, and staffing;
- (2) incentivizing agricultural conservation; and
- (3) tracking of Best Management Practice (BMP) implementation and impacts.

The findings and recommendations arising in each of these categories are summarized here. Note that actions are already underway on many fronts to address some of the recommendations.

Program structure, operations, and staffing

The agricultural conservation sector in Michigan broadly suffers from inadequate staffing, inexperienced and underpaid staff, and high turnover. This impacts the ability of programs to build effective long-term relationships with producers and partners, and results in limited institutional memory and relatively low engagement over time, especially where new programs or changes to existing programs need to be communicated. Many programs are also characterized by fragmentation and ineffective coordination among related groups.

Recommendations:

- Develop more complete career paths for conservation organizations at all levels (e.g., conservation districts, State of Michigan Quality of Life agencies, watershed councils or non-governmental organizations [NGOs]) with competitive compensation within programs that would allow staff to progress from technician positions to watershed-scale program management, regional responsibilities, and even statewide roles while staying in the same geographic location. Keeping continuity between staff and their locations can stabilize their networks, build trusted relationships, and produce more permanent results over time as they train junior staff and introduce them to regional producers and partners.



- Develop more formalized communication pathways, agreements, or other structured collaborative relationships among agency-led agricultural conservation programs and NGOs to provide better outreach on technical and financial assistance opportunities, improve coordination of activities, reduce redundancy in programs, and leverage trusted partner relationships with producers and other agricultural stakeholders. Many NGOs, including TNC, play an integrator role – linking stream health and biodiversity to agricultural stressors across jurisdictions. These groups can also develop policy, play advocacy roles, access subject matter experts and communicators outside of agencies, serve as effective conveners, and augment program funds with philanthropic support.
- Encourage better integration between federal, state, and local programs. This may include leveraging the Michigan Agriculture Environmental Assurance Program (MAEAP) as an established program known throughout the State to streamline participation between multiple programs, simplify producers’ paperwork and data submissions, and incentivize participation in programs with similar goals or for which only a few additional practices are needed to expand certification to multiple programs.
- Expand support for the development and maintenance of producer conservation networks including administrative management to allow them to share conservation information, program opportunities, experiences in implementation, and guidance through adoption on the farm.
- Offer opportunities to producer conservation networks to be more engaged and integral in planning field day events and expanding demonstration farm networks to bring conservation professionals, the farm community, and other stakeholders together.

Incentivizing agricultural conservation

There is broad agreement that the incentives that are associated with many agricultural conservation programs under the Farm Bill and other legislation are inadequate to justify the investment of time, money, and energy required by producers to participate. While investments by producers to reduce erosion and nutrient losses from their farms may seem like common sense, the reality is that current agricultural markets do not provide sufficient or timely financial returns on many BMP investments, making their implementation a drain on farms’ business viability. Long-term efforts that support the creation of reliable markets that provide premiums for products created using positive environmental practices or other market-based incentives (e.g., carbon credits) could support expanded and sustained adoption of BMPs.

Recommendations:

- Build on recent studies of the BMP investments needed to meet nutrient reduction targets in the Western Lake Erie Basin (AGL and OEC 2023) by completing similar analyses for the Saginaw Bay watershed to better quantify the technical and financial challenges that exist to meeting nutrient load reduction targets for the bay. The study could further investigate various strategies for directing funding toward enabling long-term BMP implementation.
- Perform comprehensive studies to determine competitive pricing for initial adoption of conservation practices (i.e., capital expenses/implementation costs) and for persistent adoption of conservation practices (i.e., rewarding producers for long-term contributions made to the public good beyond their farm).



- Identify stable funding sources and allocate adequate resources to meet the needs of producers to accelerate sustained BMP adoption. Remove disincentives and barriers like complex application procedures, short-duration contracts that do not allow sufficient flexibility to adjust for weather conditions or diverse crop rotations, conservation program restrictions on equipment purchases or capital improvements, and challenges associated with landowner/tenant relationships and agreements.

Tracking of BMP implementation and impacts

Being able to track existing BMP implementation at sufficiently high spatial (field scale) and temporal (seasonal to annual) resolution to understand what is happening on the landscape is a critical component of effectively executing agricultural conservation programs. Similarly, higher resolution water quality data are also needed to link field-scale conservation practices with improvements in streams and rivers. Concerns about protecting the anonymity of Farm Bill program participants have led to anonymizing of survey data and other information to the county scale in most cases, which is too coarse to be useful for many purposes. New technologies may be able to provide more spatially relevant information while still protecting individual producer privacy and make the most of limited resources to provide a balance of the need for long-term monitoring with the implementation of practices to improve water quality. New monitoring approaches and policies are needed.

Recommendations:

- Develop and implement scientifically sound monitoring strategies that increase resolution and better integrate ground-based, water-based, and remote sensing data to allow conservation professionals to make informed decisions about where to direct producer outreach, what practices are most effective, and how the agricultural landscape is shifting based on private, public, technical, and market-based drivers. This information could be used to perform an annual BMP adoption analysis at the watershed scale, drive the application of emerging artificial intelligence/machine learning tools, confirm that funded conservation commitments are being implemented, and guide new agricultural conservation and ecosystem service market-based programs.
- Incentivize voluntary data-sharing by rewarding conservation-oriented producers with meaningful credentials and certifications that will be valued by their customers, colleagues, and other interested parties.
- Establish and maintain long-term water quality monitoring programs to measure whether improvements in in-stream nutrient loading are being made.

The path forward will require improved programs, better tracking, and more compelling incentives. The pace at which these recommendations are implemented will substantially determine the rate of water quality improvement in the waters and tributaries of Lake Erie and Saginaw Bay.



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1 INTRODUCTION

The Saginaw River and Maumee River basins are two of four agricultural priority watersheds highlighted in the Great Lakes Restoration Initiative (GLRI) action plans (GLRI 2024). A significant cause of water quality challenges is excessive phosphorus in runoff in these watersheds that leads to harmful algal blooms (HABs) in the shallow embayments to which these river systems discharge: Saginaw Bay and Western Lake Erie. The other smaller drainage areas that discharge directly to Saginaw Bay and Western Lake Erie are also acknowledged as priority tributaries contributing to nearshore water quality issues (USEPA 2018, USDA NRCS 2023). Accelerating adoption of agricultural conservation practices in these areas is critical so that nutrient load reductions can be realized within established timeframes.

1.1 Project Vision and Approach

For the past 12 years, The Nature Conservancy (TNC) Michigan chapter has focused its agricultural conservation efforts on the Saginaw Bay watershed. Over that time certain tactics for accelerating awareness and adoption of conservation measures have succeeded and others have failed. As TNC-Michigan expands its strategic area of focus to other parts of the State critical for both water quality and agricultural production, it partnered with the Fred and Barbara Erb Family Foundation (2021-2024) on an effort to export learnings between the Saginaw Bay and Western Lake Erie priority watersheds, with the end goal of crowdsourcing proven and shovel-ready strategies that could be deployed in either area.

The project approach included conducting a series of three workshops that brought together agricultural interests from both watersheds in 2022 and 2023 to exchange knowledge and discuss ways that conservation practices could be more widely adopted and nutrient loading could be reduced to acceptable levels. An essential aspect of accelerating agricultural conservation practice adoption is for Michigan's conservation community to break down geographic silos and instead work together across watershed boundaries to share lessons learned, innovative ideas, and successful strategies. The workshops served to initiate communication and knowledge exchange across the priority watershed boundaries for conservation practitioners to share experiences on successes and failures regarding agricultural conservation implementation efforts. Although the workshops and white paper focus on Michigan watersheds, lessons and information from Ohio and Indiana, among other states and provinces, have also been included. The agricultural programs of TNC are global in scope.

This white paper is an outgrowth of the three workshops conducted as part of the project. It examines the various challenges associated with increasing agricultural conservation practice adoption, discusses potential approaches for supporting and tracking progress, and explores alternatives to promote knowledge exchange regarding various aspects of conservation programming among advisors and stakeholders in Michigan's Saginaw Bay and Western Lake Erie watersheds. Prior to covering these topics, the paper first gives a brief overview of the two watersheds followed by a review of recent watershed research and technological developments relevant to agricultural nutrient management in the region.



1.2 A Tale of Two Watersheds

Although Saginaw Bay and Western Lake Erie watersheds are both named as agricultural priority watersheds under the GLRI for excessive phosphorus runoff leading to eutrophication issues, they have certain notable differences (Table 1). Though the Western Lake Erie Basin (WLEB) is about 30% larger than the Saginaw Bay (SB) watershed, it has more than double the amount of land area in farms, and a percentage distribution of 75% farmland in the WLEB compared to 47% for the Saginaw. Of the total area of the Maumee River watershed, which is the largest WLEB tributary, 7% lies in Michigan, with the rest in Indiana (20%) and Ohio (73%). The WLEB has a larger portion of its cropland in corn, soybeans, or small grains at 83% compared to 61% for the SB watershed. It has a similar population density of cattle, but almost nine times the hog and pig density and more than five times the chicken density when compared to the SB watershed. The SB watershed, though also dominated by cropland, is more diverse in land use than the WLEB, with greater land area in forest or forested wetlands in the northern part of the watershed and a more diverse crop mix (sugar beets, dry beans, potatoes).

Both watersheds are mostly comprised of rural towns and villages, but the WLEB has a greater human population, with relatively larger cities like Detroit, Toledo, Fort Wayne, Ann Arbor and surrounding suburban communities, while the SB watershed has smaller cities (Flint, Saginaw, Midland, and Bay City). The farming communities in both watersheds are comprised of people with similar European ancestry -- German (largest), English, Irish – but the SB watershed has more residents with Polish ancestry than the WLEB. There are Amish farming communities in both watersheds, especially in the Michigan “thumb” area of SB and in the western headwaters region of the WLEB Maumee River watershed around Ohio, Michigan, and Indiana.

The WLEB and SB watersheds are generally similar in physiographic characteristics, as both are primarily situated in the Huron/Erie Lake Plains ecoregion, which is characterized by the flattest landscape in Michigan formed by ancient glacial lakes. Relatively smaller portions of each watershed have greater relief where glacial moraines were deposited, including the Eastern Corn Belt Plains ecoregion of the western WLEB and the Northern Lakes and Forests ecoregion of the northern SB watershed. The agricultural parts of the watersheds generally have poorly draining clay-rich soils, which has resulted in another common characteristic of both areas -- the introduction of artificial drainage to move water off the landscape from former marshes and swamps and lower the regional water table via both surface ditches and subsurface tile drainage pipes.

Table 1. 2022 Census of Agriculture for the Saginaw Bay and Western Lake Erie watersheds (USDA 2024).

Category	Saginaw Bay (HUC-040801 & 040802)	Western Lake Erie (HUC-041000)	Saginaw Bay	Western Lake Erie
Total area	5,836,800 acres	7,616,000 acres	-	-
Land in farms	2,754,970 acres	5,676,105 acres	47% of total	75% of total
Corn	692,129 acres	1,691,468 acres	25% farmland	30% farmland
Soybeans	759,552 acres	2,700,234 acres	28% farmland	48% farmland
Small Grains	228,302 acres	335,882 acres	8% farmland	6% farmland
Cattle & Calves inventory	36 per mi ²	29 per mi ²	329,018	343,276
Hogs & Pigs inventory	13 per mi ²	114 per mi ²	115,433	1,357,147
Chickens inventory	125 per mi ²	647 per mi ²	1,139,696*	7,701,585

**Sum of permitted inventory for two regulated CAFOs in the watershed.*



1.3 Water Quality Impairments and Phosphorus Loading Targets

The 112 square miles of Lake Erie falling within Michigan's jurisdiction and 223 square miles of the Saginaw Bay nearshore area are both currently on Michigan's comprehensive list of Federal Clean Water Act Section 303(d) impaired water bodies for not supporting the other indigenous aquatic life and wildlife designated use due to nutrient-related eutrophication (Goodwin et al. 2024). Lake Erie was first added to Michigan's list of impairments in 2016 (MDEQ 2016), while the inner Saginaw Bay shoreline was added in 2022 (Goodwin and Smith 2022). Ohio and Indiana have taken different approaches. The 2018 integrated report added another designated use impairment for Lake Erie: not supportive of public water supply due to microcystin toxins from cyanobacteria. There are several other impairments listed for these water bodies and various tributaries within the watersheds, too numerous to comprehensively list in this white paper, but include not supportive of fish consumption due to PCBs and DDT in fish tissue and total body contact recreation due to *E. coli*.

Phosphorus is commonly accepted as the limiting nutrient for the growth of both WLE and SB algal communities, hence the GLRI Action Plan prioritizes both watersheds for phosphorus reductions. Both the WLEB and Saginaw River have phosphorus loading targets established, though the Saginaw River target has not been updated since the 1978 amendment to the Great Lakes Water Quality Agreement (GLWQA) (Stow et al. 2014). Under the GLWQA, a 440 metric ton per year total phosphorus (TP) loading target was established for the Saginaw River, and an inner bay target TP concentration of 15 ug/L was also set for Saginaw Bay. Due to the 2022 listing of the Saginaw Bay shoreline impairment, however, a total maximum daily load (TMDL) study may be conducted and would likely result in updating the area's loading targets. For Lake Erie, a 40% TP load reduction relative to 2008 conditions was established for reducing WLE HABs (spring loads) and Central Basin hypoxia (annual loads) (Annex 4 Objectives and Targets Task Team 2015, USEPA 2018). This 40% TP load reduction target represented an update to previous load targets established under earlier versions of the GLWQA. Relevant to the State of Michigan, the River Raisin, Maumee River, and Detroit River were all named as priority tributaries, though the 40% load reduction target applied to the entirety of TP loads linked to the State (i.e., all WLEB drainage areas). While the River Raisin and Maumee River are among the most well-monitored tributaries in the nation due to the work of the National Center for Water Quality Research (NCWQR) at Heidelberg University and therefore have a robust history of TP load measurements, the Saginaw River lacks such a monitoring program and therefore estimates of TP loads are far less certain for it.



2 REVIEW OF RECENT WATERSHED RESEARCH AND TECHNOLOGY DEVELOPMENTS

Among the key actions needed to improve water quality outcomes of agricultural conservation are research and technology innovation and deployment to optimize farming system and conservation program operations. As insight and innovation grow, there is also a need to transfer technology to farmers (or producers, as used below). In some cases, this leads to minor adjustments in programs and practices that require minimal investments of time and financial resources. In other cases, structural or equipment changes may require years to develop and substantial funding commitments, including financing and grants. The role of communicating new developments is played by a diverse set of individuals including researchers, extension agents, crop advisors, conservation technicians, commodity experts, and innovators from within the producer community itself. Here we summarize recent research and technology developments that can inform nutrient management in Saginaw Bay and Lake Erie and accelerate the uptake and impact of modified farming practices and programs. In Section 3 we discuss how progress can be tracked more effectively, and in Section 4 we discuss changes to programs that can improve the delivery of insights and enhancement of on-farm practices to yield sustained improvements in water quality.

2.1 Recent Synthesis Reports

Three recent reports synthesized the state of knowledge about agricultural nutrient management and impacts for the Western Lake Erie watershed:

1. *Alliance for the Great Lakes and Ohio Environmental Council: The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie* (AGL and OEC, 2023)
2. *International Joint Commission: Synthesis of Recommendations and Assessment of Action to Reduce Great Lakes Nutrient Impacts* (IJC, 2022)
3. *International Joint Commission: Toward the Implementation of a Manure Management Framework* (IJC, 2023)

The AGL and OEC (2023) study concluded that annual spending for agricultural conservation in Ohio and Michigan would need to increase by a minimum of 70% and over 600%, respectively, to meet phosphorus load reduction goals. A related Canadian study by Brouwer et al. (2023) of a major watershed draining to eastern Lake Erie also showed a substantial funding gap for best management practice (BMP) implementation. The IJC 2022 report found that substantial progress has been made in advancing research priorities identified in binational reports, but nonpoint nutrient reductions are not on track with commitments in most Lake Erie jurisdictions. The report further found that substantial progress has been made since 2012 in developing the monitoring, modeling, and data management infrastructure necessary to support future adaptive management, but that increased spring runoff, ongoing installation of tile drains in agricultural land, and less incorporation of applied fertilizer and manure into agricultural soil due to reduced tillage have led to increased loading of dissolved phosphorus to Lake Erie over the prior 20 years, despite advantages in reducing sediment and particulate phosphorus losses. Finally, the IJC 2023 manure framework study found that state and provincial programs and guidelines in Ohio and Ontario have been modified in the last decade, under Federal



oversight, to promote more intensive manure management to control nutrient loss to waterways, but that additional work remains to be done, especially where livestock operations are expanding.

No comparable synthesis has been completed in the last few years for the Saginaw Bay watershed, but earlier work looked at the impact of multiple stressors on the bay (Stow 2014) and reviewed the status of agricultural conservation (Fales et al. 2016) and restoration in the Saginaw Bay Area of Concern (Selzer et al. 2014). Fales et al. (2016) summarized three case studies from 7 of the 17 Saginaw Bay subwatersheds and concluded that securing conservation funding from outside U.S. Farm Bill programs can be an effective way to augment those programs and avoid associated restrictions on prioritizing funding in areas that are the biggest sources of excess nutrient loading. These case studies built on the analysis of Sowa et al. (2016), which sought to determine how much conservation was needed to restore healthy fish communities in Saginaw Bay tributaries, similar to the AGL and OEC (2023) analysis described above for Lake Erie restoration. Sowa et al. (2016) concluded that more than 50% of agricultural land in the study area, which consisted of 4 of the 17 Saginaw Bay subwatersheds, would need to have conservation practices applied consistently to meet ecological goals.

