Great Lakes Commission
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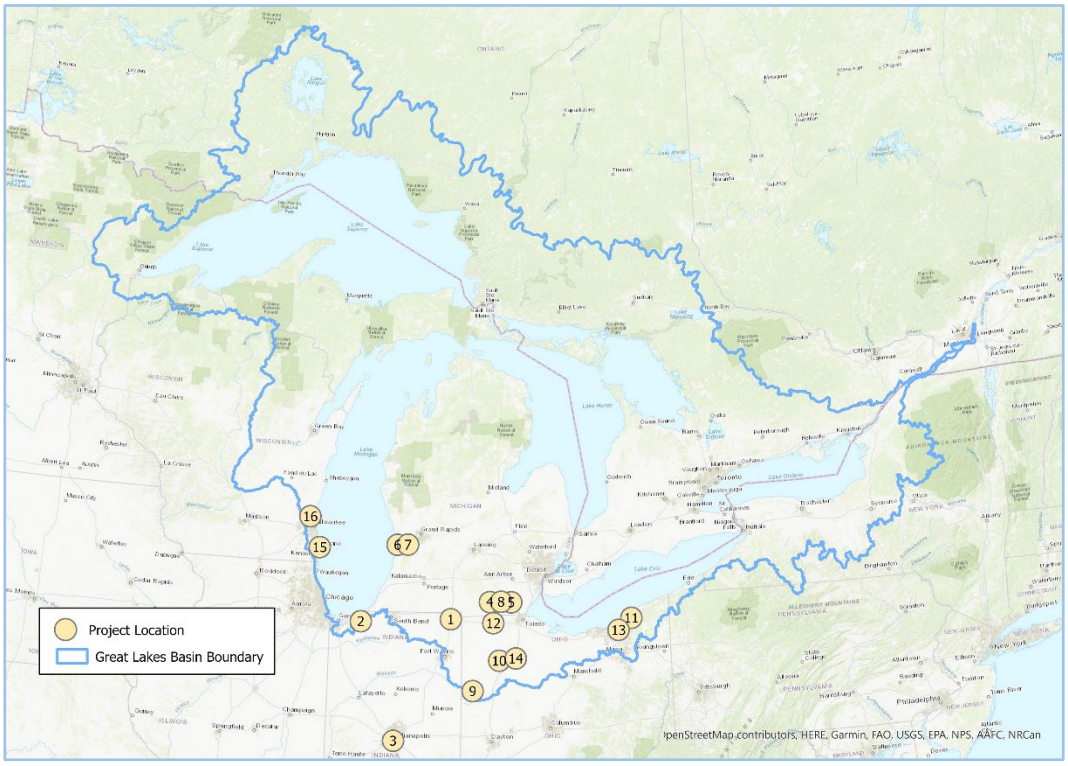
Great Lakes Sediment and Nutrient Reduction Program

REPORT ON AGREEMENT 7 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 GLC has provided grants to nonfederal units of government and watershed organizations to install erosion and sediment 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. The funding has been directed to 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.

2017's grantees were uniquely challenged by two events: an extremely wet spring in 2019 (following a wet 2018) followed by the COVID-19 pandemic that arrived just as grantees were hoping to catch up on work already delayed by weather. GLC staff worked with grantees to extend a number of awards to provide for more time; however, an unusual amount of planned work is incomplete for this Agreement.



Locations of Agreement 7 grantees. Overall, 16 projects were funded through this agreement. Each number corresponds to a description below.

