

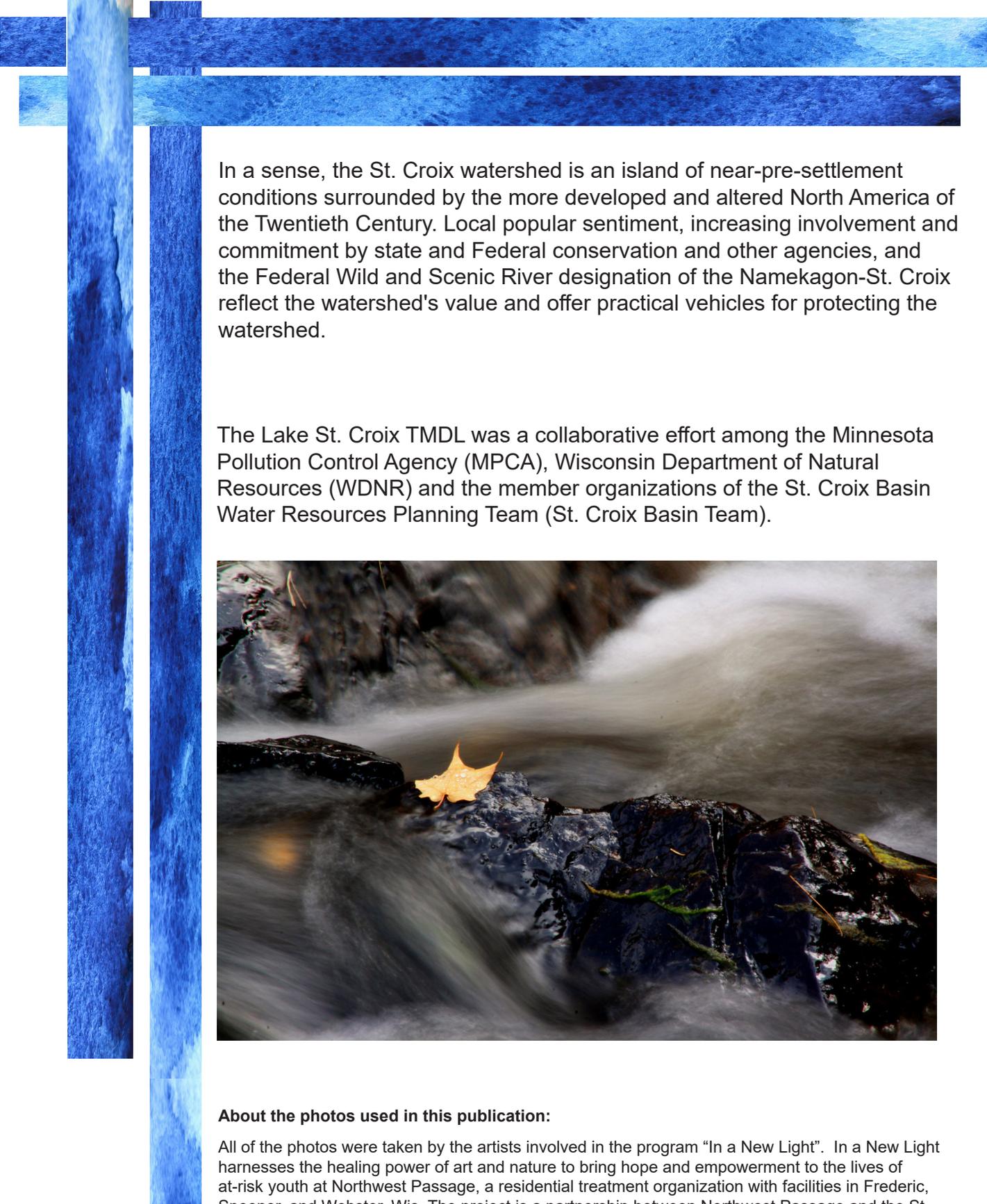
Progress Report

Lake St. Croix
Total Daily Maximum Load



2016

June 2018



In a sense, the St. Croix watershed is an island of near-pre-settlement conditions surrounded by the more developed and altered North America of the Twentieth Century. Local popular sentiment, increasing involvement and commitment by state and Federal conservation and other agencies, and the Federal Wild and Scenic River designation of the Namekagon-St. Croix reflect the watershed's value and offer practical vehicles for protecting the watershed.

The Lake St. Croix TMDL was a collaborative effort among the Minnesota Pollution Control Agency (MPCA), Wisconsin Department of Natural Resources (WDNR) and the member organizations of the St. Croix Basin Water Resources Planning Team (St. Croix Basin Team).



About the photos used in this publication:

All of the photos were taken by the artists involved in the program "In a New Light". In a New Light harnesses the healing power of art and nature to bring hope and empowerment to the lives of at-risk youth at Northwest Passage, a residential treatment organization with facilities in Frederic, Spooner, and Webster, Wis. The project is a partnership between Northwest Passage and the St. Croix National Scenic Riverway, a unit of the National Park System, and was funded through an "America's Best Idea" grant from the National Park Foundation. To learn more about this inspiring program and see more photos visit <http://nwpltd.org/inanewlight/>

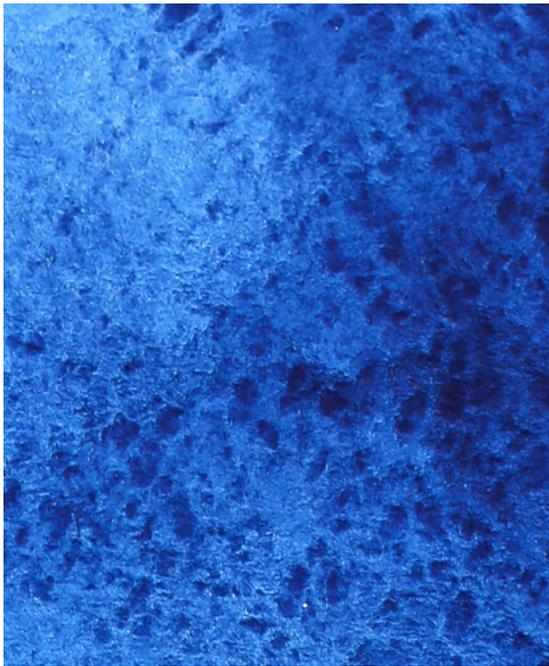


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St. Croix River Basin

The St. Croix River begins near Solon Springs, WI flowing west & south more than 160 miles until joining the Mississippi.

The basin is **7,760 square miles** - 44% in MN and 56% in WI

St. Croix Basin Land Use

56% Forest

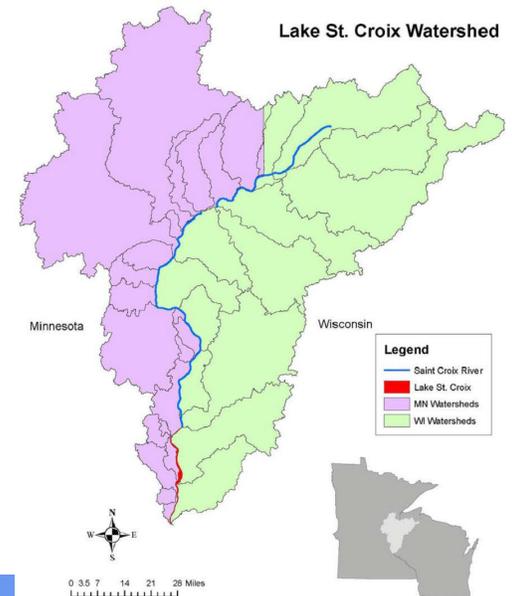
17% Grassland

16% Agricultural

9% Water

1% Shrubland

1% Urban



Years of **excess** inputs **phosphorus** cause algae blooms that diminish the health of Lake St. Croix.

No longer meeting state water quality standards it was placed on the impaired waters list in 2008.

The maximum allowable pollutant quantity or Total Maximum Daily Load (TMDL) was calculated.

123 ton/yr reduction

is needed to meet a phosphorus water quality standard of 40 $\mu\text{g/L}$



Protecting the St. Croix



Overview

This is the second progress report on phosphorus reduction activities in the St. Croix Basin by partners in Wisconsin and Minnesota since US EPA approval of the Lake St. Croix Total Maximum Daily Load in 2012 and the subsequent Implementation Plan approval in 2015. Although this report is required as part of EPA's approval of the Implementation Plan, it is also a good way for all partners involved to track our progress and learn from each other as we work to protect the water quality and habitat of the excellent water resources that comprise the St. Croix Basin.

This document reports accomplishments mainly from survey responses from the county and local partners on Best Management Practices (hereafter BMPs) and educational efforts. It is very likely that many more projects were completed by a myriad of partners and individuals than what is reported herein. Our continued challenge is to secure uniform quantification methods and a basin-wide tracking system for more complete and accurate future reports.

As with the 2015 report there continues to be a wide range of activities undertaken to lower the phosphorus discharged in the basin and improve the health of all waters and the St. Croix in

particular. These included:

- forestry practices and education
- agricultural practices including grassed waterways, gully erosion correction, soil health and tillage practice improvements, manure storage correction, and nutrient management
- lake management planning, carp barriers, shoreland buffer and habitat restoration
- rural and urban stormwater practices including raingardens, infiltration strips, and larger scale MS4 projects
- land protection, native plantings, and prairie restoration
- wastewater treatment plant upgrades and phosphorus limits implemented in discharge permits
- educational efforts in all of the categories above

The St. Croix River has a **long human history**, from the early Native American and fur trading days to the logging boom and then the tourism heyday. It is also **rich in plant and animal life**, including many rare species of freshwater mussels, whose populations are declining precipitously in other parts of the world.

For background information please read the 2015 Progress Report. Visit <https://www.pca.state.mn.us/water/tmdl/lake-st-croix-excess-nutrients-tmdl-project> or search for the key words MPCA 2015 Lake St Croix Progress Report.