An earlier report by the Great Lakes Commission (GLC 2020) examined the effectiveness of agricultural programs in all four GLRI priority watersheds and concluded that the top three barriers to greater adoption of nutrient BMPs, as identified by producers, were (1) restrictions on land management associated with conservation programs, (2) too much paperwork for application and reporting, and (3) payments that were too small to justify the investments needed to implement the BMPs and comply with program requirements. Recommendations that came out of the study included increased federal interagency coordination and program tracking, more investment in outreach and capacity building staff, more funding for the purchase of conservation-oriented farming equipment, and better alignment of reporting requirements with crop cycles.

Prior to these efforts, TNC led Conservation Effects Assessment Projects (CEAPs) of agricultural streams in Wisconsin and lower Michigan (Sowa et al. 2011), including the Saginaw Bay watershed, and later in the WLE watershed (Keitzer et al. 2016). The 2011 study found that the Soil and Water Assessment Tool (SWAT) could be applied over large areas to effectively simulate impacts of agricultural BMP scenarios on stream water quality and, by correlation with water quality limitations, fish communities. The WLEB study found that impacts of agricultural nutrients and erosion of soil limited fish community health in more than 10,000 km of streams and rivers, representing more than 50 percent of the watershed. Additional mitigation measures needed on WLEB farms to substantially reduce impacted river length were estimated to cost \$149 million annually above the 2012 annual spending level of \$277 million.

2.2 Recent Modeling and Field Studies

There have been several recent water quality modeling studies completed in the WLEB that can inform the management of agricultural nonpoint nutrient loading. Similar studies have been undertaken in the Saginaw Bay watershed but are approaching 10-years old or more (Giri et al. 2012, Giri and Nejadhashemi 2014, Karpovich et al. 2016). A project funded by the Fred and Barbara Erb Family Foundation convened a team of Michigan universities, federal and state government groups, TNC, and LimnoTech to develop an Optimization Decision Model (ODM) for strategically allocating resources and conservation practices to benefit multiple ecological and socioeconomic endpoints and applied the ODM to guiding investments of restoration funds through actual conservation programs. Discussions are underway among investigators about beginning a new



modeling effort for the watershed and bay. Modeling studies in the WLEB have identified potential priority areas for nonpoint source management (Dagnew et al. 2019). They also examined climate change forecasts for the region, concluding that there was “no clear agreement on the direction of change in future nutrient loadings or discharge” in one case (Kujawa et al., 2020), but that “climate impacts on watershed processes are likely to lead to reductions in future loading” in another (Scavia et al. 2021 and 2024).

Recent numerical modeling work in the WLEB has concentrated on improving understanding of how to optimize BMP placement and combinations to achieve the 40% phosphorus load reduction target for Lake Erie. Yuan and Whisenant (2023) combined the Agricultural Conservation Planning Framework (ACPF) with the Soil and Water Assessment Tool (SWAT) to evaluate the potential effectiveness of various BMPs in reducing phosphorous losses. They showed that a combination of grassed waterways, contour buffer strips, water and sediment control basins, nutrient removal wetlands, and farm ponds could reduce total phosphorus losses by up to 49% in the watershed studied. Martin et al. (2021) performed a related study using an ensemble of multiple models to evaluate management options to reduce Lake Erie loading and blooms. A stakeholder group provided guidance throughout the modeling project and advised on the development of realistic scenarios. Combinations of subsurface placement of phosphorus-containing fertilizers, cover crops, riparian buffers, and wetlands were determined to be among the most effective management options. In all scenarios evaluated, however, the loading reduction goal was not met as frequently as desired based on the average of model predictions, indicating that greater (and possibly unrealistic) adoption rates of practices than those tested may be needed to reach the targets.

Several field-based studies have refined the understanding of the presence and mobility of legacy phosphorus stored in watershed soils, streambanks, and sediments, which can improve results of future modeling efforts. Williamson et al. (2024) showed that geomorphology and land use play important roles in streambed sediment mobility and phosphorus storage. Guo et al. (2020) demonstrated that tributary loading can respond rapidly (within the same season) to reductions in the application of new phosphorus in fertilizer to WLEB fields. Tedeschi et al. (2024) showed by analyzing 11 years of data that increasing the amount of tile drainage in the study area (Canadian tributaries) can increase dissolved phosphorus loading, especially during the spring thawing season. Osterholz et al. (2023 and 2024) demonstrated that older phosphorus is more likely to contribute to tile drain loss than newer fertilizer and manure applications, which appear to be more susceptible to losses via surface runoff at the sites studied.

2.3 Human Dimensions Research

Additional studies of the human factors that influence agricultural BMP adoption and perception have been conducted over the last several years that provide insights into ways that nutrient control programs can be better implemented. Most of this recent work has been in the WLEB, with relatively little in the Saginaw Bay watershed. In a 2019 commentary, Wilson et al. reviewed BMP effectiveness and behavioral data to determine how best to achieve the 40% load reduction target. They determined that a majority of the farming population is willing to consider many of the recommended practices, but that inadequate cost-benefit information, site-specific decision support tools, and technical assistance are limiting adoption of conservation practices. They concluded that a combination of voluntary and mandatory approaches may be needed. Walpole et al. (2023) found that the 4R Nutrient Stewardship Certification Program, which certifies crop advising companies and agronomy retailers or Nutrient Service Providers to promote best practices in nutrient management, has had



a positive impact on 4R behaviors that is independent of other potential explanations for observed changes in practices. Shaffer-Morrison and Wilson (2024) examined local water quality perception in the Lake Erie Basin and concluded that greater trust in agricultural organizations and local government was consistently associated with better perceived water quality, whether or not water quality was improved. In the absence of specific metrics of water quality, beliefs about water quality may be formed based on who is trusted the most; this also correlates with political affiliation. Kast et al. (2021) linked what they termed “conservation identities” of producers with a numerical watershed model. Their results indicated that by developing nutrient management strategies that optimized BMP placement based on a combination of physical field characteristics and human-operator characteristics, limited resources could be spent most efficiently to provide maximal environmental benefits.

2.4 Expansion of Water Quality Monitoring

Ohio’s Western Lake Erie Basin

Tributary water quality monitoring in Ohio’s WLEB expanded significantly during the 2013-2018 period with the addition of over 15 new stations with sufficient sample collection to estimate seasonal and annual loading, adding to the approximately six existing stations with longer-term datasets. Funding for the monitoring efforts is derived from a variety of sources, including federal, state, regional, city, and corporate. The NCWQR at Heidelberg University and the U.S. Geological Survey (USGS) are the two primary institutions that conduct the monitoring. Water quality data produced from these monitoring initiatives are available in various forms, including data downloads from NCWQR and USGS websites, annual Water Monitoring Summary documents presented on the Ohio Lake Erie Commission website, a biannual Nutrient Mass Balance Study produced by the Ohio EPA, and numerous peer-reviewed publications that rely on the data.

Field-scale water quality monitoring and associated research was also expanded in Ohio’s WLEB over the last decade in response to the agricultural runoff-fueled HABs in Lake Erie. Similar to the tributary monitoring, the edge-of-field monitoring has been funded by numerous sources. The monitoring has largely been conducted by researchers with the USDA Agricultural Research Service (ARS) and the USGS (Williams et al. 2016; Fermanich et al. 2023). A subset of the Ohio edge-of-field monitoring sites makes up the Blanchard River Demonstration Farms network (discussed later in this white paper; <https://blancharddemo farms.org/>).

Michigan’s Western Lake Erie Basin

Michigan has been expanding its tributary water quality monitoring capabilities in the WLEB over the last several years in response to increased attention to Lake Erie HABs and loading targets. The River Raisin near Monroe is monitored by the NCWQR for water quality and USGS for streamflow and is Michigan’s most robust water quality monitoring station, with sediment and nutrient load estimates dating back to 1982. In October 2018, an additional three stations were brought online for water quality monitoring: Bean Creek, East Branch St. Joseph River, and West Branch St. Joseph River. These three locations essentially monitor the loading from the State of Michigan that contributes to the Maumee River watershed. An additional four locations representing much smaller drainage areas were brought online in November 2020 (Lime Creek, Nile Ditch, South Branch River Raisin, and Muddy Creek) and a fifth HUC-12-scale location was initiated in May 2024 (Headwaters Saline River). The Michigan Department of Agriculture and Rural Development (MDARD) recently announced that additional hydrology and water quality monitoring will be conducted within those five priority



HUC-12 subwatersheds over the next five years to better understand nutrient losses and transport in the WLEB. The initiative was also supported by funding from the Fred and Barbara Erb Family Foundation and involves the Alliance for the Great Lakes (AGL), Michigan State University (MSU) Institute of Water Research (IWR), and LimnoTech as partners.

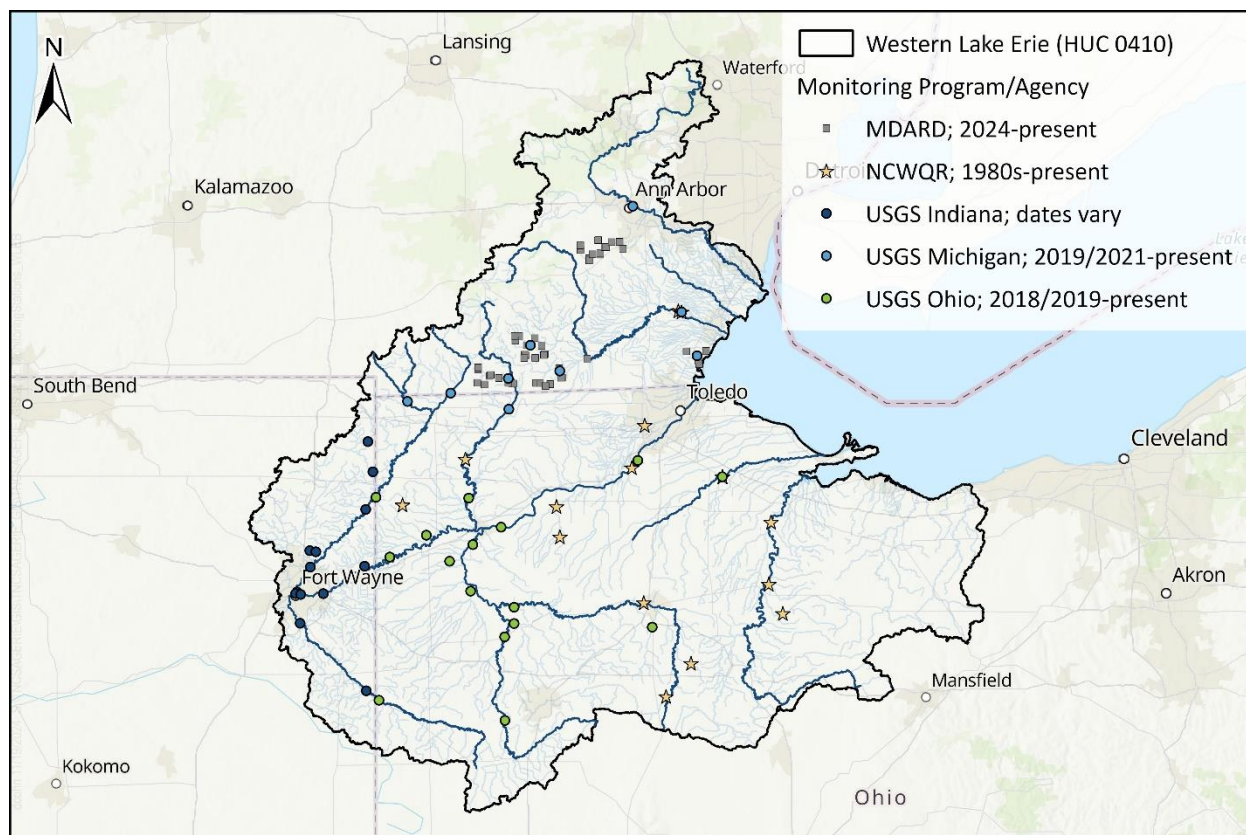


Figure 1. Water quality monitoring stations in the Michigan, Indiana, and Ohio WLEB watersheds.

Michigan's Saginaw Bay Watershed

Relative to the WLEB watersheds, the Saginaw Bay watersheds have historically had less water quality monitoring, though efforts to expand monitoring have increased in recent years. Saginaw Valley State University's Saginaw Bay Environmental Science Institute has conducted various research, such as special monitoring of dissolved oxygen and bacteria in the Kawkawlin River, but unlike the WLEB the SB tributaries have insufficient nutrient datasets to understand trends over time (i.e., long-term data) and space (i.e., a network of stations distributed throughout the watershed). Recently, however, the [Saginaw Bay Monitoring Consortium](#) (SBMC) was established in an effort to fill these data gaps and inform future management actions. Like efforts in the WLEB, the SBMC is a collaboration between various institutions, organizations, and the Saginaw Chippewa Indian Tribe that is leveraging funding from multiple sources. Under the SBMC, the USGS expanded its streamflow monitoring locations during the 2022-2023 period by adding 11 gages to complement the existing 7 gages in the watershed. Numerous water quality parameters, including phosphorus and nitrogen, are monitored at these USGS stream gages. Additionally, the National Oceanic and Atmospheric Administration (NOAA) expanded its monitoring of 10 Saginaw Bay sampling points to complement the expanded watershed monitoring and data from an existing seasonal buoy that it maintains.



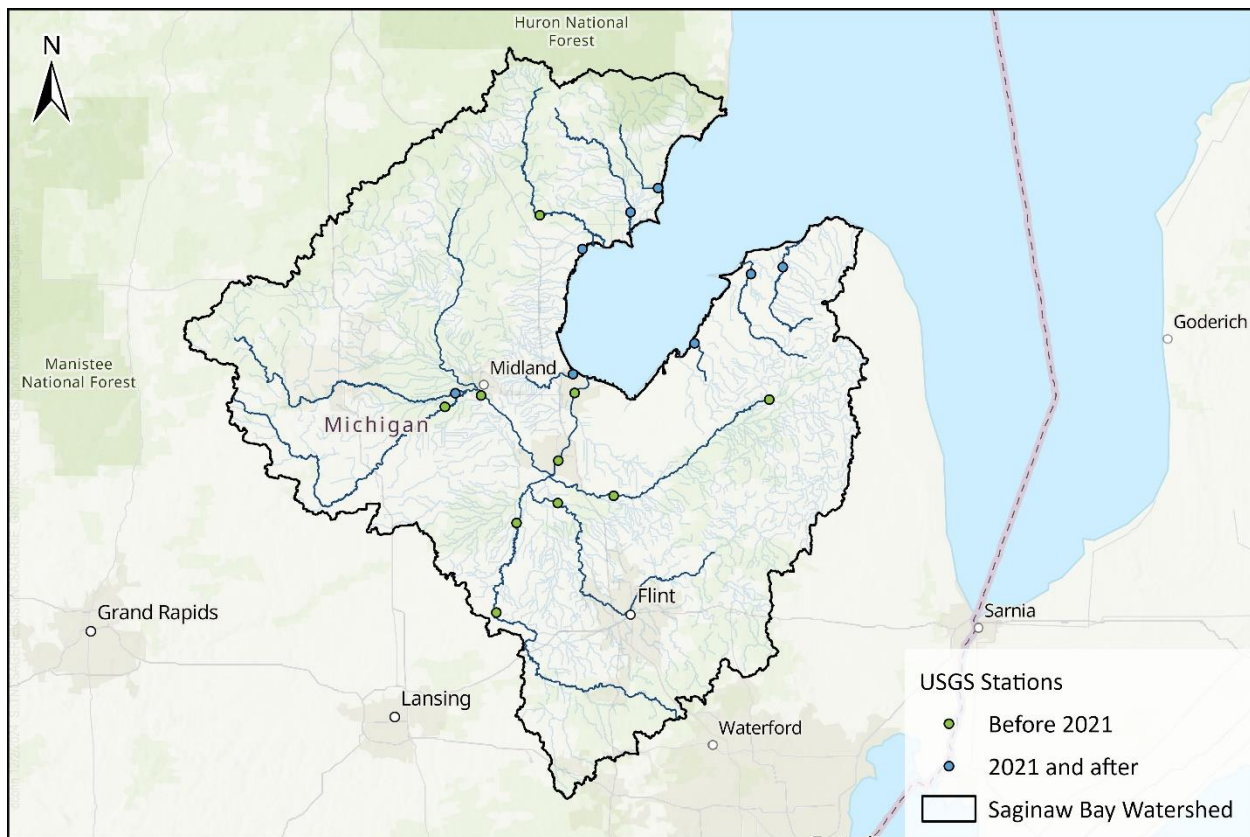


Figure 2. Water quality monitoring stations in the Saginaw Bay watershed.

2.5 Agricultural Conservation Programs

Many federal, state, and local programs seek to support the adoption of agricultural conservation measures in both the WLEB and SB watersheds. The programs vary in longevity, funding availability, geographic coverage, and many other factors. Some of these programs have been established for decades and are sustained with funding allocated by the U.S. Congress through the Farm Bill, while others are relatively short-term offerings for specific purposes.

Table 2. Select agricultural conservation programs in WLEB and SB watersheds.

