



HEADWATERS *of the* ST. CROIX

WATERSHED STUDY SUMMARY RESULTS



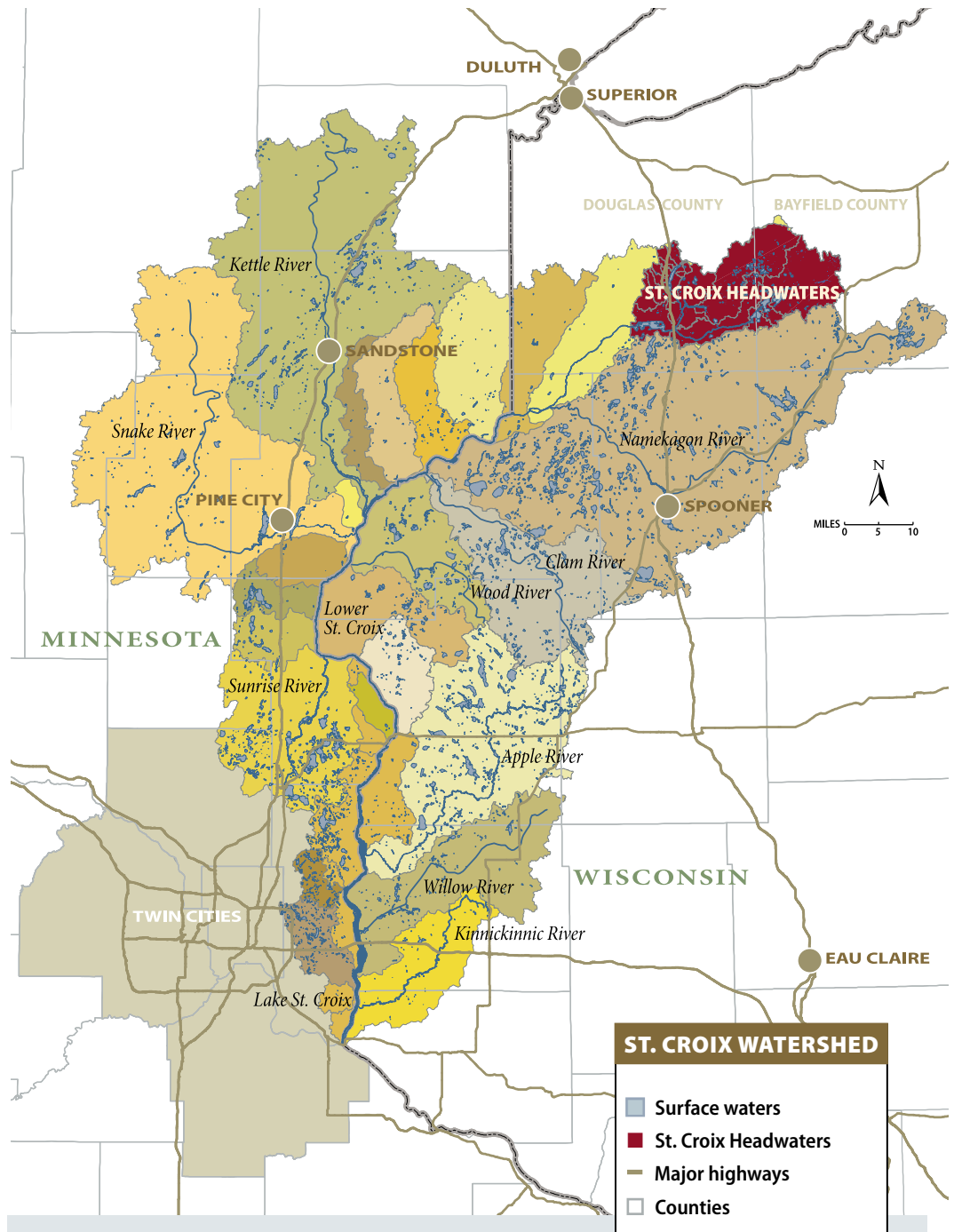
Local lake and river groups collaborating as the Upper St. Croix Watershed Alliance, the Army Corps of Engineers, and the Wisconsin Department of Natural Resources partnered on studies to provide the information and recommendations in this summary report. Major components of this study included lake and stream water quality and quantity, water level management and fish passage, wetlands, critical habitat, AIS, and current and future land use.