Summary of Management Practices and Activities

County	State	Estimated Phosphorus Reduction (lbs)	Investment	Shoreline/ Riparian	Education Attendance	Agricultural Acres	Forestry	Urban/ Residential
Aitkin	MN	No projects identified for 2016						
Anoka	MN	752	\$496,000	4 carp barriers	Newsletter	X	X	X
Barron	WI	No projects identified for 2016						
Bayfield	WI	No projects identified for 2016						
Burnett	WI	1,268	\$195,000;	18 install	190	1,833	X	X
Carlton	MN	60 tons +	\$45,000	227 ft 1,532 sq ft	Training	X	6 education	13,776 sq ft
Chisago	MN	10	1 FTE	5 install	200+	X	X	X
Douglas	WI	No projects identified for 2016						
Isanti	MN	No projects identified for 2016						
Kanabec	MN	No projects identified for 2016						
Mille Lacs	MN	No projects identified for 2016						
Pierce	WI	1,290.2	\$31,815 0.25 FTE	X	Farmer-Led Council	499.7	X	X
Pine	MN	No projects identified for 2016						
Polk	WI	14,460	\$621,000	23 install	Farmer-Led Council	13,888	X	X
Ramsey	MN	No projects identified for 2016						
St. Croix	WI	3260	2952 hours	52.39 acres	Farmer-Led Council	4,746 acres 23,375 ft	X	Permits
Sawyer	WI	No projects identified for 2016						
Washburn	WI	?		0.05 acres	132	X	X	X
Washington	MN	466		?	?	?	?	?
E-Link	MN	10560	For 2003 - 2015 See page 22 for more information.					

Basin-wide Partnership Initiatives

St. Croix Basin Water Resources Planning Team (Basin Team)

The St. Croix Basin Team unites the efforts of partners in both states to protect the water quality and habitat of the St. Croix. The team meets quarterly to coordinate protection efforts. Shortly after the team was formed in 1993, it named nutrient inputs to the basin as the number one threat to water quality, and has spearheaded development of the TMDL and Implementation Plan.

The St. Croix Basin Water Resources Planning Team Implementation Committee (formerly the Nutrient Subcommittee) was formed in 2006 to carry out the work outlined in the MPCA-WDNR Nutrient Reduction Agreement. The team (led by Buzz Sorege of Wisconsin DNR) met several times in 2016 to highlight implementation projects underway, revise the team's strategic plan (<https://www.pca.state.mn.us/sites/default/files/wq-b6-16.pdf>), provide input on a State of the Lake Report and an updated SWAT model for the entire basin. UW-Extension is producing a brochure on the findings of the SWAT model, but written with a citizen focus.

The Basin Team's Monitoring and Assessment Committee meets regularly, reviewing monitoring underway by each partner agency, and identifying further efforts needed to track progress

with the phosphorus reduction goal and other initiatives. A Basin Team Monitoring Plan was compiled in 2006 and updated every few years as needed.

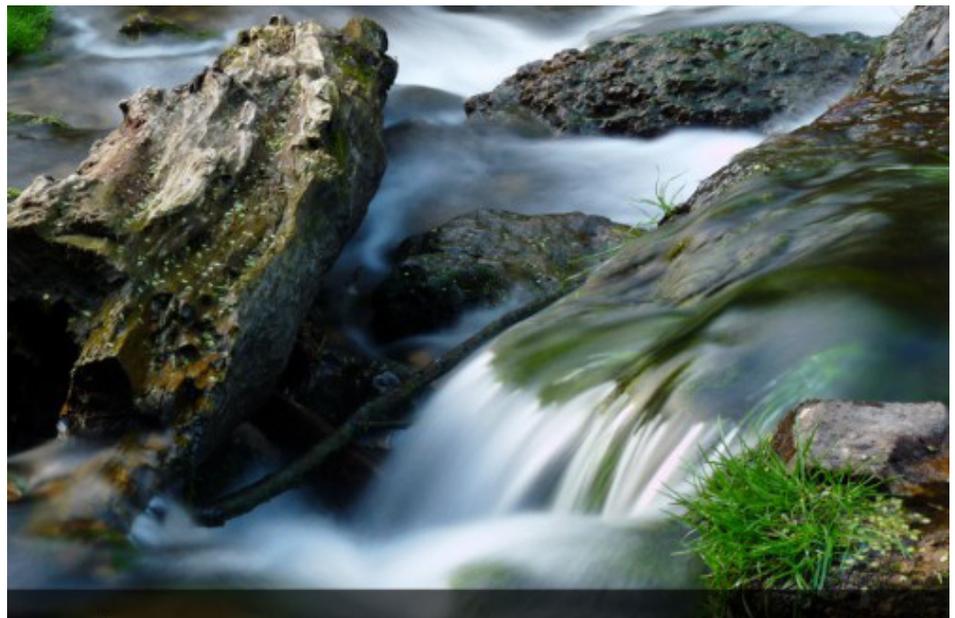
2016 St Croix Basin Conference

On March 22 and 23, 2016 the 17th annual "Protecting the St. Croix" conference, now called labeled as the 'St. Croix Summit' was held at the University of Wisconsin of River Falls. There were around 120 people in attendance over the two-day session. Presentations on soil health, cover crops, and conservation tillage practices were well attended by UW-River Falls agriculture students and agency staff and partners (many of whom appreciated gaining a better understanding of farming practices).

The conference is sponsored by the St. Croix River Association and the member organizations of the Basin Team.

United States Geological Survey (USGS)

USGS Staff are developing a model for Lake St. Croix and continuing monitoring in the lake. USGS also operates stream gages on the mainstem of the St. Croix and major tributaries with funding from the Metropolitan



Resiliency in Action: Communities & Resources
2016 ST CROIX SUMMIT
March 22-23, 2016

Council and the Stillwater Bridge Mitigation fund. The stream gages are used to calculate nutrient loads entering and leaving Lake St. Croix, which is one means of monitoring the effectiveness of implemented practices to reduce nutrient loading into Lake St. Croix.

St. Croix Watershed Research Station – Science Museum of Minnesota

With direction from the Basin Team, staff members of the St. Croix Watershed Research Station of the Science Museum of Minnesota are working on two projects that will further inform the Basin Team’s efforts in nutrient control: a Soil and Water Assessment Tool (SWAT) model evaluating basin-wide land cover scenarios and a “State of the Basin” report

summarizing assessment of recent water quality data from Lake St. Croix.

Yields of nonpoint source pollutants (annual loads per unit area, or kg/ha/yr) were extracted from the St. Croix SWAT model at the subbasin scale to show spatially the net results of the source and transport factors acting within subbasins across the St. Croix basin. For each of the 419 subbasins in the model, Figure 1 shows the average annual yield of total phosphorus over the 2000-07 period. These yields represent the net delivery of total phosphorus from the landscape to the stream network, beginning with the mobilization of phosphorus in the uplands (source factors) and following the movement of that phosphorus from the uplands to the stream channel (transport factors). Source factors include the type of land