Federal	Active or Inactive	Notes
Conservation Reserve Program (CRP)	Active	Participants receive financial support to establish long-term, resource-conserving covers on erodible or environmentally sensitive land
Conservation Reserve Enhancement Program (CREP)	Active	An offshoot of the CRP; pays producers for long-term conservation contracts, removing environmentally sensitive land from agricultural production and implementing conservation practices
Conservation Stewardship Program (CSP)	Active	Supports development and implementation of conservation plans to expand and improve previously implemented BMPs that yield cleaner water, healthier soil, and better wildlife habitat, all while improving agricultural operations
Environmental Quality Incentives Program (EQIP)	Active	Provides technical and financial assistance to agricultural producers and forest landowners to address natural resource concerns

Regional Conservation Partnership Program (RCPP)	Active	Partners with state agencies, and nonprofits to provide financial and technical assistance to producers to install conservation activities in a state or region
Conservation Innovation Grant (CIG) program	Active	Supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands
Great Lakes Restoration Initiative (GLRI)	Active	Funds restoration and protection of Great Lakes ecosystems, including reducing impacts from agriculture
American Rescue Plan Act (ARPA)	Inactive	Created to support recovery from the COVID pandemic; included agricultural investments
Infrastructure Investment and Jobs Act (IIJA), a.k.a. Bipartisan Infrastructure Law (BIL)	Active	Designed, in part, to improve water quality and help protect communities from climate change impacts
Inflation Reduction Act (IRA)	Active	Provides funding through EQIP and CSP to address unmet demand for these programs; includes climate-smart activities
State		
Michigan Agriculture Environmental Assurance Program (MAEAP)	Active (Michigan)	Voluntary program to support producers via education, farm-specific risk assessment, and on-farm verification
Soil Testing to Reduce Agriculture Nutrient Delivery (STRAND)	Inactive (Michigan)	Allowed cost share on new practices and equipment, nutrient management planning, soil testing, and nutrient mapping and yield analysis
EGLE Nonpoint Source Program implementation grants	Active (Michigan)	Supports projects that will prevent, reduce, or eliminate polluted runoff and other nonpoint sources of pollution (statewide)
Clean Michigan Initiative grant program	Active (Michigan)	Invests in pollution control, water quality measures, and the redevelopment of contaminated sites
Lake Erie and Saginaw Bay Wetland Conservation Program	Active	Used ARPA funds to acquire, engineer, restore, create, or enhance wetlands in the Lake Erie and Saginaw Bay watersheds
H2Ohio Program	Active (Ohio)	Supports the creation of wetlands, reduction in phosphorus runoff, and upgrading of septic systems
Other Programs		
Sustainable Option Wheat Program	Inactive	Pilot program where TNC and Star of the West paid nature-based bonuses to wheat growers in the Saginaw Valley who implemented sustainability practices
The Fertilizer Institute 4R Nutrient Stewardship Certification Program	Active (in OH and Ontario, but not MI)	Encourages agricultural retailers and independent crop consultants to adopt proven best practices through application of the 4Rs

The H2Ohio program represents one of the largest state-sponsored, water quality focused conservation initiatives in the country, encompassing both natural resources and agricultural lands. Funding is a critical element to increased adoption of practices such as the development of voluntary nutrient management plans (VNMP) covering over one million acres in Ohio's WLEB counties.

MAEAP has been a staple of Michigan's agricultural conservation efforts for over two decades, with its vision beginning in the late 1990s and the first livestock farm verification occurring in 2002. MAEAP is a voluntary program where producers can complete a confidential verification process to meet the mission of "ensuring that producers are engaging in cost effective pollution prevention practices and working to comply with state and federal environmental regulations." The latest annual legislative program report (fiscal year 2023) suggests that 12% of Michigan's nearly 8 million acres of cropland were verified or reverified at some point during the



last five fiscal years. MAEAP is in the process of being modified to improve its effectiveness and impact, but final details about proposed modifications have not yet been resolved. Aspects being considered include enhancements to data tracking, increasing staff compensation to reduce turnover, adjustment of jurisdictional boundaries around watersheds rather than county lines, adapting program components to better identify and address climate resiliency and regenerative agriculture principles, and changes to the program management structure.

TNC led a Sustainable Option Wheat Program in the SB watershed to pilot a pay-for-performance approach to encourage adoption of multiple conservation measures for wheat-growing operations. The three-year program leveraged partnerships with consumer-packaged goods (CPG) companies, MDARD, and a local grain processing company (Star of the West Milling Company). Similarly, TNC was part of a team that implemented a USDA grant program in the Saginaw Bay watershed starting in 2021 known as the Accessing Subsidized Strip-Till Equipment Trial Program (ASSET). The ASSET program developed and delivered a competitive incentive package to Saginaw Valley sugar beet producers that included financial and enhanced technical assistance, peer learning networks, and assistance acquiring specialized equipment. The program sought to catalyze the purchase of 10 new sets of strip tillage equipment in the watershed on 10 different sugar beet farms.



3 PROPOSED FRAMEWORKS FOR MAKING AND TRACKING PROGRESS

Here we describe frameworks for how conservation practices and associated water quality improvements can be supported and tracked more effectively, with special emphasis on successful structures and lessons learned in the Saginaw Bay watershed that can be adapted for the Western Lake Erie watershed, and vice versa.

3.1 Framework for Supporting Progress

The State of Michigan draft five-year update of the Domestic Action Plan (DAP) for Lake Erie centers around five strategies to support progress on nonpoint source phosphorus load reductions. The strategies are aimed at supporting progress toward the State's phosphorus-reduction goal and include:

- implementing and tracking conservation practices,
- measuring water quality results,
- conducting research and improving modeling,
- expanding outreach and education, and
- maintaining and expanding collaboration (State of Michigan 2024 *in prep*).

Among changes underway with state-run programs, MAEAP is currently undergoing restructuring in response to critiques like those raised during the three in-person workshops conducted as part of this Saginaw-Erie project. Aimed at enhancing the capability of MAEAP staff to perform verification work, and improving retention of critical technicians, the MAEAP restructuring will include goalsetting for staff, and incorporating climate resiliency and regenerative agriculture principles into the program. With support from the University of Michigan, an advisory group and science panel were also created to provide input to state agencies on agricultural conservation in the Lake Erie watershed, as envisioned in *Michigan's Adaptive Management Plan (AMP) to Reduce Phosphorus Loading into Lake Erie*, released in 2021. The state has no similar plans to the DAP and the AMP for Saginaw Bay.

3.2 Framework for Tracking Progress

Tracking temporal changes in adoption rates of conservation practices across different geographies and different funding programs, and subsequently reporting out to producers and stakeholders can be accomplished through various means, such as online conservation dashboards. These types of systems can have multiple benefits, such as facilitating communication with producers about the impacts of their efforts, highlighting the variety of conservation practices being adopted to public stakeholders, and demonstrating progress toward meeting water quality goals. Examples of tracking progress tied to monitoring-based load estimates include the federally supported Blue Accounting platform, Ohio Lake Erie Commission's annual water monitoring summary fact sheets for WLEB tributaries, and Ohio EPA's biannual nutrient mass balance study.



The Michigan State University Institute of Water Research (MSU IWR) is refining a system to track progress on Michigan's phosphorus-reduction goal for the WLEB. The [Great Lakes Watershed Management System](#) (GLWMS) has been around for over a decade, and recently has received state funding to be further enhanced, specifically for tracking progress. GLWMS is an online tool with sediment and nutrient calculators capable of assessing the environmental benefits of various conservation practices from a field-to-watershed scale for priority basins around the Great Lakes. Updates are underway that will allow Michigan's Quality of Life agencies to quantify and track progress toward phosphorus load reduction goals in the WLEB. Working with the State and stakeholders, researchers and programmers are developing a dashboard that will allow centralized reporting of key indicators and critical metrics, as data become available. In addition, existing models will be expanded to include watersheds not currently covered, and IWR will expand the types of BMPs available in the GLWMS. Currently, the dashboard is limited by data availability, but research is underway to improve linkages between field-scale practices and monitored water quality improvements, as well approaches to use satellite-derived data to track some BMPs such as planting of cover crops (Wang et al., 2023), establishment of filter strips along waterways (Novoa et al., 2018), and changes in tillage practices (Zhang et al., 2024).



Figure 3. Screenshot of the nutrient reduction dashboard prototype that will be incorporated into GLWMS.

Dating back to 2017, the State initiated work on a database to track BMPs implemented by verified farms as well as those working toward verification in MAEAP and other projects funded by MDARD. The MAEAP database has been in various stages of development since its inception, including introduction of spatial mapping to help prioritize acres and tracking of verified acres in priority WLEB watersheds (State of Michigan 2018, State of Michigan 2021).

Other states, such as [Iowa](#), have updated their reporting systems to include a series of dashboards, allowing increased timeliness, frequency, and transparency of updates. The Iowa platform includes six primary dashboard categories of interest, several of which are relevant to the topic of this white paper: (1) Funding and

Resources, (2) The Human Dimension, (3) Wastewater and Industrial Permitting, (4) Land Use and In-Field Practices, (5) Edge of Field and Erosion Control Practices, and (6) Water Quality and Nutrient Export (Figure 4).

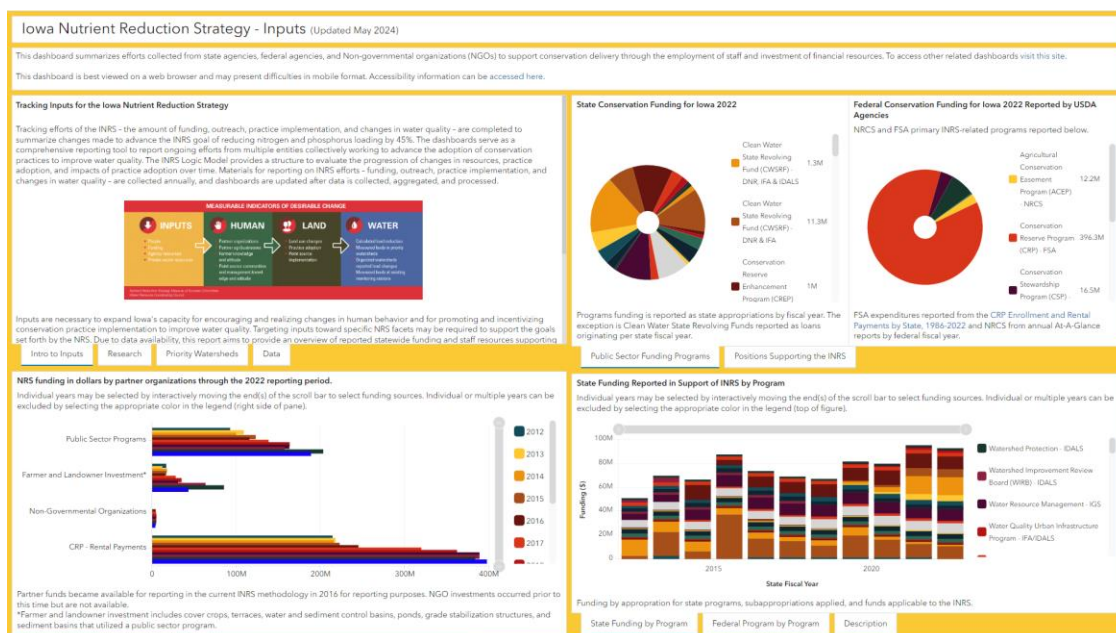


Figure 4. Screenshot of Iowa's Nutrient Reduction Strategy dashboard.

The Indiana State Department of Agriculture (ISDA) developed an interactive map-based web application (Figure 5) that highlights Indiana's efforts to enhance water quality and enables users to learn more about conservation programming in each of Indiana's ten major river and lake basins. Users can see the spatial distribution of conservation efforts and programming and can access information about soil health and local watershed groups. Indiana also hosts a [Sediment and Nutrient Load Reductions](#) application that allows users to view and download data on conservation practices, and sediment and nutrient load reduction information that is aggregated at the HUC-12 watershed scale.

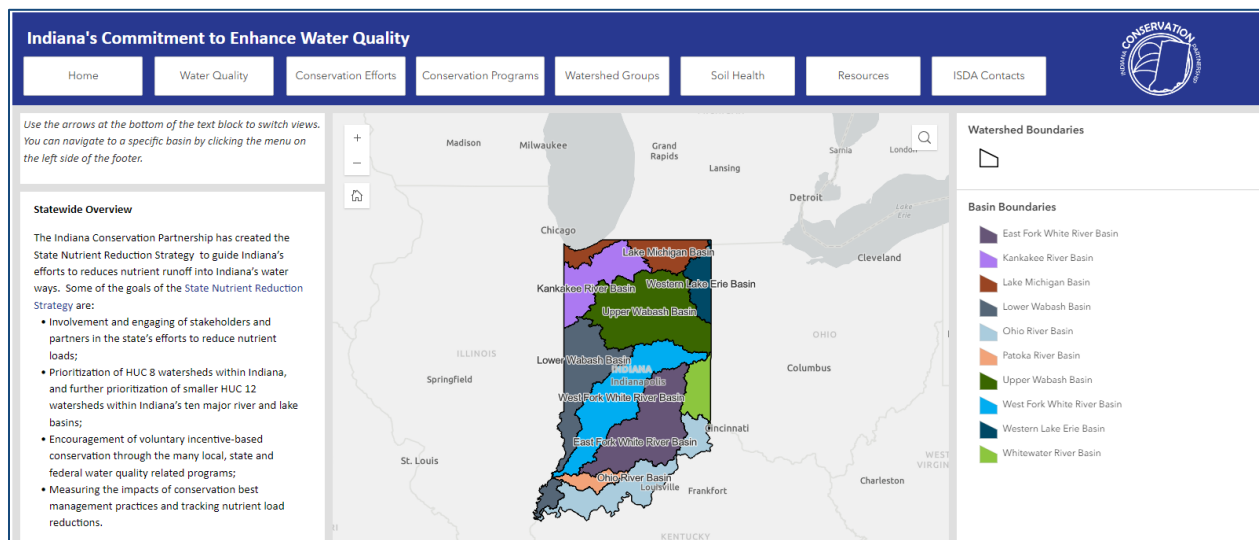


Figure 5. Screenshot of Indiana's map-based web application for agricultural conservation program tracking.



4 IMPROVING COMMUNICATION AND PROGRAM UPTAKE

As with most human endeavors, improving the effectiveness of communication among interested parties is the key to unlocking success in on-farm conservation and downstream water quality improvement in Michigan. Those in positions to sell ideas for improving farming practices must understand producers' motivations, communication styles, seasonal availability, comfort zones, and values. Messaging should be tailored to cropping systems, landscape characteristics, and other factors for it to be effectively received by producers. Likewise, the conservation "salesforce" needs to listen to ideas and insights that producers and agricultural landowners communicate back. Below we summarize messages and themes about what works and what does not when it comes to communication and response to farm-related conservation programs. The key takeaways and summaries from three in-person workshops also cover this topic (Appendix A).

4.1 Barriers to Implementation of Conservation Practices

Conservation practice adoption rates are relatively stable in Michigan and other Great Lakes states, even though BMPs are promoted heavily by conservation districts, government programs, and NGOs (Beetstra et al., 2022). What is not working when it comes to asking producers to adopt new practices or recruiting new producers to existing programs? What is working? What are the best pathways towards improving conservation uptake? We have identified four types of barriers to increasing the adoption of BMPs: programmatic, technological, economic, and cultural.

Programmatic barriers are the logistical challenges presented to conservation staff when trying to enroll more producers in conservation programs. How does a conservation specialist go about getting producers to come in the door, to voluntarily listen to information or ask for information? How can conservation specialists engage with more than just willing and easy to reach individuals? During the third workshop, participants strongly felt that developing and retaining high-quality technicians who can build trust with producers was a priority for outreach to new producers. In addition to quality, there must also be a sufficient *quantity* of these trustworthy technicians. One complaint is that there are simply not enough people: not enough conservation technicians or specialists, not enough trained and capable co-op or agricultural applicators, for example. One potential cause may be that these types of career paths in agricultural conservation are not perceived as a profitable or sustainable option compared to alternatives in the agricultural or environmental industry such as product or equipment sales jobs. Another cause of high turnover can be dissatisfaction among technicians if they feel as though they are being sent out to pitch practices that do not actually succeed in generating the environmental benefits that are intended because of the short duration of contracts. Another common programmatic barrier to uptake of BMP incentive programs can be complexity and timing issues with the application process. During the third project workshop many participants felt that rolling application periods and simple applications were important programmatic solutions, as complicated applications or rejections of applications deter producers from applying or reapplying for conservation funding.

The second type of barrier to conservation practice uptake is technological in nature. Certain BMPs, such as precision nutrient management, may require technologies that producers or even agricultural service providers are not able to implement due to lack of training or proper equipment. There can also be considerable variation



in the success of BMPs from field to field when the technologies used to design or implement BMPs do not consider site-specific factors. These differences can result from factors such as variations in soil types or in previous management practices. Looking ahead, it may become increasingly important to adapt BMPs to increase on-farm resilience to climate variability. This adaptation will be crucial to address not only as a technological challenge but also to ensure that these practices can accommodate changing weather patterns.

The third category discussed here is economic barriers to the voluntary adoption of conservation practices. From the financial point of view, available payments are insufficient in amount or duration, or are perceived to be insufficient, to incentivize change in a successful farming operation or to offset the potential risks or downsides of change. Producers generally do not have the luxury of passing the “buck” back to the consumer because they are limited by market prices and tight profit margins. Each year, Purdue University releases a [Crop Cost & Return Guide](#). For 2024, this guide shows that all productivity-size-rotation combinations evaluated resulted in a net operating loss once annual overhead costs (machinery, land, labor) were factored in. Even if the per unit BMP financial incentive were more attractive to producers such that it would incentivize change, the overall magnitude of spending on agricultural conservation incentives may be the greatest economic barrier to scalable adoption. As noted previously in Section 2, the AGL reported in 2023 that Michigan and Ohio would need to increase spending on conservation by \$40-65 million and \$170-250 million annually, respectively, over current investments. Related to the programmatic barrier discussing conservation professionals, increased conservation staff turnover due to salary limitations undermines the ability to build consistent, long-term, and trusting relationships with producers.

