



United States Department of Agriculture

Western Lake Erie Basin Initiative Fiscal Years 2016-2018

USDA, Natural Resources Conservation Service

March 2016



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Executive Summary

The U. S. Department of Agriculture's Natural Resources Conservation Service (NRCS) is the lead federal agency with responsibility to assist farmers in designing and delivering voluntary conservation to address water quality concerns in the Western Lake Erie Basin (WLEB or Basin). NRCS partners with farmers and an array of organizations, including soil and water conservation districts, Federal and State agencies, universities, agricultural businesses and associations, and non-governmental organizations, all with the goal of addressing natural resource management and agricultural production goals.

The Basin includes millions of acres of land in Michigan, Indiana, and Ohio, 70 percent of which are used to grow crops and livestock. Even though farmers are using conservation practices to a significant degree across the WLEB—99 percent of cropland acres have at least one conservation practice in use—a significant portion of the phosphorous that is contributing to the harmful algal blooms in Lake Erie originates from surface and subsurface losses of commercial and organic fertilizer applied to agricultural land.

While no single approach will eliminate nutrient loading to Lake Erie, we do know that conservation practices applied as a system will reduce surface and subsurface nutrient losses. The 2014 Farm Bill provides several programs that offer financial assistance to farmers to offset a portion of the short-term financial risk of conservation practice adoption as well as technical assistance to design site-specific conservation plans that will most effectively reduce nutrient and sediment transport.

NRCS developed this WLEB Initiative after soliciting recommendations from numerous agricultural, conservation, environmental, research, and government agency partners during a series of meetings held in the fall of 2015. Based on these recommendations, NRCS created the WLEB Initiative—a 3-year, \$41 million investment to target, expand, and accelerate conservation solutions in the Basin.

The WLEB Initiative focuses on comprehensive conservation planning, first and foremost. These plans assess the current conditions of an agricultural operation, outline the actions that will have the greatest impact on nutrient and sediment reduction, and estimate the expected environmental benefits. The numerous agencies and organizations that contributed to shaping this initiative will be instrumental in diffusing the information gained from the effort.

Rural and urban communities in the WLEB want and need clean and abundant water. Farm families rely on this same water for their family's health and well-being. They enjoy fishing, swimming, boating, and visiting the treasures of lakeside communities. Lake Erie is their backyard. The conservation partners working with these farmers also live in the communities they serve. All share a common motivation to use the best science-based conservation practices and natural resource data to design the best solutions for farmers.

Background - Challenges in the Western Lake Erie Basin

In the 1960s, the water quality of Lake Erie had degraded so severely that many referred to it as “dead.” Excessive phosphorus in the lake caused algae blooms so severe, that the governments of Canada and the U.S. acted together to limit phosphorus loading by regulating point source discharges, encouraging agricultural practices that reduced phosphorus run-off, and restricting the use of phosphates in detergents. This combination of actions worked to reduce algae blooms, allowing for a shift in focus to other contaminants such as polychlorinated biphenyls (PCBs).

Conditions in Lake Erie changed over the next several decades, including land use changes, new agricultural management approaches, more frequent and intense precipitation events, and the introduction of invasive species like the zebra mussel. These factors and others caused ecological shifts in the lake basin and Lake Erie once again began to experience algae blooms reminiscent of the 1960s. While scientists do not yet entirely understand the cause of increasing phosphorus levels, they do know that the dissolved type of phosphorus, which is readily bioavailable for algae consumption, has increased. Dissolved phosphorus can result from “legacy” loads, phosphorus from previous years held in ground water systems and the sediment beds of rivers and lakes, as well as from “live” loads that result from leaching and runoff from urban and rural lands, including agricultural operations.

The drainage basin of the western portion of Lake Erie covers a vast area of 7 million acres or about 11,000 square miles. Agriculture is an important part of the landscape and economy of the Western Lake Erie Basin (WLEB). For instance, agriculture occurs on almost 4.9 million acres, or 70 percent of the acreage in the WLEB. Consequently, the management of private agricultural lands has a significant influence on the quality of the region’s natural resources, including the water that flows to Lake Erie.

Agriculture is a significant contributor to the region’s economy. The 2007 Census of Agriculture reports that the value of agricultural sales in the basin was nearly \$3 billion, primarily from crop production. Maintaining a vibrant agricultural industry and well-managed natural resources on working lands are vital not only for the communities in Indiana, Michigan, and Ohio, but ultimately for the health of the waters of Lake Erie itself.