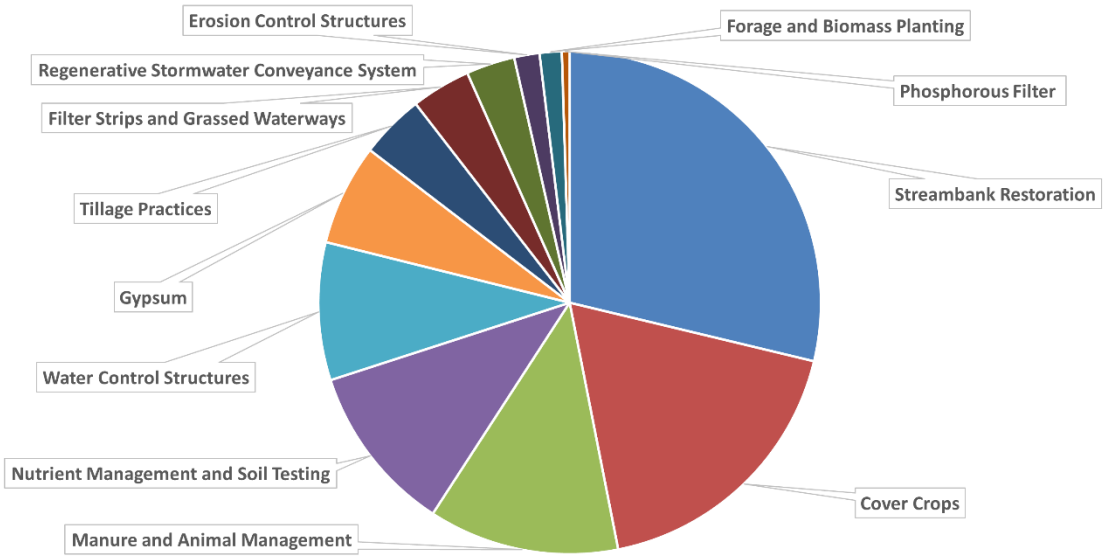
Great Lakes Sediment and Nutrient Reduction Program
BY THE NUMBERS

16 GRANTS, $1,428,287 IN TOTAL FUNDING

State	Number of Grants	Total Funding
Indiana	3	$290,259.59
Michigan	5	$345,631.62

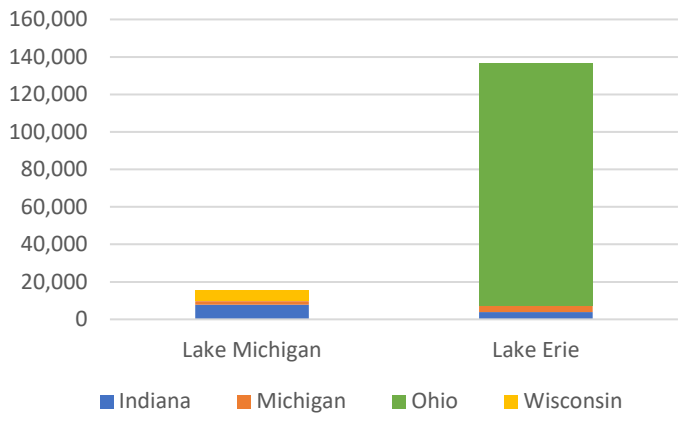
State	Number of Grants	Total Funding
Ohio	6	$707,258.38
Wisconsin	2	$88,137.61

AGREEMENT 7 GLSNRP PRACTICES



Under Agreement 7 the Great Lakes Sediment & Nutrient Reduction Program funded a variety of best management practices.

TOTAL PHOSPHORUS REDUCTIONS AGREEMENT 7



For Agreement 7, practices were installed in 4 states with total phosphorus reductions occurring in the watersheds of 2 Great Lakes. A majority of funds were spent in Ohio for this award.

Phosphorus reductions were estimated based on RUSLE 2 soil savings estimates, which were translated to estimated phosphorus reductions for the life of the installed practice. Estimated total phosphorus reductions amount to 26,310 pounds per year. For more information, see Appendix 7C.

The average lifespan for practices installed under this agreement is 3.8 years.

1. Pigeon Creek Watershed- Reducing Soil and Nutrient Runoff #2

Steuben County Soil & Water Conservation District (Indiana)

The goal for the Pigeon Creek Watershed – Reducing Soil and Nutrient Runoff #2 grant was to implement agricultural conservation practices within the Pigeon Lake, Mud Creek, and Long Lake sub-watersheds of Pigeon Creek to reduce nutrient runoff and soil erosion that impact the creek and ultimately, the nearshore waters of Lake Michigan.

