Our Upper Mississippi River

Large River and Basin Restoration and Protection Strategies

- From Lake Itasca to Hastings
- Targeting and prioritizing implementation

Mississippi River Headwaters, Lake Itasca

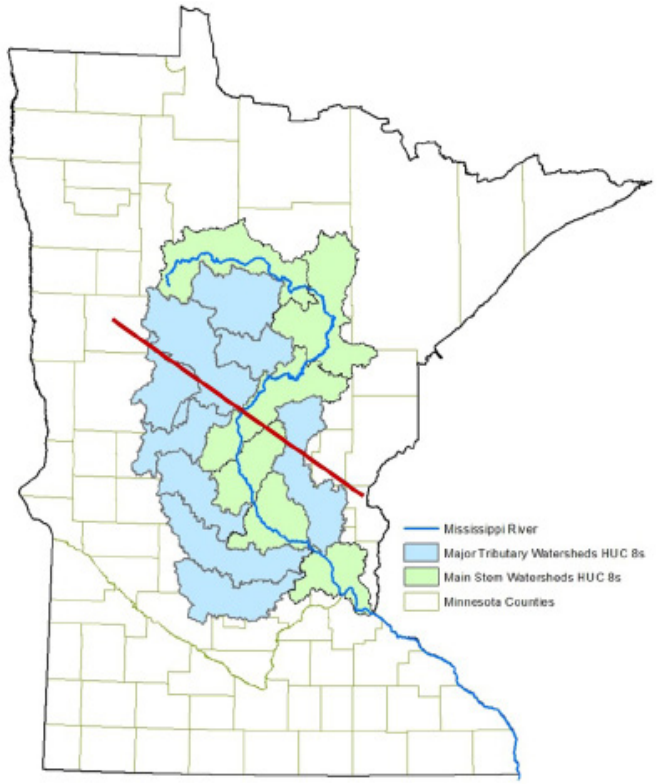
The Upper Mississippi River Basin (UMRB) within Minnesota stretches from the headwaters of the Mississippi River at Lake Itasca to Lock and Dam #2 near Hastings. It is the largest of Minnesota's 10 major river basins, and is the only major drainage basin with all of its watersheds contained entirely within Minnesota's borders.

Basin characteristics

- Size: Drains 20,105 square miles.
- 510 miles of river corridor within the basin; 2350 miles of River to Gulf of Mexico.
- 2010 Census: Over 2.8 million people reside in the Upper Mississippi Basin. Population growth trends show increasing pressure on the upper part of the basin.
- The 4-digit hydrologic unit code or HUC for the Upper Mississippi Basin is 0701.

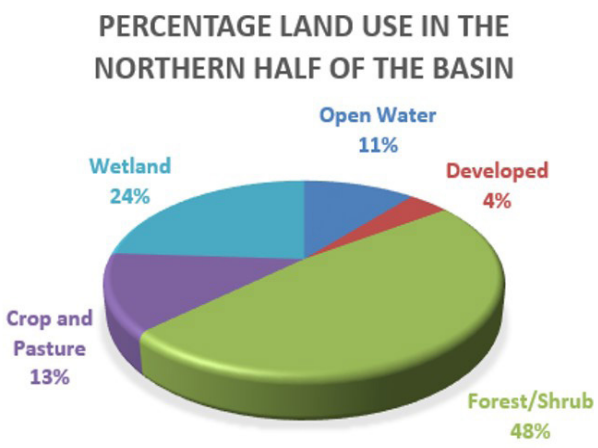
There are dramatic changes in the river as it flows downstream from the headwaters to the metro area.

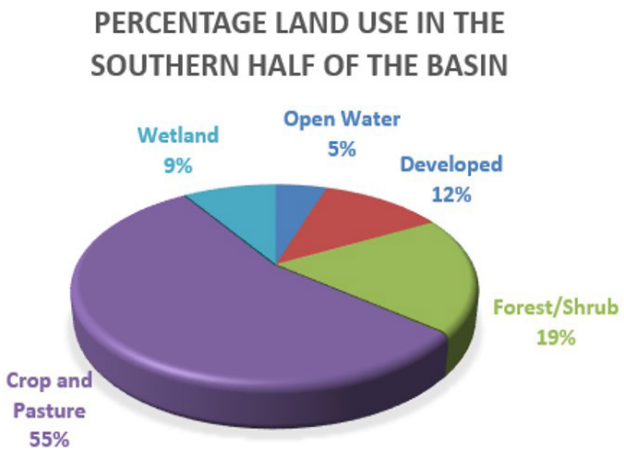
- The Northern part of the River and Basin is dominated by lakes and forests (above the red line).
- The Southern part of the River and Basin is dominated by more agricultural and urban areas (below the red line).



Upper Mississippi River Basin (HUC 4)

These differences in land use dictate the type of water quality issues found across the basin, as well as the specific strategies that are needed to protect or restore the river.



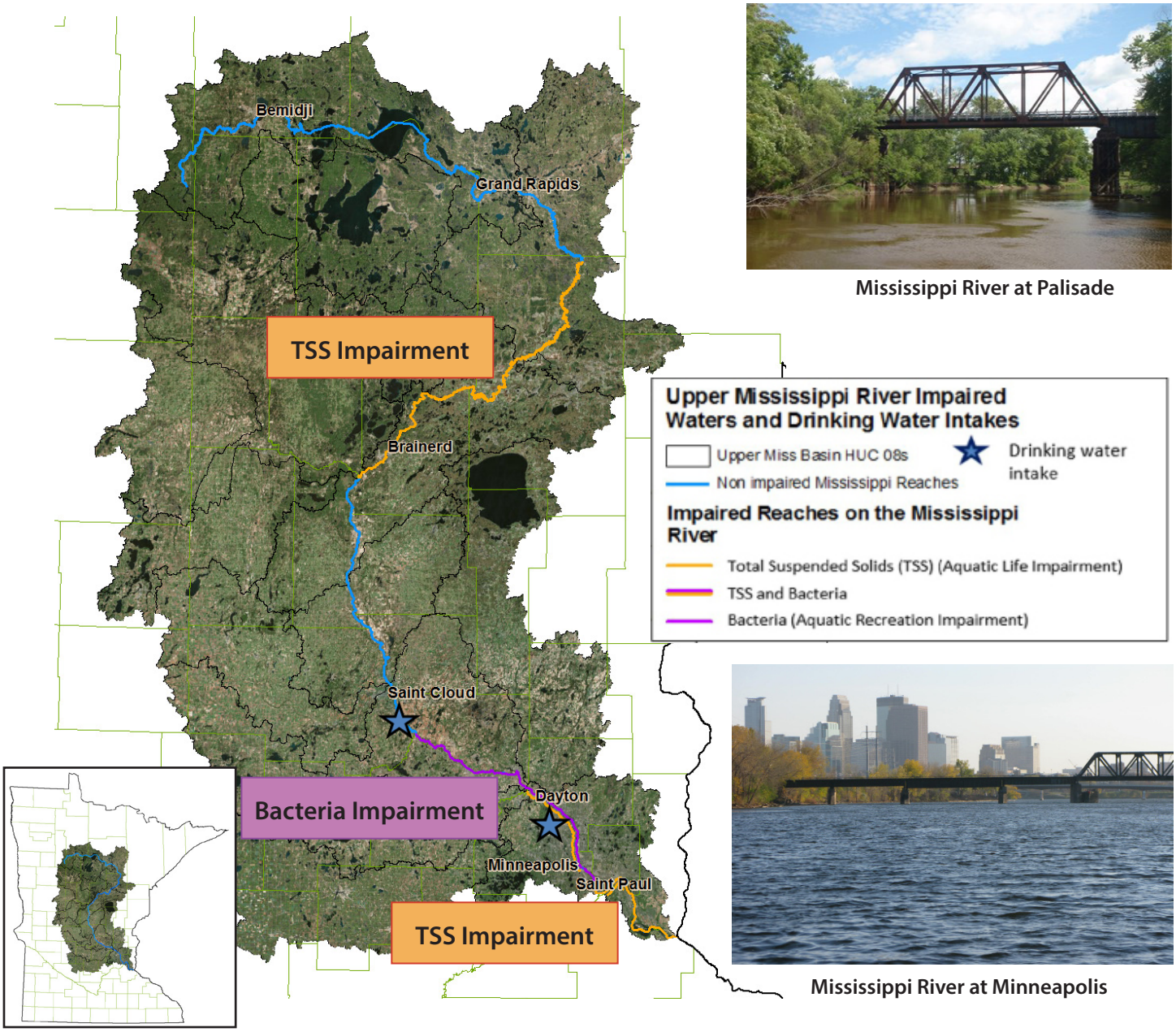


Assessments: Is the river meeting standards and providing beneficial uses?