Voluntary Conservation is Generating Results

Through an incentive-based, voluntary approach, NRCS partners with farmers, ranchers, and forest landowners to sustain and enhance natural resources across the region. Based on over 80 years of experience, scientific monitoring, and on-the-ground success, NRCS and its conservation partners have demonstrated that voluntary approaches to agricultural conservation on private lands work.

Farmers are already contributing significant benefits through voluntary conservation activities they have undertaken on their operations. A new scientific assessment of agricultural conservation in the WLEB estimates that farmers have implemented at least one conservation practice on 99 percent of cropland acres, and these conservation investments are making headway towards reducing losses of sediment and nutrients from farm fields.¹

¹ “Effects of Conservation Practice Adoption on Cultivated Cropland Acres in Western Lake Erie Basin, 2003-06 and 2012.” USDA Natural Resources Conservation Service, Conservation Effects Assessment Project Special Study Report. March 2016.

As compared with a hypothetical scenario that simulates an absence of all conservation practices, the assessment estimates that conservation practices in use in 2012 reduced:

- annual sediment losses by 81 percent (or 9.1 million tons per year),
- annual total nitrogen losses by 36 percent (or 40.6 million pounds per year), and
- annual total phosphorous losses by 75 percent (or 11.4 million pounds per year).

Western Lake Erie Basin Initiative

Notwithstanding the conservation results that farmers are already providing, there are opportunities to further protect and restore WLEB water quality by continuing to enhance soil and nutrient management on farm operations in the Basin. Nonpoint sources, including agriculture, are estimated to be responsible for about 61 percent of the total phosphorus load entering Lake Erie each year; in the western basin, nonpoint sources are estimated to contribute upwards of 89 percent of the annual total phosphorus load in that portion of the lake's tributaries.²

A Three-Year Initiative to Invest Additional Resources and Accelerate Results. To help address water quality concerns in the WLEB, NRCS is starting a three-year initiative to invest additional NRCS financial and technical resources in the Basin. Because the WLEB spans three States and includes millions of acres of cultivated cropland, NRCS will be using a science-driven approach to focus the Agency's limited resources to generate the most cost-effective results for agriculture and water quality.

Over the three-year period, NRCS will be investing \$41 million in Environmental Quality Incentives Program (EQIP) assistance to expand and accelerate conservation opportunities through the WLEB Initiative. This is in addition to the \$36 million in NRCS state resources available in the WLEB. Combined, NRCS estimates that a total of almost \$77 million will be invested in the Basin over the course of Fiscal Years (FY) 2016-2018.

Importantly, the WLEB Initiative will complement—not supplant or replace—other conservation investments in the Basin. For example, the Conservation Stewardship Program and the Agricultural Conservation Easement Program contributions to phosphorus reduction are in addition to the phosphorus reductions to be achieved using EQIP funding. Farmers will have numerous opportunities to participate in other conservation programs; assistance provided through these other programs will also help address the health of the Basin's soils, and protect and improve the quality of the water.

Landscape-Scale Approaches Have Multiple Advantages. NRCS has demonstrated how a focused initiative in large landscapes can lead to more effective on-the-ground action. This approach helps NRCS better: collaborate with other conservation partners; leverage additional financial resources to deploy more "boots on the ground" to work with individual farmers and offer more program participation opportunities; coordinate with scientific researchers to monitor and evaluate the effectiveness of conservation actions; develop new technical tools that will help field-level conservationists provide conservation planning and installation assistance to farmers; and accelerate outreach, education, and conservation practice adoption by farmers.

NRCS and Its Partners Can Target Conservation Solutions at Multiple Scales. One of the key attributes to a landscape-scale approach is for the Agency and its conservation partners to use science and technology to target conservation actions at the greatest opportunities for addressing natural resource

² "Ohio Lake Erie Phosphorus Task Force Final Report." Ohio Environmental Protection Agency, Division of Surface Water. April 2010.

concerns. In some cases, this can include targeting actions *in geographic regions of a large landscape* to the locales in greatest need of conservation.

