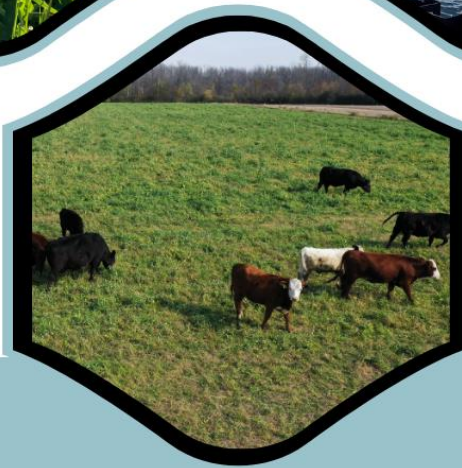




# LOWER FOX RIVER

## WATERSHED RECOVERY PLAN



# PROJECT PARTNERS & WORKGROUP MEMBER ACKNOWLEDGEMENT

The Lower Fox River Watershed Recovery Effort was developed in partnership between staff at **Alliance for the Great Lakes, Fox-Wolf Watershed Alliance**, and the **Wisconsin Department of Natural Resources, Office of Great Waters** through support from Fund for Lake Michigan.

A diverse group of stakeholders contributed to the development of the Recovery Plan including representatives of the following organizations:

Brown County Land & Water Conservation

The Nature Conservancy

City of Green Bay

University of Wisconsin Extension

Diederich Farms

University of Wisconsin - Green Bay

Ducks Unlimited

University of Wisconsin-Milwaukee

Future Neenah

University of Wisconsin Sea Grant

NEW Water, the brand of the Green Bay  
Metropolitan Sewerage District

U.S. Fish & Wildlife Service

U.S. Geological Survey

Outagamie County Land Conservation

Village of Wrightstown

Oneida Nation

Wisconsin Department of Natural Resources

NRCS

**We thank you for your continued support  
in our efforts for watershed recovery!**





## THE LAND, WATER, AND PEOPLE OF THE LOWER FOX RIVER WATERSHED

Home to over 400,000 residents across four counties and the Oneida Nation, the 340 square miles that make up the Lower Fox River watershed attract those drawn to its unique blend of urban, small town, and rural communities. The 39 miles of Fox River, its 13 main tributaries, and the Bay of Green Bay, the largest freshwater estuary in the world, have long provided a source of economic benefit through industry, agriculture, recreation, and tourism and since settlement times, communities have clustered around the water. Agriculture is an important part of the heritage, community, and economy of the region and land use in the Lower Fox River reflects this. Approximately 50% of the land in the watershed is in agricultural use, primarily by dairy and cash crop producers. As the region has grown, the demands of these diverse land uses that includes agriculture as well as industry, urban and rural development, and natural areas have reinforced the need for a multi-faceted approach in addressing land and water concerns.

## THE CHALLENGE IN A NUTSHELL

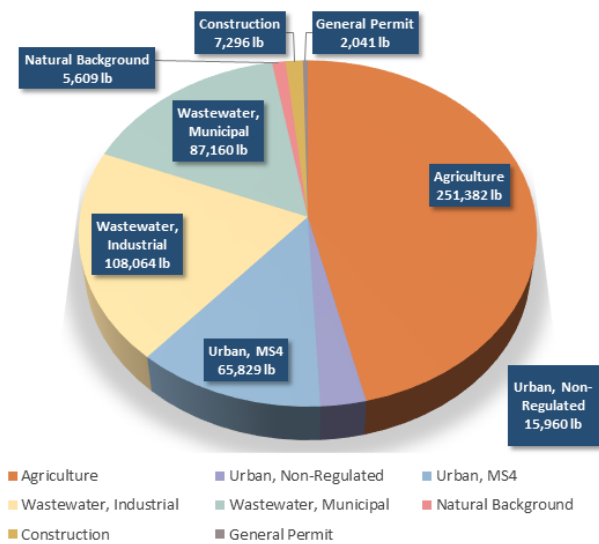
Industrial discharges, runoff from traditional agricultural practices, and urban development have all contributed to degraded land and water quality in the watershed. Excessive sediment and nutrient loading to the Lower Fox River and Bay of Green Bay has led to increased harmful algal blooms (HABs), oxygen depletion, water clarity issues, and degraded fish and wildlife habitat. [The Lower Fox River Total Maximum Daily Load \(TMDL\)](#) was approved in 2012 to address the excessive phosphorus and sediment loading to the River and assigned nutrient and sediment (also known as total suspended solids) reduction targets to urban stormwater utilities, wastewater treatment facilities, and nonpoint contributions from agriculture. While point source entities are working toward their reduction goals through their state-approved discharge permits, the biggest impact on nutrient and sediment contributions to the River needs to come from nonpoint agricultural reductions.