The Upper Mississippi River was the first of the large rivers in the state to have intensive monitoring done on the mainstem of the river. Biology and chemistry data were collected in 2013 and 2014 to determine if the river is meeting state water quality standards. During the Mississippi River intensive monitoring the Environmental Outcomes Division of the Minnesota Pollution Control Agency (MPCA) and local partners collected data about biology including fish and insect populations, and chemistry (phosphorous, nitrogen, sediment, and bacteria) to determine if the river is meeting water quality standards. Samples were taken at 34 different sites along the river.

Impairments on the Upper Mississippi Main Stem Corridor

The map below shows where and what types of impairments exist, as well as locations of drinking water intakes. Waters are "impaired" if they fail to meet standards. Standards for aquatic life look at the fish and insect populations to see if they are in the numbers and types that are expected. Aquatic recreation looks at bacteria and *E. coli* levels to ensure that the water is swimmable and fishable. Under federal and state laws, impaired waters must have Total Maximum Daily Load (TMDL) studies completed to determine reductions of pollutants needed to, again, meet water quality standards. Impairments located upstream of drinking water intakes are of particular concern. Current and future threats to water quality in the northern end of the basin impact every community downstream of that point. A recent study reports that **for every 10% decrease in forest cover in the source area, the cost of water treatment for downstream communities increase by 20%.**

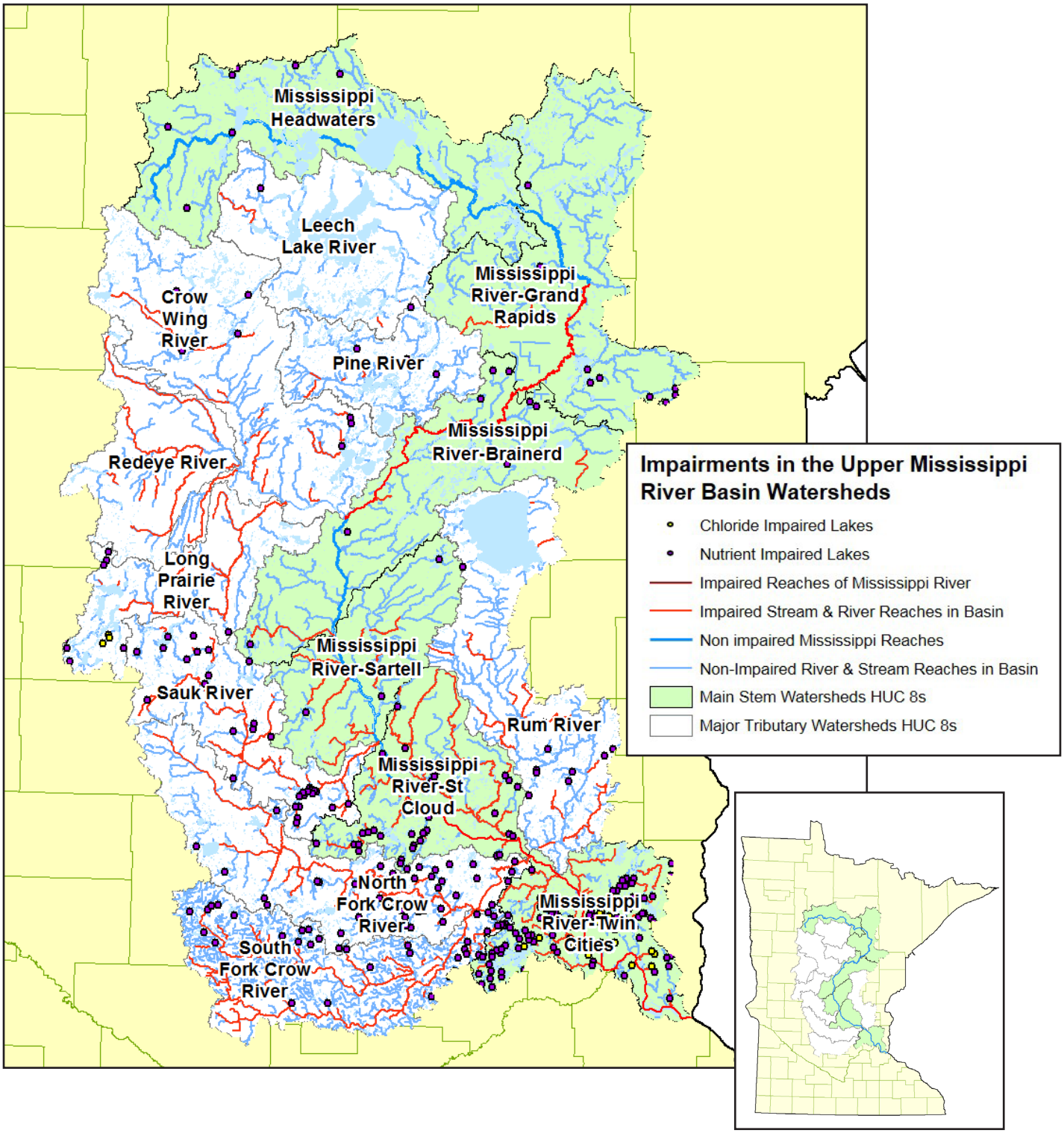


Mississippi River at Palisade

Mississippi River at Minneapolis

Impairments in the Upper Mississippi River Basin

The map below shows current impairments on the Mississippi mainstem, as well as the lakes and streams impairments in the 15 major HUC 8 watersheds of the Upper Mississippi Basin. Impairments for lakes include chloride, as well as nutrients. Stream impairments include biology (fish and/or bug populations are not healthy), dissolved oxygen, chloride, sediment, bacteria and/or nutrients. The same water body can have multiple impairments. The table includes all of the non-mercury impairments in each watershed. For information on mercury impairments in the basin, visit the [MPCA Mercury TMDL webpage](#).



Where do the impairments come from?

Type of Pollutant	Number of waterbodies
Nutrients	309
Biology	223
Bacteria	121
Dissolved Oxygen	49
Chloride	38
Total Suspended Solids	21

Phosphorus (nutrients) is a common element in storm runoff from yards and streets, agricultural fertilizers, manure, and organic wastes in sewage and industrial discharges. Excess phosphorus in lakes, rivers, and streams causes algae to grow. Algae-covered water is less attractive for fishing and swimming — uses that are protected under the federal Clean Water Act. In addition, phosphorus can fuel toxic blue-green algal blooms, which are harmful to people and pets.

Chloride can harm fish and plant life at high concentrations. Road salt contains chloride. When the snow and ice melts off treated surfaces, the chloride runs into waterways. One teaspoon of road salt can permanently pollute five gallons of water.