Figure 1 - SWAT Model Yields of Total Phosphorus

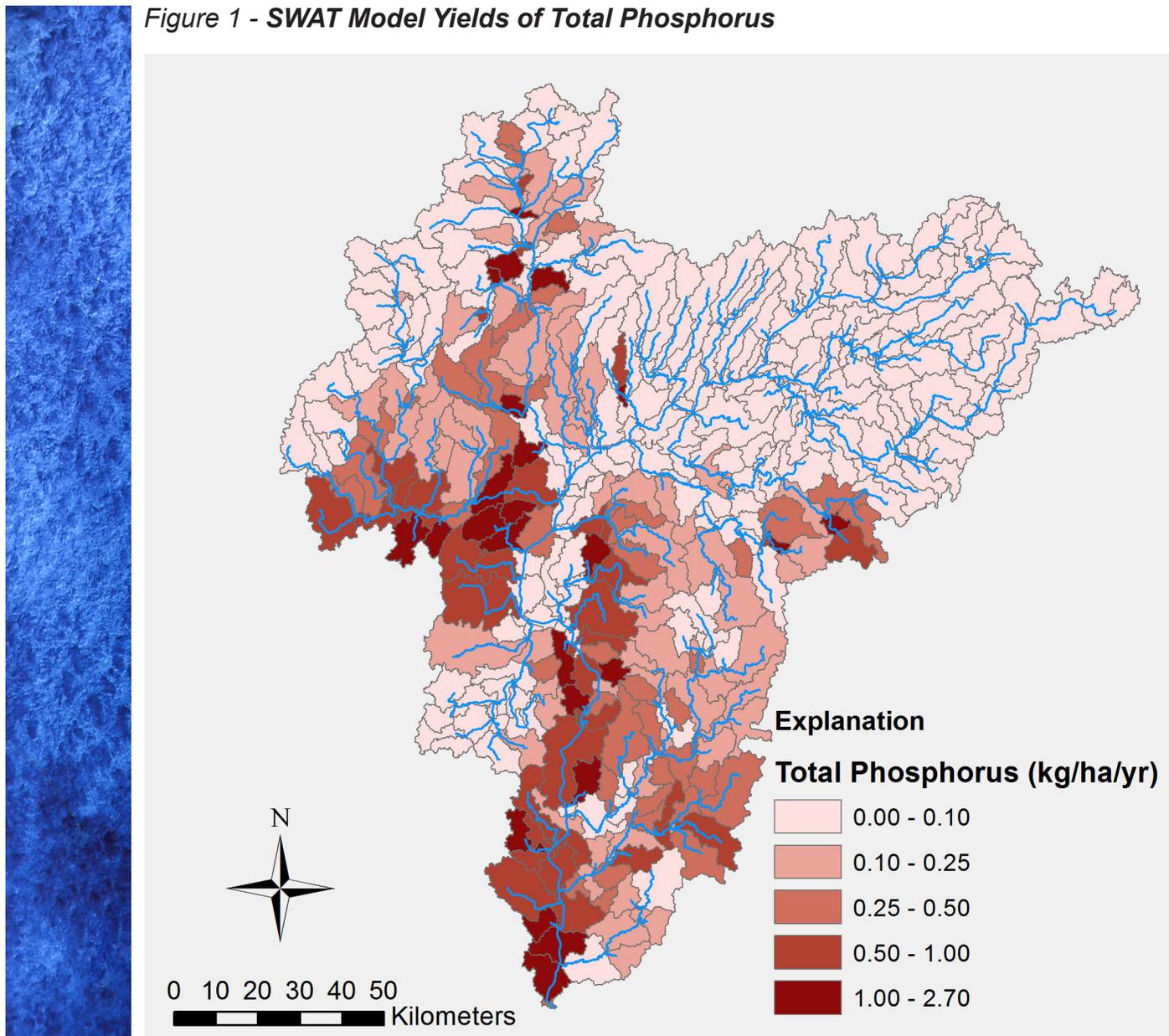
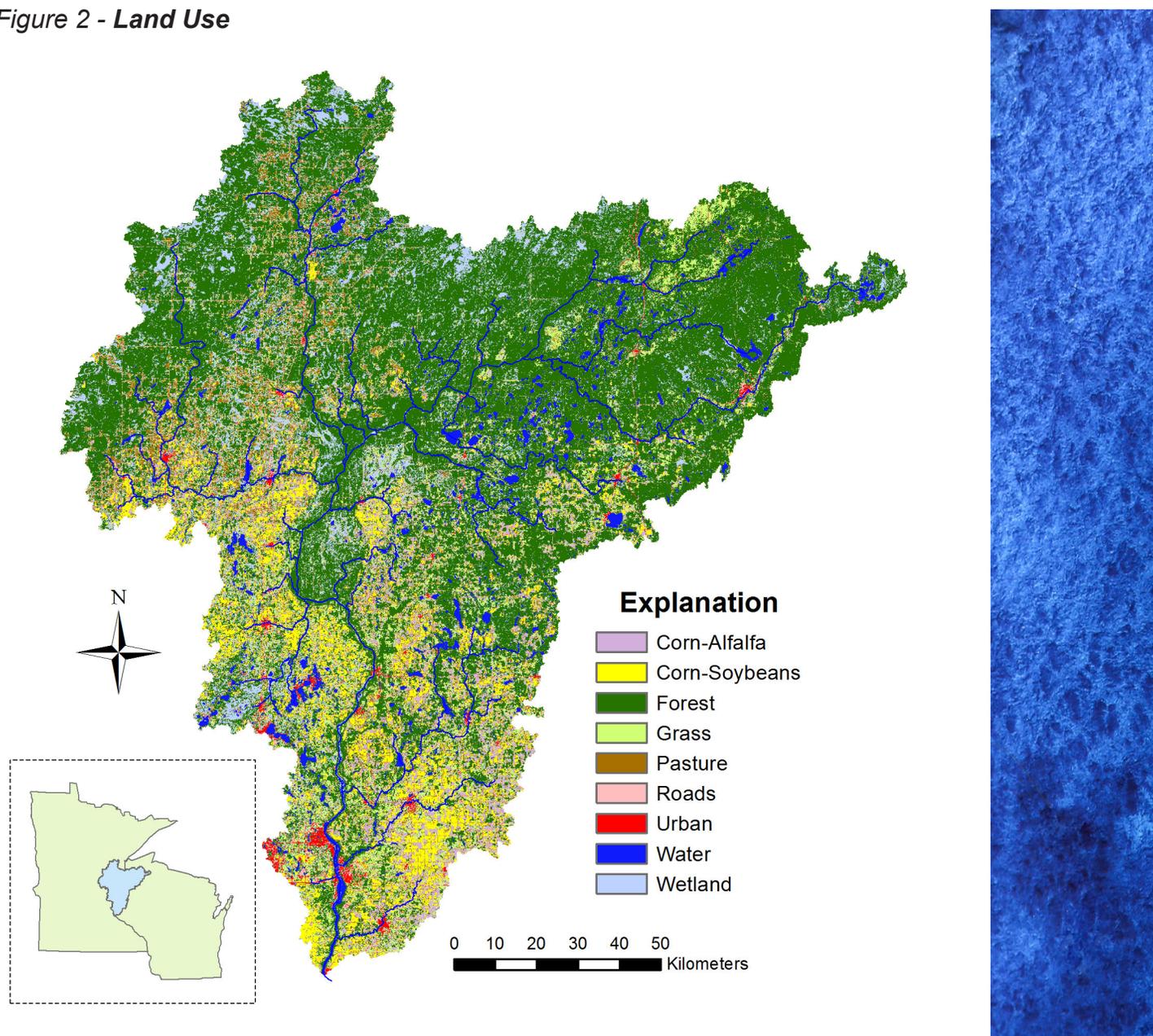


Figure 2 - Land Use



use (fields, cities, grassland, forests, etc.) as well as soil type and slope. Transport factors include overland flow paths and routing of runoff through wetlands that may trap some of the phosphorus. This map can help guide implementation efforts by locating “hot spots” of sediment and nutrient sources and delivery. Because both source and delivery are considered, such maps should be superior to those based on source (land use) alone, where export coefficients are used to translate land use into area-weighted yields and annual loads. When compared to the land-use map (Figure 2), Figure 1 shows that the largest yields phosphorus correspond to those parts of the basin with the most agriculture and

urbanization, and with the least wetland area.

Wisconsin Farmer-Led Councils

The Farmer-Led Watershed Council program was developed by the University of Wisconsin Extension and Wisconsin DNR to improve water quality in the Red Cedar and St. Croix River basins through reduced phosphorus and sediment loading while increasing farmer knowledge and leadership on water quality issues.

In 2016 there are three Farmer-Led Watershed Councils (FLWCs) in the St. Croix River basin: the Horse Creek Watershed (Polk County), the Dry Run Creek watershed (St. Croix County), and the South Kinnickinnic Watershed (Pierce County). To increase farm participation, they host field days and

conferences within their separate watersheds.

Natural Resource Conservation Service Projects

The Natural Resource Conservation Service (NRCS) provides funding and technical support to landowners and local conservation departments.

In Minnesota, 888 practices and in Wisconsin 1148 practices were installed in 2016 across the St. Croix Basin. The list of practices and map of project locations is included in Table 2 and Figures 3 and 4.

Minnesota Board of Water and Soil Resources and Local Watershed Organizations

Table 2 - NRCS practices for Wisconsin and Minnesota

NRCS Practice	WI	MN	NRCS Practice	WI	MN
Access Control	...	5	Residue and Tillage Management, Reduced Till	...	49
Access Road	4	...	Restoration of Rare or Declining Natural Communities	...	1
Brush Management	15	6	Riparian buffer, terrestrial and aquatic wildlife habitat	2	...
Conservation Cover	28	9	Riparian Forest Buffer	...	1
Conservation Crop Rotation	708	382	Roof Runoff Structure	1	1
Cover Crop	86	33	Roofs and Covers	1	...
Critical Area Planting	6	10	Seasonal High Tunnel System for Crops	2	2
Diversion	...	9	Sediment Basin	...	1
Early Successional Habitat Development/Management	...	15	Spoil Spreading	7	...
Fence	13	15	Stream Crossing	1	...
Forage and Biomass Planting	8	6	Subsurface Drain	...	1
Forest Management Plan - Written	4	3	Terrace	...	2
Forest Stand Improvement	4	...	Tree/Shrub Establishment	...	18
Grassed Waterway	7	2	Tree/Shrub Site Preparation	...	15
Heavy Use Area Protection	2	5	Underground Outlet	...	10
Herbaceous Weed Control	1	...	Upland Wildlife Habitat Management	8	112
High Tunnel System	2	...	Vegetated Treatment Area	...	2
Invasive Plant Species Control	...	1	Waste Facility Closure	2	3
Lined Waterway or Outlet	...	5	Waste Storage Facility	3	...
Livestock Pipeline	2	10	Waste Transfer	2	...
Mulching	5	12	Water and Sediment Control Basin	...	2
Nutrient Management	123	24	Water Well	...	1
Obstruction Removal	2	...	Watering Facility	6	8
Operational and Maintenance	...	2	Well Decommissioning	...	2
Plant an annual grass-type cover crop that will scavenge residual nitrogen	8	...	Wetland Restoration	...	2
Prescribed Grazing	35	49	Wetland Wildlife Habitat Management	2	1
Pumping Plant	2	2	Windbreak/Shelterbelt Establishment	...	2
Residue and Tillage Management, No-Till	46	47	Total Practices	1148	888