In other cases, targeting means focusing on *the most effective system of conservation practices* to address water quality concerns. In the WLEB, NRCS and its partners have the opportunity to target actions on multiple scales. At the Basin scale, NRCS and partners will be working with farmers to promote systems of conservation practices to address the appropriate risks for sediment and nutrient losses; on soils at risk for erosion and surface loss, NRCS will be using planning and conservation systems to prevent and capture losses. On soils and farmlands at risk for subsurface loss for nutrients, NRCS will be planning and helping farmers install conservation systems that avoid and manage losses through subsurface pathways.

Beyond the large-scale targeting of systems across the Basin, through the WLEB Initiative, NRCS and partners will work with farmers to analyze and target conservation needs at the sub-field scale. Comprehensive field-scale conservation planning and conservation systems are needed to accommodate different treatment needs within and across farm fields, while maintaining productivity. Nutrient and erosion control needs vary across cropped fields, requiring management of unique zones or soils within field boundaries. Precision agriculture techniques that involve potential yield effects, zoned or gridded soil testing, and variable fertilizer rates can help achieve additional nitrogen and phosphorus loss reduction.

The high variability of soil types and the run-off or leaching potential in the Basin, even within one field, necessitate site-specific conservation assessment and treatment. These small areas with vulnerable soils often produce lower yields while serving as major contributors to nutrient losses. NRCS will give priority consideration for financial assistance to these highly vulnerable soils, particularly in areas draining directly Lake Erie tributaries. Conservation plans that address these vulnerable areas within fields may require precision conservation planning and agriculture management, including several conservation practices ranging from GIS gridded soil testing, variable rate nutrient application, drainage water management, and new technologies that micro-target areas within a field.

The Initiative Will Use Four Strategies to Address Water Quality Opportunities. Through the WLEB Initiative, NRCS will work closely with its conservation partners to implement a comprehensive approach to protect and enhance water quality. The four elements of the initiative are:

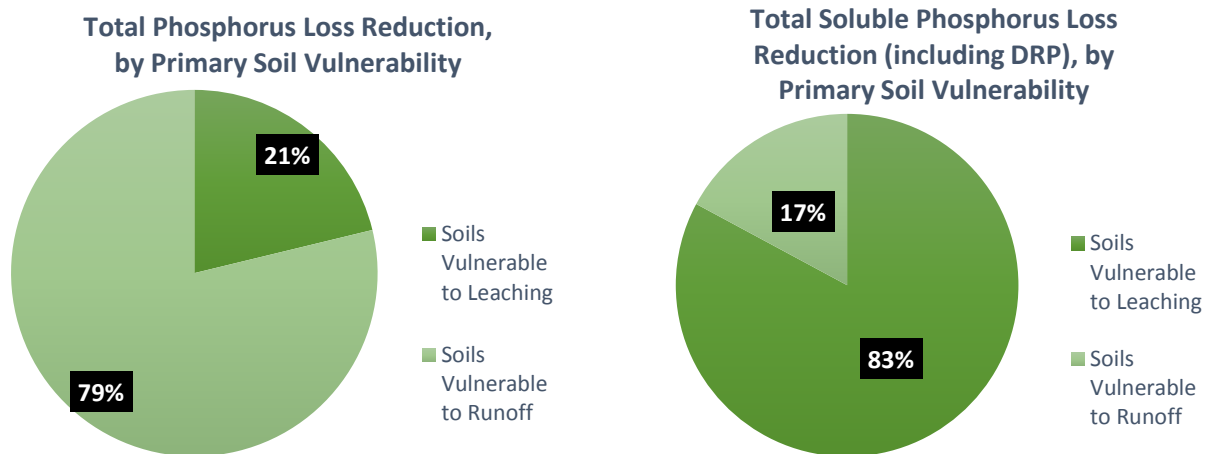
1. Avoid Excess Nutrient Application
2. Control Nutrient and Sediment Movement
3. Trap Nutrient and Sediment Losses
4. Manage Hydrological Pathways to Reduce Nutrient and Sediment Losses

Performance Goals

By the end of 2018, NRCS estimates that it will be able to assist farmers to apply conservation systems on about 870,000 acres of cultivated cropland across the WLEB – nearly 18 percent of the cultivated cropland in the basin. The WLEB Initiative will fund approximately 460,000 of these acres, while 410,000 will be funded through anticipated State allocations of technical and financial assistance. As a result of these conservation investments, the Agency will more than double the level of conservation applied in the WLEB; reducing edge-of-field losses by more than 640,000 pounds of total phosphorus (annually), 175,000 pounds that is in the form of soluble phosphorus (including dissolved reactive phosphorus

(DRP)). These edge-of-field phosphorus reductions will ultimately reduce the phosphorus load reaching tributaries that empty into Lake Erie.³

Nearly 80 percent of the total phosphorus loss reduction will come from conservation applied to soils that are highly vulnerable to runoff. Almost 30 percent of the total reduction is in the form of soluble phosphorus (including DRP), the majority of which is achieved through conservation applied to soils highly vulnerable to leaching.