Watershed Name	Number of Lake Impairments	Number of River/Stream Impairments
Headwaters	8 (*1)	0
Leech Lake	1	5 (*3)
MR-Grand Rapids	9	2
MR-Brainerd	9	6
Pine River	5 (*1)	5
Crow Wing	8	19 (*2)
Redeye River	0	13
Long Prairie	13	16
MR- Sartell	3	13
Sauk River	31	50
MR-St Cloud	8	49
North Fork Crow	41	57
South Fork Crow	35	100
Rum River	15	24
MR-Twin Cities	106	73

*number of impairments due to natural background, or non-human caused

Sherburne County algae bloom

Bacteria: *E.coli* and/or fecal coliform can indicate sewage or manure in water and makes the water unsafe for swimming. Bacteria in our waters can come from wildlife, pet waste, improperly maintained septic systems or feedlots.

Nutrient pollution - wikipedia

Dissolved Oxygen (DO): Low or highly fluctuating concentrations of DO can have detrimental effects on many fish and bug species. It primarily results from excessive algae growth (due to excess phosphorus or nitrogen) or decomposition of submerged plants. DO concentrations change seasonally and daily in response to shifts in ambient air and water temperature, along with various chemical, physical, and biological processes within the water column. Many species of fish avoid areas where DO concentrations are below 5 mg/L.

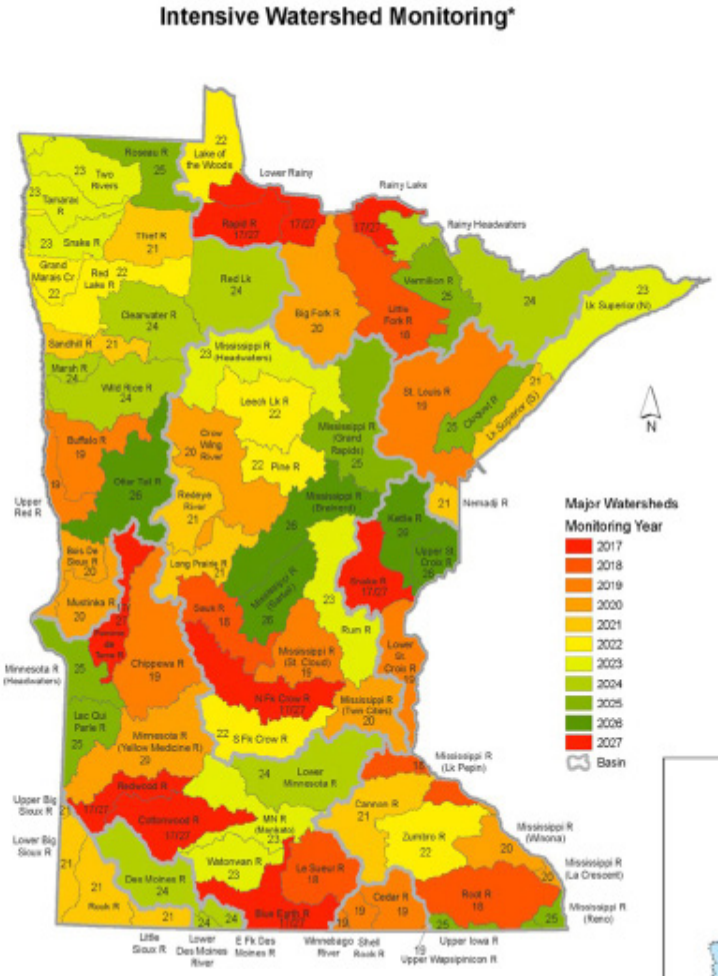
Stormwater runoff near lakeshore

The Watershed Approach

Minnesota has adopted a "watershed approach" to address the state's 80 "major" watersheds (denoted by 8-digit hydrologic unit code or HUC). This approach looks at the drainage area as a whole instead of focusing on lakes and stream sections one at a time, thus increasing effectiveness and efficiency. This watershed approach is repeated every 10 years.

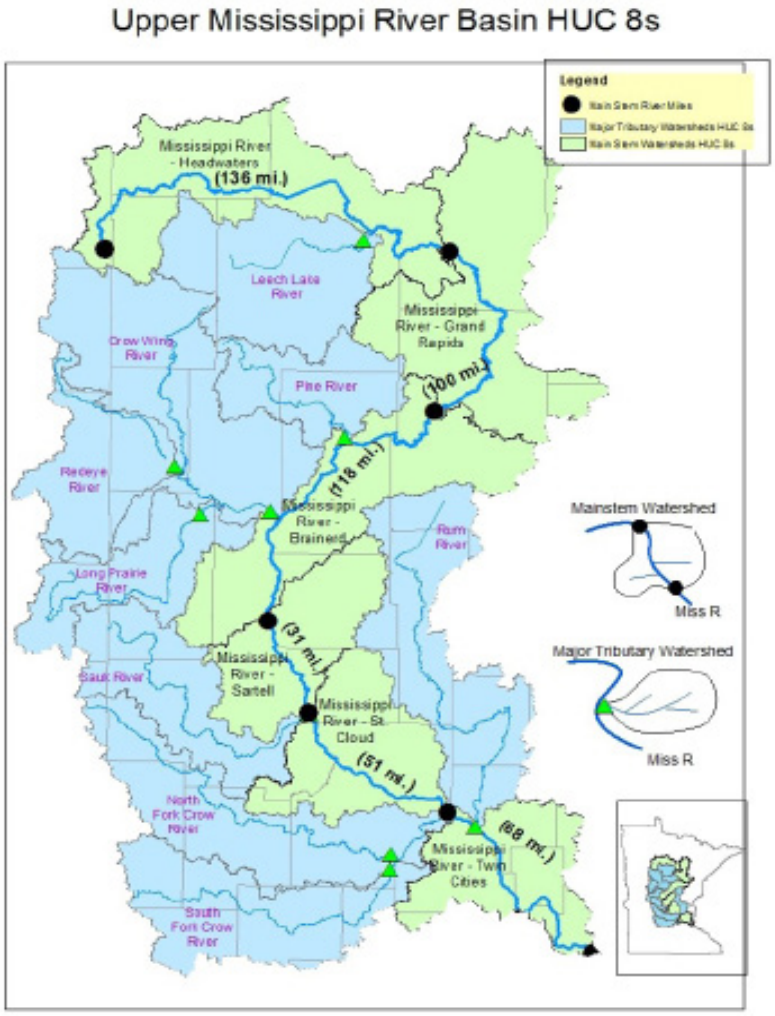
Following the monitoring and assessment of each major watershed, MPCA and its partners develop restoration and protection strategies to address both impaired and unimpaired waters in the watershed – this product or report is referred to as "Watershed Restoration and Protection Strategies", or WRAPS.