"The Steuben County Soil and Water Conservation District is grateful to have received funding from the Great Lakes Commission through the Great Lakes Sediment and Nutrient Reduction Program to help agricultural landowners in Steuben County apply conservation practices to reduce the amount of sediment, nutrients, and other pollutants in Pigeon Creek."

Janel Meyer
District Administrator

Practices were installed in support of the Pigeon Creek Watershed Management Plan (2014) and included 1,287.26 acres of cover crops, 34.81 acres of forage/biomass plantings, and pasture best management practices that included the installation of 10,223 ft. of fence and one alternative watering system. Above normal precipitation and ongoing wet weather conditions experienced in northeastern Indiana in 2018 and 2019, coupled with the economic uncertainties from the coronavirus public health emergency (beginning in 2020), were a challenge for the District. As a silver lining of sorts, the sheer number of acres in 2019 that were not planted due to wet weather- breaking records- inspired producers to recognize the importance of maximizing soil cover on their fields through cover crops. Producer interest also grew for cost-share assistance to convert row crops into pasture (forage/biomass plantings). Through the GLSNRP grant, the District was able to support 10 unique producers with their conservation activities.

Cover crop planted on acres that were prevented from planting due to extreme wet weather in 2019

2. Trail Creek Bank Stabilization

LaPorte County Park Department (Indiana)

The Park Department used a $50,000 dollar investment from the GLSNRP to bolster $80,000 in local contributions to stabilize two meander bends on Trail Creek, which runs through Park Department property. The project utilized 573 tons of rocks to deploy natural channel design principles through the installation of ten structures in the form of four cross vanes and six J-hooks. All disturbed areas were seeded, woody debris were properly secured, and 60 hardwood trees were planted along the project site.

"We learned that the bigger the rock the better. It's hard to move but once it is set in place it's not going anywhere. Thank you to the Great Lakes Commission for helping us complete this project."

Jeremy Sobecki
LaPorte County Parks Department

Trail Creek facing upstream at final construction of a J-hook (foreground) and cross vane (further upstream)

3. Promotion of the 4Rs in Indiana with Partners

Indiana State Department of Agriculture (ISDA)

The ISDA utilized funds to support the reduction of nutrients and sediment in Indiana's portion of the western Lake Erie basin through outreach and demonstration practices involving gypsum additions, cover cropping, equipment modifications, and hay and pasture planning. Installed practices resulted in soil savings of 2,364 tons and 3,764 pounds of phosphorus retained on farm fields rather than moving to local waterways and ultimately, Lake Erie. The work helped demonstrate the important of soil health and the "4Rs" of nutrient management (i.e. applying nutrients from the right source, at the right rate, at the right time, in the right place). Through this grant, ISDA was able to work closely with county Soil and Water Conservation Districts in planning educational events, building relationships that led to successful efforts including:

- a soil and manure sampling program
- a soil fertility and nutrient management program
- conservation workshops inclusive of the large Amish community in the watershed
- farmer-led identification of natural resource concerns to be addressed in the Auglaize watershed through the grant's cost-share program.

"The Western Lake Erie Basin is an intertwined system with diverse land use that needs a unified message to ensure it is healthy and resilient for years to come. Financial assistance opportunities, like the one provided by the Great Lakes Commission, allow local units to coordinate conservation efforts to protect the Basin."

Jennifer B. Thum
ISDA

A curious horse supervises soil sampling activities in its pasture.

4. Watershed Wide Conservation

Lenawee Conservation District (Michigan)

The Lenawee Conservation District worked with local partners including Michigan State University extension, the drain commissioner, and Michigan Farm Bureau to implement conservation practices in a small 4,327 acre drainage district (this terminology arises from Michigan's unique Drain Code of 1954) within the River Raisin watershed. The area is intensively farmed with extensive sub-surface drainage. The project was affected by very wet weather and then efforts to catch up were slowed by the COVID-19 pandemic. Despite these challenges that precluded construction of structural controls, the goal for filter strip construction in the watershed was exceeded by 57% and GPS sensors were adopted by producers in the area to significantly reduce nitrogen applications in the project watershed and beyond.