Finally, cultural barriers may stand in the way of conservation uptake. Farming communities are typically close-knit, with producers knowing many of their peers operating in the same area. This may result in a social stigma attached to adopting certain farming practices or participating in certain government programs. For example, just a few failed attempts to implement a new practice by otherwise successful producers may result in negative experiences being shared broadly, leaving others reluctant to try that practice. Producers also take pride in their ability to care for their land, with aesthetics often serving as a measure for such care. If a BMP leaves a field looking unkempt or creates delays or challenges with necessary agricultural operations like planting, weed and pest management, harvest, or efficient drainage, that may sway a producer to look at other practices. Additionally, trust in institutions has eroded in American society at large. In a recent study, rural populations specifically were 20% more likely to say they had little to no trust in the federal government than their urban counterparts (Hitlin and Shutava, 2022). The 2024 Edelman Trust Barometer reports that respondents rated their peers as equally reliable as scientists to tell them the truth about new innovations and technologies. These barriers to trust may serve to inhibit the uptake of BMPs recommended by federal programs and research scientists. Barriers to conservation practice adoption, along with potential solutions to overcome the barriers, are summarized in Table 3 below.



Table 3. Common Barriers to BMP Implementation and Methods for Addressing

Barrier Type	Problems	How to Address
Programmatic	Marketing and logistical challenges for conservation staff	Raising incentives and matching them better with producer needs (e.g., equipment costs, like STRAND program) helps programs sell themselves
	Complexity of the application process	Creation of online forms and tutorials that can simplify the process and reduce staff workloads, and ensure program staff are trained to maximize both customer service and streamlining applications
Technological	Variation in the success of any given BMP from field to field	Develop geospatial analysis at the field scale of BMP suitability to inform staff and applicants
	Differences in soil types or previous management	Create and maintain high-resolution and up-to-date BMP databases
	Adapting practices to climate variability	Build in situ and remote sensing data into automated BMP management systems to increase resilience
Economic	Insufficiency of conservation payments (real or perceived)	Explore innovative ways to enhance conservation funding through credit programs (carbon, nutrient, water), adjusting contract length, and premium commodity pricing for sustainably grown products
	Producers limited by market prices and tight margins	Adjust subsidy programs to make them more responsive to market forces (e.g., fertilizer costs, political instability abroad)
	Agency staff turnover due to low salaries	Rework agency salary structures and career paths to incentivize stable staffing and the development of long-term advisor/producer relationships
Cultural	Social stigma attached to adopting certain farming practices	Create media campaigns that shift attitudes about field aesthetics and tie practices to a multi-generational stewardship ethic (e.g., work with faith communities)
	Erosion of trust in institutions	Strengthen partnerships among trusted institutions and facilitate conversations that mix groups with different interests; seek endorsement of trusted individuals for programs and practices

4.2 Communication Strategies for Sharing Information

There are several approaches for sharing information with the farming community. Field day events are a common method for conservation specialists to engage with area producers and other stakeholders. These may be annually recurring events at common locations or special, one-time events associated with conferences or other initiatives. For example, the Erb Family Foundation recently supported a [regenerative agriculture field tour](#) that took participants to several WLEB farms. The MSU Extension held field day events around the state



in 2024, including [two events at the Saginaw Valley Research and Extension Center](#) showcasing wheat (June) and bean and beets (August).

Demonstration farms are a popular and well-received strategy that may host multiple field day-type events per year as well as share information by other means. The [Blanchard River Demonstration Farms Network](#), a partnership between USDA-NRCS and the Ohio Farm Bureau Federation, showcases conservation practices meant to improve water quality in the Maumee River basin. Three farms in Northwest Ohio demonstrate eight to ten conservation practices each and allow researchers to study their impact while simultaneously serving as an information hub for producers and landowners. In Michigan, the Lenawee County [Center for Excellence](#) works with local family farms that serve as demonstration sites during annual field day activities. Elsewhere in the Great Lakes Region, several of these research-oriented farm networks have been established, including one of the oldest in the [Wisconsin Discovery Farms](#), a spin-off [Discovery Farms Minnesota](#), and the [Fox Demo Farms](#).

Other examples of producer-focused sharing out can be seen in the [Farmer-Led Watershed Conservation Group](#) and the [Saginaw Watershed Farmer Network](#). Within these networks, producers can interface with other producers to get assistance in adopting BMPs. Thinking creatively can also bring non-producers to the action. In March of 2020, the Great Lakes Commission launched '[Conservation Kick](#)', a program designed to create a water quality marketplace for the Great Lakes Basin. This program takes lessons the GLC has learned by designing and leading water quality trading efforts in both the Fox River Basin (Wisconsin) and the WLEB and seeks to expand water quality trading across the Great Lakes Basin.

University-affiliated agricultural extension offices or research farms are yet another means for directly engaging producers during in-person events or fostering information sharing and communication by other means. In the Saginaw area, MSU Extension operates the [Saginaw Valley Research and Extension Center](#) (SVREC) near Frankenmuth. It opened in April 2009, replacing the previous Saginaw Valley Bean and Beet Research Farm, and grows dry beans, sugar beets and rotational crops like wheat, corn, and soybeans on roughly 250 acres. The education center can host meetings, gatherings, and educational programming with space for over 300 people. SVREC specifically seeks to provide growers with accurate, economically relevant knowledge that keeps them competitive in dry bean and sugar beet production.

4.3 Recent Programmatic Changes

There have been several substantial changes in recent years in staff, positions, and organization at MDARD. These have included the hiring of a new director in March 2023, creation of a Western Lake Erie Strategist position in 2022, and hiring a Chief Science Officer in 2024. The MAEAP and its staff have been targets of executive branch and legislative reworking in Michigan in 2024. The Governor's 2025 budget proposed moving the MAEAP technicians from the Soil Conservation Districts to MDARD and shifting their geographic coverage from counties to watersheds, while the State's House of Representatives supported leaving the program unchanged and the Senate proposed moving the technicians to MSU Extension. In the signed budget, MAEAP technicians ultimately stayed with Conservation Districts and the Michigan Legislature approved funding to study the challenges and needs of Conservation Districts to help them succeed. The state is also looking for ways to enhance and expand MAEAP practices and enrollment with information gathered from the [Michigan](#)



[Climate Smart Farm Project](#) and the [MI Healthy Climate Plan](#) as well as include regenerative agriculture principles, working with MSU's [Center for Regenerative Agriculture](#).

4.4 Knowledge Exchange Themes and Ideas

As part of the three-workshop series that initiated this project, several recurring themes were identified, and often carried over from one event to the next. Workshop #1 included three facilitated breakout groups covering knowledge exchange on: (1) conservation practitioner programming, (2) conservation practitioner outreach to new producers, and (3) farmer-led watershed groups. Conclusions of the discussions highlighted the importance of building relationships, establishing and maintaining credibility, continuity in programs and staff, fairness in design and eligibility of programs, effectiveness of conservation practices, and affordability of implementation for producers. Workshop #2 involved presentations covering a variety of project-related topics covered by TNC, AGL, Michigan Farm Bureau, LimnoTech, and Monroe Conservation District. Several of the conclusions from Workshop #1 were repeated during Workshop #2, and new themes emerged such as the importance of sustained conservation funding, a lingering notion that producers are singled out for nutrient pollution issues, the lack of adequate systems to track BMP adoption and water quality impacts, and the need to better account for challenges presented by owned vs. rented agricultural land for production. Workshop #3 included live polling of attendees to capture opinions regarding priorities for programming, outreach to new farmers, and farmer-led knowledge exchange, and to explore a series of “Million Dollar Ideas” that participants had proposed following the second workshop. The tone of Workshop #3 was positive and optimistic (Figure 6). Participants were energized by the prospects of new funding, new ideas, new technologies, and new leadership in Michigan’s approaches to agricultural conservation. Full summaries for each of the three workshops are available in Appendix A.



Figure 6. Workshop #3 at Devries Nature Conservancy in Owosso, May 31, 2023.

Several themes, unresolved questions, or tensions emerged from Workshop #3, some of which were carried over from prior workshops. Among these were the following:

- Good technicians were recognized as a key component in building trusting relationships between producers and program managers. Insufficient staffing and compensation lead to high turnover rates, which has handicapped program effectiveness in the past.
- Participants were interested in the development of demonstration farm networks in the Michigan portions of the WLEB and Saginaw Bay watersheds as a method to facilitate technology transfer, foster improved communication, and build a sense of community and engagement among producers, researchers, and conservation program leads and staff.
- The results of prior investments in programs and research under GLRI and other initiatives do not always make their way back to advisors and producers. More effective technology transfer and plans for communication of lessons learned should be developed and implemented, working with existing networks and outlets that reach these audiences.
- Better coordination across states and organizations is needed, including basin-wide agencies (e.g., Great Lakes Commission, International Joint Commission advisory boards and working groups), academic institutions (land grant schools and others), and NGOs to maximize impact and minimize duplication.
- Expanded monitoring and data access for water quality, BMP implementation, and BMP effectiveness was recognized as a broad need, including real-time or at least in-season information and easy access through smart phone applications.
- Innovative approaches like remote sensing for monitoring BMP and cropping system practices were supported as ways to improve the temporal and spatial resolution of information to support program decisions and avoid data anonymity issues.

Seven ideas were presented and discussed, as described in Table 4. Appendix B contains greater detail for each of the “Million Dollar Ideas”.

Table 4. Summaries of Million Dollar Ideas.

Idea Name	Summary
1. Pay-for-Performance+	Expand on the prior pilot framework of linking producer incentives to measured environmental outcomes by establishing a minimum payment threshold, requiring in-field measurement “spot checks”, reinforcing voluntary enrollment and de-emphasizing “targeting”, and providing streamlined contracting procedures
2. STRAND+	Build on the success of the prior STRAND program by establishing an improved results modeling and monitoring protocol, and establishing better baseline and post-implementation documentation of impacts
3. Two-Stage Ditches	Support expanding the width of drains to allow for water to be contained in channels rather than flooding fields, capturing phosphorus and sediment; leverage impact with easements on filter strips, which could be hayed or planted with trees; ditches maintained in coordination with local drain commission



Idea Name	Summary
4. MiWater Challenge	Fund watershed and municipal BMPs and restoration for water quality improvements through a taxpayer-supported water fund, analogous to H2Ohio, which will connect water users with those who implement sustainable agricultural practices
5. Profit for Soil Health	Conduct an economic analysis and then develop a linked cost-share program that ties improved soil health to profitability, providing bridging funds to protect producers from the economic costs of implementation until the profitability impacts are clearly realized and sustained
6. Risk-Managed Conservation	Provide cost-share for a suite of in-field practices that improve water quality and prevent erosion, along with protection for any related decrease in yield (not just weather-related but related to new practices)
7. Cover Crop Transitions	Provide cost-share at a reduced per-acre rate but over a longer transition period than traditional programs (6 to 9 years, versus 3 years) to allow for soil health and yield benefits to become clearer to producers, resulting in permanent cover crop adoption without cost-share



5 SUMMARY AND RECOMMENDATIONS

The overall goal of enhancing the adoption of permanent on-farm conservation measures and improving the water quality of Michigan's Western Lake Erie Basin has proven to be challenging. Progress has been made in the Saginaw Bay watershed with pilot-scale versions of successful on-farm conservation approaches, which are beginning to be adapted to Michigan's Western Lake Erie Basin to achieve permanent agricultural conservation and improved water quality. Likewise, Saginaw Bay programs have adapted Western Lake Erie Basin approaches, including the recent expansion of watershed monitoring facilitated by the Saginaw Bay Monitoring Consortium's efforts, coordinated by TNC. LimnoTech supported TNC in preparing and executing a series of three workshops to promote the exchange of effective agricultural conservation approaches among advisors and stakeholders in the Saginaw Bay watershed and the Western Lake Erie watershed to reduce nonpoint source nutrient loads and eutrophication. Findings and recommendations from the Saginaw Bay and Western Lake Erie Basin knowledge exchange effort can broadly be subdivided into three categories:

- (1) program structure, operations, and staffing;
- (2) incentivizing agricultural conservation; and
- (3) tracking of BMP implementation and impacts.

The findings and recommendations arising in each of these categories are summarized here. Note that actions are already underway on many fronts to address some of the recommendations.

5.1 Program structure, operations, and staffing

The agricultural conservation sector in Michigan broadly suffers from inadequate staffing, inexperienced and underpaid staff, and high turnover. This impacts the ability of programs to build effective long-term relationships with producers and partners, and results in limited institutional memory and relatively low engagement over time, especially where new programs or changes to existing programs need to be communicated. Many programs are also characterized by fragmentation and ineffective coordination among related groups.

Recommendations:

- Develop more complete career paths for conservation organizations at all levels (e.g., conservation districts, State of Michigan Quality of Life agencies, watershed councils or non-governmental organizations) with competitive compensation within programs that would allow staff to progress from technician positions to watershed-scale program management, regional responsibilities, and even statewide roles while staying in the same geographic location. Keeping continuity between staff and their locations can stabilize their networks, build trusted relationships, and produce more permanent results over time as they train junior staff and introduce them to regional producers and partners.
- Develop more formalized communication pathways, agreements, or other structured collaborative relationships among agency-led agricultural conservation programs and NGOs to provide better outreach on



technical and financial assistance opportunities, improve coordination of activities, reduce redundancy in programs, and leverage trusted partner relationships with producers and other agricultural stakeholders. Many NGOs, including TNC, play an integrator role – linking stream health and biodiversity to agricultural stressors across jurisdictions. These groups can also develop policy, play advocacy roles, access subject matter experts and communicators outside of agencies, serve as effective conveners, and augment program funds with philanthropic support.

- Encourage better integration between federal, state, and local programs. This may include leveraging MAEAP as an established program known throughout the State to streamline participation between multiple programs, simplify producers' paperwork and data submissions, and incentivize participation in programs with similar goals or for which only a few additional practices are needed to expand certification to multiple programs.
- Expand support for the development and maintenance of producer conservation networks including administrative management to allow them to share conservation information, program opportunities, experiences in implementation, and guidance through adoption on the farm.
- Offer opportunities to producer conservation networks to be more engaged and integral in planning field day events and expanding demonstration farm networks to bring conservation professionals, the farm community, and other stakeholders together.

5.2 Incentivizing agricultural conservation

There is broad agreement that the incentives that are associated with many agricultural conservation programs under the Farm Bill and other legislation are inadequate to justify the investment of time, money, and energy required by producers to participate. While investments by producers to reduce erosion and nutrient losses from their farms may seem like common sense, the reality is that current agricultural markets do not provide sufficient or timely financial returns on many BMP investments, making their implementation a drain on farms' business viability. Long-term efforts that support the creation of reliable markets that provide premiums for products created using positive environmental practices or other market-based incentives (e.g., carbon credits) could support expanded and sustained adoption of BMPs.

Recommendations:

- Build on recent studies of the BMP investments needed to meet nutrient reduction targets in the Western Lake Erie Basin (AGL and OEC 2023) by completing similar analyses for the Saginaw Bay watershed to better quantify the technical and financial challenges that exist to meeting nutrient load reduction targets for the bay. The study could further investigate various strategies for directing funding toward enabling long-term BMP implementation.
- Perform comprehensive studies to determine competitive pricing for initial adoption of conservation practices (i.e., capital expenses/implementation costs) and for persistent adoption of conservation practices (i.e., rewarding producers for long-term contributions made to the public good beyond their farm).
- Identify stable funding sources and allocate adequate resources to meet the needs of producers to accelerate sustained BMP adoption. Remove disincentives and barriers like complex application procedures,



short-duration contracts that do not allow sufficient flexibility to adjust for weather conditions or diverse crop rotations, conservation program restrictions on equipment purchases or capital improvements, and challenges associated with landowner/tenant relationships and agreements.

5.3 Tracking of BMP implementation and impacts

Being able to track existing BMP implementation at sufficiently high spatial (field scale) and temporal (seasonal to annual) resolution to understand what is happening on the landscape is a critical component of effectively executing agricultural conservation programs. Similarly, higher resolution water quality data are also needed to link field-scale conservation practices with improvements in streams and rivers. Concerns about protecting the anonymity of Farm Bill program participants have led to anonymizing of survey data and other information to the county scale in most cases, which is too coarse to be useful for many purposes. New technologies may be able to provide more spatially relevant information while still protecting individual producer privacy and make the most of limited resources to provide a balance of the need for long-term monitoring with the implementation of practices to improve water quality. New monitoring approaches and policies are needed.

Recommendations:

- Develop and implement scientifically sound monitoring strategies that increase resolution and better integrate ground-based, water-based, and remote sensing data to allow conservation professionals to make informed decisions about where to direct producer outreach, what practices are most effective, and how the agricultural landscape is shifting based on private, public, technical, and market-based drivers. This information could be used to perform an annual BMP adoption analysis at the watershed scale, drive the application of emerging artificial intelligence/machine learning tools, confirm that funded conservation commitments are being implemented, and guide new agricultural conservation and ecosystem service market-based programs.
- Incentivize voluntary data-sharing by rewarding conservation-oriented producers with meaningful credentials and certifications that will be valued by their customers, colleagues, and other interested parties.
- Establish and maintain long-term water quality monitoring programs to measure whether improvements in in-stream nutrient loading are being made.

5.4 Conclusion

There is broad agreement among the farming community and the conservation community that the current approach to improving the environmental sustainability of agriculture in the SB watershed and the WLEB is not meeting nutrient reduction targets. The path forward will require improved programs, better tracking, and more compelling incentives. Little progress is likely to be made without solid and lasting partnerships that eschew adversarial approaches and embrace and articulate common goals, objectives, agendas, and desired changes to taxpayers, consumers, investors, and people in positions of influence, recognizing that those people change over time. The pace at which these recommendations are implemented will substantially determine the rate of water quality improvement in the waters and tributaries of Lake Erie and Saginaw Bay.