The Upper Mississippi River Basin "WRAPS" schedule includes 15 major watersheds. Included in those are six that are considered Mainstem Watersheds that have large sections of the mainstem Mississippi River flowing through them. The other 9 watersheds within the basin



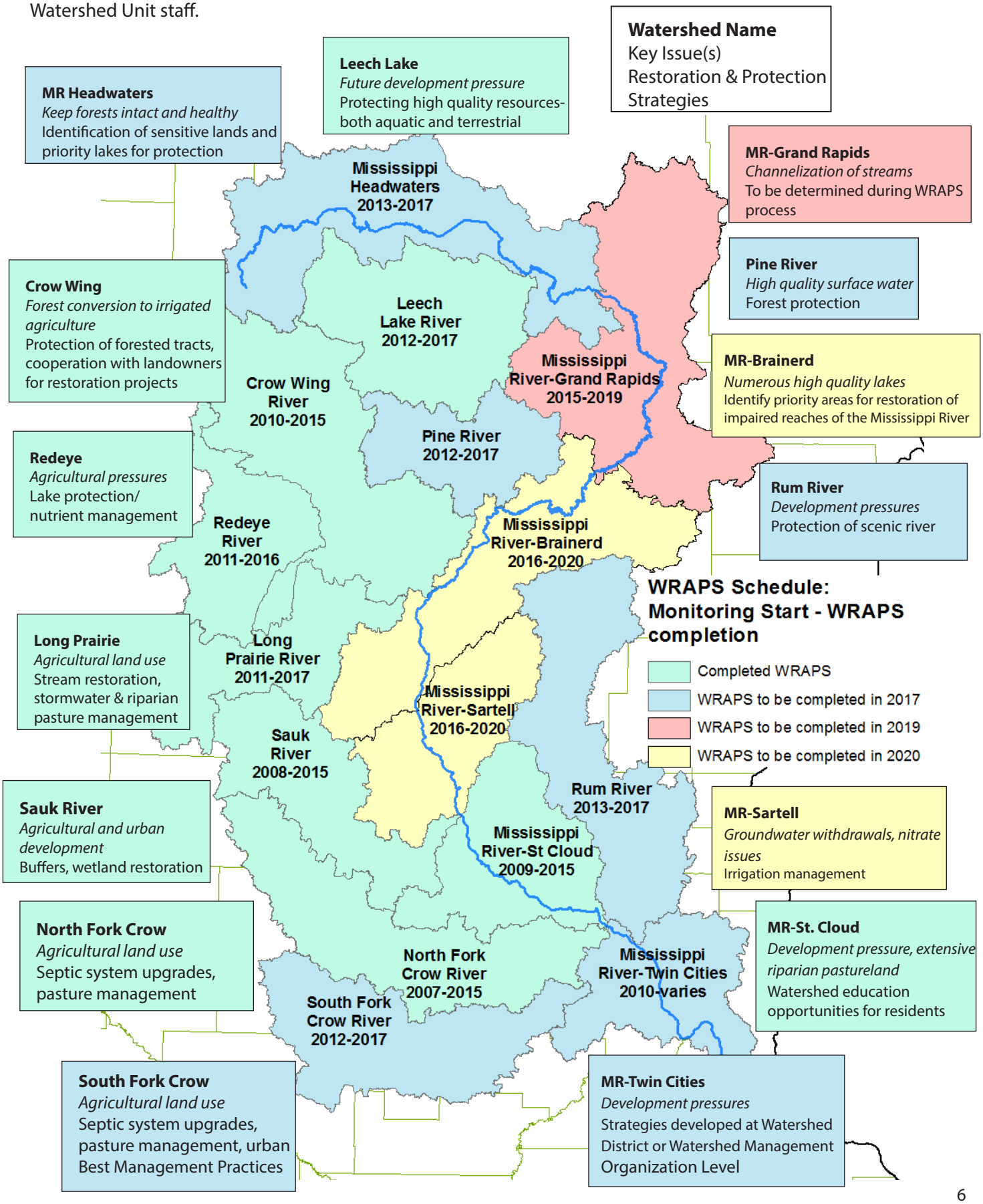
are Major Tributary Watersheds consisting of large tributary rivers that enter the mainstem Mississippi River at various locations. Taken together, the 15 WRAPS watershed projects provide strategies that address restoration and protection needs in the entire river corridor.

The current WRAPS schedule for major watersheds within the Upper Mississippi River Basin is presented in the figure below. The WRAPS reports currently in progress will have sections in them that will address the large river corridor to some extent. These reports/documents will be available on the MPCA web site upon completion, at https://www.pca.state.mn.us/water/watersheds.



WRAPS Schedule and Main Issues

To get more information on a specific reach of the Upper Mississippi River, please refer to the appropriate major watershed WRAPS project report containing specific Restoration and Protection Strategies, or contact MPCA Brainerd Watershed Unit staff.



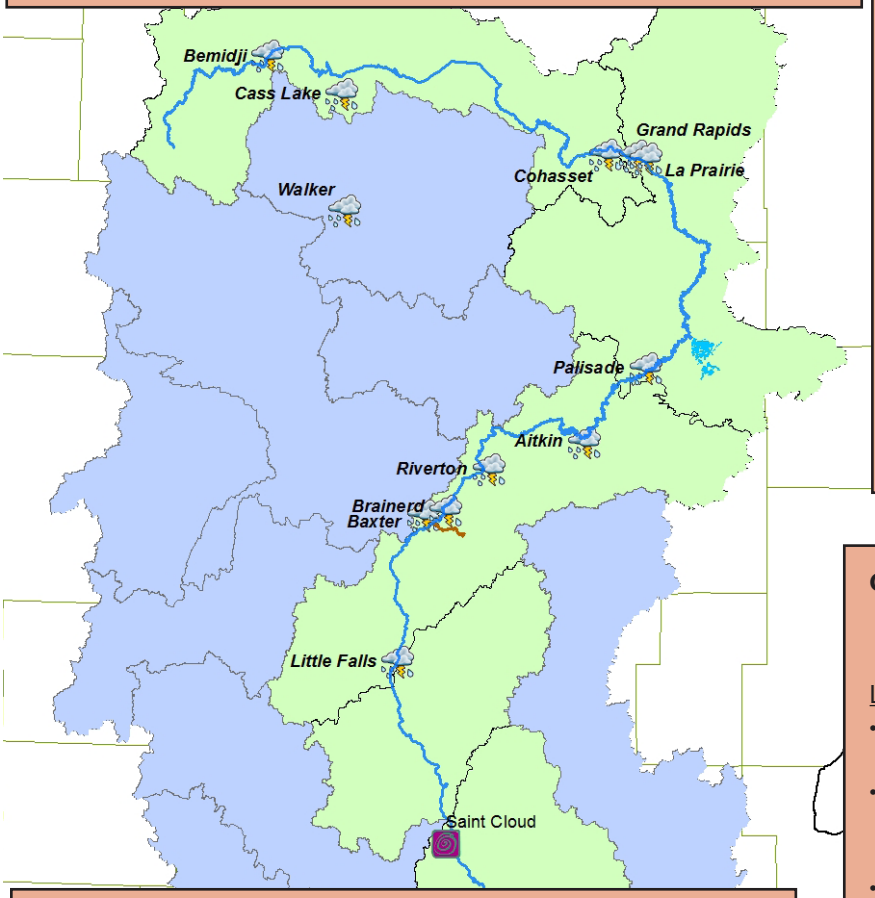
Current Implementation Projects on the Mainstem Corridor

Many projects in the UM Basin have been completed or are underway. Many other projects are being proposed as a result of the WRAPS projects to target and prioritize both restoration and protection strategies. The maps below displays just a few of the many accomplishments and efforts underway in the Upper Mississippi Basin Watersheds.

Mississippi Headwaters Board

Stormwater Planning Cities

- Mississippi Headwater Board worked with multiple agencies and utilized the Clean Water Fund to study 12 cities on the Mississippi River
- Prioritize, target, and measure the effectiveness of each stormwater pollution prevention practice on a city and regional scale
- Now in the implementation stage



Aitkin Soil & Water Conservation Dist.

Big Sandy & Minnewawa Lakes Phosphorus Reduction

This project will implement phosphorus reduction strategies for the Big Sandy Lake Watershed, as outlined in the Big Sandy Lake and Lake MinnewawaTMDL Implementation Plan.

The picture below shows volunteers planting a rain garden and shoreline buffer project on Big Sandy Lake.

Crow Wing Soil & Water Conservation Dist.