5. Closed Loop Drainage Water Management/Sub-Irrigation System

Lenawee Conservation District (Michigan)

The GLSNRP contributed a small ($50,000) investment in a nearly $400,000 project enabling completion of a demonstration project allowing the storage and "harvest" of drainage water for use in a sub-surface or overhead irrigation system. A storage reservoir 16.5 deep with a surface area of nearly 5 acres was constructed. A companion sub-surface irrigation system is designed to provide a water table in 12-18 inch zones. Excess drainage water during the growing season is recycled back into the storage pond for use in dry weather. Water is stored in-field outside of the growing season through the use of water control structures. The closed loop system is intended to mitigate phosphorus and nitrogen loss from field to surface water through the innovative collect and reuse approach.

6. Macatawa Watershed Streambank Restoration

Macatawa Area Coordinating Council (Michigan)

For this streambank restoration project, approximately 160 linear feet of streambank was stabilized along Noordeloos Creek in the Macatawa watershed. The existing bank was excavated and smoothed to a 2:1 slope, then a rip rap revetment and toe protection were installed. A native plant buffer was installed in the area above the rock that was previously turf grass. Construction was completed in September 2020 with the native plant buffer installed in early October 2020. Live stakes were planted in a section in early November 2020. The private landowner will continue to maintain the project for a short period until the Ottawa County Water Resources Commissioner assumes maintenance as part of a larger drainage district being formed. This will enable funding for maintenance and continued improvements in the years to come, furthering a key objective of the Macatawa Watershed Management Plan which identified streambank erosion as a source of excess sediment and phosphorus contributing to impaired water quality and habitat in Lake Macatawa and its major tributaries.

Implementation of the project was challenging due to unforeseen engineering and permitting costs and delays of time. A key lesson learned is that even before applying for funding, quotes for engineering services- with contingencies- should be secured to assure accurate budgeting of costs. In addition, understanding of regulations is critical for work in floodplains.

Before and after of Noordeloos Creek streambank stabilization

7. Two-stage Ditches in the Macatawa Watershed

Macatawa Area Coordinating Council (Michigan)

The Watershed Management Plan identifies two-stage channels as a high priority recommendation for addressing sediment pollution in agricultural areas of the watershed. The initial intention of the project was to secure designs and implement 1,650 linear feet of two-stage channels based on willingness of landowners and input from local drain offices and advisory groups. The nearly $50,000 GLSNRP investment enabled work with one farming landowner and the Ottawa County Water Resources Commissioner (OCWRC) to design and install a total of 2,660 linear feet of two-stage channel.

The work with the OCWRC was not identified until 2020. There were some concerns with a section of the Brower Drain through the City of Zeeland in the Noordeloos Creek Subwatershed. Dead ash trees were starting to fall in this section causing streambank erosion and obstructions. In addition, downstream flooding indicated that this stream would further benefit from the added capacity provided by a two-stage channel. The original scope of this project was limited by available grant funds but was expanded due to willingness of some of the adjacent landowners to assist in paying for the project. A total of 2,025 linear feet was restored.

A Facebook post shared by the project team and participating producer responsible for a 635-foot two-stage channel and cattle crossing installed in an existing pasture in the Upper Macatawa subwatershed

8. Phosphorus Remediation Project

Lenawee Conservation District (Michigan)

The GLSNRP contributed a small ($50,000) investment enabling the District to partner with Plant Tuft to implement phosphorus removal structures for education, demonstration and possible watershed-wide implementation of the practice. One Phosphorus filter was installed at the Bakerlads Farm as part of the Center for Excellence field day with a couple hundred people viewing the process of installation. Design was completed by Chad Penn of Purdue University and was installed by Levy company from Detroit using treated slag material produced from steel mills as the sorption material attaching and trapping phosphorus from farm field runoff.

Photo taken at the Center for Excellence Field Day in 2019. Attendees observed P-filter installation with presentations from Levy corporation and Purdue University's Chad Penn.

