Great Lakes Commission
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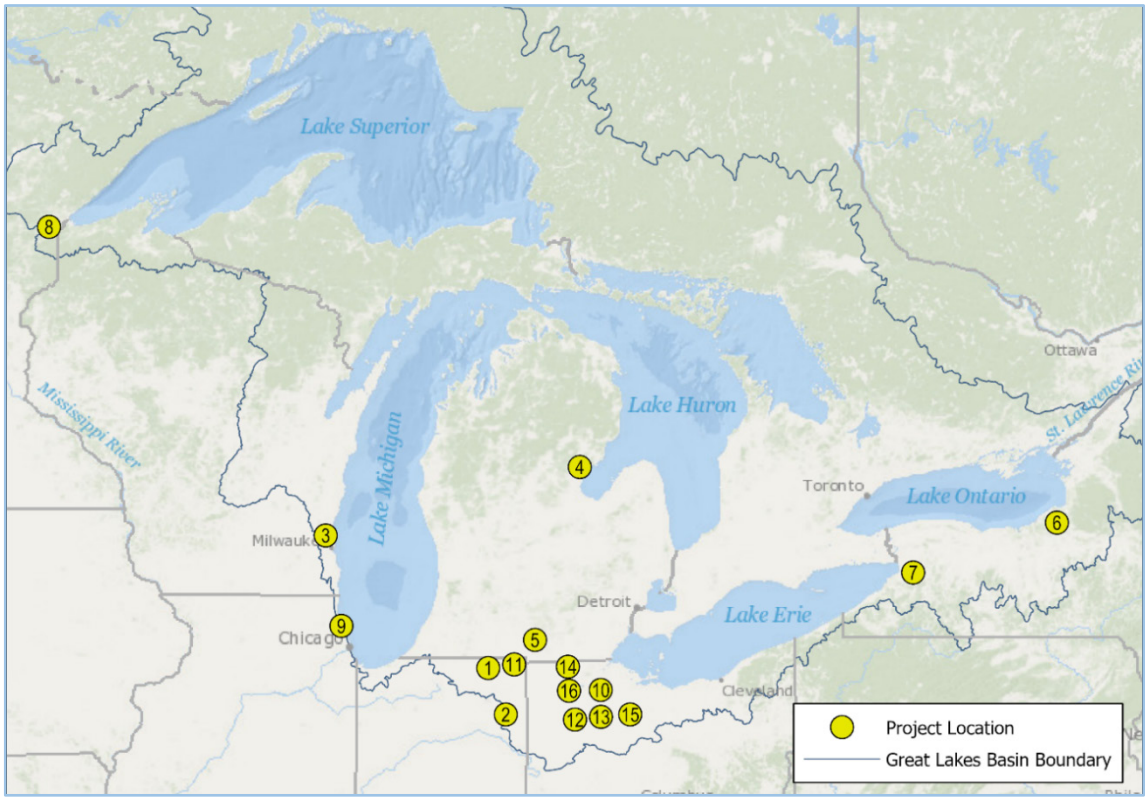
Great Lakes Sediment and Nutrient Reduction Program

REPORT ON AGREEMENT 5 OUTCOMES

The **Great Lakes Sediment and Nutrient Reduction Program** is a state and federal partnership managed by the Great Lakes Commission in cooperation with the USDA's Natural Resource Conservation Service (NRCS), U.S. EPA, and the eight Great Lakes states. Through this program, the Commission has provided grants to nonfederal units of government and watershed organizations to install sediment and nutrient control practices in the Great Lakes Basin for nearly 30 years.

Since 2010, funding for the program has been provided by the Great Lakes Restoration Initiative, a federal investment geared toward accelerating efforts to protect and restore the largest system of freshwater I the world. Funds support innovative projects that help address sources of nutrient and sediment losses within the Basin. The program is directed by a Task Force that includes representatives from the states, NRCS, and U.S. EPA; the Task Force identifies priorities for funding and reviews proposals to award funding each year.



Locations of Agreement 5 grantees. Overall, 16 projects were funded through this agreement. Each number corresponds to a description below.

