WRAPS report summary
Water Restoration and Protection Strategy

Two Rivers Watershed

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 incorporates the following activities into a 10-year cycle:

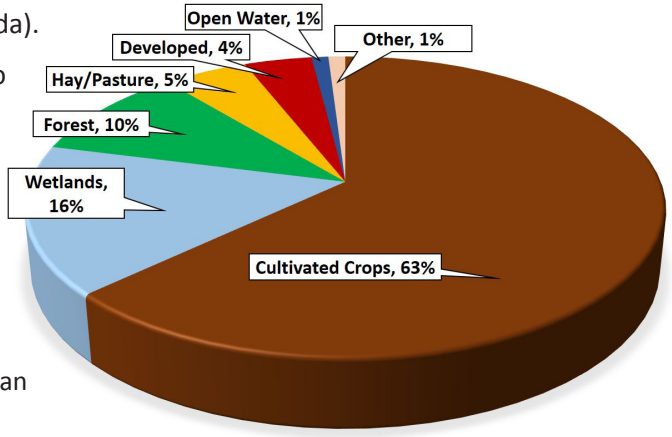
- Water quality monitoring and assessment
- Watershed analysis
- Public participation
- Planning
- Implementation
- Measurement of results

The Two Rivers Watershed process began in 2013 with monitoring flows and water quality in surface waters. In 2015, all surface waters were assessed for aquatic life (fish and aquatic insects), recreation (fishing/swimming), and fish consumption. The watershed approach adds a protection component for water resources that currently meet standards rather than focusing entirely on restoration of impaired waters.

Watershed characteristics

- Size: 1098 sq. miles (additional 3 sq. miles extends into Canada).
- Surface water: One lake >25 acres; three branches of the Two Rivers - South, Middle, North; other streams of various size.
- Counties: Roseau, Kittson, and Marshall.
- Land use: Predominantly small grains, sugar beets, corn, and soybeans.
- The 8 digit hydrologic Unit Code (HUC) for the Two Rivers Watershed is 09020312.

Land Use – Two Rivers Watershed



Cultivated crops is the dominant land use cover, comprising more than 63% of the watershed. The next largest cover is wetlands at 16%.

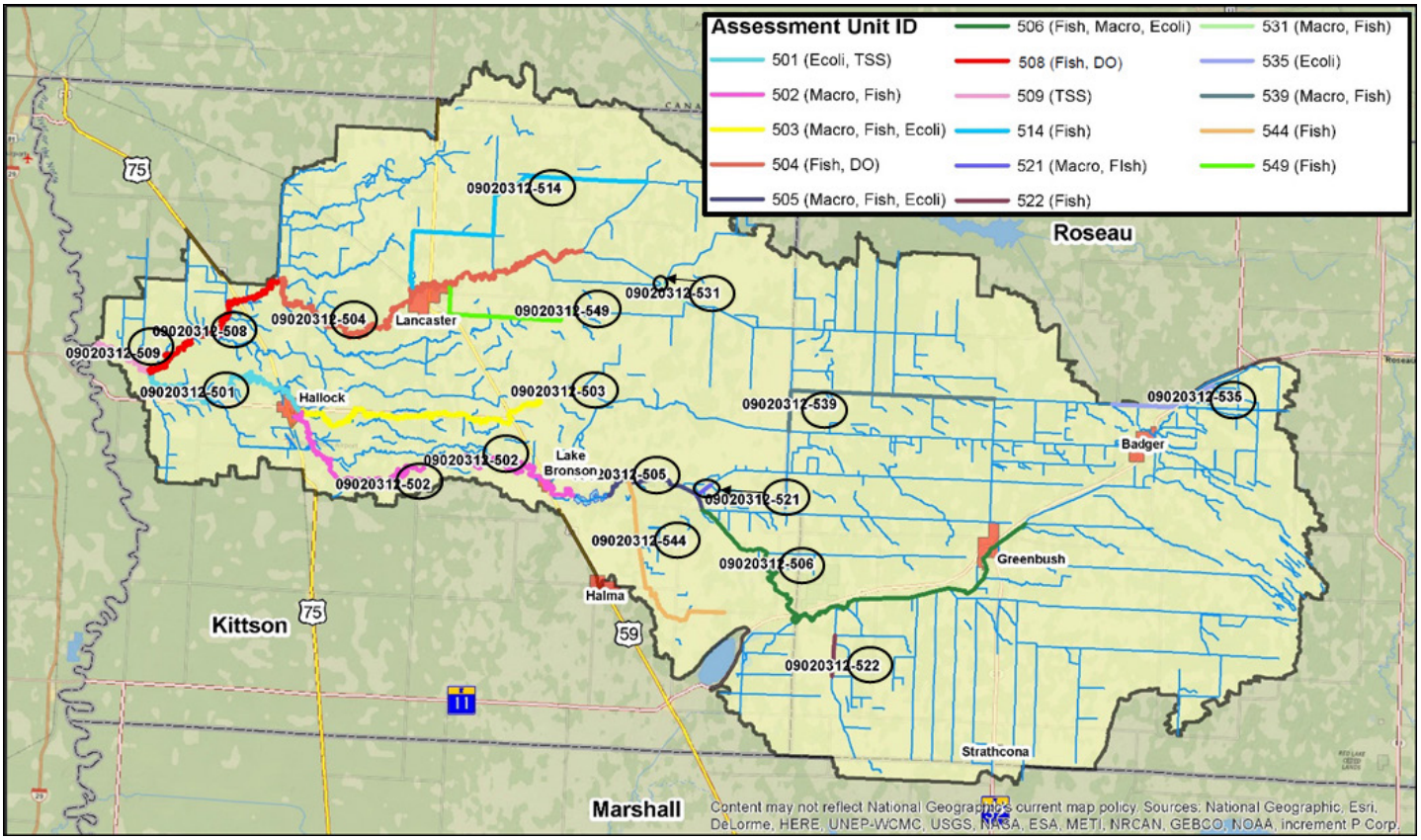
About 79% percent of streams in the watershed have been altered by channelization and ditching. The creation of dams within the watershed also affects how water flows through the area and on fish and aquatic insect communities. The watershed has very few lakes, with Lake Bronson being the largest and most used.