Figure 3 - Wisconsin NRCS St. Croix River Basin Applied Practices 2016

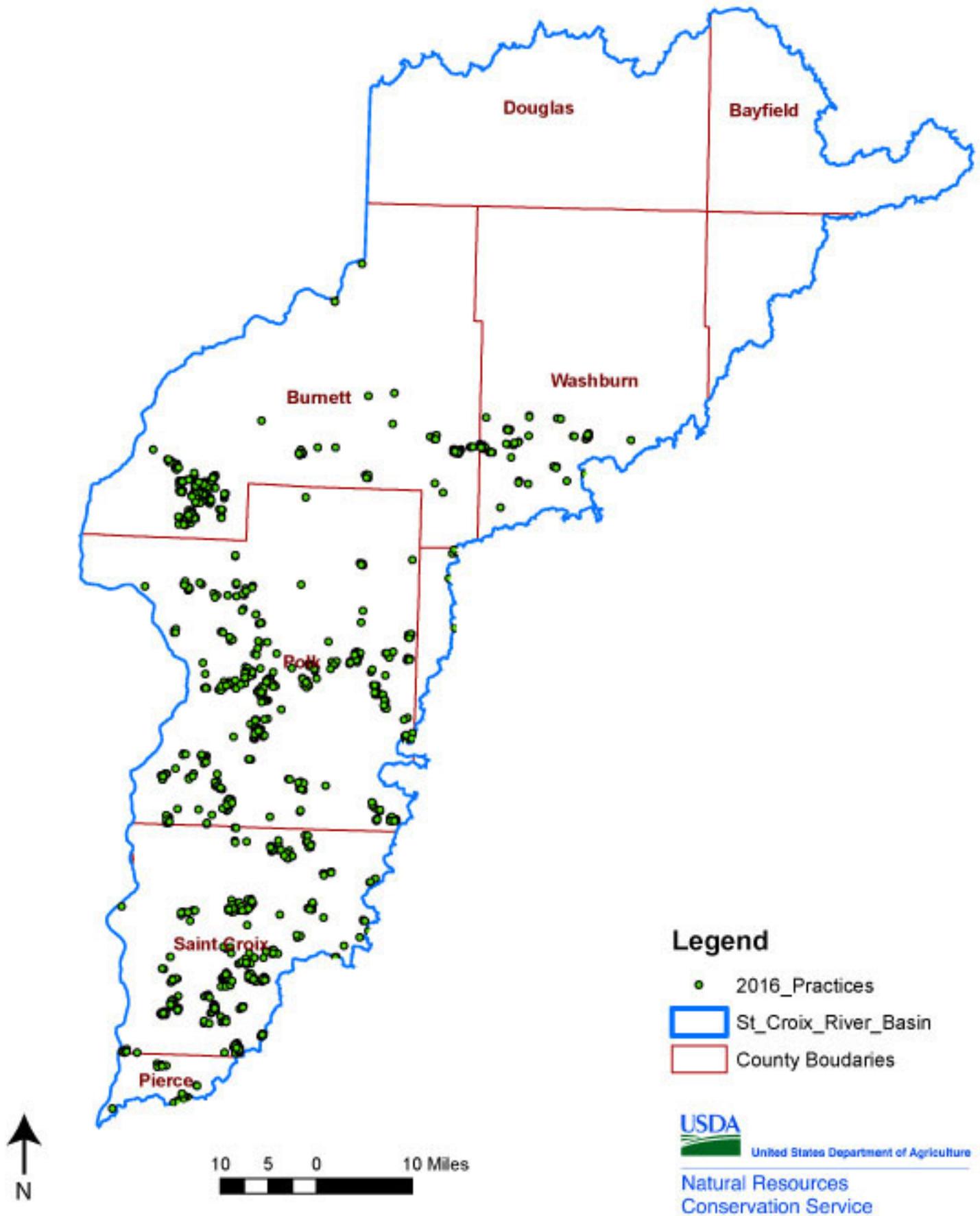
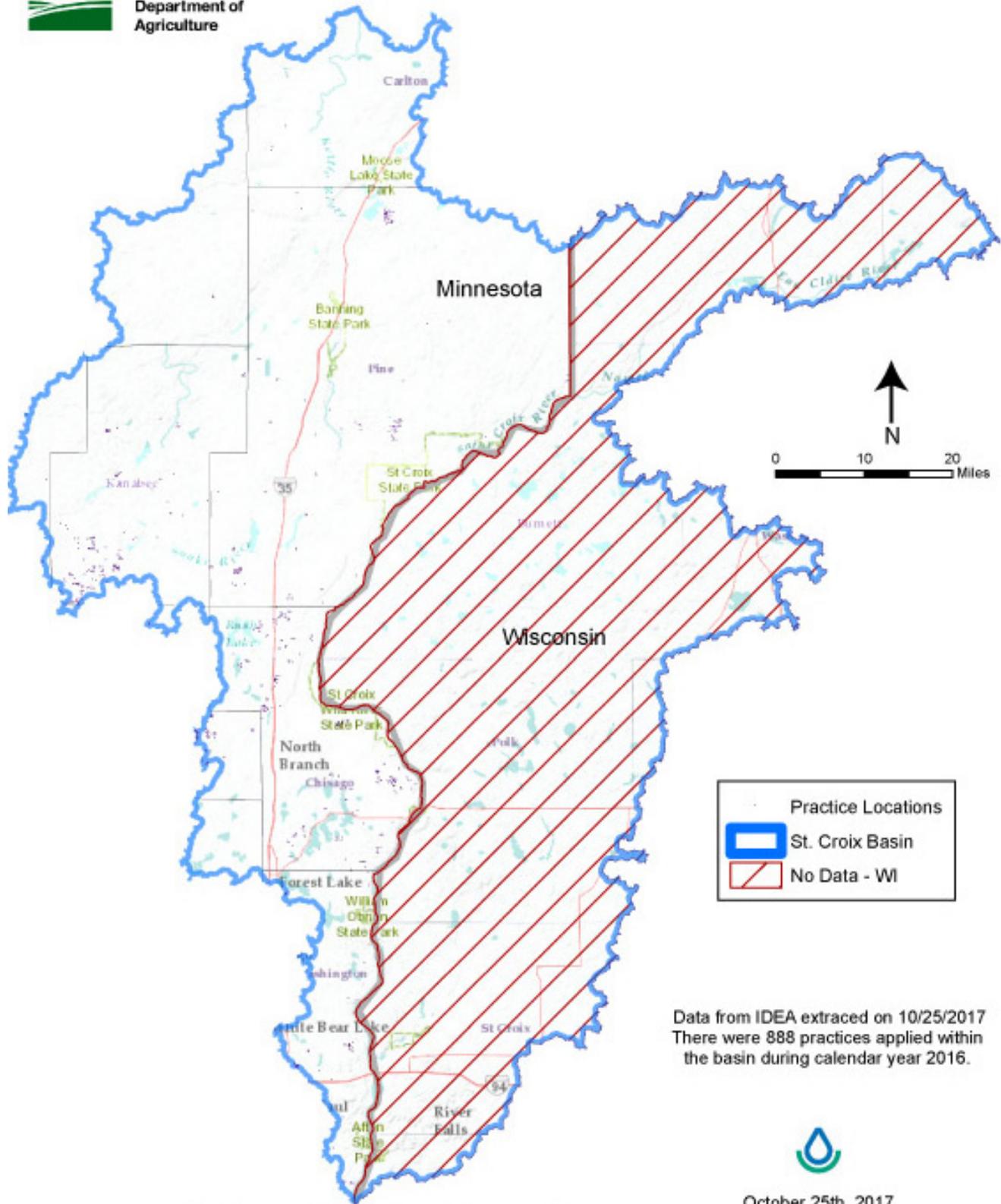


Figure 4 - Minnesota NRCS St. Croix River Basin Applied Practices 2016



USDA is an equal opportunity provider and employer.

The Minnesota Board of Water and Soil Resources (BWSR) was created in 1987, when the Legislature combined the Soil and Water Conservation Board with two other organizations with local government and natural resource ties: the Water Resources Board (established in 1955) and the Southern Minnesota Rivers Basin Council (established in 1971).

The Minnesota Board of Water and Soil Resources (BWSR) consist of 20 members, including local government representatives that deliver BWSR programs, state agencies, and citizens. The board sets a policy agenda designed to enhance service delivery though the use of local government. Board members, including the board chair, are appointed by the governor to four-year terms. Core functions include implementing the state's soil and water conservation policy, comprehensive local water management, and the Wetland Conservation Act as it relates to the 41.7 million acres of private land in Minnesota. BWSR tracks the conservation accomplishments (described below) of the many organizations under its umbrella.

In 2012, BWSR started development of a new web-based system to track statewide conservation projects (eLINK). With eLINK, BWSR, local government partners, and stakeholders in conservation can manage grants; and track conservation projects and grants, indicators and pollution reduction benefits, cumulative grant funding over a period of years; and map locations of projects on a statewide, or on a county, watershed, or individual-project basis.

Minnesota BWSR St. Croix River Pollutant Reduction reporting 2016

Figure 5 entitled "Minnesota St. Croix River Pollutant Reduction Reporting 2016" depicts the locations of BMP's reported to BWSR (through eLINK). The reported estimated pollutant reductions (by major watershed, for Phosphorus, Sediment and Nitrogen, due to the installation of those BMP's) are identified in the figure's table. The BMP projects identified in this table, as reported in eLINK, are from projects that received funding in the form of grants administrated primarily by BWSR. Reporting via eLINK is required via the grant agreement that each grant

recipient must enter into to receive funds.

There are also other BMP Projects that have been installed in Minnesota within the St. Croix River Basin by local cities, counties, SWCD's, watershed districts and watershed management organizations that were installed without BWSR administrated grant funds that are not included in the attached figure.

The map in Figure 5 and Table 3 shows the locations of St. Croix Basin phosphorus reduction activities tracked in eLINK, and quantified in the embedded table.

The St. Croix River valley is an area rich in geologic history. Sediments and rock formations throughout the valley range in geologic age from the 1-billion-year-old Precambrian lava flows at Interstate Park to very recent sediment deposition at the mouth of the Kinnickinnic River.

The most notable geologic feature along the St. Croix is the Dalles, a deep gorge cut by runoff from Glacial Lake Duluth into the ancient bedrock. Within the Interstate Parks are a series of potholes formed by glacial meltwater 10,000 years ago. More than 100 large glacial potholes mark the landscape in the parks. The only other place you can see this kind of pothole display is Switzerland. A number of potholes are at least 40 feet deep; the largest is 68 feet deep. Most of the potholes can be viewed from the top looking down; visitors can walk in and explore one of the potholes on foot.