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APPENDIX A

Workshop Summary Memos



Memorandum

From: John Bratton, LimnoTech

Date: 25 July 2023

Project: TNC SAGERIE

To: Ben Wickerham and Becky McNitt, TNC

SUBJECT: Workshop #1 Summary: Great Lakes Priority Watershed Knowledge Exchange (Saginaw Bay – Western Lake Erie)

Overview

LimnoTech is supporting The Nature Conservancy (TNC) in preparing and executing a series of three workshops to promote the exchange of effective agricultural conservation approaches among advisors and stakeholders in the Saginaw Bay watershed and the Western Lake Erie watershed to reduce nonpoint nutrient loads and eutrophication. The first workshop in the series took place at LimnoTech's office in Ann Arbor on the morning of October 25, 2022 (Figure 1). In addition to organizers, 25 attended, representing 19 conservation organizations. The workshop began with an overview and discussion of the set of articles published by Circle of Blue in 2022 titled, *Danger Looms Where Toxic Algae Blooms* (Figure 2; <https://www.circleofblue.org/lake-erie-algae/>). The workshop then moved to a series of three facilitated breakout groups covering knowledge exchange on: (1) conservation practitioner programming, (2) conservation practitioner targeting of new farmers, and (3) farmer-led watershed groups. Conclusions of the discussions highlighted the importance of building relationships, establishing and maintaining credibility, continuity in programs and staff, fairness in design and eligibility of programs, effectiveness of conservation practices, and affordability of implementation for producers.



Figure 1. Workshop #1 at LimnoTech offices in Ann Arbor, October 25, 2022.

Summary of Opening Session and Circle of Blue Discussion

After informal conversation and light refreshments, the workshop began with a formal kickoff by TNC covering workshop goals and structure—especially the desire for the outcomes to be practical and useful for participants and to allow the voices of a mix of viewpoints, geographies, and constituencies to be heard. These viewpoints included those of conservation practitioners, farm advocacy groups, environmental advocacy groups, state agencies, federal agencies, and producers. As a way of engaging workshop participants early in the workshop, LimnoTech presented a summary of the content of the Circle of Blue investigative reports (Figure 2). A short discussion period allowed participants to express their views of the series. Several felt that the message of the reporting was misleading, somewhat inaccurate, or even inflammatory, although there were mixed views about how effective the series would be in terms of raising awareness and motivating action at a minimum. The depiction of expanding livestock operations as being directly linked to worsening algal blooms was especially controversial. While no attempt was made to move the group toward consensus on the usefulness of the series or on the topics it raised, the discussion got people engaged in meaningful conversations quickly, as intended.



Figure 2. Screenshot of a video overview of the six-part series by Circle of Blue on the Lake Erie algal bloom issue.

Summary of Break Out Group Discussions

After the opening presentation and discussion, a series of three break out group discussions covered the topics listed in the agenda (excerpt at right). The large group was broken into four smaller break out groups with five to six participants and a facilitator with flip charts or white boards to record the discussions, as shown in the photos below (Figures 3-7). Highlights from each breakout group are included by topic, in sequence, below.

10:10 - Break Out #1

- Conservation Practitioner Knowledge Exchange on **Programming**
 - What worked well in your county/area (successful programming for conservation adoption?)
 - Where has MAEAP been successful--and why?
 - What has NOT worked well in your county/area (successful programming for conservation adoption—and why?)

10:55 - Break Out #2

- Conservation Practitioner Knowledge Exchange on **“Targeting” New Farmers**
 - How do you proactively engage farmers that are NOT walking into an office or reaching out to us?
 - What has been your most successful outreach campaign?
 - What are the most and least effective tools for screening/targeting?

11:40 - Break

11:50 - Break Out #3

- Farmer-led Watershed Group **Knowledge Exchange**
 - What are characteristics of your most successful group(s)?
 - What are characteristics of less successful group(s) or other lessons learned?
 - How do you plan to engage farmers that are NOT joining groups yet?





Figure 3. Wide view of the full conference room during the first break out session, with three groups at small tables on the left and a fourth group at the end of the large table in the center. Facilitators and scribes are standing.

Break Out #1: Conservation Practitioner Knowledge Exchange on Programming

The following three questions were discussed by each group and common themes were consolidated across groups:

- What worked well in your county/area (successful programming for conservation adoption?)
- Where has MAEAP been successful--and why?
- What has NOT worked well in your county/area (successful programming for conservation adoption—and why?)

Consolidated results of Break Out #1 discussions:

- Cover crop programs are very popular among producers.
- A generational shift in farmland ownership is underway, which presents conservation opportunities.
- There is substantial variation in programs and producer perspectives from county to county, even in the same watershed; program designs and measures of success should take this into account.
- The MAEAP program was recognized as allowing for a high diversity of participants—from large farms to hobby farms—but was seen as best for newer farmers.
- Non-Farm Bill programs are attractive to producers for a variety of reasons including relative simplicity of applications, quick decisions, better alignment with modern practices, and generally competitive incentives. Their temporary nature, however, leads to program fatigue and lack of engagement.
- Rolling application periods are desirable, as farm demands are unpredictable and fixed deadlines do not always work well with this.
- Producers dislike ranking of applications for conservation programs and prefer a “first come, first served” approach.
- There is a need for knowledgeable and reliable conservation technicians with continuity for the building of relationships.; current workloads for technicians are unreasonable and the pay is low, leading to high turnover.





Figure 4. Becky McNitt (TNC) facilitates a break out group and takes notes.

Break Out #2: Conservation Practitioner Knowledge Exchange on Targeting New Farmers

The following three questions were discussed by each group and common themes were consolidated across groups:

- How do you proactively engage farmers that are NOT walking into an office or reaching out to us?
- What has been your most successful outreach campaign?
- What are the most and least effective tools for screening/targeting?

Consolidated results of Break Out #2 discussions:

- Views on targeting are mixed. The need for concentrating resources on the most problematic areas and operations is broadly recognized and understood, but limiting eligibility to a subset of producers can also be unpopular.
- Who provides the information is key for trust and response to invitations, regardless of the medium and format. Most “new” farmers are new to conservation, not to farming.
- Producers pay more attention to individuals than to organizations, including on social media. Some are wary of self-proclaimed “influencers” though.
- Programs must be credible, sustained (multiple years), integrated, and make economic and technical sense for producers. Programs that support equipment purchases are especially popular. Metrics need to be defined and data collected to measure program success to allow for learning and adaptation to what works.
- Messaging oriented toward particular religious groups may be effective (e.g., Amish).
- Consider that many producers work off the farm as well, so do not call or schedule meetings over dinnertime or at other times that will conflict with this.

- Go to other meetings where you know the farmers will be (e.g., fairs, field days, continuing education events). Build rapport in these venues—do not just try to sell something or push a program. Also consider basic hospitality by providing good food, beverages, etc.



Figure 5. Derek Schlea (LimnoTech; seated in center left) facilitates a break out group and records comments on a flip chart for posting behind him.



Figure 6. Chelsie Boles (LimnoTech; standing, far right) facilitates a break out group and captures discussion points on an easel-supported flip chart for posting to her left.

Break Out #3: Farmer-Led Watershed Group Knowledge Exchange

The following three questions were discussed by each group and common themes were consolidated across groups:

- What are characteristics of your most successful group(s)?
- What are characteristics of less successful group(s) or other lessons learned?
- How do you plan to engage farmers that are NOT joining groups yet?

Consolidated results of Break Out #3 discussions:

- Successful groups include effective leaders, solid logistical support, structured meetings, engaged and empowered participants, and audience-appropriate communications.
- Many successful groups include compensation for leader training and sometimes for leader and participant time in conversations.
- Less successful groups can result from untrained leaders without authority or facilitation skills, or leaders who have to step down due to the burden of too much logistical responsibility.
- Challenges include discussions that drift and lose focus, lack of clarity about objectives or inappropriate objectives (too aggressive), divisions within the group, exclusivity, generational barriers, and inadequate budgets for compensation and food.
- Best ways to recruit new participants are to have convincing pitches and testimonials about the value to participants, leaders who are respected and personally invite from their network, messages that resonate with producer values (e.g., sustainable farming for their grandchildren to take over someday).
- Success follows success, but bad experiences have a long legacy too—it is hard to get people back once they have been turned off and are actively discouraging others from participating.



Figure 7. Michelle Selzer (State of Michigan; standing) captures break out discussion on the white board and flip charts behind her.

Key Discussion Points

Several themes or unresolved questions or tensions emerged from workshop #1. Among these were the following:

- Building strong relationships over time, establishing and maintaining credibility, and providing continuity with minimal turnover were all recognized as challenges.
- Fairness, effectiveness, and affordability or economic suitability of programs and incentives were all seen as keys to success.
- Tensions exist between targeting to improve program effectiveness by optimizing resource use, and broadening access to programs as much as possible.
- Overall insufficiency of resources makes it difficult to recruit, train, and retain enough qualified and effective staff, and to allow relationships with producers to grow and persist over time.
- There is a desire from producers for simple paperwork and minimal accountability, which is at odds with establishing metrics and compiling data on the effectiveness and impact of programs.
- Programs that allow for a greater breadth of participation and practices are more complex and harder to implement and sustain.

Debrief Summary and Considerations for Other Workshops

A virtual debrief was held on October 31 to discuss outcomes and lessons from the October 25 workshop. Highlights of the conversation include the following:

- The amount of feedback received was greater than expected.
- The long-term impacts of perceived betrayed trust by government agencies and program representatives among producers were commonly raised in discussions.
- Rates of BMP adoption outside the USDA EQIP program and similar programs are difficult to determine.
- The idea of modeling BMP verification after the approach used in Iowa was raised (see: <https://www.gis.iastate.edu/BMPs>), possibly for use in the “STRAND 2.0” or MAEAP programs.
- Access to remote sensing data for adoption of conservation adoption of tillage practices and cover crops was discussed as an approach to be pursued further.
- There was a desire expressed for relative weighting of feedback received, especially being careful not to overweigh the views of environmental or agricultural advocacy groups.
- A nutrient management theme was discussed as an option for the next workshop (4R-oriented agenda?).
- Good conservation delivery strategies--not just traditional programs--were also discussed as a future workshop focus.



- Additional options: present an overview of the TNC program for BMP promotion in Saginaw Bay; recap the STRAND 2.0 program concept; use a *Shark Tank* pitch format for conservation program ideas; include an emphasis on soil health enhancement programs; and think about higher technology approaches, including a presentation by Ann Arbor-based Farm Logs software company (acquired by [Bushel Farm](#) in 2021).



Attachment 1: Participant List

<i>Participant</i>	<i>Organization</i>
Ladean Anderson	Gratiot Conservation District
Logan Banning	Gratiot Conservation District
Chelsie Boles	LimnoTech
John Bratton	LimnoTech
Connor Crank	Michigan State University Institute of Water Research
Kathy David	State of Michigan - EGLE
Julie Doll	Michigan Agriculture Advancement
Jenna Falor	MSU Extension
Allsion Grimm	Hillsdale Conservation District
Ralph Haefner	U.S. Geological Survey
Bretton Joldersma	State of Michigan - EGLE
Jenny Leininger	Hillsdale Conservation District
Nicholas Machinski	Michigan Assoc. of Conservation Districts
Becky McNitt	The Nature Conservancy
Julia Miller	State of Michigan - EGLE
Keeley Pape	Lenawee Conservation District
Brittany Santure	Monroe Conservation District
Derek Schlea	LimnoTech
Michelle Selzer	Michigan Department of Agriculture & Rural Development
Stephanie Singer	The Nature Conservancy
Craig Stow	NOAA GLERL
Megan Tinsley	Michigan Environmental Council
Tess Van Gorder	Michigan Farm Bureau
Peter Vincent	State of Michigan - EGLE
Ben Wickerham	The Nature Conservancy
Hannah Witt	Monroe Conservation District
Nicole Zacharda	Great Lakes Commission
Robert Zeilinger	Cass River Greenway
Tom Zimnicki	Alliance for the Great Lakes



Attachment 2: Agenda

Priority Watershed Knowledge Exchange

Meeting #1

October 25, 2022 9:00a-12:30p

LimnoTech

501 Avis Drive

Ann Arbor, MI 48108

734-332-1200, jbratton@limno.com

Agenda

8:45 - Get settled, refreshments and conversation

9:00

- Welcome & Introduction
 - Goals & Structure of the Workshop Series
 - Goals & Challenges of Our Work

10:00 - Break

10:10 - Break Out #1

- Conservation Practitioner Knowledge Exchange on **Programming**
 - What worked well in your county/area (successful programming for conservation adoption?)
 - Where has MAEAP been successful--and why?
 - What has NOT worked well in your county/area (successful programming for conservation adoption—and why?)

10:55 - Break Out #2

- Conservation Practitioner Knowledge Exchange on **“Targeting” New Farmers**
 - How do you proactively engage farmers that are NOT walking into an office or reaching out to us?
 - What has been your most successful outreach campaign?
 - What are the most and least effective tools for screening/targeting?

11:40 - Break

11:50 - Break Out #3

- Farmer-led Watershed Group **Knowledge Exchange**
 - What are characteristics of your most successful group(s)?
 - What are characteristics of less successful group(s) or other lessons learned?
 - How do you plan to engage farmers that are NOT joining groups yet?

12:30 - Adjourn & lunch (boxed lunch provided)

*With funding from the
Fred A. and Barbara M. Erb Family Foundation*



Memorandum

From: John Bratton, LimnoTech

Date: 22 March 2023

Project: TNCSAGERIE

To: Ben Wickerham and Becky McNitt, TNC

SUBJECT: Workshop #2 Summary: Great Lakes Priority Watershed Knowledge Exchange (Saginaw Bay – Western Lake Erie)

Background

LimnoTech is supporting The Nature Conservancy (TNC) in preparing and executing a series of three workshops to promote the exchange of effective agricultural conservation approaches among advisors and stakeholders in the Saginaw Bay watershed and the Western Lake Erie watershed to reduce nonpoint nutrient loads and eutrophication. The first workshop in the series took place at LimnoTech's office in Ann Arbor on the morning of October 25, 2022 (Figure 1). That workshop began with an overview and discussion of the series of articles published by Circle of Blue in 2022 titled, *Danger Looms Where Toxic Algae Blooms* (<https://www.circleofblue.org/lake-erie-algae/>). The workshop then moved to a series of three facilitated breakout groups covering knowledge exchange on: (1) conservation practitioner programming, (2) conservation practitioner targeting of new farmers, and (3) farmer-led watershed groups. Conclusions of the discussions highlighted the important of building relationships, establishing and maintaining credibility, continuity in programs and staff, fairness in design and eligibility of programs, effectiveness of conservation practices, and affordability of implementation for producers.



Figure 1. Workshop #1 at LimnoTech offices in Ann Arbor, October 25, 2022.

The second workshop (Figure 2), also hosted and facilitated by LimnoTech in Ann Arbor, began with lunch on March 2, 2023, and continued through the afternoon. A participant list and agenda are attached at the end of this memo. There were 30 total participants in the workshop including three TNC staff, three LimnoTech staff, and a representative from the Erb Family Foundation. All participation was in person. The workshop was organized as a series of informal presentations followed by discussion after each presentation.



Figure 2. Workshop #2 at LimnoTech offices in Ann Arbor, March 2, 2023.

Summary of Presentations



Figure 3. Ben Wickerham from TNC provides an overview of Workshop #1. Ben also provided an overview of the Saginaw Bay Pay for Performance program after Tom Zimnicki spoke.

The workshop began with lunch and informal conversations. About half of the participants had attended Workshop #1 and half were new. The workshop was structured around a series of presentations followed by live feedback and discussion. The last two presentations were Shark Tank style program pitches. **Ben Wickerham** from TNC gave a kickoff presentation that included a recap of Workshop #1 (Figure 3). Ben was followed by **Tom Zimnicki** from the Alliance for the Great Lakes who provided an overview of their recent publication and fielded questions from the group after he completed his slides.

The publication is titled, *The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie* (<https://greatlakes.org/2023/02/bold-action-needed-to-meaningfully-reduce-algal-blooms-in-western-lake-erie/>). The recap included the following:

- BMPs considered, magnitude needed to meet 40% reduction in each tributary watershed in Michigan and Ohio, with a Michigan focus
- More spending is needed on an ongoing annual basis (about 5-6X in Michigan)
- Current spending is about \$10M per year
- Many barriers to adoption exist, but insufficient funding is a primary one
- December 2022 roundtable highlights
 - Source reduction vs. trapping or controlling
 - Need to update Tri-State recommendations
 - Markets need to be created to give competitive advantage to conservation-minded producers
 - More water quality monitoring, edge-of-field (EOF) level and larger regional level
 - The farmers present said they would "...welcome regulations and standards..."
- Conservation-minded producers are tired of other people dragging them down



Figure 4. Tom Zimnicki from the Alliance for the Great Lakes provides an overview of the February 2023 report, *The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie* (<https://greatlakes.org/2023/02/bold-action-needed-to-meaningfully-reduce-algal-blooms-in-western-lake-erie/>).

Summary of Q&A on presentation, and broader comments/extended discussion:

- Roundtable - is this the average WLEB farmer?
 - No, intentionally brought in conservation-minded farmers
- Need more structural measures? [Yes].
 - A theme heard in Monroe and elsewhere is that operators are not sure that landowners will allow certain structural measures. They are worried about the length of the leases.
 - Should we focus on producer-owned land in Ag Inventories? See surveys by American Land Trust.
 - This complexity was brought up in the roundtable. Maybe an internal decision tree is needed?
- Working with NWF on a pilot to have leases with clauses to incorporate landowner and renter perspectives. MI has lower land rental rates than OH, IN, IL, IA.
- How to fit into bigger picture across more than agriculture? Other sources?
 - We assumed trying to get a 40% reduction across all sources. This exercise was for a 40% reduction from Ag compared to baseline Ag.
- We already exceeded the 40% goal for point sources in MI; spending over a million a year above normal costs just to meet that. Other plants are meeting permits but not reduction targets.
- Elaborate on the Ottawa-Stony drainage areas?
 - Basically, not enough Ag acres to meet a 40% overall reduction goal from just Ag.
 - Should be consideration for larger watershed contributors. Have to get more load reduction from some subwatersheds than others because they are contributing more.
 - We know more about these watersheds now than 5 years ago with better monitoring and models.
- Don't have a good handle on what's out there (e.g., contributions to the Maumee River). Initial monitoring showed some pretty significant differences in the tributaries. Focus where we think we can have the most impact.
- Identify BMP prioritization. Nutrient management wasn't one of the scenarios. It felt downplayed. Why not included?
 - Not included because it is hard to model--hard to come up with a number for reduction from NMP and research shows mixed results. Up against 2025 target (note: none of the jurisdictions are going to meet their targets [ON, MI, OH, IN, PA...]).
- Running out of time? Climate scenarios not a part of the modeling? [No]. These scenarios are optimistic then. Clarify what you mean by structural? Buffer strips? [Yes]. Drainage water management? [Not modeled and not shown to be effective at P loss reduction.]
- Need things like restored wetlands. What time scale was considered?