## THE TMDL - A MECHANISM FOR DETERMINING REDUCTION GOALS

Point and nonpoint source nutrient and sediment loading has created considerable water quality impairments which impacts industrial, municipal and recreational uses of the Lower Fox River and the Bay of Green Bay. To remedy these impairments and bring the water bodies back to a condition in which citizens and businesses in the watershed can again use the water in its full capacity, a Total Maximum Daily Load (TMDL) was developed in 2012 by the WDNR through coordination with basin stakeholders for the Lower Fox River Watershed. A TMDL is a study of a waterbody to determine the maximum amount of a particular pollutant the waterbody can handle while still meeting water quality criteria. The study is completed by analyzing the watershed to determine the source(s) of pollution, both point and nonpoint, and the amount each source is contributing. A pollution reduction goal, like a water pollution “diet,” is assigned to each source to bring the total amount of the pollution in line with what the waterbody can tolerate without its uses being impaired.

The pollutants of concern addressed in the Lower Fox River Basin and Lower Green Bay TMDL are total phosphorus and total suspended solids. During TMDL development, baseline phosphorus loading for the entire Lower Fox River Basin was determined to be approximately 549,703 lbs/year [Source: [TMDL](#)]. This includes point source loads from urban MS4, industrial wastewater, municipal wastewater, construction and general permits as well as nonpoint source loading from agriculture, urban non-regulated sources, and natural background contributions.

Source of Phosphorus in the Lower Fox River Watershed [Source: [Lower Fox TMDL](#)]



Total Phosphorus Loading by Source	Baseline (lbs/year)
Agricultural	251,382
Urban, Non-Regulated	15,960
Urban, MS4	65,829
Wastewater, Industrial	114,426
Wastewater, Municipal	87,160
Natural Background	5,609
Construction	7,296
General Permit	2,041
<b>Lower Fox River Recovery Area Totals</b>	<b>549,703</b>

## POINT SOURCE POLLUTION

Point sources release pollutants from an identifiable source, such as a discharge pipe, and are regulated by federal and state agencies. The main point source dischargers are factories and sewage treatment plants, which release treated wastewater to surface water bodies. Point source pollution is regulated through the federal Clean Water Act, which gives the State of Wisconsin authority through the US Environmental Protection Agency (EPA) to set limits on the amount of pollutants that can be discharged into waters of the State.

Point sources in the state hold one of four types of Wisconsin Pollution Discharge Elimination System (WPDES) Permits issued by the Wisconsin Department of Natural Resources (WDNR):

- Individual: A unique permit is issued for each discharger. Most municipal and industrial wastewater facilities have this type of permit.
- General Permit: A single permit that covers a large number of similar dischargers. Larger communities in the Lower Fox River operate under a Municipal Separate Storm Sewer System (MS4) Permit and are regulated under this general permit. General permits are also issued to construction sites greater than 1 acre in size.
- Agricultural: State and federal laws require that Concentrated Animal Feeding Operations (CAFO) have water quality protection permits. A farm is considered a CAFO if it has 1,000 animal units or more. Smaller animal feeding operations may be designated as a CAFO by the WDNR if the farm discharges pollutants to navigable waters or groundwater. A minority of farms in the Lower Fox River ([currently 24](#)) operate under these permits which require zero discharge from the facility's production area. These WPDES permits do not extend to nutrient or sediment runoff from the farm's cropland.