CONSERVATION ACTION 1: Avoid Excess Nutrient Application

Purpose and Need: Balancing nutrient application with crop nutrient requirements to apply only what is needed in light of unpredictable weather helps avoid the potential for nutrient losses. Techniques to match nutrient applications with crop need require a high degree of management. Advanced conservation planning provides tools to farmers, helping them make informed decisions based on present field conditions and achieve yield goals as well as soil and water quality improvement.

Conservation Objective: Reduce soil erosion and improve soil health with a site-specific conservation plan that incorporates the “4 R” principles of applying nutrients using the right source applied, at the right rate, at the right time, and in the right place. Encourage the use of precision conservation and precision application to more closely match the supply of applied nutrients with the uptake of nutrients – removing a higher percentage of applied nutrients in the harvested crop and contributing to better production, as well as environmental outcomes.

³ The Nutrient and Sediment savings were calculated based on CEAP Model findings. The total savings represent the per acre (per year) CEAP model average annual savings for each of seven different conservation practice bundles, times the projected acres of each of those conservation systems that will be applied to the landscape.

The percent nutrient and sediment reductions represent the pounds of edge-of-field savings (per year) divided by the total pounds of nutrient or sediment losses (leaving the edges of fields) in the CEAP determined 2010-2012 baseline condition.

Nutrient management and animal waste storage is a priority of this Initiative. Large Concentrated Animal Feeding Operations (CAFOs) must follow strict rules for managing animal waste by State law. For example, in Ohio, all but the smallest livestock operations must, by law, manage animal waste according to NRCS standards and specifications, necessitating the storage of waste for several months. A comprehensive nutrient management plan (CNMP) addresses the proper storage and application of manure. NRCS offers eligible livestock farmers both technical and financial assistance to create CNMPs and construct animal waste storage structures. NRCS also offers financial assistance if a farmer chooses to employ a certified private Technical Service Provider (TSP) for these services.⁴

Examples of “Avoiding” Practices: Conservation practices that help farmers avoid excess nutrient application include, but are not limited to, conservation cover (perennial), conservation crop rotation, cover crops (annual), nutrient management, and animal waste storage structures with associated CNMPs.

CONSERVATION ACTION 2: Control Nutrient and Sediment Movement

Purpose and Need: Phosphorus and nitrogen from commercial and organic fertilizers can leave farm fields through surface run-off and sub-surface infiltration and drainage under certain conditions, including saturated soils, frozen ground, and during intense storms. Researchers identified phosphorus and nitrogen as major contributors to the annual harmful algal blooms and hypoxia in Lake Erie which negatively impact health, the economy, recreation, and the aquatic ecosystem.

Conservation Objective: Through the joint efforts of NRCS, other conservation partners, and farmers, minimize losses through surface and sub-surface pathways by providing farmers with comprehensive conservation plans containing structural and management practices that are applied in combination, referred to as conservation systems.

Conservation practices used together in a conservation system reduce soil erosion and transport of sediment within the field. They also create healthier soils by increasing organic matter content, storing carbon, improving the infiltration of water into the soil and the soil’s capacity to hold water during periods of drought. Using no-till or minimum tillage techniques allow the biological processes that create these conditions to continue undisturbed. Planting cover crops enhances soil health further by providing microorganisms with the nutrients they need to grow. Using no-till and planting cover crops maximizes soil health, which, over time, has shown increased yield, resiliency to drought and significant precipitation events.

Examples of “Controlling” Practices: Conservation practices that help farmers control nutrient and sediment movement include, but are not limited to, cover crop (annual), nutrient management, residue and tillage management, drainage water management, field borders, grade stabilization structures, grassed waterways, and amending soil properties with gypsum products.

⁴ CNMPs and animal waste storage structures must meet NRCS standards and specifications. An NRCS-licensed engineer must approve the products provided by a TSP before issuing a payment to the farmer to cover a portion of the TSP’s fees.