Buffalo Creek

<u>Little Buffalo Creek Restoration Project</u>

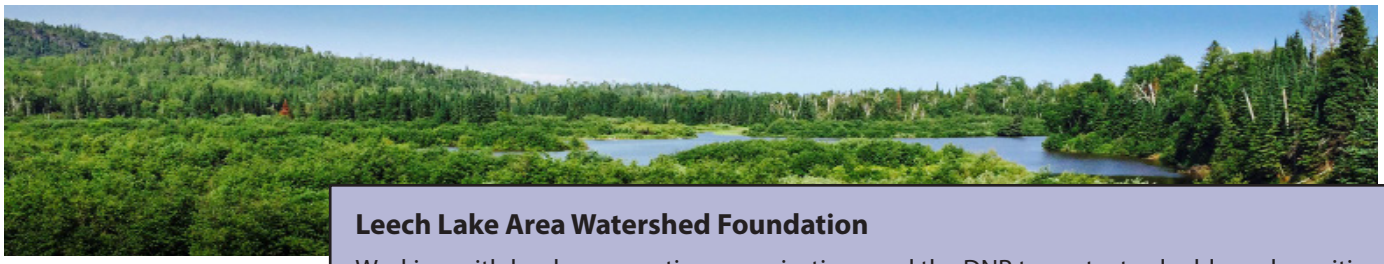
- Streambank restoration, curb and gutter rain gardens
- Preventing an estimated 35 tons of sediment from flowing into a tributary of the Mississippi River
- Collaborative effort between 32 citizens who installed rain gardens in their front yards, the city of Brainerd, Central Lakes College and the University of Minnesota Extension Master Gardeners

Sauk River Watershed District

St. Cloud enhanced Street Sweeping

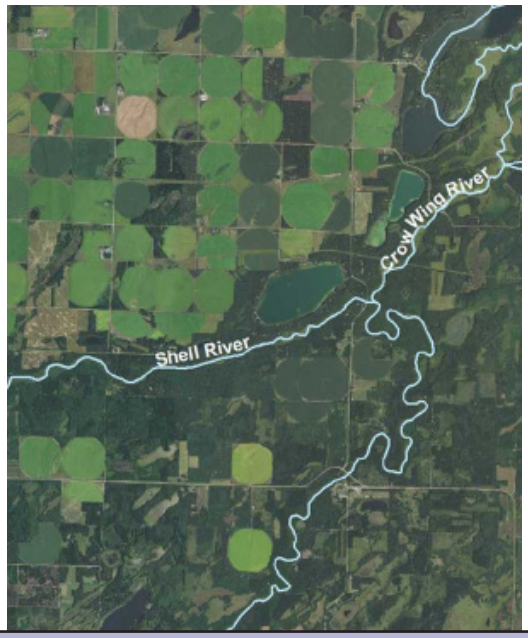
- In 2012, the Sauk River Watershed District assisted the City of St. Cloud in obtaining a regenerative air vacuum street sweeper to address targeted high priority areas
- Twenty-four miles of streets in the priority area
- City of St. Cloud removed approximately 560 tons of sediment and debris and 271 pounds of phosphorus during the 2013-2015 targeted sweeping efforts
- Sweepings are screened and sand is stockpiled for re-use and organic material is composted

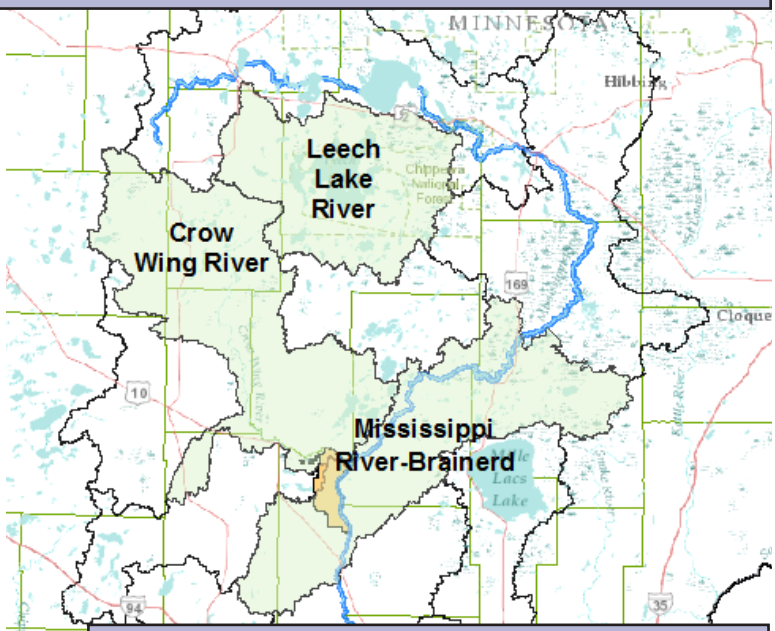
Successes/Challenges in the Northern Half of the Basin



Leech Lake Area Watershed Foundation

Working with land conservation organizations and the DNR to protect valuable and sensitive lakeshore properties through conservation easements and fee acquisitions. Since 1997, LLAWF has protected over 30 miles of critical shorelands and 3,000 acres of critical habitat lands for future generations to enjoy.





Camp Ripley Sentinal Landscape (CRSL)

Crow Wing River Watershed

- This major watershed includes the flowage from the Redeye and Long Prairie River Watersheds and contributes the **largest volume of water** entering the Mississippi River above the Minnesota and St. Croix Rivers.
- Since it is upstream of the St. Cloud drinking water intake and the Twin Cities drinking water intake, it is imperative to keep this large volume of water clean and free of excess nutrients, especially Nitrates.
- Forest-to-agricultural land conversion in the River's upper basin is happening fast. The image above displays center pivot irrigation. Between 2008 and 2013, more than 260,000 acres of forest, wetland and grassland were converted to agriculture, with the largest proportion of this occurring in critical water supply source areas.
- Modeling data suggests that the future conversion 7,708 acres of forest land to agriculture would **triple** the phosphorous reduction needed to clean up First Crow Wing Lake which is already impaired due to excess nutrients.

Morrison and Crow Wing SWCDs

Main goals

Protection:

- Continue easement priority focus with willing landowners within the 3-mile Army Compatible Use Buffer (ACUB) area around Camp Ripley
- Develop forest protection in the northern third of the CRSL project area following riparian corridors, lake buffers and moraine topography.

Nutrient Reduction:

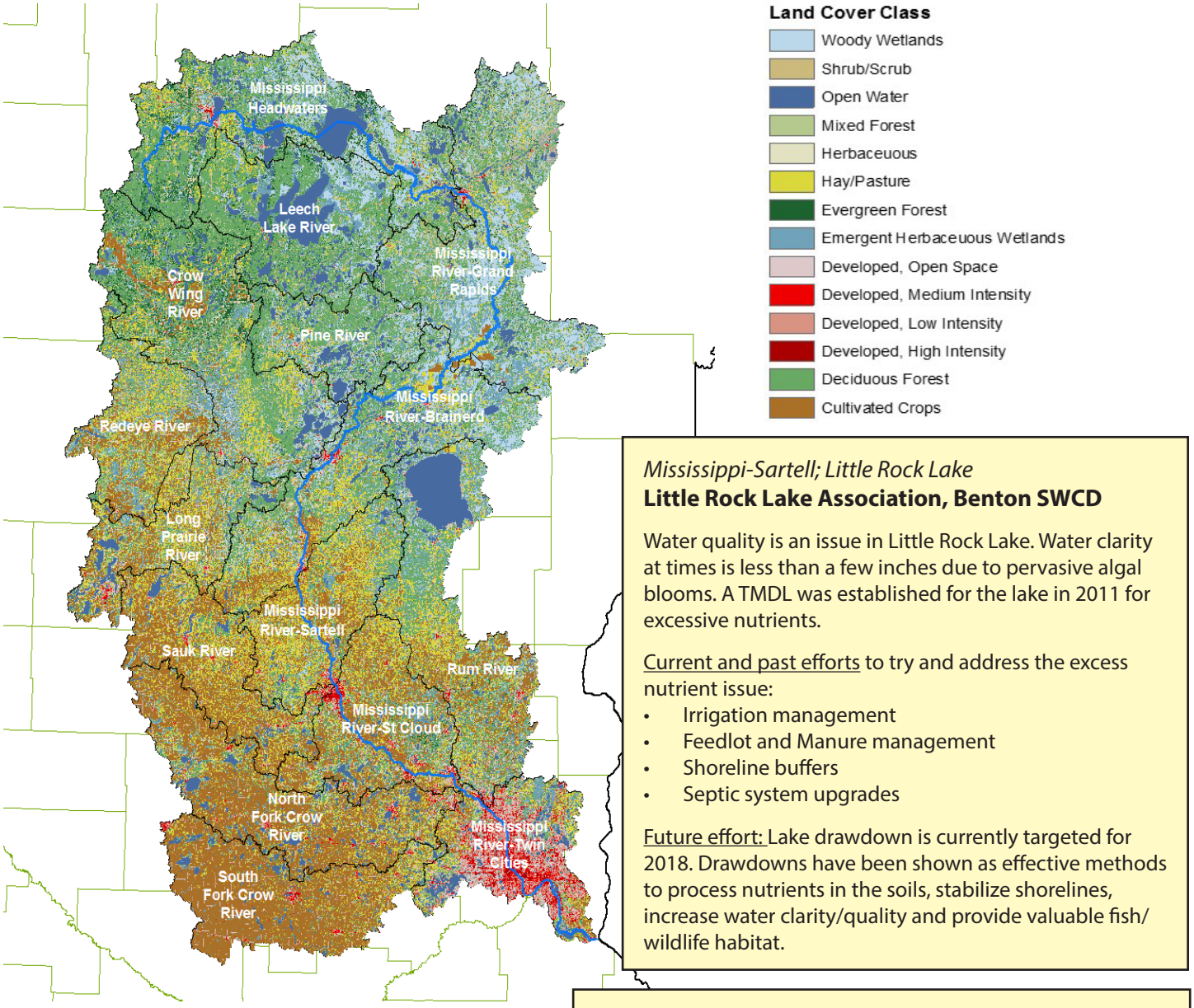
- Develop program support to cost-share practices and restoration in the southern two-thirds of the CRSL project area to reduce nitrogen, phosphorus and soil loss by 20% in priority minor watersheds

Working Lands Programs:

- Support funding private landowner engagement in private forest management
- Support sustainable grazing programs that benefit water quality

Successes/Challenges in the Southern Half of the Basin

This map displays the change in land use from north to south in the basin. Green and blue denotes forests and wetlands, while brown and yellow illustrates farmland. Shades of red show areas of development.



Mississippi-Sartell; Little Rock Lake

Little Rock Lake Association, Benton SWCD

Water quality is an issue in Little Rock Lake. Water clarity at times is less than a few inches due to pervasive algal blooms. A TMDL was established for the lake in 2011 for excessive nutrients.

Current and past efforts to try and address the excess nutrient issue:

- Irrigation management
- Feedlot and Manure management
- Shoreline buffers
- Septic system upgrades

Future effort: Lake drawdown is currently targeted for 2018. Drawdowns have been shown as effective methods to process nutrients in the soils, stabilize shorelines, increase water clarity/quality and provide valuable fish/wildlife habitat.

Long Prairie River

Todd, Morrison and Douglas SWCDs

Changes to vegetation, hydrology and natural channels have caused many segments of the river to unnaturally cut into banks at the loss of 10-20 feet per year. Engineered streambarbs at certain locations along the river allow river current energy to be redirected and the barbs enable sediment deposition where banks have eroded.

Mississippi-St. Cloud

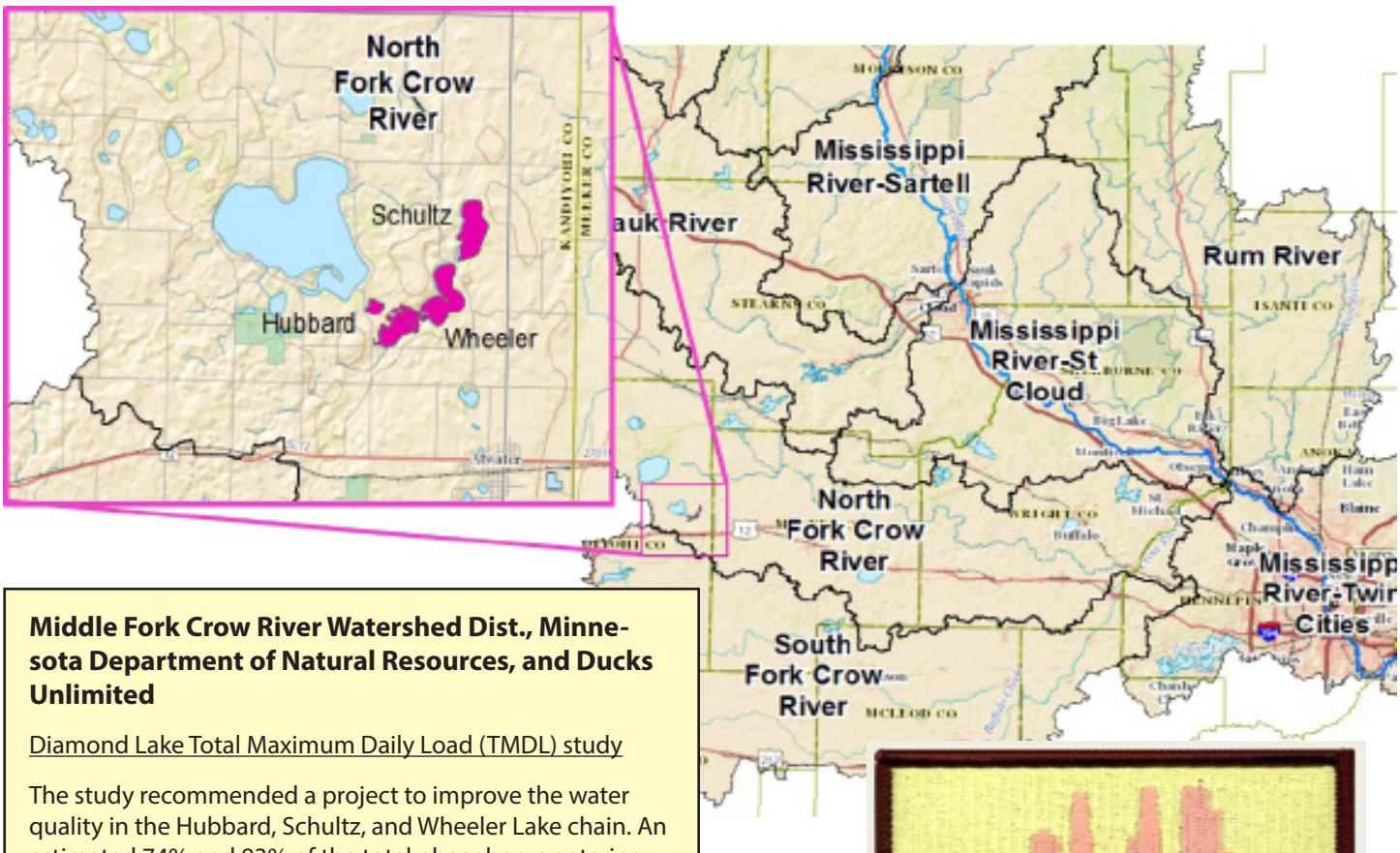
Clearwater River Watershed District

Kingston Wetland Restoration Project (WAR 2016)

The river was historically ditched through Kingston wetland to provide agricultural drainage, and was placed on the impaired waters list because it did not meet standards for dissolved oxygen (DO). Studies showed that the wetland was exporting soluble phosphorus to downstream lakes (seven of which are listed as impaired).