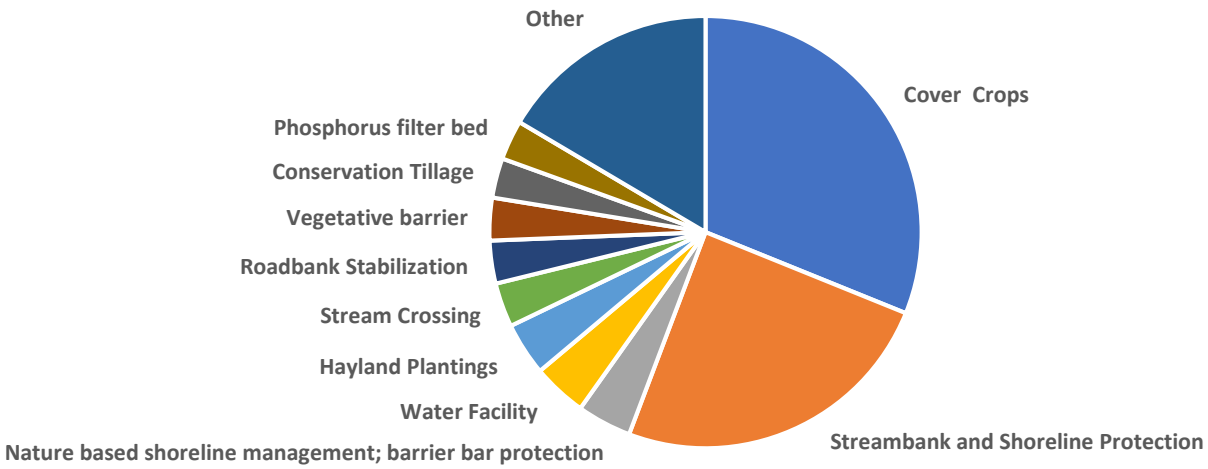
Great Lakes Sediment and Nutrient Reduction Program
BY THE NUMBERS

16 GRANTS, $1,649,344 IN TOTAL FUNDING

State	Number of Grants	Total Funding
Illinois	1	$50,000.00
Indiana	3	$426,697.78
Michigan	2	$142,235.78
Minnesota	1	$75,276.40

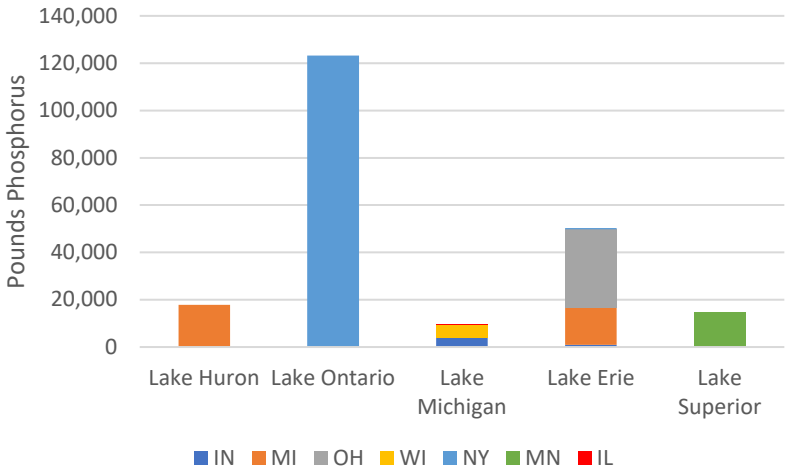
State	Number of Grants	Total Funding
New York	2	$229,878.00
Ohio	6	$695,256.65
Wisconsin	1	$30,000.00

AGREEMENT 5 GLSNRP PRACTICES



Under Agreement 5 the Great Lakes Sediment & Nutrient Reduction Program funded a variety of best management practices.

TOTAL PHOSPHORUS REDUCTIONS AGREEMENT 5



For Agreement 5, total phosphorus reductions occurred in all five of the Great Lakes. The largest reductions occurred in the Lake Ontario and Lake Erie basins where reductions of 123,215.8 and 50,279.51 lbs. occurred respectively.