THE HEADWATERS

The Headwaters of the St. Croix River includes waters of exceptional quality with 160 miles of streams and rivers, 197 lakes, and almost 38,000 acres of wetlands. The major rivers are the St. Croix and the Eau Claire. These waters and the lands draining to them – the Headwaters Watershed – cover nearly 335 square miles in the Northern Wisconsin Counties of Douglas and Bayfield. The Headwaters ends where the St. Croix River is impounded by the Gordon Dam. Below the dam, the St. Croix River becomes the St. Croix National Scenic Riverway.

Waters and surrounding lands of the Headwaters are home to a diversity of birds, fish, and wildlife. The natural beauty and water resources also attract people who live and recreate in the area. Largely because of the water, we enjoy natural scenic views and abundant wildlife along with many opportunities for boating, swimming, fishing and hunting.

Clean water from the Headwaters enhances water quality and habitat as this water flows down along the entire length of the Riverway. In fact, two federally listed endangered mussels occur in part because of the clean waters of the St. Croix.

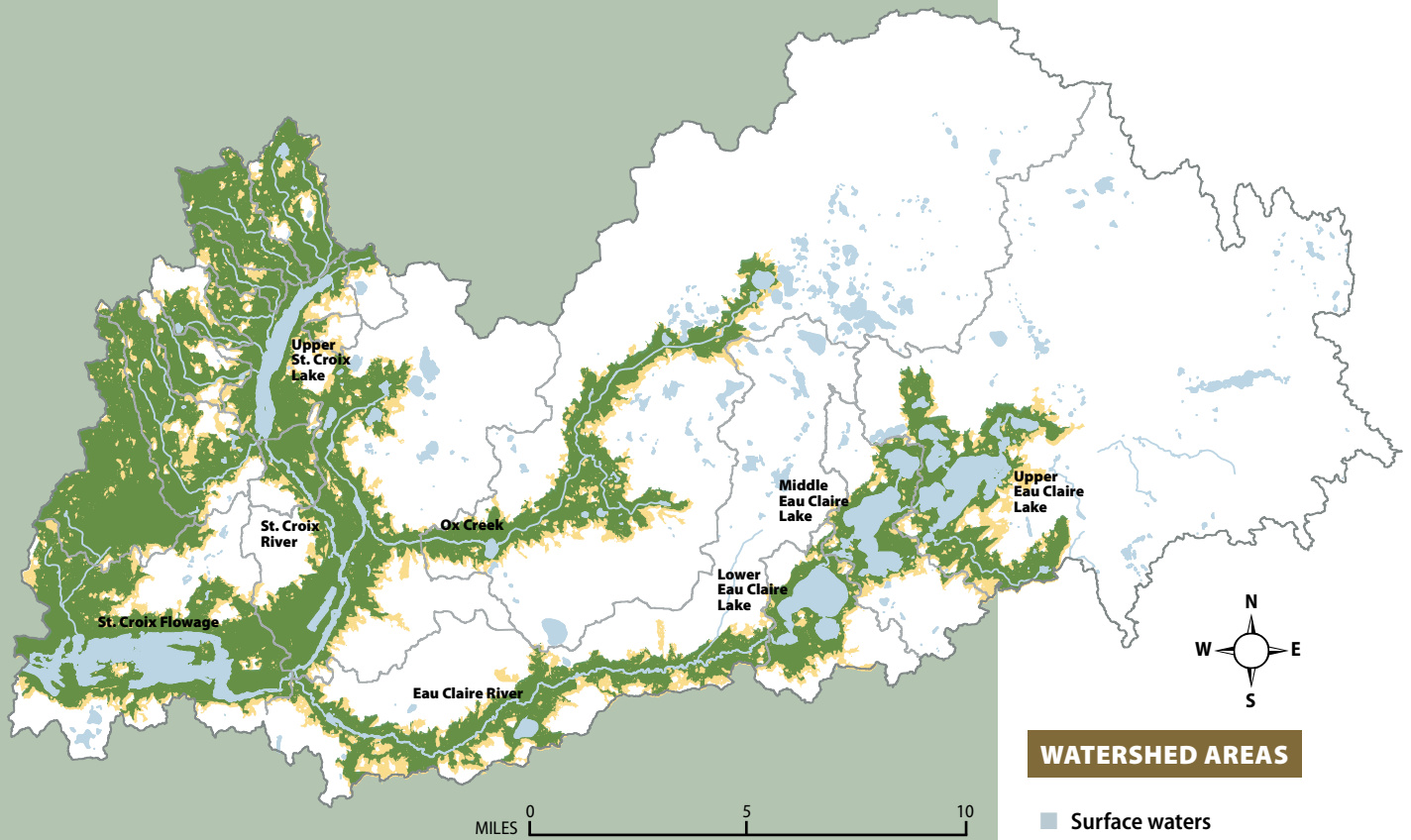


LAKE ST. CROIX, the lower twenty five miles of the St. Croix River between Stillwater, Minnesota and Prescott, Wisconsin, is the target of water quality improvement efforts which affect the entire River Basin. Water quality goals established for Lake St. Croix target a modest five percent decrease in phosphorus loading from the Headwaters area. Phosphorus is the focus of the Lake St. Croix project because it is an important ingredient for algae growth in the St. Croix and most lakes and rivers in the region.

Phosphorus is carried dissolved in runoff waters and attached to eroding soil particles. The export of phosphorus in the Headwaters is low because of sandy soils, large areas where waters are drained to internal pockets in the land, and limited development.

Future development in areas directly draining to water presents the biggest threat to the quality of both water and habitat in the Headwaters.

COVER PHOTO: RYAN RODGERS



WATERSHED AREAS

- Surface waters
- Tier 1 watershed areas
- Tier 2 watershed areas
- Watersheds