Point source entities are charged with meeting reduction goals as outlined in the TMDL through their permit process. The majority of point sources in the Lower Fox River are achieving reductions through facility upgrades, but [adaptive management, water quality trading](#), and [multi-discharger variance programs](#) are facilitated through the WDNR to allow entities to meet permit requirements through a variety of options.

## NON-POINT SOURCE POLLUTION

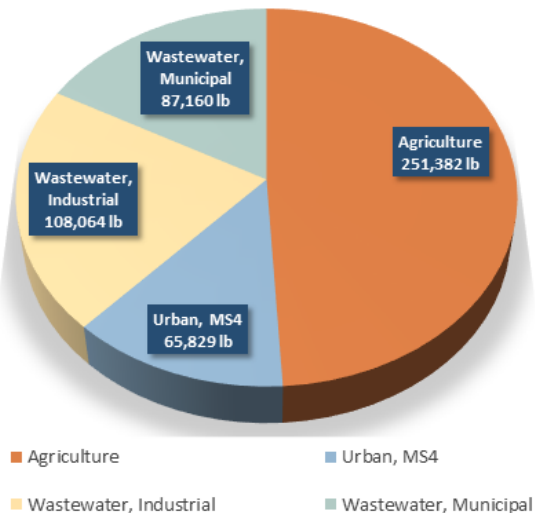
The WDNR describes non-point source (NPS) pollution, also known as polluted runoff, as "a leading cause of water quality problems in Wisconsin. Polluted runoff is caused when rainfall or snowmelt moves across and through the ground, picking up natural and human-made pollutants, and depositing them into rivers, lakes, wetlands and groundwater. Pollutants include fertilizers, nutrients, oil, grease, sediment and bacteria from agricultural, urban and residential areas. [Source: [TMDL](#)]."

Non-point pollution sources can include:

- **Agricultural:** Sediment and nutrient pollution from runoff across phosphorus-rich agricultural soil is exacerbated by poorly located or managed animal feeding operations, over or mistimed application of manure and/or fertilizer, or frequent tilling that leaves soil unprotected.
- **Urban Areas (non-permitted):** Urbanization increases the variety and amount of pollutants carried into our waters because in urban and suburban areas, much of the land surface is covered by buildings, pavement, and compacted landscapes. These surfaces are impermeable, meaning they do not allow rain and snowmelt to soak into the ground and instead run off those surfaces which greatly increases the volume and velocity of stormwater runoff. Many smaller communities in the Lower Fox River, generally those with a population less than 10,000, do not meet the requirements for a MS4 permit and therefore fall into the Urban, Non-Regulated category of the TMDL.
- **Forests & Wetland/Riparian Areas:** Natural levels of phosphorus in undeveloped land including forests and wetlands are much lower than in cultivated soils, but these areas do contribute a small percent of pollution loading through runoff and are combined into the Natural Background category in the TMDL.

As nonpoint sources, agricultural, non-permitted urban areas and forests and wetland/riparian areas are not required to meet the reductions outlined in the TMDL through permits, other mechanisms and practices exist to reduce nonpoint source loading from these areas. Annual practices, sometimes called “soft practices,” consist of agricultural management techniques that minimize the disturbance to soil and keep organic matter and root systems intact year round. Structural practices are designed practices that restore natural hydrology, store water, and repair natural systems such as streambanks and wetlands.