9. Concentrated Flow Area Improvements – St. Mary's River Watershed

Mercer Soil and Water Conservation District (Ohio)

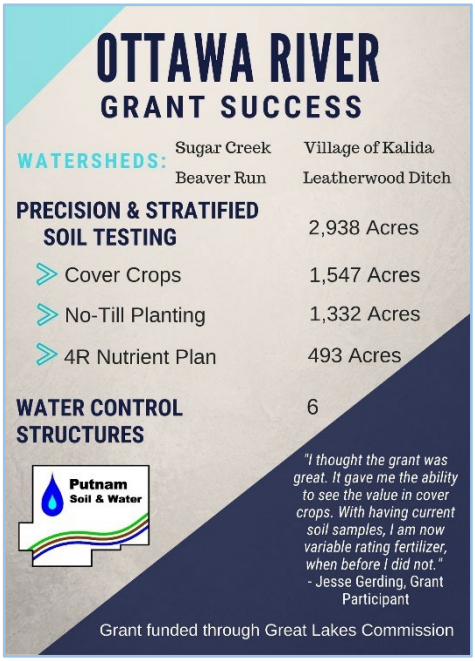
This project addressed an ongoing severe erosion problem within a concentrated flow area in the St. Mary's River Watershed in Mercer County, Ohio. The project area had gullies that were, on average, eight feet wide, three feet deep and 500 feet long. At least ten years of erosion had occurred in this concentrated flow area, which pushed an estimated 370 tons of sediment into the St. Mary's River. To address the issue, grass seed was planted, and an erosion control blanket was installed on May 18, 2018. On May 24, 2018, Mercer SWCD, Ag Solutions and Parkway FFA students planted 1,100 wetland plants in the vegetated wetland bed of the project. Several native wetland species were introduced into the wetland areas. This project has three wetland pool areas, 210 feet of vegetated wetland bed, 200 feet of traditional grassed waterway, a blind inlet, two stone crossings and several rock checks for erosion control. The $20,929.75 investment from GLSNRP allowed the Conservation District to build stabilization of gully erosion, increase water holding capacity, and enhanced water quality treatment possibilities due to the type of vegetation planted on-site. The installation of this grassed waterway will prevent roughly 378 tons of soil from entering the St. Mary's River.

Before and after of the grassed waterway installation in a concentrated overflow area in the St. Mary's River Watershed

10. Watersheds in the Ottawa River Sediment Reduction Project

Putnam Soil and Water Conservation District (Ohio)

This project addressed reducing nutrient and sediment losses in Ottawa River Watersheds. The project goals were to identify if there were any stratified nutrient layers present in the critical areas. Putnam SWCD wanted to identify the soil test levels through precision soil testing and see if there were differences in layers of the soil tests based on various farming practices. 2,938 acres of Precision Soil Testing and Stratified Testing were completed, and 1,547 acres of cover crops were installed. 1,332 acres of conservation tillage were also implemented along with 493 acres of the 4R/Nutrient Management Plans. In addition, six water control structures were installed. In total, the implementation of these six conservation best management practices will result in a 763.47-ton reduction in soil erosion and a 5,048-pound reduction in Phosphorus entering the Ottawa River Watersheds.



Cover crops and water control structure installation

11. Chagrin River Sediment and Nutrient Reduction BMP Program

Chagrin River Watershed Partners (Ohio)