- Time lag for effectiveness was not considered. Annualized the cost over 20 years, including a percent for O&M.
- What do regulations and standards look like on a variable landscape?
 - Report is neutrally agnostic about regulations. This would be the next phase of discussions.
- Did farmers who welcomed regulations and standards say more about that? [No. Mostly levels the playing field.]
- Sounds like decision influencers needed for the farmers. Not getting adequate coaching.
 - Agree, have heard that over the years. Not able to find the technical expertise, at extension, at agencies, and crop consultants/providers. Advice is product driven--not service-driven.
- A handful of names keep coming up as influencers. Can we bring those people here, leverage them?
 - Not sure all want to be seen as beacons of information. Heard they are learning from Twitter, or weird little conferences. That's where they have to go to find critical information because they're not finding it elsewhere through normal routes.
- Research is behind. [Agree]. Producers don't have 7 years' worth of data to give out without a recommendation—lack the credibility of something like the Tri-State recommendations.
- Is nutrient management off the table? [No, but benefits are low.]
 - Research on site specificity of nutrient management planning→ very difficult to generalize.
 - Modeling the impact of a whole "plan" can't be done cleanly, as benefits vary based on practices and site
- The 1985 farm bill drove producers to cover crops. Many receiving Farm Bill funds weren't complying with eligibility requirements. Many soil scientists say the number one problem for Lake Erie is erosion and that 50% are not in compliance with rules. New answers may not be needed if the problem is non-compliance with existing program rules.
 - Enforceability is a problem for old and new programs.
- Initial reaction from decision-makers to report?
 - Positive, provides value in scaling the resources to the problem. The environmental advocacy community response was less positive.
- Presented 6 times so far--most funding from federal sources--engaging NRCS and FSA?
 - Yes. Talked with FSA. No contact from MI senators' staff yet. Some interest from Ohio side.





Figure 5. Laura Campbell from the Michigan Farm Bureau reports on a February 27 meeting to discuss a potential 4R nutrient management program pilot project in the Lake Erie basin.

Laura Campbell (Michigan Farm Bureau) presented on 4R pilot program and soil testing

- Giving them (ag consultants) a list of things that they should recommend to their clients and then verifying that they're recommending them
- Helps to reach farmers that don't walk into the SWCD, etc.
- Another way to deliver conservation
- Once up and running in WLEB, run it statewide
- Crucial partners are agribusinesses, program is funded in part by fees that they pay (4R)
 - Helps to pay for techs that are doing on-site audits
- Had a meeting recently - who else needs to be at the table, what standards should we be using here in the state, what should the final checklist look like, how should we engage?
 - Look to OH--they've had a successful program going on for 10 years
 - There are some OH farmers who have their MI locations already participating
- There is a template (here's the kinds of Qs that you should be asking) but it is flexible
 - If there are any gaps in MAEAP, we (Farm Bureau) can cover
 - Who needs to be part of the steering committee?



- Want to start this as a pilot, run it in the WLEB area, you have to get a certain saturation among retailers to get them to feel comfortable-- THEN people will get on board. Nobody wants to be first but they also don't want to be the only ones either.
- How do we figure out who we need to talk to? For example, if someone is independent, but they work for ZZ agribusiness, then you just talk to ZZ and you hit these people by association.
- There are 55 certified branch facilities (look at the website, for OH only) they don't tell you how many facilities total.
 - Decisions by corporate players drove the adoption of the program. Coops have to come along as corporates lead.
 - Even corporate locations will eventually stagnate if the people on the ground aren't passionate. There's a super low-cost test that CCAs can get here in MI (\$75), and it has super-low uptake.
 - Don't let it become like the word "sustainability" because the word has been hijacked. Everyone says it, so it has become meaningless. Don't let 4R become like that.
 - If they're not even buying into their own programs (CCA), are they the best format for selling conservation?
- Manure?
 - 4R sometimes leaves this out
 - The system disincentivizes salespeople from understanding manure because they don't sell manure. They need to be taught how to talk about soil health because there is a lack of use of that type of biological interaction language.
 - We've spent a lot of time teaching people how to grow corn with urea but not a lot of understanding how to understand how to grow it with manure
 - A MI manure hauler certification program exists

No Q&A.

Derek Schlea (LimnoTech) talking about prior 4R assessment project done in Ohio

- Presented a modified version of his 2018 ASABE conference talk titled, "Using Linked Watershed-Lake Models to Evaluate the Environmental Benefits associated with 4R Nutrient Stewardship in the Western Lake Erie Basin"

Summary of Q&A, discussion.

- Loading per amount of flow - did we incorporate that into modeling?
 - The loading target is expressed in X years out of 10 years so we expressed what it would take to meet that target.
 - There are things that can cause the flow - load relationship from year to year to break down (e.g., wet spring in 2019 resulted in less planting; see Guo, T., Johnson, L.T., LaBarge, G.A., Penn, C.J., Stumpf, R.P., Baker, D.B. and Shao, G., 2020. Less agricultural phosphorus applied in 2019 led to less dissolved phosphorus transported to Lake Erie. Environmental Science & Technology, 55(1), pp.283-291.)



- How was this used by the state?
- Unknown; there was intent to have another project build from this one, but that didn't happen.
- State of OH only really used the multi-modeling work led by OSU (Martin et al.)
- Some people believe that OEPA may not be using the modeling work as much as it could or should.
- Michigan could use this approach, however. In other places (e.g., Chesapeake Bay), the gold standard is to use models to measure progress and consolidate data.

Ben Wickerham (TNC) - Program Pitch: Saginaw Bay Pay for Performance (PfP)

example.

- These programs have come and gone. Goal to convince you that our idea is the best.
- Pay for Performance
 - Ran side-by-side watersheds. Simulation software. Pay for Practice in reality, but as a proxy for Pay for Performance (model-based site-specific impact calculated for weighted compensation).
 - Great Lakes Watershed Management System ([GLWMS](#)) used in Sag Bay to analyze results of conservation on the ground and target practices.
 - Mostly oriented toward sediment loss reductions. Have done groundwater recharge as well. Approach can be applied for nutrients.
 - HIT model, RUSLE and SEDMOD.
 - RCPP 2015-2020, for the pay for practice. P4Performance 2013-2020.
 - This model flips the payment schedule. Incentivized reduce tillage (higher) vs. cover crops (lower) compared to NRCS, which caps reduced tillage compensation.
 - Limitations – “Performance” is modeled, not measured. GLWMS not available everywhere; rates for Saginaw Bay need to be recalibrated for Lake Erie.
 - Private companies, Agribusiness, outpacing us in IT capability related to conservation (e.g., [TruterraAg](#) pilot).

Q&A:

- How many farmers, acres engaged?
 - >100 in pay for practice; pay for performance (EPA, GLC, then private), maybe 50 - half as many over longer time period. Was not for everyone—not attractive if only offering \$4/acre.
 - \$31/acre average in Pay for Performance.
- With focus on sediment, any evidence that no-till increases DRP? [Not evaluated.]
- Any targeting challenges?
 - Issues with exclusionary watershed boundaries—farms of many people interested seem to straddle boundaries.
 - This was also an issue with the OSU-led project on “Cooling the Hotspots”.
 - Model-based payment structure was effectively a targeting approach in that compensation was weighted by site (e.g., higher potential loading = higher payment per acre). That said, producers were not sought out based on the potential of their fields.
- Pitched a quicker turn around on payment for farmers. How many applicants came forward, vs. signed up or qualified? How much effort goes into the projection vs. actual contracts signed?
 - There is a contract agreement. Uptake was not great. Next evolution may involve putting it in the hands of a better-connected entity. Hard for [TNC] to implement and hard for a totally different payment structure.





Figure 6. Brittany Santure from Monroe Conservation District reviews the 2019-2021 STRAND program for the Lake Erie watershed.

Brittany Santure (Monroe Conservation District), Program Pitch - Soil Testing to Reduce Ag Nutrient Delivery (STRAND)

- 2019-2021 funded by EPA. Bare bones proposal so easy to complete.
- Administered by MDARD, facilitated by MCD, delivered by MAEAP techs.
- Gist was to get producers to understand what is available to them.
- Funding won't make the producer money but replaces what might otherwise be contracted out.
- One page contract. Awarded and funded in a streamlined process. One season, option to continue.
- \$490,504 paid out (of \$555,489 awarded)
- 24 producers. Reviewed NMPs on 48,000 acres. 28 new MAEAP cropping assessments.
- Advertised at events or via media 38 distinct times.
- Very quick process from payment request to checks being mailed.
- Available funding was depleted very quickly.

Q&A:

- Did you estimate environmental impacts?
 - Yes and no. No modeling system covers the entire WLEB for all practices implemented. Used info from cropping systems that were in the MAEAP database and only Raisin River watershed for GLWMS. Expand to entire WLEB was discussed but there is a high cost to expand that model.
- Any documenting of before/after fertilizer practices?

- No, not on variable rate. Concerns about data sharing so used MAEAP confidential approach.
- What reporting went back to EPA based on GLRI funding?
 - The MAEAP info/cropping assessment outputs and the GLWMS snapshot were provided.
 - MAEAP adoption was modeled out using SWAT and RUSLE.
- Only 24 producers participated, but likely more if MSU were involved. They are good social scientists and could interview participants.
 - MSU conducted a qualitative in-house survey.
- Program was not intended to compete with Farm Bill but was meant to be supplemental.
- You had a waitlist; if you could have funded everything, how much would it have cost?
 - Unknown--didn't have Lenawee County list, or cost share lists.
- Money was gone by the time some heard about it.
 - Within 3 weeks, equipment was completely funded. Some level 1 and 2 funding lasted longer.
- Same funding pool to the whole area? [Yes]. If you could do it again, would you look at subdivided funding pots?
 - Yes--likely NRCS priority watersheds first. However, people say entire WLEB conveyed as the problem, but not eligible for funding. If we do it again, we'll pool some to priority areas, get enrollment, then expand outside priority areas.
- How many farmers on a county-by-county basis are not doing nutrient management, soil conservation, etc.? The narrative that every farmer is a shrewd business owner that knows every inch of their land, but then programs are undersubscribed doesn't make sense.
 - Trying ways to bridge the gap: using watershed management plans to target, anonymous surveys, FSA list of farms and Farm Bureau, engaging drain commissioners, sent mailings to every owner of 40 acres or more based on parcel records, ... diminishing returns at some point—give up and move on?
- How does STRAND compare to other programs?
 - Great feedback. Much simpler--lack of extensive paperwork and red tape.

Key Discussion Points

Several themes or unresolved questions or tensions emerged from workshop #2 discussions, some of which were repeated from workshop #1 and some of which were partially or completely new. Among these were the following:

- Programs like PfP and STRAND that are reasonably well-funded, practical, and easy to apply for are very popular but rare and often short-lived. They are attractive to producers in contrast to Farm Bill programs, but the ease of access and limited documentation make assessment of impact difficult to determine. Scaling up and sourcing ongoing funding are also challenging.
- Net impacts of 4R practices are difficult to assess and the effectiveness is mixed so their role for reducing nutrient loss in the larger conservation portfolio is controversial. This is also true for popular BMPs like cover crops, which improve soil health and decrease erosion, but research results show mixed benefits for nutrient retention.
- Producers are quick to recognize new opportunities and respond, but they are also easy to alienate. They can have a long memory of past mistakes and are not quick to try something



a second time after a prior negative experience. New programs need to be pitched in the context of prior efforts (e.g., use positive STRAND “branding” by calling the successor program “STRAND 2.0”, even if the new program differs in some details). Fragmentation of programs, funding, and messaging is a challenge.

- The “Not just the farmers” perspective remains strong in terms of the relative importance of agricultural nutrient loading. There is a consistent response from producers that agriculture may be singled out (unfairly?) for mitigation, when other sources like septic systems, urban non-point sources, and stream sediments also contribute and are not mitigation priorities. Although the point is valid in detail, the overarching concept is not, but this is a challenging thing to communicate without triggering a defensive and sometimes emotional response.
- Technology and data management systems to track BMP adoption and water quality impacts at the appropriate temporal and spatial scales are not in place, hindering data-driven decision-making and adoption based on proven local cause/effect relationships.
- To be effective at broad scales, programs need to deal with the challenges presented by the owner/renter split on agricultural land. The ratio of owned to rented farmland [in Michigan](#) is approximately 60:40.

Considerations for Workshop #3

A virtual debrief was held on March 10 to discuss outcomes and lessons from the March 2 workshop. Highlights of the conversation include the following:

- It was good that the group felt comfortable sharing and voicing opinions in front of everyone. We usually don’t get that without smaller breakouts.
- Attendance slightly increased (25 @ workshop #1, 29 @ workshop #2), with about half of the participants being new in workshop #2. This is a good sign of interest. We need to think about how to keep the momentum growing into workshop #3, which will likely be held closer to Saginaw Bay.
- How do we carry over the discussion and ranking of projects to the next meeting? Maybe not a true voting on them but showcase the project ideas that came in for discussion.
- We may have given too much time for speakers in general and to a few speakers in particular. Overall, the only negative impacts of this were potentially some speakers feeling like they were put on the spot to facilitate discussions that followed their presentations, and that the final exercise (million-dollar ideas) got squeezed for time. The positive outcome was that good discussions were not cut short in order to stick rigidly to the agenda.
- Next time we should bring speakers into pre-meetings and possibly a dry run or compressed “dress rehearsal” so they’re in on the gameplan of what we’re trying to accomplish, and expectations are clear.
- We may need a time extension on the project. This would make it possible for agricultural conservation funding issues by the State to be resolved and the draft Domestic Action Plan for Lake Erie to be released, with results of both being incorporated into project results.
- If extended, we can still finalize a report in December, but then set up focus group presentation(s) to share results and provide a 60ish day comment period.



- Next time have a longer meeting (add value/enrichment activities.) Also, more time is needed for “last calls on input” to inform the report

Ideas for upcoming work:

- Sharper analysis of workshop #1 notes and report out in light of workshop #2; how can we objectively synthesize this feedback and base recommendations on it? For example, are there recurring/reinforced themes, questions for further research, conflicting opinions, consensus issues vs. non-consensus?
- Begin outlining white paper.



Attachment 1: Participant List

Priority Watershed Knowledge Exchange

March 2, 2023

Participant:	Organization:
Amanda Herzog	Erb Family Foundation
Andrew Bahrou	EGLE
Ben Wickerham	The Nature Conservancy
Blaine Baker	Bakerlads Farms
Bretton Joldersma	EGLE
Brittany Santure	Monroe Conservation District
Chelsie Boles	LimnoTech
Christie Apple	CropScout Christie Consulting
Derek Schlea	LimnoTech
Doug Pearsall	The Nature Conservancy
Hannah Witt	Monroe Conservation District
Jenna Falor	Michigan State University Extension
Julia Miller	EGLE
Julie Doll	Michigan Agriculture Advancement
Keeley Couture	Lenawee Conservation District
Laura Campbell	Michigan Farm Bureau
Logan Banning	Gratiot Conservation District
Megan Naplin	Bluewater Conservation District
Megan Tinsley	Michigan Environmental Council
Michael Alexander	Water Resources Division, MI-EGLE
Michelle Selzer	MDARD
Monica Jean	MSU Extension
Nadene Berthiaume	MDARD
Rebecca McNitt	TNC
Rebekah Faivor	Gratiot Conservation District
Ryann Rich	Pheasants Forever
Sarah Fronczak	MSU Extension
Tess Van Gorder	Michigan Farm Bureau
Thad Cleary	EGLE
Tom Zimnicki	Alliance for the Great Lakes



Attachment 2: Agenda

Priority Watershed Knowledge Exchange

Meeting #2

March 2, 2023 12:45pm – 4:00pm

LimnoTech

501 Avis Drive

Ann Arbor, MI 48108

734-332-1200, jbratton@limno.com

Agenda

12:00pm – Arrival & networking: LUNCH PROVIDED

12:45pm – Meeting Kickoff

- Welcome & Introduction
- Review of Meeting #1 outcomes
- Cost of Compliance: Discuss “The Cost to Meet Water Quality Goals”
[AGL_WLEB_AgReport_2023_Final-WITH-CHARTS.pdf \(greatlakes.org\)](#)

1:30pm – Segment #1 – Program showcase: Pay for Performance (SagBay) vs. STRAND (WLEB)

2:15pm – Break

2:30pm – Segment #2 – 4Rs in WLEB?

3:15pm – Segment #3 – Idea Incubator

- Propose to us your “\$ million-dollar idea \$”!

3:45pm – Wrap-up & next steps

4:00pm – Depart

*With funding from the
Fred A. and Barbara M. Erb Family Foundation*



Distributed in person and in follow-up email with play money (million-dollar bill).

Tell us your million dollar idea!

Scenario: You've received an unexpected \$1M grant over the next 3 years (no match!) to fund a program to help meet the aggressive nutrient reduction goals in your watershed.