Phosphorus reductions were estimated based on RUSLE 2 soil savings estimates, which were translated phosphorus reductions. For more information, see Appendix 7C.

1. Pigeon River Phosphorus and Sediment Reduction

LaGrange County (Indiana) Soil & Water Conservation District

Indiana's Pigeon River watershed is influenced by a significant Amish population in the western portion of LaGrange County, with 98 percent of livestock operations in the watershed owned and managed by Amish farmers. Livestock management both on grazing lands and within barnyards presented opportunities for Soil & Water Conservation District staff to continue to build their relationships with this unique farming community. Staff collaborated with the community on practice installations that keep livestock waste out of local streams and ditches and help Amish farmers more efficiently (and safely) manage their herds. A GLSNRP investment of $147,540 was distributed through 28 contracts with 23 unique landowners. Outcomes from installed practices are shared below, grouped by practices excluding livestock from waterways and barnyard practices.

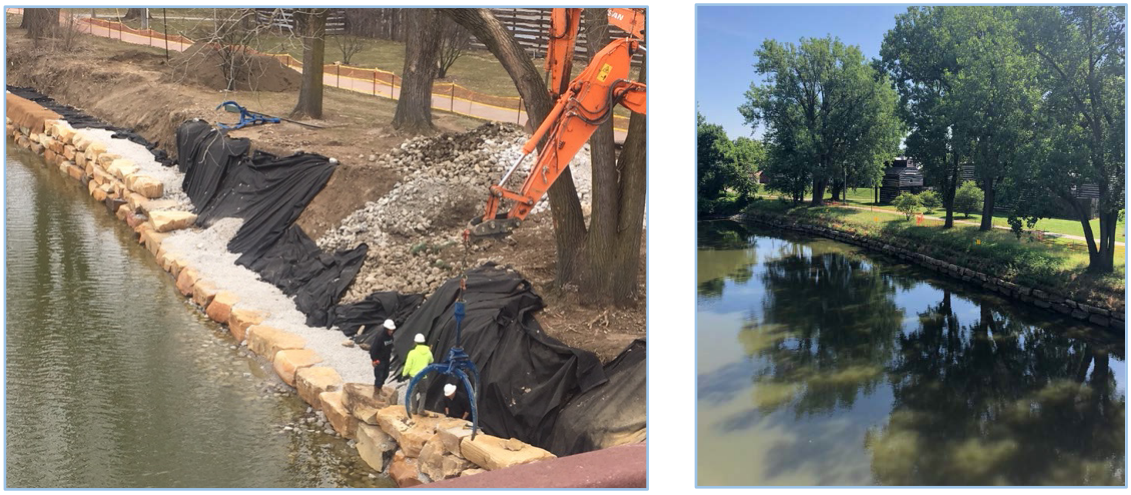
Photos reflect before and after conditions demonstrating the benefits of livestock exclusion fencing, with buffers and streambank stabilization occurring as additional benefits not tabulated below.

Practice Type	**Number of Practices Installed**	**Tons of Soil Saved (over life of practice)**	**Pounds of Total Phosphorus Reduced**
Livestock Exclusion Practices			
Fencing	13 project areas/ 18,221 feet of fencing	893	1,321
Stream Crossing	8	289	201
Water Access/Water Facility	4	274	124
Barnyard Manure Management Practices			
Diversion	1	41	48
Dry Stack	1	20	13
Heavy Use Protection Area	4	2,536	2,240
Roof Runoff System-Rock Trench	6	92	60
Tile/Subsurface Drain	3	350	23
Underground Outlet	1	12	10
TOTALS	**41**	**4,507**	**4,042**

2. St. Marys River Old Fort Wayne Streambank Stabilization

City of Fort Wayne (Indiana)

A $30,000 investment from the GLSNRP supported a prior (GLSNRP Agreement 3) award of funding for the city of Fort Wayne to tackle two priority locations for riverbank stabilization and restoration, consistent with its Riverfront Master Plan and Riparian Management Plan. GLSNRP funds supported the purchase of materials for structural and soil bioengineering improvements at Headwaters Park and Old Fort Wayne, both located on the St. Marys River. Boulder bank protection at the toe of slopes prevents mid-bank scouring, while remaining slopes were flattened and stabilized with live branches layered between soil wrapped with coir fiber matting. The city noted that future grantees could learn from their struggles with permit delays and uncertain project costs by starting permitting processes early and obtaining project cost estimates from more than one firm.