CONSERVATION ACTION 3: Trap Nutrient and Sediment Losses

Purpose and Need: Even when a complete suite of practices is applied to avoid and control nutrient and sediment run-off from the surface, run-off may occur during intense storms. In addition, some conservation practices designed to avoid and control run-off also take time to establish optimal performance and provide the maximum intended benefit, such as improving soil health.

Conservation Objective: Trapping nutrients and sediment in priority areas provides an additional, often critical, layer of conservation to protect water quality. In some cases, trapping conservation practices provide an additional benefit of wildlife habitat. Flood-prone fields, large acreage drainage points, riparian corridors, and areas with soils at risk for surface and sub-surface runoff are areas for conservation planners to address with “trapping” conservation practices.

Riparian forest buffers trap nutrients and sediment near streams, provide cover and food sources for birds and mammals, and shade streams which helps to keep temperatures lower benefitting fish, mussels, and other aquatic species.

Lower areas in fields may drain a small area in a field that holds water longer, often resulting in crop damage. Creating small wetland areas out of these low yield spots trap nutrients and sediment and create critical habitat for migrating birds. They may also improve the average yield and profit margin for farmers.

Farmers in the WLEB have the opportunity to receive cost share and annual payments from the Lake Erie Conservation Reserve Enhancement Program (CREP) administered by the Farm Service Agency (FSA) to install and maintain 10,000 acres of filter strips in drainage pathways, and buffer strips around field borders. These practices also trap sediment and nutrients at the edge of fields and help slow the flow of surface drainage.

A vast network of drainage ditches provide outlets for the tilled agricultural fields in the WLEB. Maintaining vegetated ditch slopes and buffers along these ditches prevents erosion of the ditch bank and filters surface flow, trapping nutrients and sediment. Two-stage ditch construction allows water to flow through a vegetated floodplain during high flows to allow sediments to settle and to filter nutrients.

Examples of “Trapping” Practices: Conservation practices that help farmers trap nutrients and sediment include, but are not limited to, filter strips, riparian forest buffers, wetland restoration, creation and enhancement, blind inlets, saturated buffers, and two-stage ditches.

CONSERVATION ACTION 4: Manage Hydrological Pathways to Reduce Sediment and Nutrient Loadings

Purpose and Need: The heavily tilled and drained agricultural land in the WLEB altered the Basin’s hydrology to efficiently move water off the landscape. Restoring hydrological functions by better managing drainage pathways offers significant potential for reducing nutrient losses while improving on-farm economics.

Conservation Objective: Conservation planners will work with farmers to minimize sediment and nutrient losses through sub-surface and surface drainage systems that provide a direct conduit to tributaries flowing directly to Lake Erie.

Conservation plans incorporating drainage water management systems, bioreactors, blind inlets, saturated buffers, and soil health management systems will receive priority consideration for funding. These practices hold water, nutrients, and sediment on fields and filter, or change the composition of drainage water before it reaches a tributary.

Examples of “Managing Hydrological Pathways”: Practices and technologies that help farmers manage hydrological pathways include, but are not limited to, drainage water management, bioreactors, blind inlets, and saturated buffers. Drainage water management has been adopted on a limited basis, while the others are largely in the field testing phase. In the WLEB, a Regional Conservation Partnership Program project is funding the installation of some of these technologies.

Summary

There is no short-term solution for the multi-decadal and complex water quality issues and resulting algal blooms in the Western Lake Erie Basin. All sectors of society must work together to develop a comprehensive solution to this shared problem and there will likely be a significant period of time before the benefits of these efforts are measurable at a regional scale. Solutions and results will spring from a strong WLEB partnership coalescing to accelerate action.

While agriculture is a contributor, it is not the only source in the Basin. Science has shown that voluntary conservation works and the farmers in the WLEB have made durable and significant investments in conservation measures that reduce nutrient and sediment losses from farm fields.

Agriculture has a large role to play in achieving the next increment of water quality objectives in the WLEB. No single conservation solution will meet the needs of each field and farm. The diversity of soils, operation types, and conservation management of WLEB farms creates differences in conservation needs and potential solutions. Comprehensive conservation planning using science-based solutions, new technologies, and precision agricultural approaches are needed.

NRCS is committed to working with farmers and partners in the region to help agriculture continue its contribution to improving water quality in the Lake while remaining a strong and vibrant economic engine for the region. This Initiative is a starting place toward achieving that shared objective.