The north-central part of the watershed is in the Northern Minnesota Wetland ecoregion with the remainder in the Lake Agassiz Plain ecoregion. The very flat and poorly defined floodplains has been a major factor in the region experiencing numerous major floods over the years. These floods have led to the creation of extensive man-made drainage networks (channelization) designed to remove surface water quickly from agricultural lands. Today, rapid surface water removal from agricultural fields continues to be a focus with underground tile piping becoming widely used within the region.

The main concerns in the watershed are wind and water erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and connectivity issues (dams). Many of the concerns relate directly to flooding and increased sediment and pollutant loadings to surface waters. Changes in land use patterns such wetland removal and the conversion of tallgrass prairie into agriculture have likely contributed to sediment and pollutant loadings to surface waters, thus reducing populations of sensitive aquatic species. Some trends that have been identified in the watershed include:

- Annual precipitation appears to be increasing;
- Annual flow appears to be increasing;
- Increased annual flows appear to be driven by increasing annual precipitation; and
- Water quality trends have remained unchanged since 1972 on the South Branch of Two Rivers near Hallock.

Assessments: Are waters meeting standards?



During the first phase of the watershed approach – intensive watershed monitoring – the MPCA and local partners collect data about biology such as fish populations, chemistry such as pollutant levels, and flow. Waters are “impaired” if they fail to meet standards. The map above shows the aquatic life and recreation impairments in the Two Rivers Watershed.

Using data from these sampling efforts, it was determined that 13 stream reaches were impaired for fish and/or aquatic insects. Five stream reaches were impaired for aquatic recreation (swimming) due to excessive levels of *E.coli* bacteria. Two stream reaches were impaired for low dissolved oxygen levels and two stream reaches were impaired for turbidity/total suspended solids (excessive sediment in the water).

Seven Total Maximum Daily Load (TMDL) studies were developed for six stream reaches; five address high levels of *E. coli* bacteria and two address total suspended solids (TSS). These studies identify known and likely sources of the pollutants and reductions needed to bring these reaches back into compliance with state standards. More information is needed before TMDLs can be done for the other impairments.

Stressors: What factors are affecting fish and bugs?

To develop strategies for restoring or protecting water bodies with biological impairments, agencies and local partners must first identify the possible causes, or stressors, of the impairments.

This table summarizes the predominant stressors of fish (F-IBI) and/or aquatic insects/macroinvertebrates (M-IBI) in the indicated streams in the watershed.