Reductions Needed to Meet Water Quality Criteria [Source: [TMDL](#)]



Total Reductions Needed by Source	Baseline (lbs/year)
Agricultural	196,748
Urban, Non-Regulated	0
Urban, MS4	21,059
Wastewater, Industrial	65,737
Wastewater, Municipal	41,858
Natural Background	0
Construction	0
General Permit	0
<b>Lower Fox River Recovery Area Totals</b>	<b>325,402</b>



## THINKING BEYOND THE TMDL - THE KEEPERS OF THE FOX WATERSHED RECOVERY EFFORT

While TMDLs determine reduction goals to achieve water quality objectives, they are not a silver bullet for achieving water quality. TMDLs exist in watersheds throughout the country and have been implemented with varying degrees of success despite significant investment from state and federal agencies. By design, TMDLs provide reduction goals outside of the context of broader watershed goals and do not include strategies to encourage adoption of voluntary practices or generate the necessary technical or financial resources needed to meet the water goals set forth in the TMDL itself.

Implementation of agricultural conservation practices has been underway in the Lower Fox River since 2013. Partners across the WDNR, Outagamie, Brown, Calumet and Winnebago County Conservation Departments, Wisconsin Department of Agriculture, Trade, and Consumer Protection, NRCS, UW-Madison Division of Extension, Fox-Wolf Watershed Alliance and numerous additional local and regional conservation organizations developed an implementation strategy that included cross boundary, watershed wide work. Targeting the highest loading subwatersheds first, conservation practices have been installed across the watershed and progress is being made. Despite this dedicated work by invested stakeholders, efforts have not been at the scale or pace necessary to meet watershed recovery goals. *Lack of funding, limited technical capacity to implement practices on the landscape, a lack of regulatory framework for nonpoint contributors, and absence of a mechanism to show basin-wide progress are barriers to recovery.*

With established partnerships and local buy in, the Lower Fox River watershed is uniquely positioned to address the challenge of achieving nonpoint agricultural reductions through innovative approaches to funding, policy, data collection and analysis, and shared decision making. Local conservation partners, elected officials, business leaders, community organizations, and environmental groups are all motivated to improve water quality and realize the many benefits to the environment, economy, and quality of life that can result. County conservation department staff, the Natural Resource Conservation Service's (NRCS) Demonstration Farm Network, and outreach to landowners through the Fox-Wolf Watershed Alliance (Fox-Wolf) have generated relationships with local conservation-minded agricultural producers and created a farmer education network which shares information, lessons learned, and successes with conservation practices to encourage new adopters of best management practices.

Seeing this opportunity, in 2020, a partnership formed between the WDNR's Office of Great Waters, Fox-Wolf Watershed Alliance, and the Alliance for the Great Lakes to work with basin partners to develop a water quality management plan that takes the

information and water quality targets from the TMDL and generates a process and structure for meeting those goals across all pollution sources in a realistic timeframe. The watershed recovery program, coined Keepers of the Fox, engaged a broad coalition of watershed stakeholders to evaluate funding and policy initiatives needed to accelerate the pace and scale of implementation, establish a shared decision-making structure to guide the long term progress of the recovery effort, and identify annual and long-term shared biological, ecological, and economic metrics to tell the story of the watershed's recovery over time.

## HOW IS THIS WATERSHED RECOVERY PLAN DIFFERENT?

This effort does not replace the existing TMDL implementation strategy; rather, it leverages a decade of action, builds upon successes and incorporates new knowledge. While the TMDL created a subwatershed framework for reduction targets, this recovery plan:

- Develops a strategy for the paired use of annual and structural best management practices to achieve reduction goals across a landscape
- Recognizes the financial need required over time to meet the TMDLs pollution reduction goals and attempts to quantify where investments should be made
- Creates a structure for long-term implementation guidance including a decision making structure to facilitate determining where new investments can best be most effectively and efficiently used to make the biggest impact
- Incorporates input from a variety of stakeholders including local businesses, municipalities, conservation groups, and residents who may not have been part of the TMDL development and targeted watershed planning processes
- Creates a standardized mechanism to quantify and report progress on the land and in the water through consistent data collection and implementation across the many partners in the basin
- Actively works to engage elected officials and residents to build support for continued efforts
- Identifies the need to use and mechanisms to track socioeconomic metrics as indicators of water quality improvement, community engagement and the benefits of water quality improvement to local economies