By restoring the main channel and meander, the river goes from being a ditch through a wetland to a more significant recreational resource.

Partner successes off the Mainstem - North Fork and South Fork Crow River



Middle Fork Crow River Watershed Dist., Minnesota Department of Natural Resources, and Ducks Unlimited

Diamond Lake Total Maximum Daily Load (TMDL) study

The study recommended a project to improve the water quality in the Hubbard, Schultz, and Wheeler Lake chain. An estimated 74% and 83% of the total phosphorus entering Diamond Lake from surface runoff in 2008 and 2009, respectively, came from the chain of lakes.
Plan: Construction, operation and maintenance of water control structures to allow for temporary draw-down of the lake chain to enhance their condition and for the combined purposes of improving wildlife habitat and water quality.

Crow River Organization of Water (CROW)

Surface Water Runoff Reduction - South Fork Crow River Watershed

From the perspective of the Upper Mississippi River Basin, the Crow River is one of its major tributaries from a water and nutrient loading standpoint. On average, discharges from the Crow River, dependent on flow, account for up to 46% of the phosphorus and up to 53% of the sediment in the Mississippi River.
In only two construction seasons, the following was accomplished:

- 6 stabilization projects
- 3 wetland restoration projects
- 1 Agriculture Waste upgrade
- 9 rain gardens
- 4 SAFL Baffles installed
- 3 shoreline naturalization projects
- 15 sediments basins
- 4 waterway projects
- 198.4 acres were enrolled into CRP
- 73 subsurface sewage treatment systems installed

Crow River Organization of Water (CROW)

Paddle Patch/Decal program

Goals for this program:

- Incentive to explore local surroundings
- Care about their local resources
- Inspire fun, adventure, and an appreciation for the outdoors

Citizens can send CROW either a picture or story about their two hour minimum adventure on the North Fork, South Fork, or main stem Crow River. The Crow River is more than just a tributary to the Mississippi River! It is a place that inspires creativity and creates memories as a resource to protect and restore.

Partner Successes off the Mainstem - Sauk River, City of St. Cloud, and Stearns Cty.

City of Avon, Stearns SWCD

Stratford Addition Raingardens

The Stratford Homeowners Association identified a stormwater runoff issue that was impacting Middle Spunk Lake.

The Stearns County SWCD worked with a local consulting firm to develop the project, situate the BMP's in the most ideal locations and implement the plan. In all, 40 BMP's were established in the 93 lot development to treat the stormwater runoff before entering Middle Spunk Lake.

Sauk River Watershed Dist., City of St. Cloud

Seberger Park neighborhood was selected for a street and utility reconstruction project in 2014. Underground infiltration systems and sumps were installed to capture and filter the first flush of stormwater pollutants. Larger rain events bypass the infiltration systems and are routed to the main storm drain pipe systems. The underground infiltration systems and sumps remove approximately:

- 33 pound of phosphorus
- 7,500 pounds of sediment
- Infiltrate over 13 million gallons of water annually

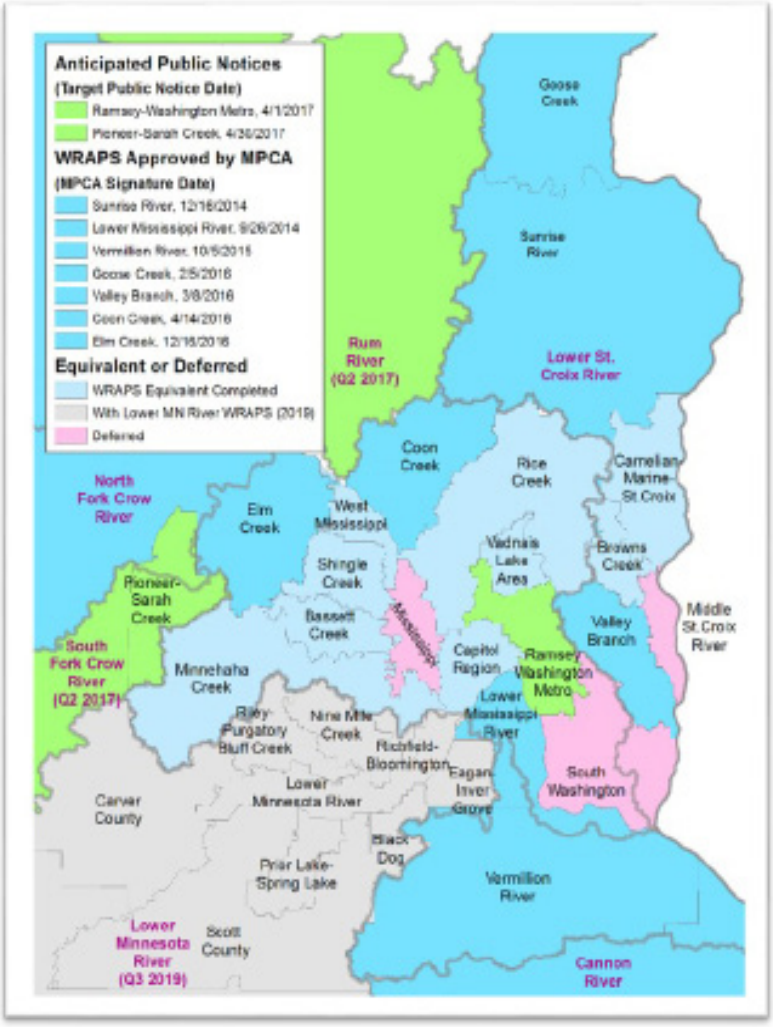
City of St. Cloud, Stearns SWCD

Whitney Park on the Sauk River has a severely eroded outside bank, caused by the low head dam in the river upstream. In order to stabilize the streambank:

- Stream barbs will be created using field stone.
- When the slope is re-graded, native grasses and wildflowers will be seeded and planted from plugs.
- Trees and shrubs will be planted from potted stock.
- The entire site will be hydro mulched or covered with erosion control blanket to ensure stabilization.
- The low head dam is scheduled to be removed.

Mississippi River - Twin Cities

The Mississippi River Twin Cities Watershed is on a different schedule than the rest of the HUC 8s in the Basin. There are 33 watershed districts (WD) and watershed management organizations (WMO) in the Twin Cities Metro Area. Within the Mississippi River Twin Cities Watershed itself, there are 13 WDs or WMOs. See the map below for the subwatershed WRAPS schedule.