"Old Fort" bank stabilization on the St. Marys River, during construction (left) and after (right)

3. Mequon-Milwaukee Farmland to Pollution Control Project

Mequon Nature Preserve, Inc. (Wisconsin)

The Mequon Nature Preserve (MNP) is a 444-acre parcel surrounded by heavily urbanized land in the Milwaukee River watershed. The MNP was created in 2002 while 400 acres were in active agricultural use. Since then, a master plan for the property called for reestablishment of the wetlands and mesic forest that dominated the area prior to European settlement. Through $30,000 in GLSNRP funding and support from other sources, the MNP now boasts 232 acres of restored habitat, included 27 acres of water-cleansing wetlands. The GLNSRP-funded work supported wetland creation, prairie installation, tree and shrub plantings, dredging, media articles, and educational programming, resulting in benefits to wildlife, water, humans, and communities beyond the physical boundaries of the project area.

4. Cass River Streambank Stabilization and Fish Habitat

Saginaw Bay Resource Conservation and Development Area (Michigan)

During local watershed planning, streambank erosion was identified as a major contributor of sediment to the Cass River. This project used overgrown coniferous trees to build "whole tree revetments" to stabilize eroding banks at 12 locations. Cost-share from landowners more than doubled the GLSNRP investment of $30,000 in this project, which is estimated to have saved 17,900 tons of soil and 17,900 pounds of phosphorus through stabilization of 3,255 feet of streambank.

Before and after photos of one whole tree revetment installation site on the Cass River

5. Phosphorus Reduction in the St. Joseph River/Lake Erie Watershed

Hillsdale Conservation District (Michigan)

The St. Joseph River is a tributary to the St. Marys River which then forms the Maumee River, the leading contributor of phosphorus and sediment to Lake Erie. This project installed conservation practices in the rolling headwaters area of the St. Joseph River, an area prone to erosion during intense rain events. The project worked on a field scale, supporting producers interested in trying cover crops and hayland planting and introducing local producers to the "4Rs" of nutrient stewardship (a relatively new approach in this community). Project leaders noted that payments for longer-term practices such as filter strips were not large enough to entice producers to take land out of production and plans for strip cropping proved too complicated under difficult weather conditions.

Practice Type	Number of Acres Installed	Tons of Soil Saved (over life of practice)	Pounds of Total Phosphorus Reduced
Cover Crops	1,006	2,013	2,875
Hayland Plantings	194	1,940	9,377
4R Nutrient Stewardship	489	3,914	3,378
TOTALS	**1,689**	**7,867**	**15,630**

6. Phosphorus Control in the Lake Ontario Basin

Oswego County Soil & Water Conservation District on behalf of the Finger Lakes-Lake Ontario Watershed Protection Alliance (New York State)

The Finger Lakes-Lake Ontario Watershed Protection Alliance supported work undertaken by three partner county soil and water conservation districts through this award.

- Cayuga County used $75,000 in grant funds, plus additional cost-share from landowners, to stabilize an area of Moon Beach in the town of Sterling. The area previously lost one to two feet of shoreline each year. A hard armor approach utilizing over 2,000 tons of stone will protect the area from water, wind, and ice.
- Onondaga County relied on $40,000 in grant funds, with additional local match, to support its critical area seeding program, with special emphasis on projects near vital water sources such as the Skaneateles Lake watershed which provides drinking water for the city of Syracuse and nearly 100,000 county residents. Nearly 30 acres were seeded, stabilizing 33 miles of roadside ditches for a savings of 14,400 tons of soil over the life of the installed practices.
- Wayne County used its $77,000 in grant funds, plus local match, to open doors to additional funding and start important conversations on the Port Bay East Barrier Bar. Specifically, project funds were used to demonstrate nature-based shoreline techniques on this area of Lake Ontario shoreline. One approach used locked logs and buried stumps to stabilize the spine of the barrier bar. Another approach relied on placement of shoreline sediment and natural beach cobbles for littoral drift and stabilization of a barrier bar breached during high-water events in 2017. Together, these projects mitigated erosion on 450 linear feet of shoreline and stabilized 8,500 tons of material between 2016-2018. Importantly, grant funds helped support the formation of the multi-sector Port Bay Work Group, which is continuing efforts to build shoreline resiliency.