Figure 5 - Minnesota St. Croix River Pollutant Reduction Reporting 2016

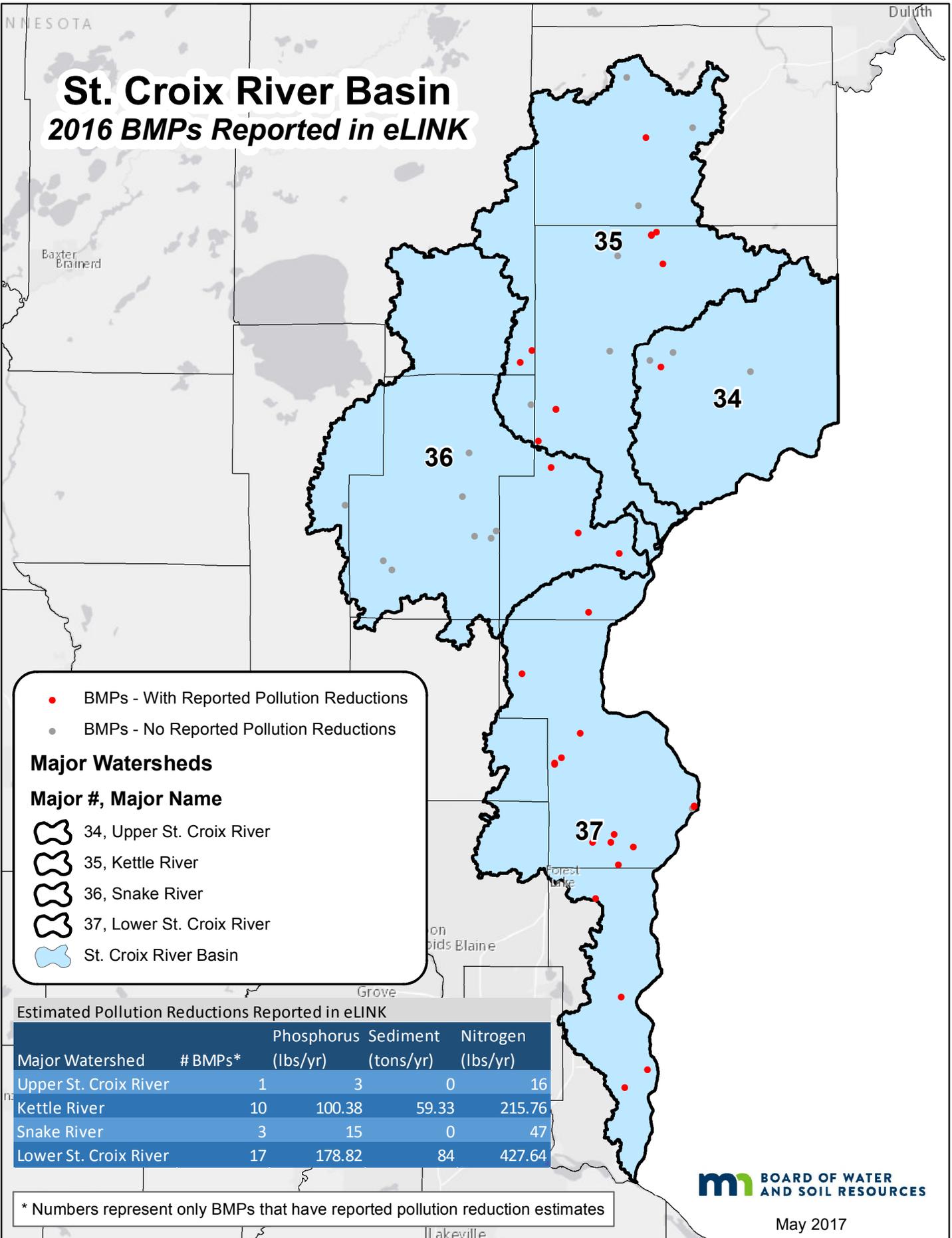


Table 3 - Locations of St. Croix Basin phosphorus reduction activities tracked in eLINK

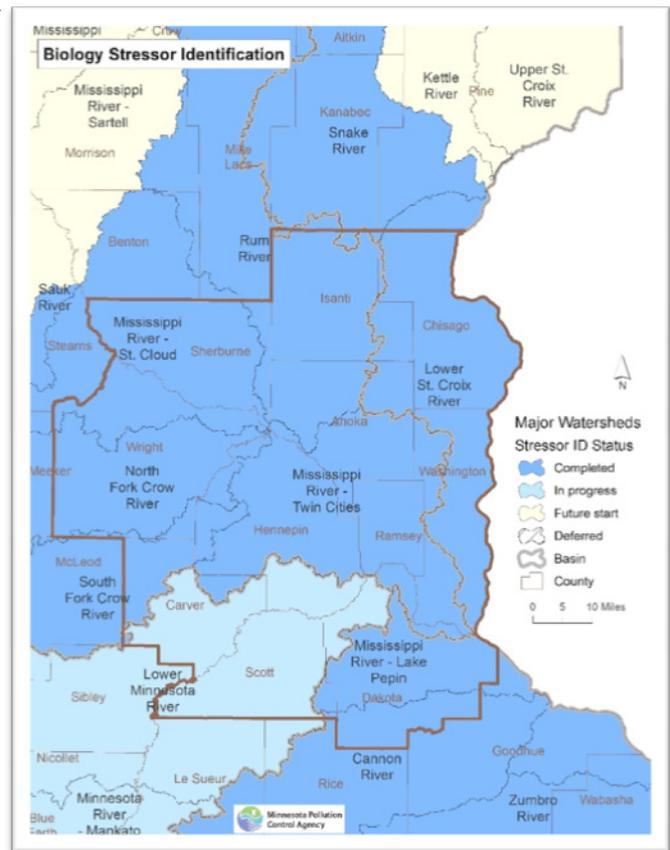
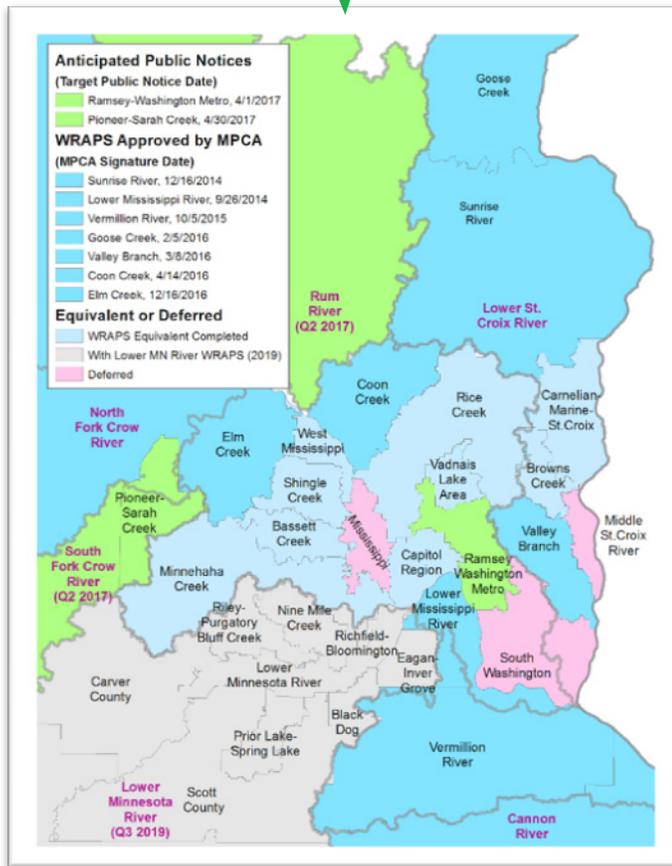
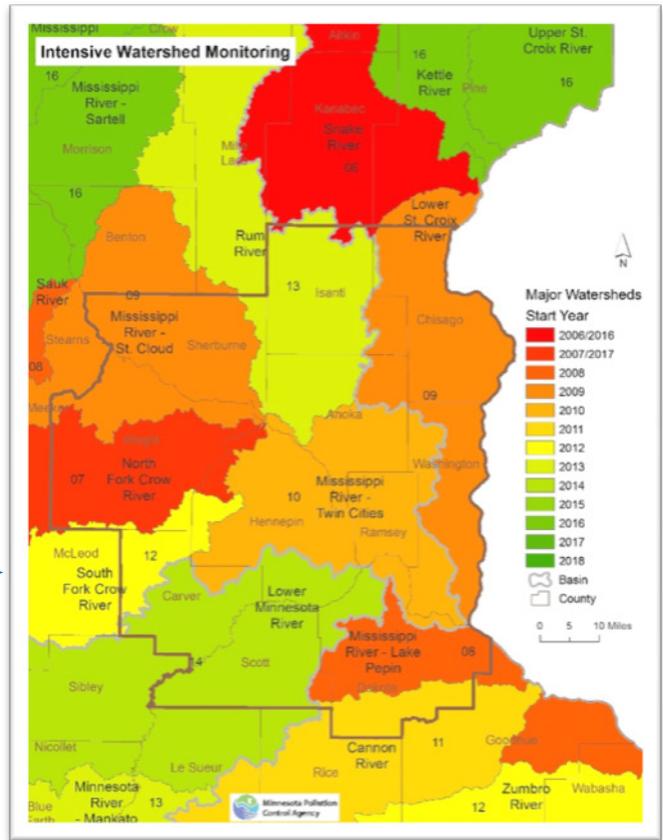
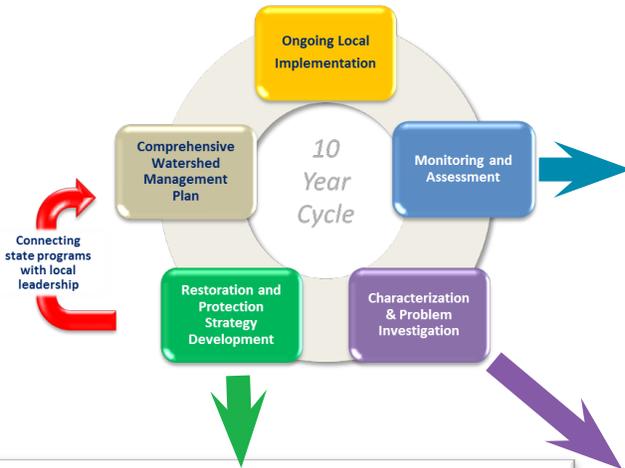
Organization	BMP Description	# practices installed	BMP Category	N total lbs	P total lbs	Prevention total lbs	Sediment total lbs	Soil Loss Reduction %	Major Watershed
Aitkin SWCD (SWCD)	342 - Critical Area Planting	2	Other Conservation Project	4.32	2.16	0.00	1.10	0.00	Kettle River
Carlton County (COUNTY)	126M - Septic System Improvement	2	Ground Water Quality	0.00	0.00	600.00	0.00	0.00	Kettle River
Chisago County (COUNTY)	126M - Septic System Improvement	6	Ground Water Quality	130.00	52.00	0.00	0.00	0.00	Lower St. Croix River
Chisago SWCD (SWCD)	468 - Lined Waterway or Outlet	2	Water Erosion	102.00	51.00	0.00	51.00	102.00	Lower St. Croix River
Kanabec SWCD (SWCD)	314 - Brush Management	3	Other Conservation Project	0.00	0.00	15.10	0.00	0.00	Snake River
	360 - Closure of Waste Impoundments	3	Feedlot Project	0.00	0.00	3,459.10	0.00	0.00	Snake River
	612 - Tree/Shrub Establishment	1	Wind Erosion	0.00	0.00	8.30	0.00	0.00	Kettle River
	614 - Watering Facility	1	Feedlot Project	0.00	0.00	0.00	0.00	1.00	Snake River
	643 - Restoration and Management of Declining Habitats	1	Other Conservation Project	0.00	0.00	11.30	0.00	0.00	Snake River
Pine County (COUNTY)	126M - Septic System Improvement	1	Ground Water Quality	60.00	28.00	0.00	0.00	0.00	Kettle River
Pine SWCD (SWCD)	580 - Streambank and Shoreline Protection	2	Water Erosion	12.08	6.04	0.00	5.25	12.81	Kettle River
Valley Branch WD (WSHED)	584 - Stream Channel Stabilization	1	Water Erosion	56.10	28.05	0.00	33.00	0.00	Lower St. Croix River
Washington County (COUNTY)	126M - Septic System Improvement	2	Ground Water Quality	20.00	11.00	0.00	0.00	0.00	Lower St. Croix River