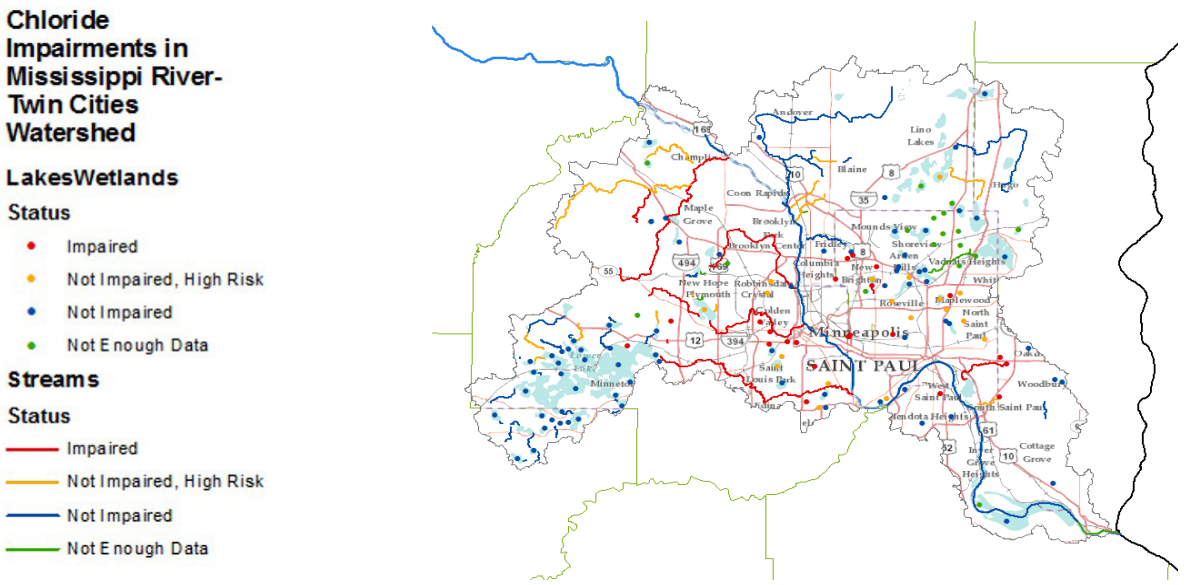
Challenges in the Twin Cities

Due to the density of industry, housing, and roads, lakes and streams in the Mississippi River-Twin Cities Area Watershed are showing signs of stress from pollution, such as:

- Higher levels of nutrients causing unsightly and sometimes toxic algae blooms in lakes
- Bacteria in streams making recreating in them potentially unsafe
- Impervious surfaces like parking lots, roads, and roofs contributing to flashier streamflows and eroding stream banks

Due to the high concentration of roadways, and water softener discharges to municipal wastewater treatment plants, there are several chloride impairments in the Twin Cities Watershed (see map below). As part of managing the impairments, a Twin Cities Metropolitan Area (TCMA) Chloride Management Plan has been developed. Several successes have come from that, which can be found in section 3.5 of this document: https://www.pca.state.mn.us/sites/default/files/wq-iw11-06ff.pdf.

As part of this Plan, the Winter Maintenance Assessment tool (WMAt) has been developed as a resource of all known salt-saving best management practices. The WMAt is a web-based tool that can be used to assist public and private winter maintenance organizations in determining where opportunities exist to improve practices, make reductions in salt use and track progress. https://stormwater.pca.state.mn.us/index.php/Winter_Maintenance_Assessment_tool_(WMAt)



History of the River - How far we've come

Historically, the Mississippi River has been seen as a tool to be used, not a resource to protect. In the 1800s, it was used as a way to move millions of logs from the forests of the north to sawmills down south. Garbage, sewage, sawdust, and industrial waste were routinely dumped directly into rivers, impeding boat navigation and creating epidemics.

Early 1900s, logging in northern Minn. Log jam on the Mississippi River

In 1962, Minnesota witnessed two of the most catastrophic oils spills in the history of the state. That December, sub-zero temperatures caused a pipeline break at Richards Oil in Savage. The ruptured line released a million gallons of oil into the Mississippi River. Shortly thereafter, a storage tank at the Honeymead plant in Mankato burst, releasing more than three million gallons of soy oil onto the ice of the Minnesota River. Oil from both spills slowly traveled downstream.

With the spring thaw, tragic results were evident. Governor Rolvaag activated the National Guard to coordinate cleanup (a project known as Operation Save-a-Duck), and citizens volunteered to rescue and rehabilitate oil-covered ducks. Unfortunately, it was not enough. The survival rate of oil-covered ducks was dismally small. Despite everyone's best efforts, more than 10,000 waterfowl and countless beaver, muskrats, turtles, and fish died.

In 1967, to address the variety and complexity of environmental problems, the Minnesota Legislature replaced the Water Pollution Control Commission with the Minnesota Pollution Control Agency and added authority over air pollution and solid waste disposal.

Downtown Minneapolis sewer in 1927. Over 1.5-million gallons of sewage, runoff and other waste, on average per day, flowing into the Mississippi River

Since then, we have made immense progress on the water quality in the Mississippi River. Long-term trend analysis of seven different water pollutants measured at 80 locations across Minnesota for more than 30 years shows consistent reductions in five pollutants, but consistent increases in two pollutants. Concentrations of total suspended solids, phosphorus, ammonia, biochemical oxygen demand, and bacteria have significantly decreased, but nitrate and chloride concentrations have risen, according to data from the Minnesota Pollution Control Agency's (MPCA) "Milestone" monitoring network. Pollutant concentrations show distinct regional differences, with a general pattern across the state of lower levels in the northeast to higher levels in the southwest. These trends reflect both the successes of cleaning up municipal and industrial pollutant discharges during this period, and the continuing challenge of controlling the more diffuse "nonpoint" polluted runoff sources and the impacts of increased water volumes from artificial drainage practices.

George Serbesku, concerned citizen, with Governor Rolvaag and a pile of oil-covered ducks.

From: https://www.pca.state.mn.us/sites/default/files/wq-s1-71.pdf

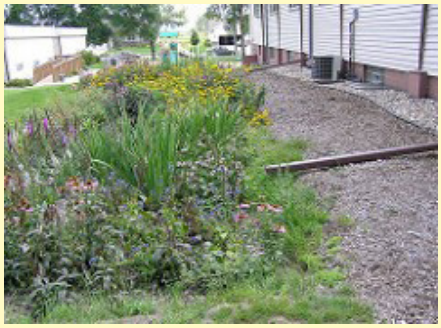
What next? What you can do - https://www.pca.state.mn.us/water/what-were-doing-and-what-you-can-do

Climate change is expected to impact the basin in multiple ways. More severe weather events, both flooding and drought, will be hard on our rivers and lakes. It is more important than ever to make sure our stormwater is properly managed. Buffers along lakes and streams can reduce the amount of sediments and pollutants reaching our waterbodies, and even help ease the effects of heavy rain events.

In order to protect this invaluable resource that provides drinking water for millions of people in Minnesota and beyond, world-class fishing and habitat for countless species, as well as a multitude of recreational opportunities, we need to continue working together. See suggestions on how to get involved in your area below.

Become a Citizen Volunteer!
Citizen volunteers measure the clarity of lakes and streams, collecting valuable data the MPCA uses to make decisions on watershed protection and restoration. For more information, or to become a volunteer: www.pca.state.mn.us/hqzq8f1

Keep your storm drains clean of leaf & grass clippings.
Rain water and melting snow in urban areas can't soak into impervious surfaces like rooftops, driveways, parking lots, and roads. Instead, it runs into streets and storm sewers, picking up leaves, dirt, salt, fertilizers, pesticides, oil, bacteria, and garbage along the way.



Grow a healthy, water-friendly lawn and garden.
Rain gardens are designed to filter water into the ground and retain stormwater that would otherwise run into streets and storm sewers. Reducing runoff is critical to minimizing the impact stormwater has on the surrounding lakes and streams. Learn more: www.pca.state.mn.us/dm0r597

As a community or on your own property:

- Rain gardens
- Buffers & swales
- Proper septic system maintenance

- Get involved in WRAPS and local water planning
- Let your elected officials hear your concerns about water quality

- Personal responsibility when recreating on water and when living or farming near water
- Adopt-A-River

We are all in this together!

Contacts & More information

- MPCA: Anna Bosch, Brainerd Watershed Unit - 218-316-3929 - anna.bosch@state.mn.us
- Watershed webpages: https://www.pca.state.mn.us/water/watersheds
- Upper Mississippi Monitoring & Assessment Report: https://www.pca.state.mn.us/sites/default/files/wq-iw8-08ab.pdf

MINNESOTA POLLUTION CONTROL AGENCY

The Clean Water, Land and Legacy Amendment is funding a large part of the MPCA's watershed approach.

CLEAN WATER LAND & LEGACY AMENDMENT

www.pca.state.mn.us

June 2017