Project Title:

Lead Organization & Partners:

Type (circle all that apply): Policy Incentives Science/Evaluation/Technology
Education/Outreach Other: _____

Affected Audience:

Describe the challenge:

Describe your solution idea (project outline):

Conservation Impact:

Note that as of March 10, three idea submissions had been received.



Memorandum

From: John Bratton and Derek Schlea, LimnoTech **Date:** 25 August 2023
To: Ben Wickerham and Becky McNitt, TNC **Project:** TNCSAGERIE

SUBJECT: Workshop #3 Summary: Great Lakes Priority Watershed Knowledge Exchange (Saginaw Bay – Western Lake Erie)

Overview

LimnoTech has supported The Nature Conservancy (TNC) in preparing and executing a series of three workshops to promote the exchange of effective agricultural conservation approaches among advisors and stakeholders in the Saginaw Bay watershed and the Western Lake Erie watershed to reduce nonpoint nutrient loads and eutrophication. The third workshop in the series took place at the Devries Nature Conservancy in Owosso on May 31, 2023 (Figure 1). The location was chosen to provide easy access for participants from the Saginaw Bay watershed. In addition to organizers, 25 attended, representing 12 conservation organizations. The workshop began with recaps of the first two workshops in the series followed by a presentation on the Saginaw Bay Monitoring Consortium. After a lunch break, an interactive session was conducted to solicit feedback from attendees via Slido live polling regarding their opinions on workshop #1 breakout session findings and workshop #2 “million-dollar ideas” for improving agricultural conservation in Michigan. The workshop concluded with a preview of a project white paper and discussion of next steps.



Figure 1. Workshop #3 at Devries Nature Conservancy in Owosso, May 31, 2023.

Summary of Saginaw Bay Monitoring Consortium

Bretton Joldersma (Michigan Department of Environment, Great Lakes, and Energy) presented a summary of the work of the Saginaw Bay Monitoring Consortium including background on phosphorus loading, key research questions, monitoring program details, project activities, timeline, and budget (Figure 2). A short discussion period allowed participants to ask questions and express their views on potential outcomes from the monitoring initiative such as the potential for a Total Maximum Daily Load (TMDL) study. Several felt that a TMDL may be a lengthy process and not an appropriate path forward for the Saginaw Bay watersheds. Past, current, and future activities to voluntarily address agricultural nonpoint source nutrient loading in the watershed was also briefly discussed. The workshop then transitioned to a time for informal small group discussions, a brief hike for a large group photo opportunity by the Shiawassee River (Figure 3), and a catered barbecue lunch before reconvening for the afternoon sessions.



PRIORITY METRICS

Informed by interested parties and water quality regulators, we have identified priority metrics for monitoring tributaries and the nearshore area of Saginaw Bay.

	Tributary Monitoring Sites	Bay Monitoring Sites
Stressor metrics	Total Phosphorus (TP) Dissolved Reactive Phosphorus (DRP) Nitrate (NO ₃ ⁻) Nitrite (NO ₂ ⁻) Ammonium (NH ₄ ⁺) Total Suspended Solids (TSS) Discharge (for loading)	Total Phosphorus (TP) Dissolved Reactive Phosphorus (DRP) Nitrate (NO ₃ ⁻) Nitrite (NO ₂ ⁻) Ammonium (NH ₄ ⁺) Total Suspended Solids (TSS)
Response metrics	Turbidity Dissolved Oxygen (DO)	Harmful Algal Blooms Chlorophyll Dissolved Oxygen (DO) Turbidity (Secchi)

MONITORING LOCATIONS

By end of summer 2023, we will have added 11 new stream gauges and 5 new bay monitoring sites, bringing the total to 18 stream and 10 bay monitoring locations.



Figure 2. Screenshot from a Saginaw Bay Monitoring Consortium [fact sheet](#).



Figure 3. Workshop #3 attendees posing for a photo on the banks of the Shiawassee River.

Summary of live polling results

After reconvening, Ben Wickerham (TNC) led the group through an interactive session that relied on live polling of attendees using the phone accessible Slido platform. Polling was used to capture opinions and priorities on topics covered during the first workshop's breakout sessions and on million-dollar conservation ideas presented during or submitted after the second workshop (Attachment 4). The first set of poll questions were:

- Pick the top finding for *Programming*.
- Pick the top finding for *Targeting New Farmers*.
- Pick the top finding for *Farmer-Led Knowledge Exchange*.

Table 1 presents the poll results from this first set of questions regarding attendees' opinions of the top finding from the various ideas and comments received during breakout group discussions held during the first workshop for each topic. There was generally good agreement on which items were top findings (over 70% agreement between the top two items for each topic) and which were not (i.e., 0% to 4% votes for the lowest items). Developing and retaining high-quality technicians who can build trust with producers was a common theme and popular priority response. Application simplicity, likelihood of acceptance, and overall credibility of programs were also popular responses.

Table 1: Ranked poll results for the top findings for Programming, Targeting New Farmers, and Farmer-Led Knowledge Exchange, sorted from highest to lowest percentage of respondents.

Programming		Targeting New Farmers		Farmer-Led Knowledge Exchange	
50%	Need good techs with continuity (build trust) and reasonable workloads	43%	Who provides the information is key for trust – messengers matter	41%	High turnover in techs is a problem
23%	Rolling application periods and simple applications are desirable	32%	Programs must be credible, sustained, integrated, make economic sense	31%	Rejection of an application discourages future participation
15%	Everyone likes cover crops	21%	Go to where the farmers are	24%	Manage expectations
8%	Non-Farm Bill programs are attractive alternatives	4%	Social media: farmers follow other farmers, not orgs	3%	Mix messaging across at least three media types
4%	Generational shift presents opportunities	0%	Messaging oriented toward religious groups may be effective (e.g., Amish)	0%	Watch out for the “coffee shop effect” (too chatty)
0%	Lots of variation from county to county	0%	Don’t schedule meetings over dinnertime		
0%	Avoid ranking—use first come, first served				

Following the first round of polling, each of seven “million-dollar project ideas” for agricultural conservation in Michigan was summarized, one at a time, including the name, lead organization, type of project, affected audience, problem, solution, and conservation impact (Attachment 4). Some of these ideas had been described during the second workshop and some were new and therefore required more in-depth descriptions. After presentation of a description of each idea, attendees were polled for to indicate one of four potential responses to the same question “What do you think about [each million-dollar idea]?” The four potential responses were:

- Great idea, fund as is.
- Pretty good, but a few details to work out.
- OK, but more than a few details to work out.
- Scrap it.

After the million-dollar ideas were all presented, attendees were asked to “Pick your favorite idea” from the seven ideas. Results from this round of polling are shown in Table 2. “Profit for Soil Health” was a clear favorite, with 52% of the vote as the favorite idea and the highest combined “great” plus “pretty good” responses at 78%. “STRAND+” was also a popular idea, with the second highest favorite idea votes at 19% and the second highest number of combined “great” plus “pretty good” responses at 74%. Cover Crop Transitions had the third highest favorite idea votes at 13% and a high number of combined “great” plus “pretty good” responses at 68%. Pay-for-Performance only had one favorite idea vote but had the highest “pretty good” responses at 60%. “Two-Stage Ditches” had mixed results, with only two respondents suggesting it was a favorite idea and ranking second highest of all ideas in number of “scrap it” responses at 13%, but it also received the second highest ranking for “great idea” responses at 29%. The “MI Water Challenge” received the lowest number of responses for the top two categories (“great” or “pretty good”) and the highest number of responses for “scrap it”. “Risk-Managed Conservation” also scored on the low end with a combined 55% of responses suggesting “OK” or “scrap it”.



Table 2: Poll results for the million-dollar ideas for agricultural conservation in Michigan, sorted approximately from the highest to lowest popularity according to respondents.

Million-Dollar Idea	Which is your favorite Idea?	What do you think about [each million-dollar idea]?			
		Great idea, fund as is.	Pretty good, but a few details to work out.	OK, but more than a few details to work out.	Scrap it.
Profit for Soil Health	52%	39%	39%	23%	0%
STRAND+	19%	17%	57%	27%	0%
Cover Crop Transitions	13%	16%	52%	29%	3%
Pay-for-Performance	3%	3%	60%	37%	0%
Two-Stage Ditches	6%	29%	23%	35%	13%
Risk-Managed Conservation	3%	6%	39%	52%	3%
MI Water Challenge	3%	0%	16%	65%	19%

White Paper Outline

John Bratton (LimnoTech) brought the workshop series to a close with a preview of a future white paper's contents to solicit feedback from attendees. The proposed white paper outline, as reproduced below, included comparing the Saginaw Bay and Western Lake Erie watersheds, a review of various recent modeling and monitoring studies, proposing frameworks for supporting and tracking progress, discussion of demonstration farms, a communication strategy, and scoping on-farm and watershed-scale conservation dashboards. This last session of the workshop allowed for and generated the most discussion, which is summarized in the bulleted list below.

Project White Paper Outline

40-50 pages total

1. Compare and contrast **background** on the two watersheds (geomorphology, draining of wetlands, crop types, climate)
2. Background on status of **P loading and BMPs** in Sag Bay and WLE watersheds
3. Review of **recent synthesis reports** (AGL Cost of Compliance, IJC Nutrients Synthesis, manure reports)
4. Review of **modeling** studies of the two watersheds
5. Review of **WQ monitoring expansion** in the watersheds
6. Review of **BMP programs** in the last 10 years or so (PfP, STRAND, RCPP, etc.)
7. Proposed **framework for supporting progress** toward long-term on-farm conservation for the Saginaw Bay watershed (program BMPs)



Project White Paper Outline (cont.)

8. Proposed **framework for tracking progress** toward long-term on-farm conservation for the Saginaw Bay watershed (monitoring of BMPs and WQ)
9. Proposed **approach** for adapting supporting/tracking **framework for Saginaw Bay to Lake Erie watershed**
10. Discussion of increased implementation of conservation practices on priority **demonstration farms in the Saginaw Bay watershed**, with measurable water quality benefits.
11. **Communication strategy** for sharing approaches with stakeholders in Michigan's Western Lake Erie basin
12. Scoping of an **on-farm conservation dashboard** that tracks maintenance of conservation and adoption rates of conservation practices over time; **scaling up dashboard** to watershed
13. Summary and recommendations
14. References

Summary of questions from participants, answers from organizers and presenters, and general discussion after the white paper presentation:

- Q. Items #7 and #8 – is that only for Saginaw Bay watershed and not Lake Erie?
 - A. It may have some Lake Erie discussion.
- Q. Item #10- Are you referring to the Blanchard River demonstration farms in Ohio?
 - A. Yes, that style.
- Q. Regarding the conservation dashboard, is it something like what Iowa does? A random sampling of fields across the state to assess trends in conservation practices vs. where in the state are we adopting? What might be the logistics of maintaining that? For example, if someone once did cover crops, to monitor if they continue? Wondering what the implementation looks like?
 - A. The paper might not recommend a single approach. Could point to Iowa. Could point to a 5-year census-type approach.
- Q. Wondering if rather than starting at the farm scale, we should use remote sensing at a larger scale instead.
 - A. Agreement and interest in remote sensing from another individual. We can see so much from space but are not using it enough in the Great Lakes.
 - A. Can also go back in time, for example to show riparian buffers and filter strips over time. A River Raisin project example was mentioned.
 - A. This would give insights into what it might look like. TNC has piloted a remote sensing approach going back 20 years.
- Q. The Great Lakes Commission archive has information on conservation research and effectiveness, a GLRI-funded project, done a few years ago.
 - A. Yes, we will reference those materials.



- Q. The IJC Water Quality Board’s manure report has a lot of problems. People in the work group felt the group’s feedback was not reflected in the final report. Looked at what we’re doing now and what can be done to improve moving forward. Might be an update coming.
 - A. There is a separate study not yet released regarding Ohio vs. Ontario watersheds.
 - A. Regarding the manure collaborative, it can be hard to hold that type of a group together; with very different views, individuals bail out.
 - A. If you want to make sure everything you care about is included in this white paper, please stay tuned and in touch.
- Q. Will you compare and contrast the watersheds, or suggest one approach vs. the other?
 - A. There might be a little of each. What works in one watershed may not work in others. We will try to make it as specific as possible.
- Q. Workshop #1 spent time talking about barriers to implementation. I didn't see that here. Will it be addressed?
 - A. Yes, missing from the outline, but it will be good to point out. Probably easier to identify barriers as part of lessons learned.
- Q. Looks comprehensive, and 40-50 pages might not be much for us open to reading reports. Will there be some distillation of this to a few pages to quickly communicate key takeaways? For producers, stakeholders, decision-makers?
 - A. Yes, like an executive summary, envision recommendations plus supporting bullets on how we arrived at them. Infographics, communication and outreach packet to go with this. Great suggestion!
- [Further discussion on the demonstration farms item]
 - Saginaw Valley Extension Center. Bean and Beet Research Center – there are very deep ditches there. Water capture studies could be done on that site. Not sure what adjacent land is available. Would be an ideal site. There is a new farm manager there, open to things like this.
 - Q. Do you mean centers of demonstration farms? Like Blanchard or Fox?
 - A. It could be, we will show examples of those--what they look like.
- Q. During the first workshop, there were some conversations about regulating farming? Any look at this in this white paper?
 - A. This effort had a narrow focus on delivery of programs that are working or not working. We could have done that on an island. But the importance of bringing together stakeholders is to have those types of issues brought up.
 - A. Policy will be brought into this white paper, for example.
 - A. Note that farms that have discharges are already regulated.
- Q. Item #6 – Will you have some type of synthesis on the GLRI program in each watershed?
 - A. We have some of that for the Saginaw reef project.
 - A. Great Lakes Commission had recommendations on how to improve data coming out of GLRI, but don't think they have done that yet.
- Q. Will the white paper identify roles for different groups or organizations?
 - A. Don’t think we will take it that far but might list example groups/orgs.
 - A. A challenge would be to do so in a not “picking winners” type of way.



- Q. Item #10 – Are there already demo farms in WLEB?
 - A. Center for Excellence in Lenawee County, a mission-driven example.
 - A. Ohio has Blanchard Demonstration Farms.
 - A. They are working on getting one in Indiana.
 - A. Lenawee County only has one event per year, only use mailing to advertise, draw the same people, not much public advertisement for new producers.
 - A. Like the idea of a network of demo farms, more field days, more variety in demonstrations, at different locations.
 - A. The demo farms network in the Fox River (WI) watershed is the most mature, with UW-Madison leading it (<https://fyi.extension.wisc.edu/foxdemofarms/>). They build a sense of community more than a single center of excellence. The Ohio one was modeled after Wisconsin.
 - A. Are the Discovery Farms part of that (<https://uwdiscoveryfarms.org/>)?
 - Wisconsin Discovery Farms program is state-wide (not just in Great Lakes watershed or Fox-Wolf). Think there are three networks in the Lake Michigan basin now (Fox = oldest).



Key Takeaways from Workshop #3

The overall tone of workshop #3 was very positive and optimistic. Participants seemed energized by the prospects of new funding, new ideas, new technologies, and new leadership in Michigan's approaches to agricultural conservation. Several themes, unresolved questions, or tensions emerged from workshop #3, some of which were carried over from prior workshops. Among these were the following:

- The value of good technicians in building trusting relationships between producers and program managers cannot be underestimated. Insufficient staffing and compensation lead to high turnover rates, which has handicapped program effectiveness in the past.
- Participants were very interested in the development of demonstration farm networks in the Lake Erie and Saginaw Bay watersheds as a way to facilitate technology transfer, foster improved communication, and build a sense of community and engagement among producers, researchers, and conservation program leads and staff.
- The results of prior investments in programs and research under GLRI and other initiatives do not always make their way back to advisors and producers. More effective technology transfer and lessons learned communication plans should be developed and implemented, working with existing networks and outlets that reach these audiences.
- Better coordination across states and organizations is needed, including basin-wide agencies (e.g., Great Lakes Commission, International Joint Commission advisory boards and working groups), academic institutions (Land Grant schools and others), and NGOs to maximize impact and minimize duplication.
- Expanded monitoring and data access for water quality, BMP implementation, and BMP effectiveness was recognized as a broad need, including real-time or at least in-season information and easy access through smart phone applications.
- Innovative approaches like remote sensing for monitoring BMP and cropping system practices were supported as ways to improve the temporal and spatial resolution of information to support program decisions and avoid data anonymity issues.
- The most popular million-dollar ideas were the “Profit for Soil Health” and “STRAND+” concepts. Both of these approaches seem to present novel, producer-friendly incentives and benefits, building on the success of previous or ongoing efforts that are already familiar and proven, and that complement Farm Bill programs.