This watershed recovery plan will go beyond *what* needs to be done to meet water quality targets to document *how* partners can work together to make it happen. It provides a 20-year roadmap for achieving our regional water quality goals while also supporting ecosystem, economic, and social resilience for those who act, drive, and support implementation to improve the quality of life for those who live, work, and play in the Lower Fox River Basin.



## VISION AND ANTICIPATED OUTCOMES

The land and water of the Lower Fox River are treasured resources that provide value to our community and are deserving of active, watershed-scale restoration, coordinated management, and ongoing protection for generations to come.

Through the continued, cooperative work laid out in this Lower Fox River Recovery Plan, the plan will provide value in the following ways and achieve the following outcomes:

- Healthy tributaries, streams, rivers, and bay that draw residents and visitors alike for the recreational, quality of life, ecosystem, and economic benefits they provide
- Community support for and ownership in water quality and investments in the stewardship and protection of the basin for future generations
- A clear path to continue watershed recovery efforts that include achievement of milestones and mechanisms for adaptive management when goals are off track
- Systems to collect and react to data metrics and communication tools to translate these data to meaningful pieces of information for the non-scientific audience
- A funding portfolio with the potential to reach the financial need for achieving water quality goals that includes investments from a diverse group of funders, opportunities to seek new avenues of support, and policy optimization
- A structured framework for shared decision making that prioritizes the health of the watershed as a whole and garners support from a broad range of stakeholders
- A successful model for cooperative, watershed scale work that can be applied to other regions of the state for their addressing water quality concerns

## ORGANIZATION OF THE RECOVERY PLAN

The Lower Fox River Watershed Recovery Plan (Recovery Plan) consists a collection of Technical Documents that detail the playbook of how *implementers* will work together to achieve water quality goals. Specific recommendations are laid out in four key Technical Documents : Implementation Action Plan, Funding Strategy for Watershed Recovery, Shared Measurement for Tracking Progress & Reporting Success, and Shared Decision Making. Each area provides a roadmap of how to achieve progress toward time-bound goals that include responsible parties, action steps, timeline, and anticipated impact.

## IMPLEMENTATION ACTION PLAN

The Implementation Action Plan charts a course for watershed scale implementation by setting time stamped goals, engaging the public in recovery, setting per acre reduction goals, and assigning a target for streambank erosion apart from agricultural reductions.

The Implementation Action Plan also provides a strategy to stack annual and structural practices to meet reduction goals.

### **FUNDING STRATEGY FOR WATERSHED RECOVERY**

The Funding Strategy for Watershed Recovery builds on the Implementation Action Plan by developing a strategy to achieve the financial support to realize implementation goals by 2040. A breakdown of anticipated investments by current funding partners is detailed along with opportunities to generate additional funding through new, novel, or innovative sources.

### **SHARED MEASUREMENT FOR TRACKING PROGRESS & REPORTING SUCCESS**

Shared Measurement lays out a mechanism to gather and report key implementation, water quality and response, organism, and socioeconomic data collected from across the watershed. An dual reporting structure divides metrics into annual and five year reports that can be scaled up from municipal to subwatershed to basin to meet the needs of conservation and non-conservation audiences.

### **SHARED DECISION MAKING**

A system of guidance for watershed-scale water quality recovery in the long term is key to meaningful change. The Keepers of the Fox Council, a diverse stakeholder group who will serve as a steering committee for the Recovery Plan, provides a mechanism for shared decision making in implementation, data collection, analysis and reporting, and community engagement.