7. West Cazenovia Creek Sediment & Nutrient Control Project

Erie County Soil & Water Conservation District (New York State)

GLSNRP provided $30,000 to the Erie County Soil & Water Conservation District to stabilize 455 feet of West Cazenovia Creek. The creek was severely impacted by an April 2009 storm event that led to significant damage and erosion throughout the watersheds of southern Erie County. Through a mix of armored toe and bank protection and natural channel design concepts, this investment is estimated to save 580 tons of soil over the anticipated ten-year life of the design.

West Cazenovia Creek, near the town of Colden, New York after bank stabilization efforts

8. Michaelson Stream Restoration Construction

Carlton Soil & Water Conservation District (Minnesota)

A conservation project in the 1970's resulted in a number of "Red Clay Dams" being built for sediment retention in the Nemadji River watershed, a tributary to Lake Superior. The dams have exceeded their design life and have started to fail. This $75,000 GLSNRP investment allowed the District to stabilize steep banks at a failed dam on Michaelson Stream, a tributary to Deer Creek, and restore the stream through the old pond area where sediment had accumulated. State-of-the-art natural channel design approaches were used, including grade control with in-stream cross vanes; bankfull benches reinforced with woody debris and coarse sediments; and stabilization of all disturbed areas. These efforts are estimated to prevent up to 13,000 tons of sediment from reaching the Nemadji River and Lake Superior.

There are many more Red Clay Dams in the Nemadji that will require restoration in the future, and we will have many opportunities to practice the natural channel design approaches that we have learned through this project.

Melanie Bomier
Water Resources Technician,
Carlton SWCD

Michaelson Stream, post-restoration

9. Aspen Lane Ravine Restoration Project

Village of Glencoe (Illinois)

The Aspen Lane ravine is located in an area surrounded by residential properties, a golf course, and a synagogue. Over time, the ravine bank had degraded causing fallen trees, exposed roots, and erosion into Lake Michigan. Additionally, flows were circumventing the originally installed storm sewer outfall. This project benefitted from support from local landowners and the Village's Sustainability Task Force which promoted the project for its alignment with an ongoing initiative to inform residents of the importance of ravine protection and management for this Great Lakes coastal community. The $50,000 GLSNRP investment, combined with significant funding from other sources, has successfully repaired the ravine.

Above: The Aspen Lane Ravine before (left) and during construction (right)
Below: Ravine, post-construction

The village is pleased to have received grant funding through this Great Lakes Restoration Initiative program. The grant funding supplemented local funding budgeted for storm sewer outfall improvements in a significant natural ravine north of Aspen Lane in Glencoe. The completed ravine improvements included the replacement of failed storm sewer outfall pipe, construction of a concrete weir structure, and installation of stone riffle pools all designed to stabilize the adjacent private property and greatly reduce the potential for future soil erosion into Lake Michigan, improving water quality for all.

David C. Mau, P.E.
Glencoe Public Works Director

10. Reducing Agricultural Phosphorus in the Maumee

Wood Soil & Water Conservation District (Ohio)

This project provided an opportunity for smaller producers and those less confident about conservation practices to try one or two practices to support nutrient and sediment reduction efforts within western Lake Erie basin watersheds that had not received support historically. Participating producers established over 7300 acres of cover crops over three consecutive winters (saving over 800 tons of soil and keeping 4,019 pounds of total phosphorus on the land). While the District did not specify species, blends, or planting method, it was required that any cover crop blend include species that would overwinter. Through its efforts, the District learned that its desire for multi-species blends can be best met on fields planted with wheat or silage corn. Fields coming to harvest later in the season (i.e. corn and beans) are better suited to single species cover crops that overwinter. The project also funded seven controlled drainage structures, including three that provide protection on fields that receive egg wash water or manure applications. Through this project, the District noticed that weather plays a large role in producer decisions on controlled drainage structures. Some producers are motivated to install structures to hold back tile water to improve yield during dry years, thus wet years (especially those years that delay planting and other work) dissuade those producers from restricting tile flow when their primary motivation is working the field.