Minnesota Pollution Control Agency

Status in East Central Watershed Unit

- Monitoring occurring in the:
 - Upper St. Croix River Watershed
 - Kettle River Watershed
 - Snake River Watershed (2nd Cycle)



East Central Watershed Section Cycle 1 WRAPS/TMDL Lake st. Croix Projects

	Watershed	Project Manager	WRAPS Completion Schedule	Comments/Status
1	Snake River	Rachel Olmanson	Complete	
2	Lower St. Croix River	Rachel Olmanson	Complete	WRAPS/TMDLs are done at the smaller Watershed Management Organization (WMO) level in the Mississippi River - Twin Cities and Lower St. Croix Watersheds.
3	Kettle River	Lynne Kolze	10/30/2020	
4	Upper St. Croix River	Chris Zadak	10/30/2020	
5	Browns Creek Watershed District (WD)	Rachel Olmanson	Complete	WRAPS equivalent completed – usually multiple TMDLs and implementation plans
6	Carnelian-Marine-St. Croix WD	Rachel Olmanson	Complete	WRAPS equivalent completed – usually multiple TMDLs and implementation plans
7	Comfort Lake-Forest Lake WD	Rachel Olmanson	Complete	WRAPS equivalent completed – usually multiple TMDLs and implementation plans
8	Coon Creek WD	Brooke Asleson	Complete	
9	Middle St. Croix River WMO	Rachel Olmanson		Deferred
10	Sunrise River WMO	Rachel Olmanson	Complete	
11	Vadnais Lake Area WMO	Rachel Olmanson	Complete	WRAPS equivalent completed – usually multiple TMDLs and implementation plans
12	Valley Branch WD	Rachel Olmanson	Complete	

Master Watershed Steward Program

This watershed education program for adults was sponsored by the North Woods and Waters of the St. Croix Heritage Area and Tropic Wings. Through place-based learning, Stewards experience examples of best management practices and observe sites where assistance is needed to remediate storm water concerns, erosion issues, and nonpoint source pollution. The entire St. Croix watershed serves as a learning lab to build a base of knowledge to truly understand the St. Croix watershed system.

The project is funded through an EPA Education Grant. In 2016 30 citizens enrolled, half of the participants from Wisconsin and half from Minnesota.

The cornerstones of the curriculum combine:

- Watershed Resource Education (ecology, hydrology, best practices, threats)
- Leadership Education (strengths-based approach to leadership)
- Community Organizing (principles and new models for community engagement)
- The Arts as a Tool (sustainable project development)

Stewards complete 70 hours of experiential learning and complete a capstone project through:

- Monthly face-to-face expeditionary learning
- Distance learning is interspersed over the six-month period
- Additional reading and writing/art options.

Many agencies and organizations have provided training. Wisconsin DNR staff has provided training on phosphorus loadings to the St. Croix, aquatic life and habitat, protection efforts, rules and regulations, citizen involvement and governance, water quality monitoring, etc.

University of Wisconsin Regional Natural Resources Educator

The Natural Resource Educator support for the St. Croix Basin TMDL included:

- St. Croix Watershed Cropland Practices for Reducing Phosphorus Loss. Working with Jim Almendinger of the St. Croix Science Museum completed a factsheet and was distributed.
- Annual St. Croix Conference- provided support to the planning team lead by the St. Croix River Association and assisted with hosting the conference.
- St. Croix Basin TMDL Implementation Team- Attended team meetings and hosted team interviews regarding restructuring meetings and team leadership.
- Northwest Wisconsin Lakes Conference- worked with team of agency and citizen leaders to host the annual event. More than 200 lake owners attend annually and learn about water quality, lake habitat, lake and water policy issues and general lake health.
- Woodland Owner Forums- hosted an annual series of woodland forums on a variety of topics that included forestry water quality BMPs.
- St. Croix Master Watershed Stewards Cohort Training- coordinated and facilitated agency discussion panel, co-taught an Active Citizen Curriculum throughout their course sessions.
- Civic Governance- Facilitated this group to develop capacity within Interstate Civic Governance Organizing Agency – St. Croix and Dunn County, citizens and UW-EX members. Goal to increase citizen leadership, sustain democracy as a just system of governance while achieving water quality goals.

**ST. CROIX WATERSHED
CROPLAND PRACTICES FOR REDUCING PHOSPHORUS LOSS**

A recovery plan based on maximum loads

Many lakes in the St. Croix watershed, including Lake St. Croix, have excess phosphorus, resulting in high levels of algae. Phosphorus originates at multiple sources including farm fields, construction sites, wastewater facilities, industrial discharges, storm drains and even back yards. Total Maximum Daily Loads (TMDLs) are plans that outline the maximum nutrient levels that a water body can sustain while still remaining healthy and are becoming an increasingly common way to bring phosphorus levels in check. The St. Croix Recovery Plan aims to reduce the amount of phosphorus entering Lake St. Croix by 27%. Based on the TMDL, the plan aims to make the waters within the St. Croix watershed healthy and sustainable for use by industry, agriculture and other citizens of the state.

TOTAL MAXIMUM DAILY LOAD



EXAMPLES:

FARMER-LED COUNCILS are collaborations between groups of farmers in the St. Croix watershed, UW-Extension and county partners. These groups support research to find effective, efficient and adaptable solutions that improve both water quality and farm performance through reduced phosphorus and sediment loading. Improvements are accomplished by:

- (1) Increasing farmer knowledge about, and engagement with, water quality issues, including the adoption of conservation practices. As a result, several counties in Western Wisconsin went from 500 acres of cover crops to tens of thousands of acres of cover crops in just two years.
- (2) developing leadership around water quality among farmers in the selected sub-watersheds.
- (3) developing a unique collaborative model of water quality improvement through farmer engagement that can be replicated in watersheds throughout the Upper Mississippi River Basin and nationwide.

The farmers themselves determine the best paths to conservation success within their watersheds and recruit and encourage other farmers to participate.

EDGE-OF-FIELD MONITORING research by UW-Extension in cooperation with local farmers is providing important data to determine effectiveness of various agricultural conservation practices. Recent research in partnership with a Polk county farmer documented extremely low edge-of-field runoff during a major rain event on fields managed for soil health. Similar edge-of-field monitors are located on several farms in the St. Croix watershed.

THE WATERSHED

The St. Croix watershed includes all of the land drained by the rivers that flow into the St. Croix River and ultimately, Lake St. Croix near Hudson, Wisconsin. The waters of Lake St. Croix drain into the Mississippi River at Prescott, Wisconsin. Although the St. Croix remains one of the most scenic and high quality river systems in the Midwest, its water quality has been degraded by too much phosphorus.



A commonsense approach, the St. Croix River Recovery Plan accounts for allowable nutrient levels that are inevitably produced from urban, suburban and rural land areas. The approach relies on the collective efforts of all watershed contributors to reach the goal. Millions of dollars have already been spent to reduce phosphorus from community wastewater facilities and other "end-of-pipe" point sources by about 75% since the early 1990s.

This publication focuses on the Soil and Water Assessment Tool (SWAT) estimates of phosphorus reduction from agricultural best management practices applied to cropland areas.



Crop photos: Jeff Papp, WisDNR

April 2016

The St. Croix River watershed is the **premier mussel watershed** of the Upper Mississippi River, and one of the premier mussel watersheds of the world.

Forty-one mussel species live in the St. Croix River. Of these, Wisconsin and Minnesota have listed 15 and 20 as state-endangered or state-threatened species, respectively. Five species of mussels that occur in the St. Croix River are also listed as endangered under the Federal Endangered Species Act: Higgins eye, sheepsnose, snuffbox, spectaclecase and winged mapleleaf.

North America is the world's great mussel continent; the richest species aggregations found in any watersheds worldwide are found in North America. North America's best mussel watersheds have species numbers in the upper 30s. Thus, with its 41 species, the St. Croix is among the world's greatest mussel watersheds.

Minnesota Department of Agriculture (MDA)

The Minnesota Department of Agriculture (MDA) coordinates a variety of agriculture conservation programs within the St. Croix Basin. The Minnesota Agricultural Water Quality Certification Program (MAWQCP) is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect our water. Those who implement and maintain approved farm management practices will be certified and in turn obtain regulatory certainty for a period of ten years. Producers who are already certified or actively seeking certification qualify for Financial Assistance Grants for implementing agricultural best management practices. Currently, there are 16 producers certified (5300 acres) in the St. Croix basin with another 10 producers (5700 acres) in the assessment phase of the certification process. The certified farms are well distributed throughout the watershed; however, a majority of the farms in process are located in Chisago County. <http://www.mda.state.mn.us/awqcp>

With project oversight provided by the Minnesota Agricultural Water Resource Center (MAWRC), the MDA has monitored agricultural runoff data from the Spring Creek Discovery Farms Minnesota site located in Chisago County. Spring Creek Farm is a corn and soybean grain farm that has had edge-of-field surface water monitoring since the spring of 2011. The producer has been utilizing a no-till planting system since the mid-1990s. The farm has been a leader in soil conservation within the watershed, practicing no-till planting since the mid-1990s. Data has indicated that the no-till system has been very effective at reducing soil loss; however, dissolved P losses were elevated since the P fertilizer was broadcasted and not incorporated into the soil. To reduce dissolved P losses, the farm started to band P and K in the fall using a strip-till approach, which has resulted in noticeable improvements in reduced nutrient losses. <https://discoveryfarmsmn.org/projects/core-farms/spring-creek-farms/>

The MDA recently launched a Cropland Grazing Exchange program designed to allow livestock producers who are looking for land to graze to identify crop producers within the watershed who may have cover crops or perennials to graze. <http://www2.mda.state.mn.us/webapp/GrazingExchange/MDAHome.html>

County and Local Land Conservation Departments

Activities reported by participating counties in both states are summarized in “Nonpoint Source Projects by County.”