Name (AUID suffix)	Biological impairment(s)	Candidate causes				
		Loss of longitudinal connectivity	Flow regime instability	Insufficient physical habitat	High suspended sediment	Low dissolved oxygen
North Branch Two Rivers (504 and 508)	F-IBI	•	•	•	•	•
Middle Branch Two Rivers (503)	F-IBI/M-IBI	•	•	•	•	•
South Branch Two Rivers (502, 505, and 506)	F-IBI/M-IBI	•	•	•	•	•
State Ditch 84 (514)	F-IBI	•	•	•		•
Lateral Ditch 1 of State Ditch 95 (521 and 539)	F-IBI/M-IBI	•	•	•	•	•
County Ditch 4 (522)	F-IBI	•	•	•		•
State Ditch 72 (531)	F-IBI/M-IBI	•	•	•		•
State Ditch 49 (544)	F-IBI	•	•	•		•
Judicial Ditch 31 (549)	F-IBI	•	•	•		•

IBI stands for “index of biological integrity.” The IBI can help watershed managers:

- Measure health of water creatures;
- Diagnose the type of stressors damaging a water body;
- Define approaches to protect/restore fish/aquatic insect communities; and
- Evaluate the effectiveness of protection and restoration activities.

Restoration and protection strategies

Numerous water quality restoration and protection strategies were identified through collaboration with state and local partners. Due to the homogeneous nature of the watershed, most of the suggested strategies are applicable throughout the watershed. The following are just a few of the recommended actions to be taken in the watershed:

- Improve feedlot/manure application management;
- Store/control the release of tile-drained waters;
- Increase vegetated cover (cover crops, convert marginal land to perennial cover, etc.);
- Improve field runoff controls (meet all buffer requirements, control tile inlets, install BMPs);
- Restore stream channels (remove dams, restore meanders, install two-stage ditches, etc.);
- Increase base stream flows during low-flow years (restore wetlands, add impoundments, increase runoff controls, etc.);
- Address failing septic systems;
- Improve habitat for fish aquatic insects (buffers, increase conservation cover, remove dams, two-stage ditches, etc., and
- Accurately size culverts and bridges.

Next steps and measuring results

The restoration and protection strategies listed in the WRAPS report will be the basis for developing local implementation plans to restore and protect water resources. The report lays out goals, milestones and responsible entities to address protection and restoration priorities in the watershed. The targets are intended to provide guidance and “measuring sticks” to assess the watershed’s health and success of actions taken.

Water quality in some areas in Minnesota has declined over many decades. While restoration activities continue, new problems develop, such as converting land to intensive cropping that negatively impacts water quality. The perpetual challenge is to make improvements and keep up with new problems. Impacts from other factors such as climate change are still not completely understood. Consequently, it may take decades to fully restore impaired waters. For these reasons, it is much more cost-effective to protect clean waters while we can.

Key conclusions of first cycle

- The watershed is dominated by agriculture, with more than 64% of the land use in crop production. Approximately 79% of streams have been altered from their original course in an effort to increase drainage rates to better suit the current land use practices of the area. These alterations have resulted in dams, loss of habitat, low flows, and lowered levels of oxygen in many streams, reducing the abundance and diversity in both fish and macroinvertebrate (aquatic insect) communities.
- Bacteria (*E. coli*) levels are very high in some reaches and dissolved oxygen is exceedingly low in some reaches.
- Widespread changes in land use practices will need to occur to bring about significant improvement in most indicators. Increased public understanding and interest in these conditions is also needed since the vast majority of land in the watershed is privately owned and improvements will require a change in agricultural practices that are largely voluntary.
- Recommended land use changes that would protect and restore water bodies include: increased buffers, field coverage, and stream restoration; improved feedlot/manure management; additional runoff controls; wetland restoration; additional impoundments; and improved habitat.
- A total of 29 stream impairments were found in the watershed. TMDL studies were done to address seven of these. More information is needed before TMDLs can be done for the remaining 22 biological community impairments.
- There is only one lake in the watershed, Lake Bronson, that is of considerable size. More information is needed to determine whether or not the lake is impaired for swimming.

Low flow conditions in the South Branch of the Two Rivers in August 2012 (left) and in July 2013 (right). Low flows can cause low dissolved oxygen levels and other conditions that are harmful to fish and aquatic insect communities.

Full report

To view the full report, go online and search for "MPCA Two Rivers Watershed WRAPS Report."

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CLEAN WATER LAND & LEGACY AMENDMENT