Attachment 1: Participant List (alphabetical by last name)

<i>Participant</i>	<i>Organization</i>
John Bratton	LimnoTech
Laura Campbell	Michigan Farm Bureau
Thad Cleary	State of Michigan - EGLE
Kathy David	State of Michigan - EGLE
	MSU Extension
Tess Van Gorder	Michigan Farm Bureau
Bretton Joldersma	State of Michigan - EGLE
Nicholas Machinski	Washtenaw County Conservation District
Becky McNitt	The Nature Conservancy
Brittany Santure	Monroe Conservation District
Derek Schlea	LimnoTech
Michelle Selzer	Michigan Department of Agriculture & Rural Development
	Michigan Environmental Council
Ben Wickerham	The Nature Conservancy
Hannah Witt	Monroe Conservation District
Nicole Zacharda	Great Lakes Commission



Attachment 2: Agenda

Priority Watershed Knowledge Exchange

Meeting #3

May 31, 2023 10am - 3pm

Devries Nature Conservancy

2635 N. M-52, P.O. Box 608, Owosso, MI 48867 • (989) 723-3365

Agenda

10:00am – Session 1

- **Welcome Conservation Advisors!**
- **Project Recap** – John Bratton, LimnoTech
 - [Meeting #1](#)
 - [Meeting #2](#)
- **Special Presentation:** Intro to the [Saginaw Bay Monitoring Consortium](#)
 - Discussion

11:00am – Session 2

- **Qualitative Assessment of Team Findings** – Ben Wickerham, The Nature Conservancy

11:45pm – Lunch

- **BBQ lunch!** Enjoy Clyde's Pit
- Group photo by the Shiawassee River

12:45pm – Session 3

- **Presentation & Peer Review of this Group's "Million Dollar Ideas" for Conservation** – Knowledge Exchange Planning Committee (ALL)

2:15pm – Session 4

- **Workshop Series Closure: Preview of Next Steps & Your Role in Advancing the Initiative** – John Bratton, LimnoTech

*With funding from the
Fred A. and Barbara M. Erb Family Foundation*



Attachment 3: Additional Images and Photos



Attachment 4: Million-Dollar Idea Summaries

1. Pay-for -Performance+
2. STRAND+
3. Two-stage Ditches
4. MI Water Challenge
5. Profit for Soil Health
6. Risk-Managed Conservation
7. Cover Crop Transitions

Project #1:

Title: Pay-for -Performance+ (PfP+)

Lead Organization: The Nature Conservancy

Type of Project: Incentives

Affected Audience: Farmers, Conservation Agencies

The Problem: Traditional farmer incentive programs typically provide per acre flat rates, regardless of environmental outcome.

Pay-for-Performance on the other hand, optimizes environmental results by linking payment amounts to measured conservation benefit. However, in early iterations of this program, participation was limited due to confusing agreement terms, and perceived inequities amongst farmers.

The Solution: PfP+ will expand on the existing framework of linking farmer incentives to measured environmental outcomes and add the following improvements:

- Establish a minimum payment threshold equivalent to at least the cost of implementation
- Require some in-field measurement “spot checks” as a quality control measure to vet estimated results.
- Reinforce messaging that PfP does not preclude participation in other carbon-type programs.
- Reinforce voluntary enrollment and de-emphasize “targeting”.
- Borrow some of STRAND’s administrative contracting procedures to improve farmer satisfaction with program.

Conservation Impact: Conservation Impact will be commensurate to funding availability. However, based on prior PfP trials, estimated conservation impact will be over 4 times greater than traditional cost-share frameworks.

Project #2:

Title: STRAND+

Lead Organization: Conservation Districts, MDARD

Type of Project: Incentives

Affected Audience: Farmers, Agribusiness

The Problem: Traditional farmer incentive programs typically require extensive time commitments and burdensome paperwork to enroll. STRAND 1.0 established a proven framework for expediting the enrollment process to accelerate nutrient reduction on the land, and improve farmer satisfaction. However, certain program deficiencies in STRAND 1.0 were identified for improvement. Once implemented, the STRAND model can serve as an even better model for delivering local conservation.

The Solution: STRAND+ will expand on the existing framework of rapid enrollment and ease of participation by implementing the following:

- Establish/require an improved results modeling/monitoring protocol



- Establish/require better before-and-after documentation

Conservation Impact: Conservation Impact will be limited to funding availability. However, it is projected that STRAND+ will result in one of the most effective conservation programs for deploying rapid results on the landscape, while still remaining a popular choice amongst farmers.

Project #3:

Title: Two-Stage Ditch Installation

Lead Organization: County Drain Commissioners

Type of Project: Science/Evaluation/Technology; Incentives

Affected Audience: Farmers

The Problem: County drains and local streams are too narrow. Wetlands have disappeared over the decades as they've been drained for farming. Expanding the width of drains allows for the water to be contained in channels rather than flooding fields. This practice has also shown to capture phosphorus and particulate matter more efficiently.

The Solution: Expanding the width of drains allows for the water to be contained in channels rather than flooding fields. This practice has also shown to capture phosphorus and particulate matter more efficiently. Easements on filter strips along the drains/ditches would be proposed and kept by the conservation district or watershed councils. These filter strips could be hayed, maintained as a regular filter strip or be planted with trees. They would be maintained in conjunction with the producer and/or local drain commission.

Conservation Impact: Improved capture of surface runoff and better capture of nutrients within the waterway. Better drainage of the waterway during storm events and a reduction of flooding in farm fields.

Project #4:

Title: MiWater Challenge

Lead Organization: State-led (EGLE)

Type of Project: Incentives; Policy;

Affected Audience: Residents of and visitors to the coasts, cities, and rural watersheds experiencing water quality challenges

The Problem: Excess sediment and nutrients from primarily agricultural sources that contribute to HABs and other water quality issues in Saginaw Bay and WLE. Funding for BMPs and restoration is inadequate and not sustained

The Solution: Funding watershed and municipal BMPs and restoration for water quality improvement through a water fund, analogous to H2Ohio.

Conservation Impact: Helping to connect water users to those on whom we rely to implement sustainable practices through a sustained funding stream. Those who are being harmed will begin to pay for practices implemented by those who are contributing to the problem.

Project #5:

Title: Profit from Soil Health!

Lead Organization: Michigan Farm Bureau

Type of Project: Incentives; Science/Evaluation/Technology; Education/Outreach

Affected Audience: Farmers, particularly those not in existing programs and no interest in participating.

The Problem: Conservation Practice programs either do not offer a long-enough pay period or don't reflect the cost/return on investment (ROI) for farmers. Middle adopters need a simple, flexible program that they can see makes business sense.

The Solution:

1.) Complete an economic study for Michigan regions/commodities on conservation practices: how much they cost to implement, what is the ROI and how much time does it take to see the soil



health/yield/profitability benefit, and what practices never even break even in cost and how much gap exists between implementation cost and ROI.

2.) Tailor a cost share program to the economic study-- pay for practices for the length of time it takes to get to break-even, or periodic payments for the life of a practice that never breaks even. Use mapping/modeling available to provide either a higher payment or bonus for enrolling acres where the practice resolves a high risk for water quality, but provide sufficient payments to make it worth any farmer's time, for the social benefit of word-of-mouth popularity of the program.

Conservation Impact: This program depends on the education/outreach impact of helping farmers understand the business implications of implementing various conservation practices. It then fills the financial gap to protect farmers from the economic cost of implementation, until the soil health, yield, input reduction, erosion, profitability impact can be seen and the farmer no longer needs the financial support. It gives the flexibility of allowing farms to enroll the number of acres and number of practices they are comfortable with, and rolls over enrollment if a practice can't be implemented due to weather or supply chain shortages. It builds the culture of thinking of soil health as something that should be part of a business plan, not just a conservation plan, and tailors payments to the actual financial impact farms must incur to put them in place. Implemented practices can be tracked and aggregated at watershed, county, or other levels and modeled through existing tools like RUSLE2, SWAT, etc. to provide environmental impact and strategic water quality monitoring can track progress to identify changes.

Project #6:

Title: Risk-Managed Conservation

Lead Organization: Michigan Farm Bureau

Type of Project: Incentives

Affected Audience: Farmers in all the of the counties that program is available

The Problem: When changing a something on the farm, especially an in-field practice, there is a risk, and this can come in the form of a hit to the farmer's yield.

The Solution: Cost-share for a suit of in-field practices that improve water quality and prevent erosion.

There would be higher cost-share rates for adopting more than one practice. AND there would be some sort of yield hit insurance - if it's a relatively normal year and your yield takes a hit below your five-year average (or whatever number makes sense) the program would pay out a certain amount of \$\$.

Conservation Impact: Hopefully increasing adoption of conservation among middle adopters.

Project #7:

Title: Cover Crop Transitions

Lead Organization: Michigan Agriculture Advancement

Type of Project: Incentives; Science/Evaluation/Technology; Education/Outreach;

Affected Audience: Conventional farmers and/or first time CC adopters.

The Problem: Introducing a new management practice to any farm increases financial risk and uncertainty.

There's often an extensive trial and error period a farmer must go through before they've perfected implementation of the new practice in their operation and can begin seeing results in improved soil health.

Unfortunately, traditional (i.e., FarmBill) incentive programs typically only offer three years of cost-share, which is barely enough time to get a farm through one full crop rotation, let alone regenerate soil health.

New research from U of M indicates that the full spectrum of cover crop benefits is not fully realized if current soil health level in a field is low. To receive maximum ROI benefit from a cover crop (e.g. carbon sequestration, nutrient mineralization), a certain level of natural processes/function must be present in the soil. If not, cover crop performance will be suboptimal. Therefore, in a quick 3-year cover crop incentive program, conventional farmers with poor soil quality won't have the opportunity to experience full cover crop benefit, thus resulting in a likely dis-adoption of the practice once incentive ends.

The Solution: To help a farmer fully unlock the benefits of cover crops and increase the likelihood of their long-term adoption, the "Cover Crop Transitions" program proposes a reallocation of traditional incentive



contracts to

A.) reduce the per-acre payment rate for cover crops, but

B.) double or triple the period a farmer will be eligible to receive those payments. Further, this program will "stair step" cover crop implementation requirements over time so that

C.) a farmer can ease into cover crop intensity to gain needed experience and knowledge of cover crop O & M, while at the same time

D.) slowly building soil health over time so that by the end of the program (the most diverse cover crop implementation requirements) a farmer's fields are more likely to produce greater environmental benefits.

The suggested timetable for cover crop progression over this 6-year period would be:

- Years 1-2: one winter terminate cover crop species

- Years 3-4: one over wintering cover crop species

- Years 5-6: a multi-species blend (of two or more functional groups).

Note, this 6 year enrollment term is suggested for a corn/soy rotation, but could be as long as 9 years for 3 or 4 way crop rotations.

Conservation Impact: 7,407 acres of permanent cover crops (important distinction is that this program will result in permanent adoption vs. the temporary adoption seen in other programs)



APPENDIX B

Million Dollar Ideas

Project #1: Pay-for-Performance+ (PfP+)

Lead Organization: The Nature Conservancy

Type of Project: Incentives

Affected Audience: Farmers, Conservation Agencies

The Problem: Traditional farmer incentive programs typically provide flat rates per acre, regardless of environmental outcome. Pay-for-Performance on the other hand, optimizes environmental results by linking payment amounts to measured conservation benefit. However, in early iterations of this program, participation was limited due to confusing agreement terms, and perceived inequities amongst farmers.

The Solution: PfP+ will expand on the existing framework of linking farmer incentives to measured environmental outcomes and add the following improvements:

- Establish a minimum payment threshold equivalent to at least the cost of implementation
- Require some in-field measurement “spot checks” as a quality control measure to vet estimated results.
- Reinforce messaging that PfP does not preclude participation in other carbon-type programs.
- Reinforce voluntary enrollment and de-emphasize “targeting”.
- Borrow some of STRAND’s administrative contracting procedures to improve farmer satisfaction with program.

Conservation Impact: Conservation Impact will be commensurate to funding availability. However, based on prior PfP trials, estimated conservation impact will be over 4 times greater than traditional cost-share frameworks.



Project #2: STRAND+

Lead Organization: Conservation Districts, MDARD

Type of Project: Incentives

Affected Audience: Farmers, Agribusiness

The Problem: Traditional farmer incentive programs typically require extensive time commitments and burdensome paperwork to enroll. STRAND 1.0 established a proven framework for expediting the enrollment process to accelerate nutrient reduction on the land and improve farmer satisfaction. However, certain program deficiencies in STRAND 1.0 were identified for improvement. Once implemented, the STRAND model can serve as an even better model for delivering local conservation.

The Solution: STRAND+ will expand on the existing framework of rapid enrollment and ease of participation by implementing the following:

- Establish/require an improved results modeling/monitoring protocol
- Establish/require better before-and-after documentation

Conservation Impact: Conservation Impact will be limited to funding availability. However, it is projected that STRAND+ will result in one of the most effective conservation programs for deploying rapid results on the landscape, while remaining a popular choice amongst farmers.



Project #3: Two-Stage Ditch Installation

Lead Organization: County Drain Commissioners

Type of Project: Science/Evaluation/Technology; Incentives

Affected Audience: Farmers

The Problem: County drains and local streams are too narrow. Wetlands have disappeared over the decades as they've been drained for farming. Expanding the width of drains allows for the water to be contained in channels rather than flooding fields. This practice has also shown to capture phosphorus and particulate matter more efficiently.

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Conservation Impact: Improved capture of surface runoff and better capture of nutrients within the waterway. Better drainage of the waterway during storm events and a reduction of flooding in farm fields.



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Lead Organization: State-led (EGLE)

Type of Project: Incentives; Policy

Affected Audience: Residents of and visitors to the coasts, cities, and rural watersheds experiencing water quality challenges

The Problem: Excess sediment and nutrients from primarily agricultural sources that contribute to HABs and other water quality issues in Saginaw Bay and WLE. Funding for BMPs and restoration is inadequate and not sustained

The Solution: Funding watershed and municipal BMPs and restoration for water quality improvement through a water fund, analogous to H2Ohio.

Conservation Impact: Helping to connect water users to those on whom we rely on to implement sustainable practices through a sustained funding stream. Those who are being harmed will begin to pay for practices implemented by those who are contributing to the problem.



Project #5: Profit from Soil Health

Lead Organization: Michigan Farm Bureau

Type of Project: Incentives; Science/Evaluation/Technology; Education/Outreach

Affected Audience: Farmers, particularly those not in existing programs and no interest in participating.

The Problem: Conservation Practice programs either do not offer a long-enough pay period or don't reflect the cost/return on investment (ROI) for farmers. Middle adopters need a simple, flexible program that they can see makes business sense.

The Solution:

- 1) Complete an economic study for Michigan regions/commodities on conservation practices: how much they cost to implement, what is the ROI and how much time does it take to see the soil health/yield/profitability benefit, and what practices never even break even in cost and how much gap exists between implementation cost and ROI.
- 2) Tailor a cost share program to the economic study-- pay for practices for the length of time it takes to get to break-even, or periodic payments for the life of a practice that never breaks even. Use mapping/modeling available to provide either a higher payment or bonus for enrolling acres where the practice resolves a high risk for water quality, but provide sufficient payments to make it worth any farmer's time, for the social benefit of word-of-mouth popularity of the program.

Conservation Impact: This program depends on the education/outreach impact of helping farmers understand the business implications of implementing various conservation practices. It then fills the financial gap to protect farmers from the economic cost of implementation, until the soil health, yield, input reduction, erosion, profitability impact can be seen and the farmer no longer needs the financial support. It gives the flexibility of allowing farms to enroll the number of acres and number of practices they are comfortable with, and rolls over enrollment if a practice can't be implemented due to weather or supply chain shortages. It builds the culture of thinking of soil health as something that should be part of a business plan, not just a conservation plan, and tailors payments to the actual financial impact farms must incur to put them in place. Implemented practices can be tracked and aggregated at watershed, county, or other levels and modeled through existing tools like RUSLE2, SWAT, etc. to provide environmental impact and strategic water quality monitoring can track progress to identify changes.



Project #6: Risk-Managed Conservation

Lead Organization: Michigan Farm Bureau

Type of Project: Incentives

Affected Audience: Farmers in all the of the counties that program is available

The Problem: When changing a something on the farm, especially an in-field practice, there is a risk, and this can come in the form of a hit to the farmer's yield.

The Solution: Cost-share for a suit of in-field practices that improve water quality and prevent erosion. There would be higher cost-share rates for adopting more than one practice. AND there would be some sort of yield hit insurance - if it's a relatively normal year and your yield takes a hit below your five-year average (or whatever number makes sense) the program would pay out a certain amount of \$\$

Conservation Impact: Hopefully increasing adoption of conservation among middle adopters. There might be other factors affecting water quality that could be addressed with regional practices).



Project #7: Cover Crop Transitions

Lead Organization: Michigan Agriculture Advancement

Type of Project: Incentives; Science/Evaluation/Technology; Education/Outreach

Affected Audience: Conventional farmers and/or first time CC adopters.

The Problem: Introducing a new management practice to any farm increases financial risk and uncertainty. There's often an extensive trial and error period a farmer must go through before they've perfected implementation of the new practice in their operation and can begin seeing results in improved soil health. Unfortunately, traditional (i.e., Farm Bill) incentive programs typically only offer three years of cost-share, which is barely enough time to get a farm through one full crop rotation, let alone regenerate soil health. New research from U of M indicates that the full spectrum of cover crop benefits is not fully realized if current soil health levels in a field are low. To receive maximum ROI benefit from a cover crop (e.g., carbon sequestration, nutrient mineralization), a certain level natural processes/function must be present in the soil. If not, cover crop performance will be suboptimal. Therefore, in a quick 3-year cover crop incentive program, conventional farmers with poor soil quality won't have the opportunity to experience full cover crop benefit, thus resulting in a likely dis-adoption of the practice once incentive ends.

The Solution: To help a farmer fully unlock the benefits of cover crops and increase the likelihood of their long-term adoption, the "Cover Crop Transitions" program proposes a reallocation of traditional incentive contracts to A.) reduce the per-acre payment rate for cover crops, but B.) double or triple the period a farmer will be eligible to receive those payments. Further, this program will "stair step" cover crop implementation requirements over time so that A.) a farmer can ease into cover crops intensity to gain needed experience and knowledge of cover crop O & M, while at the same time B.) slowly building soil health over time so that by the end of the program (the most diverse cover crop implementation requirements) a farmer's fields are more likely to produce greater environmental benefits.

The suggested timetable for cover crop progression over this 6-year period would be:

- Years 1-2: one winter-terminated cover crop species
- Years 3-4: one overwintering cover crop species
- Years 5-6: a multi-species blend (of two or more functional groups).

Note, this 6-year enrollment term is suggested for a corn/soy rotation but could be as long as 9 years for 3- or 4-way crop rotations.

Conservation Impact: 7,407 acres of permanent cover crops (an important distinction is that this program will result in permanent adoption vs. the temporary adoption seen in other programs).