### **FUTURE WORK**

Future work will create products independent of the Technical Documents that provide a high level overview of what implementation partners are collectively advancing to achieve water quality goals, delivers a call to action to *landowners, business and industry, and residents*, and offers an opportunity for implementers to communicate a snapshot of the recovery actions to *funders, community leaders, and change advocates*. The support of these audiences is key in building support for long term progress in implementation.

Beyond the specific vision and outcomes of the Recovery Plan, an important correlation exists between water quality improvements and a variety of collateral benefits. These collateral benefits are not only important for what they provide for the communities of the Lower fox River, they are meaningful processes by which non-conservation audiences can connect with the work of the Recovery Plan. The implementation of best management practices to improve water quality provide additional long term benefits including, but not limited to:

- *Fish & Wildlife Habitat (Ecosystem Benefits)*  
Through land development, natural fish and wildlife habitat has been lost or degraded. Wetland creation and streambank restoration practices coupled with reduced sediment and nutrients in waterbodies create environments that allow fish and wildlife to flourish.
- *Risk Management (Flood Mitigation, Climate Adaptation)*  
Changing land use has significantly reduced the extent of wetlands in the LFR which diminishes water storage in the basin. Urbanization also increases surface runoff volumes from impermeable areas. Eliminating places for precipitation, snowmelt, and runoff to collect and infiltrate, coupled with the frequency of heavy rainfall events has created a hydrologic system prone to flooding and soil erosion. By reestablishing water storage capacity in the basin, the quantity and velocity of water is reduced, benefitting flood-prone areas and keeping valuable topsoil in place.
- *Climate Mitigation (Carbon Sequestration, Energy Generation)*  
Regenerative agriculture practices including improved manure management and soil health practices on dairy farms can significantly lower the greenhouse gas contribution from dairy herds, reducing their climate impacts while keeping soil and waterways healthy. Soil health practices such as use of no-till and cover crops have the potential to sequester carbon in the soil, while the process of anaerobic digestion can generate and capture the biogas from manure. As these practices and technologies continue to develop and market's for the sale of carbon credits from agriculture are standardized, producers utilizing these practices will have opportunities for additional income streams while also benefiting water quality.
- *Local Economies (Recreation, Tourism, Employee Recruitment)*  
Watershed restoration provides greater recreational boating, sailing, fishing, water sports and canoeing opportunities, increases tourism for revitalized waterfront businesses, and can be used as a draw for local businesses looking to recruit top tier talent to their organizations. Economic modeling funded by the Great Lakes Restoration Initiative suggests that every \$1 of spending on restoration projects produces at least \$3.35 in additional economic activity. [\[source: GLRI\]](#) Nearly half of this anticipated increase benefits the tourism economy.
- *Social Wellbeing (Sense of Place, Quality of Life)*  
The benefits of clean, healthy water resources to local communities and its citizens' sense of wellbeing cannot be understated. In the Lower Fox River watershed, water-based and water-adjacent recreation such as hiking and walking trails, fishing, boating, hunting, kayaking are intrinsic parts of the area's lifestyle and highly valued by residents and visitors alike. Waterfront

developments including residences, shopping, and dining have prospered and serve a community who is enthusiastic about water access.

- *Sustainable Food Systems (Soil Health, Ag Business Success)*

As a center of dairy production, regional adoption of best management practices that are economically and environmentally advantageous benefit both water quality and promote a sustainable food system. As agricultural commodity processors and supply chains move toward integrating climate friendly practices into their business models, adopting conservation farming practices is likely to become a requirement to do business.

This plan will be iterative and will be evaluated, revised, and adapted as new funding sources are available, new conservation technologies are developed, and implementation nears water quality targets. It is our hope that the meaningful, collaborative work in the Lower Fox River will not only provide water quality benefits to our local communities, but the Recovery Plan will be a success that can be adapted and implemented in other TMDL areas.