WHAT DID WE LEARN ABOUT THE HEADWATERS?

Some watershed areas contribute more to surface water runoff and therefore to pollution. These are shown as Tier 1 and Tier 2 areas in the map above. Tier 1 areas are most directly connected. Tier 2 areas could be connected readily with simple grading and drainage changes such as road construction and culverts.

Why do some areas contribute more runoff to connected Headwaters?

Tier 1 areas are the areas that are most likely to generate runoff and carry pollution to the water for a combination of reasons. Much of the Headwaters is covered in sandy soils which drain very rapidly. Organic soils, with slow drainage, occur in low-lying wetland areas. Runoff readily soaks into the ground in areas where soil is very sandy. The slope of the land also influences how water runs off the land, how much soil is eroded, and how much water soaks in. The glaciers left a Headwaters landscape with rolling hills and closed depressions which create internal drainage. In contrast, areas with land that slopes steeply to the water have rapid runoff with associated higher pollution potential.

Tier 1 areas cover approximately 27 percent of the Headwaters (90 square miles). Tier 2 areas cover an additional six percent (19 square miles). Both of these areas are especially important for water quality protection and improvements.

Tier 1 and Tier 2 areas are especially important for water quality protection and improvements.



RYAN RODGERS

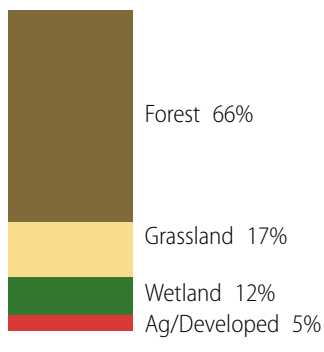


WDNR

Individual lakes with impervious surface levels at or above 6 percent within 300 feet of the lake

Island Lake, Bayfield County	10.3%
Lower Eau Claire Lake	9.2%
Upper St. Croix Lake	9.1%
Lake of the Woods	8.3%
Ellison Lake	8.1%
Pickerel Lake	7.8%
George Lake	7.2%
Bony Lake	7.1%
Kelly Lake	6.2%
Middle Eau Claire Lake	6.0%

Headwaters land cover



HOW DOES LAND COVER IMPACT THE HEADWATERS?

Land cover and land management practices strongly influence water quality. The native plant cover of forest, grasslands, and wetlands stabilizes and slows and filters runoff water in addition to providing habitat for a range of creatures. Land cover examined in the report found natural land covered a great majority of the watershed (95 percent).