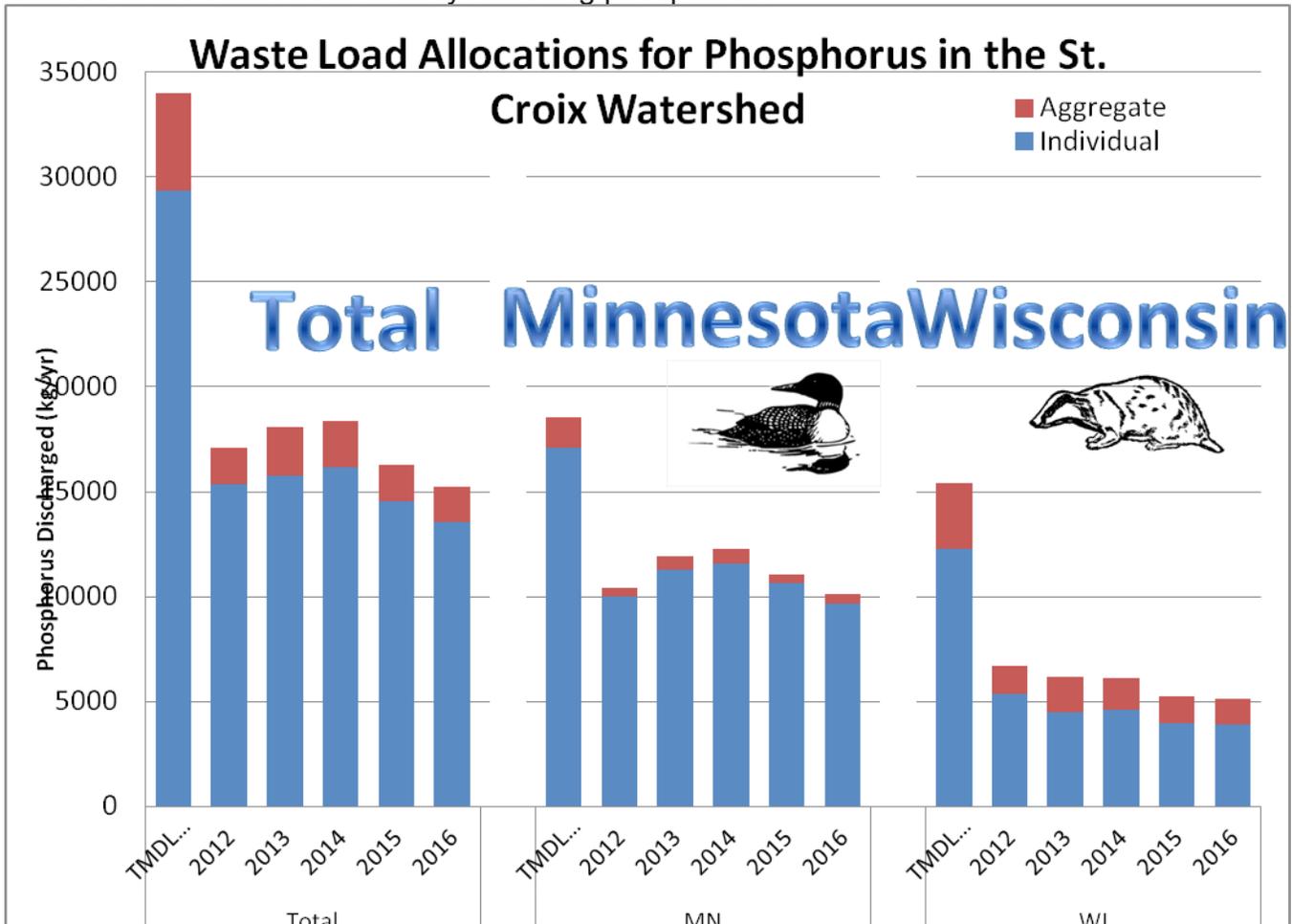


Municipal Wastewater Treatment Plants

The wastewater treatment facilities on specific NPDES permits in the St. Croix Basin collectively discharged well below the Lake St. Croix TMDL Wasteload Allocation (WLA) in 2016. The total WLA for wastewater treatment discharges is 33,994 kg/year, divided between Minnesota and Wisconsin facilities. A portion of each state's allocation is also combined as an “aggregate” allocation for smaller facilities. The facilities included in this category can either demonstrate compliance by meeting their individual allocation, or by showing that the combined discharge levels of all facilities in this group is less than the aggregate allocation. The graph below shows the respective WLAs and discharge levels for 2012 through 2016. In both states, limits based on the Wasteload Allocation are being included in all permits when they are reissued. Several facilities now have more restrictive phosphorus limits for their immediate receiving waters (under NR 217.13 in Wisconsin) than the mass limits imposed by the TMDL. This provides two levels of protection to the basin's waters: concentration limits to protect and improve the immediate receiving water, and mass “caps” to protect downstream waters in the light of

future growth. Minnesota is implementing their new eutrophication standards as well.

The City of St. Croix Falls also completed a plant upgrade and is now providing chemical treatment for phosphorus removal, which means lowering the effluent discharge from around 4 - 6 mg/L to 1 mg/L. This was one of the larger point source loads on the Wisconsin side of the river, as larger facilities to the south were already removing phosphorus.



CAFOs

As of December 2015, there were 10 permitted concentrated animal feeding operations (CAFOs) in the St. Croix Basin in Wisconsin. The number of CAFOs will fluctuate as farms expand, change operation, or stop production.

Since there is no phosphorus allocation allowed for the production areas at CAFOs, and the permits require that the cropland be operated under a Nutrient Management Plan, it is not possible to quantify reductions for this sector. However, there is potential for soil conservation measures and non-point phosphorus reduction through proper manure handling, improved cropping practices (such as improved soil health, year-round cover crops, no-till planting,

etc.) on the large farms as well as on the smaller ones that don't require CAFO permits.

1. Bomaz Farms
2. Emerald Sky Dairy
3. Goodrich Farms- Application received
4. Minglewood Inc
5. Arcand Poultry
6. Friendshuh Farms
7. Ulrich Farms
8. Four Cubs Farm
9. Owens Farms
10. Legacy Farms

Nonpoint Source Projects by County

Aitkin (MN)

No projects identified in 2016.

Anoka (MN)

Submitted by the Anoka Conservation District and Sunrise River Watershed Management Organization

Shoreline/ Riparian Practices

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Carp barriers	Sunrise River	4 carp barriers installed at Martin and Typo Lakes to reduce common carp overwintering survival and spawning success, ultimately resulting in water quality improvement.	502 lbs/yr in Typo Lake and 250 lbs/yr in Martin Lake Reductions may take years to be realized.

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs	Sunrise River	1 watershed organization newsletter about lakeshore stewardship	5,123 approx

Investments

	Shoreline
Funding sources for BMPs and projects	Carp barriers: \$496,000
Funding sources for staff	
Full time staff hours*	150 hrs/yr x 3 yrs = 0.07 FTE/yr

Barron (WI)

No projects identified in 2016.

Bayfield (WI)

No projects identified in 2016.

Burnett (WI)

Submitted by Burnett County Land & Water Conservation Dept.

Shoreline/ Riparian Practices

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Erosion control		4	77
Buffer plantings		10	36
Increase infiltration (i.e. remove impervious surfaces)		4	25

Agriculture

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Cover Crops		437 acres	328
Nutrient Management		1184 acres	675
Grazing Systems		212 acres	127

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs		Cover crop workshops (1)	40
		Lake Association Meetings (5)	150

Investments

	Shoreline	Agriculture	Forestry	Urban	Other
Funding sources for BMPs and projects	\$5,000	\$30,000	0	0	\$35,000
Funding sources for staff					\$160,000
Full time staff hours*	5000 hrs	1500 hrs	300 hrs	200 hrs	3000 hrs

Carlton (MN)

Submitted by the Carlton SWCD

Shoreline/ Riparian Practices

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Erosion control	070300030101	277 feet Stream Channel realignment	60 tons
Wetland Restoration	070300030305	1532 sq ft wetland restored	unknown

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs			
Civic Engagement	070300030102, 070300030201, 070300030205, 070300030204	Surface Water Monitoring Grant/ Provided training and organization for local volunteers to collect lake samples in the Kettle River Watershed	Lake Shore Residents

Forestry

Program	HUC 12	Program Name/ Topic	Audience #s
Forest stewardship plans	070300030202 30108 30107	Tullibee Lakes Northeast Landscape Northeast Landscape	2 2 2

Urban/Rural residential

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Wetland restoration	070300030102 30107	8682 sf wetland restored 5094 sf wetland restored	unknown unknown

Investments

	Shoreline	Agriculture	Forestry
Funding sources for BMPs and projects	\$5,000	\$10,000	\$10,000
Funding sources for staff	\$5,000	\$10,000	\$5,000
Full time staff hours*	.2	.5	.2

Chisago (MN)

Submitted by Chisago Soil and Water Conservation District

Shoreline/ Riparian

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Buffer plantings	070300050406	3	6 lbs
	070300050407	2	4 lbs

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs	070300050406 & 070300050205	Lake Association Meetings/ Workshops	200+

Investments

	Shoreline	Agriculture	Urban
Funding sources for BMPs and projects	Local State	Local State Federal	Local State
Funding sources for staff	Local State	Local State	Local State
Full time staff hours*	0.25	2.00	1.00



CHISAGO COUNTY CHILDREN'S WATER FESTIVAL

14TH ANNUAL

SEPTEMBER 29, 2016



Partners:

- Chisago County
- Chisago Soil & Water Conservation District
- Minnesota Department of Natural Resources Project WET (Water Education for Teachers)
- Wild Mountain, Taylors Falls, MN

Schools:

- CE Jacobson Elementary
- Lakeside Elementary
- North Branch Middle School
- North Lakes Academy
- Taylors Falls Elementary
- Wyoming Elementary
- 680 Students
- 25 Teachers
- 80 Volunteers & Presenters
- 75 Parent Volunteers



Douglas (WI)

No projects identified in 2016.

Isanti (MN)

No projects identified in 2016.

Kanabec (MN)

No projects identified in 2016.

Mille Lacs (MN)

No projects identified in 2016.

Pierce (WI)

Shoreline/ Riparian Practices

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs	Kinnickinnic 070300511	Farmer-Led Watershed Council Meetings	Ave. attendance 15

Agricultural

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Cover Crops	Kinnickinnic 070300511	195 acres	205
Nutrient Management	Kinnickinnic 070300511	297 acres (New plans)	891
Waterways	Kinnickinnic 070300511	7.7 acres	186
Grade Stabilization Structures (Small Dams)	Kinnickinnic 070300511	1	8.2
Clean water diversions	Kinnickinnic 070300511	1	NA

Investments

	Agriculture
Funding sources for BMPs and projects	17,415.00
Funding sources for staff	14,400.00
Full time staff hours*	.25

Pine (MN)

No projects identified in 2016.