With so much attention paid to water quality in the western Lake Erie basin, this was a great opportunity to focus on a small area that had been overlooked in other water quality incentive programs, and to include new producers and new acres in the regional efforts to improve the Maumee and Lake Erie.

Beth Landers
Resource Protection Watershed Specialist, Wood Soil & Water Conservation District

11. Removing Dissolved Phosphorus from Agricultural Drainage

The Nature Conservancy in Ohio

A partnership between The Nature Conservancy in Ohio, USDA-ARS, The Ohio State University, Putnam and Hardin County Soil and Water Conservation Districts, Blanchard River Demonstration Farms, Levy Company, Inc., Plant Tuff, and Sines Excavating, LLC was provided $162,337 in GLSNRP funding to install four phosphorus removal structures. Outreach materials and events reached over 400 farmers and led to the installation of additional phosphorus filter structures in the western Lake Erie basin between 2015 and 2019. Program funds are estimated to have reduced 64 pounds of total phosphorus that would have been lost from treated fields.

A phosphorus removal structure is a large surface or subsurface filter designed to capture dissolved phosphorus runoff before it reaches downstream waterbodies. Dissolved phosphorus has been identified as a leading cause of harmful algal bloom formation in the western Lake Erie basin. Costs vary based on site characteristics, target dissolved phosphorus removal rates, and type of filter media. The project team learned that these structures are most cost-effective when sited to treat high soil test phosphorus fields more likely to experience dissolved phosphorus losses through subsurface tiles. The team also learned that installing filter media in a tank rather than loose in a lined bed can facilitate future maintenance and reduce installation costs. A free spreadsheet tool has been created through this project to support preliminary phosphorus filter designs that can be imported into AutoCAD or other software to visualize what the structure would look like and how to build it.

Phosphorus filters, like the one being installed in this photo, are located at Demonstration Farms in collaboration with The Ohio State University, allowing for longer-term monitoring and maintenance of each structure.

12. Sediment & Phosphorus Reduction in the Miller City Cutoff & Pike Run Creek

Putnam Soil & Water Conservation District (Ohio)

For this project, the District partnered with the Blanchard River Watershed Partnership to address water quality impairments arising from sediment and total phosphorus as documented in a 2005 total maximum daily load prepared by the Ohio Environmental Protection Agency. Over $222,000 in grant funding supported 62 contracts with landowners for practices that retained soil and nutrients on agricultural land and restored 10,480 feet of streambank. The District noted a concern that participants in the cover crop program appeared to remove wheat from their rotations as it could not count as both a cash crop and cover crop, making it clear that adaptions to accommodate shifting farm economics and commodity prices remain important considerations. An innovative "Bring Your Own Shovel" event was held at the District's research farm to allow producers to see for themselves differences in soil health across different tillage and cover cropping scenarios.

Practice Type	Acres Installed	Number of Practice	Tons of Soil Saved (over life of practice)	Pounds of Total Phosphorus Reduced
Cover Crops	1504		530	573
Conservation Tillage	1533		348	377
Precision Nutrient Management	1266		1,005	1,061
Grassed Waterway	1.3		262	282
Blind Inlet		4	257	615
Water Control Structures	345	10		3,698
Streambank Restoration		10,480 feet	340	525
TOTALS		**N/A**	**2,742**	**7,131**

13. Sediment and Phosphorus Reduction in the Middle Riley Creek

Blanchard River Watershed Partnership (Ohio)

This project relied on a $29,930 GLSNRP investment to provide farmers in the Middle Riley Creek watershed with resources to try cover crops and conservation tillage and implement a watershed action plan for Riley Creek, which was endorsed by the Ohio Environmental Protection Agency in 2012. Four local producers in the watershed worked to install cover crops on 488 acres and deploy conservation tillage on 950 acres. When conditions in year two of the project were unfavorable to cover crops, the Blanchard River Watershed Partnership was able to adapt and shift more funds toward conservation tillage, reducing 281 pounds of total phosphorus. In addition, signs were provided for placement on fields with road frontage to share with the community the conservation efforts underway.