Sediment impacts habitat suitability for aquatic life in the Chagrin River as well as being a mode of transport for particulate phosphorus and other pollutants to Lake Erie. Additionally, the lower reaches of the Chagrin River routinely require dredging to maintain access for recreational boats. Surveys from Ohio EPA and anecdotal notations by the Port Authority of Eastlake indicate that sedimentation has increased in recent years. Sources of sediment in the Chagrin River watershed include streambank and streambed erosion, slope failure, construction, suspended solids carried from stormwater runoff, and runoff from agricultural lands in the watershed. The installation of best management practices to reduce nutrients and sediment to Lake Erie and minimize the need for dredging is recommended in the Ohio Lake Erie Commission's Lake Erie Protection and Restoration Plan and the Lake Erie Biodiversity Conservation Strategy Core Team's Lake Erie Biodiversity Conservation Strategy. The following 12-digit hydrologic unit code (HUC) watersheds will be targeted for sediment and nutrient BMPs in this project, all of which are identified as sediment and phosphorus sources to Lake Erie within the Chagrin River Watershed Action Plan: Headwaters Aurora Branch, Beaver Creek-Chagrin River, East Branch-Chagrin River, and Silver Creek. These watersheds were chosen based on areas of need for BMPs identified by project partners. Ten streambank stabilization projects totaling 2,000 linear feet and two heavy use pads were installed. It is estimated these streambank stabilization projects will result in a reduction of over 4,000 tons of soil and 4,800 pounds of Phosphorus from entering the Chagrin River watershed.

Before and after of streambank stabilization along the Chagrin River

12. Central Fulton Conservation Project

Fulton Soil and Water Conservation District

Given that the Old Bean Creek, Turkeyfoot Creek and Brush Creek watersheds consist of 80 percent cropland with highly erodible slopes (4-8 percent), it is imperative that the Central Fulton Conservation (CFC) Project addresses soil erosion, sedimentation, nutrient loading, and water quality concerns in these watersheds. Through this project, the Conservation District was able to plant 3,825.67 acres of cereal rye, convert 14.8 acres of cropland to a permanent vegetative cover, stabilize the grade and control erosion in natural or artificial channels, preventing the formation or advance of gullies, enhancing environmental quality and reducing pollution hazards, and lastly, conducted soil testing on 1,300.5 acres. In total, it is estimated these best management practices will result in the reduction of 119,000 tons of sediment and 115,700 pounds of Phosphorus from entering the Old Bean, Turkeyfoot and Brush Creek watersheds.

Before and after of cereal rye planting at Rufenacht Farms

13. Euclid Waterfront Improvements – Erosion Control

City of Euclid (Ohio)

This project is in the HUC 041100030502 frontal Lake Erie watershed in an urban environment directly along the coastline between Sims Park (a city-owned park) and extending east to E.242nd Street. The project, before construction, was in an ODNR Coastal Erosion Area losing more than 13" of land annually due to the impact of higher water levels and sustained wave action at the unprotected bluff. Steeply sloped bluffs (70-90%) along the shoreline contributed to soil loss into the lake, destroying habitat and making the upland properties less livable. The project laid back the bluff to a 2:1 slope and vegetated it with nearly 78,000 square feet of dense, fibrous native prairie mix and pollinator plants to stabilize and prevent over 2,100 pounds of phosphorous from entering the lake through soil loss. In total, 6,200 tons of sediment will be prevented from flowing into Lake Erie. The project addressed the GLRI's priority of promoting nearshore health by mitigating invasive species and by planting native and pollinator species to attract migratory birds and insects as well as reducing sediment and nutrient load into Lake Erie.

The City of Euclid worked with nearly 100 residents and landlords to execute long term easement agreements, which was one of the most innovative parts of this project to stabilize the shoreline and provide public access. These were executed prior to the project beginning construction and led to the success of this project. The model is now being sought by other communities and Euclid residents alike through the creation of a lakefront SID. Euclid public works crews are receiving updated training through the city's stormwater department and another local agency to ensure proper on-going maintenance.

Bluff stabilization along Lake Erie

14. Manure Utilization in the Silver, Wildcat, and Prairie Creeks

The Ohio State University (Ohio)

Approximately half of the livestock manure applied in the Western Lake Erie Basin (WLEB) is applied in the fall after crops have been harvested. Rarely are there growing cover crops in the fields, so much of the nitrogen is lost to the environment before a crop is planted the following season. What manure is eventually incorporated, is done so, with whole-field tillage. The Natural Resource Conservation Service RUSLE2 soil loss calculation is 1.8 tons per acre per year with fall chisel tillage. This compares to 0.52 tons per acre per year if the manure could be incorporated using strip tillage. If manure were strip tilled to incorporate during the fall months, the soil savings difference is 1.28 tons per acre. All original work plan activities were completed. The university provided two strip-till manure incorporation toolbars and bought a third toolbar with grant funds. Each of the four years of these grant (a one year extension was requested and approved) funds were used to rent two or three large tractors to pull the manure toolbars through emerged corn fields.