The largest recreational and forest land acquisition in state history will help to preserve significant forest cover in the Headwaters. The DNR purchased an easement of about 44,679 forest acres including land in Douglas and Bayfield Counties in 2012. Phase II of the acquisition would include an additional 22,668 acres, some of which is in the Headwaters watershed.

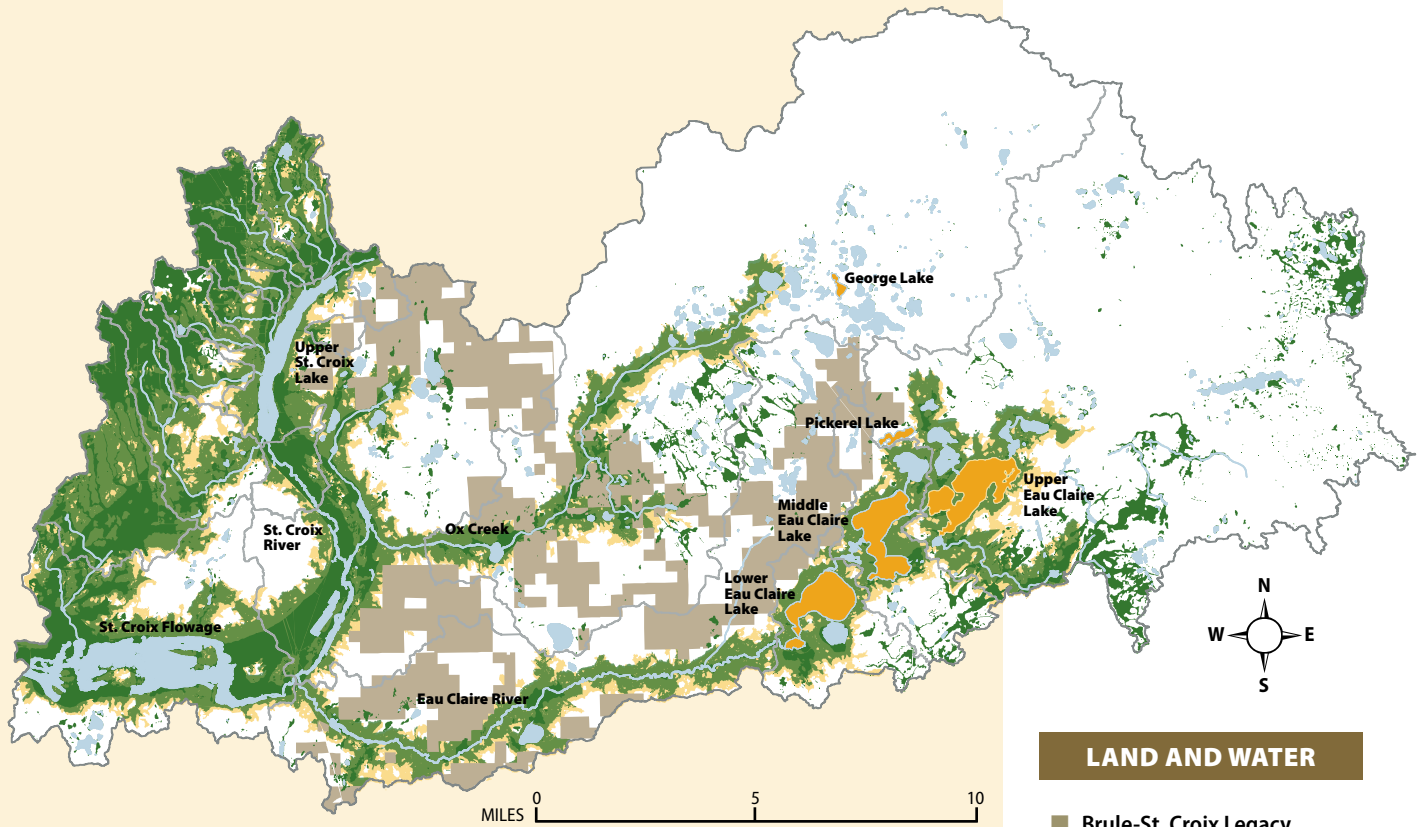
Land developed for agricultural, residential, and commercial use has the greatest potential to degrade water quality. Development often leads to changes in natural drainage patterns and removal of native vegetative cover. Lack of native vegetative cover can increase soil erosion and runoff and eliminate habitat. Impervious surfaces such as roads, rooftops, and compacted soils can greatly reduce or prevent the infiltration of runoff and carry more pollutants to the water faster. Water temperatures also increase when water flows across impervious surfaces instead of soaking into the ground and being cooled by the soil. Cold-water species such as trout are harmed by warmer waters.