14. Tiffin River Sediment & Nutrient Reduction Initiative

Fulton County Soil and Water Conservation District (Ohio)

This project focused its efforts on soil-saving practices (filter strips and grassed waterways) in the Flat Run and Bates Creek watersheds, where 80 percent of cropland has highly erodible slopes (4-8 percent). The project team relied on straw blankets to assure the success of installed practices, especially in areas with grade changes within grassed waterways. Contracts with 11 landowners were supported by $28,900 grant dollars. In addition to the edge-of-field practices, 117 acres were seeded with cereal rye and other cover crops that reliably germinate in cooler conditions. The project resulted in savings of 16,534 tons of soil and 17,182 pounds of total phosphorus.

A grassed waterway installed by
Ohio's Fulton County Soil and Water Conservation District

15. Personalized Phosphorus Reductions in Wolf Creek

Seneca Soil & Water Conservation District (Ohio)

For this project, the Seneca Soil & Water Conservation District focused on three watersheds identified as impaired due to excess nutrients and sought to not only reduce phosphorus losses from local farms but address the need for changing attitudes and behaviors in the long term. An $86,000* investment from the GLSNRP supported an innovative approach to nutrient management planning, driven by simple dialogues with participating farmers and short documents. The team had learned that the traditional 50-80 Nutrient Management Plan document was intimidating and unusable for most farmers in the community. The simpler approach was further supported by incentives to install practices such as cover crops and gypsum soil amendments. Unique among other GLSNRP projects, the District analyzed grab samples for farmers interested in seeing what left their fields in runoff water, inspiring the GLSNRP Task Force to specifically include this type of educational water or soil testing in future requests for proposals.

*Note: due to unexpected staff changes and shifts in other funding streams, the District was unable to complete some of its planned work and consequently returned a portion of its obligated funds to the GLSNRP.

I really enjoyed having the technician sit at my kitchen table and talk with me about ways I could change how I apply fertilizer. He showed me how to save money, keep my yields and help Lake Erie.

Larry Holman
Seneca County Farmer

Those farmers that pulled samples of water from their tile outlets to see how much phosphorus was leaving their farm were very brave! It was encouraging to see them care that much about what they were contributing to Lake Erie.

Beth Diesch
Team Leader, Seneca Soil & Water Conservation District

16. Subsurface Soil Incorporation of Phosphorus Fertilizer

Conservation Action Project

This project was initially awarded $193,180 to promote subsurface fertilizer placement in the western Lake Erie basin through outreach to farmers and opportunities for equipment retrofits. Two equipment retrofits occurred for the two farmers that expressed interest in the program, but a combination of poor weather and the preference for traditional broadcast placement of fertilizer hampered progress. Due to issues with recordkeeping, remaining GLSNRP funds were returned and the award was terminated in February 2019. In addition to the equipment retrofits (which were used on 895 acres for an estimated savings of 900 pounds of total phosphorus), the project team and local partners presented three field days averaging 200 attendees each and further completed three newsletters explaining subsurface fertilizer placement and the program.

Disclaimers

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Any opinions, findings, conclusion, or recommendations expressed in this publication are made by the Great Lakes Commission staff and do not necessarily reflect the views of the U.S. Department of Agriculture.

This publication was authored by Great Lakes Commission staff members Ken Gibbons and Nicole Zacharda, with input from Great Lakes Sediment and Nutrient Reduction Program grantees.

The Great Lakes Commission convenes the states and provinces — Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Ontario, Pennsylvania, Québec and Wisconsin — and other key voices to develop best practices and evidence-based policy, and to speak collectively for a healthy, vibrant Great Lakes Basin. Established by the Great Lakes Basin Compact of 1955 and authorized by Congress in 1968, the Commission promotes the sustainable use, development and conservation of the water resources of the Great Lakes Basin.

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Great Lakes RESTORATION