Polk (WI)

Submitted by the Polk County Land & Water Resources Dept.

Shoreline/ Riparian

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Buffer plantings		1	17
Other:shoreland zoning permits		4	6

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs		6 events (adults)	100
Civic Engagement		33 events (news releases, radio)	unknown
Other:		20 events (students)	400

Agriculture

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Cover Crops		2875 ac.	2128
Nutrient Management		3513 ac.	2002
No-Till		7500	10200
Manure storage closures and manure storage construction		1 constructed 1 closure	55 42
Other: feed storage runoff		1	20

Practice	HUC 12	Total Installed	Estimated Cumulative
Civic Engagement		Farmer-led Watershed Council	200

Investments

	Shoreline	Agriculture	Urban	Other
Funding sources for BMPs and projects				State grants=\$100k Lake districts=\$6k Nonprofits=\$26k
Funding sources for staff				County levy=\$340k State grant=\$149k
Full time staff hours*	280	9030	730	

TMDL 2016 highlights:

Our highlight is still the Horse Creek Farmer-led Watershed Council. They have implemented at least two thousand acres of cover crops and no-till beyond the Horse Creek watershed.

Ramsey (MN)

No projects identified in 2016.

St. Croix (WI)

Submitted by the St. Croix LWD

Shoreline/ Riparian Practices

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Buffer plantings	Parker Creek (070300051104), Dry Run (070300051002)	52.3 acres	20

Program	HUC 12	Program Name/ Topic	Audience #s
Civic Engagement	Bass Lake (70300051008)	Bass Lake-Lake Management Plan	24

Agricultural

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Cover Crops	Headwaters-Kinni (070300051101), Parker Creek (070300051104), Twin Lakes (070300051102), Bass Lake (070300051008), Dry Run (070300051002), Paperjack (070300051007), Ridge Lake (070300051005)	881.4 acres	215.9
Nutrient Management	Ridge Lake (070300051005), Headwaters-Kinni (070300051101), Parker Creek (070300051104), Dry Run (070300051002)	3,648.9 acres	618.6
Waterways	Headwaters-Kinni (070300051101), Parker Creek (070300051104), South Fork-Kinni (070300051103), Bass Lake (070300051008), Black Brook (070300051003), Dry Run (070300051002)	22,575.0 feet	1,897.0
No-Till (contracted)	Ridge Lake (070300051005), Headwaters-Kinni (070300051101)	471.1 acres	246.8
Streambank Stabilization	Dry Run (070300051002)	800.0 feet	102.3
Critical area stabilizations	Bass Lake (070300051008)	0.7 acres	0.1
Manure storage closures and manure storage construction	Dry Run (070300051002)	1 number	25

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs	Dry Run (070300051002), Riverdale Flowage (070300050809)	Groundwater Education Program, Farm City Day	32; 2,800
Civic Engagement	Dry Run (070300051002)	Farmer-Led Council, Interstate Civic Governance	6; 8

Urban/Rural residential

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Stormwater pollution prevention planning and implementation (non-MS4)	Bass Lake (070300051008)	50 permits	62.5
Installation of rain gardens/wetlands/retention basins	Bass Lake (070300051008), Headwaters-Kinni (070300051101), Twin Lakes (070300051102), Parker Creek (070300051104)	18	72.0

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs	Trout Brook (070300051205), County Wide	Earth Day, School-age programs	150; 1,500
Sanitary System Required Maintenance & Reporting	County Wide	St. Croix County Private Onsite Wastewater Treatment (POWTS) 3-year pumping program to monitor maintenance	4,583 of 15,000 total POWTS systems

Investments

	Shoreline	Agriculture	Urban
Funding sources for BMPs and projects	National Fish & Wildlife Foundation (NFWF)	Wisconsin Department of Agriculture and Consumer Protection (DATCP), National Resource Conservation Service (NRCS), McKnight Foundation, NFWF	Private
Funding sources for staff	NFWF, St. Croix County	DATCP, NRCS, NFWF, St. Croix County	DATCP, St. Croix County
Full time staff hours*	32	2,400	520

TMDL 2016 highlights:

National Fish and Wildlife Foundation “Dry Run Creek” Streambank Stabilization Demonstration site, Willow River Watershed:

In 2016, with aid from our National Fish and Wildlife Foundation partners, St. Croix County Resource Management completed an approximate 500 feet of shoreline stabilization along Dry Run Creek, a tributary to the Willow River. The demonstration project consisted of reshaping 500 lineal feet of

streambank for the purpose of remediating severe bank erosion. Upon completion of native seeding, erosion fabric was installed in an effort to armor the bank. In addition, a further focus of the project was to repair an existing gully that had formed at the outlet of an existing waterway. The waterway discharged to Dry Run creek at the midpoint of our demonstration project. The gully and associated waterway were regraded and stabilized in efforts to eliminate nutrient and sediment loading to the Dry Run.



Introduction of Precision Agriculture methods within Dry Run Creek, focused on both profitability and conservation stewardship:

2016 found Resource Management and NRCS staff introducing a precision Ag “tool” to Farmer-Led Council producers within Dry Run Creek. The “tool” utilizes data acquired by means of GPS, which

in turn is used to analyze the profitability of a given crop field and or a specific portion of the field. Based on the results from the analysis, decisions can then be made as to which parts of a field are not profitable. Non profitable areas of production are thus good candidates for long term conservation programs and sediment reducing best management practices (BMPs). Programs and conservation practices such as Conservation Reserve Enhancement, riparian buffers, and filter strips.



Sawyer (WI)

No projects identified in 2016.

Washburn (WI)

Submitted by the Washburn County LWCD

Shoreline/ Riparian

Practice	HUC 12	Total Installed	Estimated Cumulative Phosphorus Reduction
Buffer plantings	070300010403 Shell Lake	0.05 Ac	????

Program	HUC 12	Program Name/ Topic	Audience #s
Education Programs		4 th grade Hatchery Day/Water Quality CBCW/AIS CLMN Workshop Restoration Education/ Discussion 2 Healthy Lakes Workshops	25 kids/adults 40 kids/adults 12 adults 40 adults
Civic Engagement		Tree/Wildflower Sale	15

Washington (MN)

Submitted by Washington Conservation District



2016 BMP Program Review For St. Croix Basin

Watershed	# of Site Visits	Total Completed Projects	TP Load Reduction for Installed Practices (Total Phosphorous) lbs/yr	TSS Load Reduction for Installed Practices (Total Suspended Solids) lbs/yr
BCWD	15		5	3106.91
CLFLWD	22		5	0.5
CMSCWD	28		2	21
SWWD	67		2	0
VBWD	58		14	99.85
MSCWMO	46		3	539369
Totals	236		31	542596.76

How do you track practices? Do you plan to change your system, if so to what?

Anoka - GIS database of practice and project summary sheets.

Carlton - We are in the process of developing a project tracking database that will include a module for reporting water quality impacts.

Pearce - Practices are tracking in GIS

St Croix - Geographic Information System (ArcGIS), Spreadsheet Tool for Estimating Pollutant Load (STEPL), Transcendent, SnapPlus

Burnett - Mapfeeder Water Quality Tracking Software

Chisago - Most of our projects are funded in part by a State Clean Water Fund (CWF) grant. Because of this all work completed with CWF grant funds are reported to BWSR via elink. We do not plan on changing our tracking system.

Polk - We do not have a good tracking system but are in the process of implementing a GIS based tracking system. Hopefully it will be in place for the 2017 report cycle.

In the next year do you anticipate potential setbacks to phosphorus reduction?

Anoka - Carp removal from Martin and Typo Lakes (Sunrise River watershed)

St. Croix - Yes, there's potential for increased animal units within the Willow River HUC 10 watershed, provided an existing Confined Animal Feeding Operation (CAFO) is granted a permit for expansion. In addition, the Little Falls Dam removal could result in increased loading of both sediment and phosphorus to Lake Mallalieu and ultimately Lake Saint Croix.

Polk - Relaxation of rules and relaxed enforcement of existing rules by state and federal agencies continues to erode our position regarding enforcement of our Stormwater and Erosion Control Ordinance and Shoreline Zoning Ordinance.

Member Organizations

St. Croix National Scenic Riverway – National Park Service

Minnesota Department of Natural Resources

Minnesota Pollution Control Agency

Wisconsin Department of Natural Resources

St. Croix Watershed Research Station – Science Museum of Minnesota

University of Wisconsin Extension

University of Wisconsin – River Falls

Wisconsin Department of Agriculture

Minnesota Department of Agriculture

The Nature Conservancy

East Metro Watershed Partners

Natural Resource Conservation Service

United States Geological Survey

Metropolitan Council Environmental Services

St. Croix River Association

Kinnickinnic River Land Trust

Wisconsin County Land and Water Resource Departments

- Barron Soil and Water Conservation Department
- Bayfield Land and Water Conservation Department
- Burnett Land and Water Conservation Department
- Douglas Land Conservation Department
- Pierce Land Conservation Department
- Polk County Land and Water Resources
- Sawyer Zoning and Conservation
- St. Croix Resource Management
- Washburn Land and Water Conservation Department

Minnesota Board of Soil and Water Resources and local member organizations

- Aitkin Soil and Water Conservation Department
- Anoka Conservation Department
- Brown's Creek Watershed District
- Carlton Soil and Water Conservation Department
- Carnelian - Marine - St. Croix Watershed District
- Chisago County
- Chisago Soil and Water Conservation District

- Comfort Lake - Forest Lake Watershed District
- Conservation Corps MN & IA
- Isanti County
- Isanti Soil and Water Conservation Department
- Kanabec Soil and Water Conservation Department
- Middle St. Croix River Watershed Management Organization
- Mille Lacs Soil and Water Conservation Department
- Pine Soil and Water Conservation Department
- Ramsey County
- Snake River Watershed Management Board
- South Washington Watershed District
- St. Louis, North Soil and Water Conservation Department
- Valley Branch Watershed District
- Sunrise River Watershed Management Organization
- Washington Conservation District
- Washington County