Strips of corn rows were left in most of the fields without manure and commercial fertilizer was used instead of manure. This gave farmers a side-by-side comparison of the corn yields. Some farmers also participated in tissue testing of the corn stalks at the silking stage. These tests typically showed the nitrogen from the livestock manure was adequate to produce a full crop yield. In the fall, corn fields were harvested, and the participating farmers were very impressed with the results of the manure application. The manure side-dress produced higher corn yields than the commercial fertilizer in almost every field over the four years.

Side dressing emerged corn with liquid manure

Conservation Practice	Acres Treated	Tons Soil Saved (life of practice)	Total Phosphorus Saved (lbs)
Side-dress of corn with manure	1,557	2,003.9	26,915.9
Fall strip-tillage incorporation of manure	1,453	1,300	24,548
Spring strip-tillage incorporation of manure	425	532.7	7,225
Total Soil & Phosphorus Reduction:		**3,836.6 tons**	**58,688.9 pounds**

15. Pike River – Ravine Restoration

Root-Pike Watershed Initiative Network (Wisconsin)

For background, erosion in the "Reck South" ravine has been contributing sediment and associated pollutants to the Pike River and Lake Michigan over the last few decades. The ravine ("School Tributary Ravine #42G") was identified as a critical area for ravine restoration in the DNR/EPA-approved Pike River Watershed-Based Plan (2013). The report listed 423 lineal feet of channel to be restored. The project site is adjacent to the Hawthorne Hollow Nature Sanctuary in Somers. Stabilizing the ravine was needed to accommodate the increased agricultural drainage flow and minimize ravine erosion. Recent upstream agricultural drainage modifications have caused greater flow into the head of the ravine and caused instability in the ravine, resulting in an escalated rate of erosion within the ravine. Stabilizing the ravine was needed to accommodate the increased agricultural drainage flow and minimize ravine erosion. The project included restoration of about 500 feet of ravine. The ravine stabilization has several projected outcomes including eliminating erosion along the tributary to School Tributary, thus reducing the amount of sediment entering the Pike River and eventually Lake Michigan. The work in the area also is creating an oak savannah that will allow the ravine vegetation to become well established while securing the slopes for the long-term.

The EPA-approved Pike River Watershed-Based Plan estimates the project will achieve reductions of 324 pounds/year of Total Nitrogen, 162 pounds/year of Total Phosphorus, and 162 tons/year of Total Suspended Solids. These pollutant reductions will benefit the downstream School Tributary, South Branch Pike River, an impaired reach of the Pike River, and Lake Michigan.

The RSC solution dissipates water energy that causes excessive erosion

16. Trinity Creek Pollution Reduction in the Milwaukee River Watershed

Mequon Nature Preserve, Inc. (Wisconsin)

The project area is a 7-acre agricultural parcel bisected by an eroded and channelized Trinity Creek. This creek is a tributary to the highly compromised Milwaukee River. The property is comprised mostly of highly erodible clay soils, located on the watershed divide of two rivers in the Milwaukee estuary Area of Concern (AOC), and is surrounded by heavily urbanized properties, making it vulnerable to being a source of water pollution. In total, this project will save 5,105 tons of soil and 11,614 lbs of phosphorus over the life of the practices.

Before and after of Trinity Creek restoration project

Disclaimers

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Any opinions, findings, conclusion, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture.

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The Great Lakes Commission is a binational government agency established in 1955 to protect the Great Lakes and the economies and ecosystems they support. Its membership includes leaders from the eight U.S. states and two Canadian provinces in the Great Lakes basin. The GLC recommends policies and practices to balance the use, development, and conservation of the water resources of the Great Lakes and brings the region together to work on issues that no single community, state, province, or nation can tackle alone.

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Great Lakes RESTORATION