The Headwaters impervious surface inventory found low percentages of impervious surfaces currently. However, increases in impervious surfaces would threaten Headwaters surface waters. Previous studies have shown that areas with high percentages of impervious surfaces (>25 percent) demonstrate definite declines in water quality. Habitat quality declines with impervious surfaces between 10 and 20 percent, and cold water fish community declines are seen with imperviousness between 6 and 11 percent. All Headwaters sub basins are at two percent imperviousness or below. However, portions of the Upper St. Croix Lake sub basin approach four percent imperviousness. This is an area where Spring Creek and Park Creek currently support cold water fish like trout.

Some lakes also had imperviousness percentages of concern. Lake owners can take actions to mitigate the impact of impervious surfaces such as allowing adequate shoreland buffers, avoiding removal of near shore in-lake vegetation and woody cover like fallen trees, removing impervious surfaces, and infiltrating runoff with best practices like rain gardens.



WDNR



LAND AND WATER

- Brule-St. Croix Legacy Forest, Phase I
- Wetlands
- Impaired water quality
- Tier 1 watershed areas
- Tier 2 watershed areas

Where is water quality degraded?

In general Headwaters water quality is excellent. There are a few areas of concern for lakes that have enough monitoring data. Some lakes need more data to better understand their health. The lakes listed below exceed or are close to exceeding the threshold for listing as impaired due to phosphorus levels.

Headwaters lakes near or above the impaired water quality recreational threshold for mean summer total phosphorus (TP)

Waterbody Name	Lake Type	Summer TP	Recreational Impairment Threshold	Relation to Threshold
Middle Eau Claire Lake	Two-Story	16	15	Clearly Exceeds
Lower Eau Claire Lake	Two-Story	20	15	Clearly Exceeds
Pickerel Lake	Deep Seepage	18	20	May Exceed
George Lake	Two-Story	14	15	May Exceed
Upper Eau Claire Lake	Two-Story	14.5	15	May Exceed

What did stream water quality monitoring tell us?

Results showed low total phosphorus loads throughout the Headwaters. However, the area is very susceptible to changes that occur with development – especially in the Tier 1 areas. Thoughtful planning for future development and use of appropriate land management practices can prevent damage to our waters.



ELLIOT STEFANIK

Why are wetlands important to the Headwaters?

Wetlands perform many ecological functions in the landscape. These functions influence water quality, water levels, sediment and nutrient cycling, and habitat. This project conducted a detailed wetland functional assessment. The map on page 7 shows wetlands particularly important for capturing and detaining surface water helping to lower flood potential. Of particular note are the wetlands that perform this function around Upper St. Croix Lake where flooding has been a problem.

Wetlands can also transform nutrients by breaking them down from both natural and human sources. Wetlands performing this function are sinks for excess nutrients, preventing them from moving further downstream. The new and more precise wetland assessment identified an additional 10,116 acres of wetlands for a total of 30,809 acres in the watershed

What about dams, water levels, and fish passage?

Dam owners follow state regulations when building, operating, and maintaining dams. The report summarizes historical studies and describes conceptual design and costs for a water level and water flow study of St. Croix Flowage and Upper St. Croix Lake

Fish passage around dams on area lakes and the St. Croix River could benefit a wide range of fish species, including lake sturgeon. Dams have contributed to the decline of these huge, ancient fish. Fish passage around dams would provide a mix of habitat types to hopefully support a self-sustaining population of lake sturgeon. DNR has stocked lake sturgeon in the upper St. Croix River since 2002.

The Headwaters study report describes potential fish passage projects at Gordon Dam, Eau Claire Hydro Dam, Ward Dam, Mooney Dam, Middle Eau Claire Lake Dam, and Upper Eau Claire Lake Dam. See the map on page 7 for dam locations.



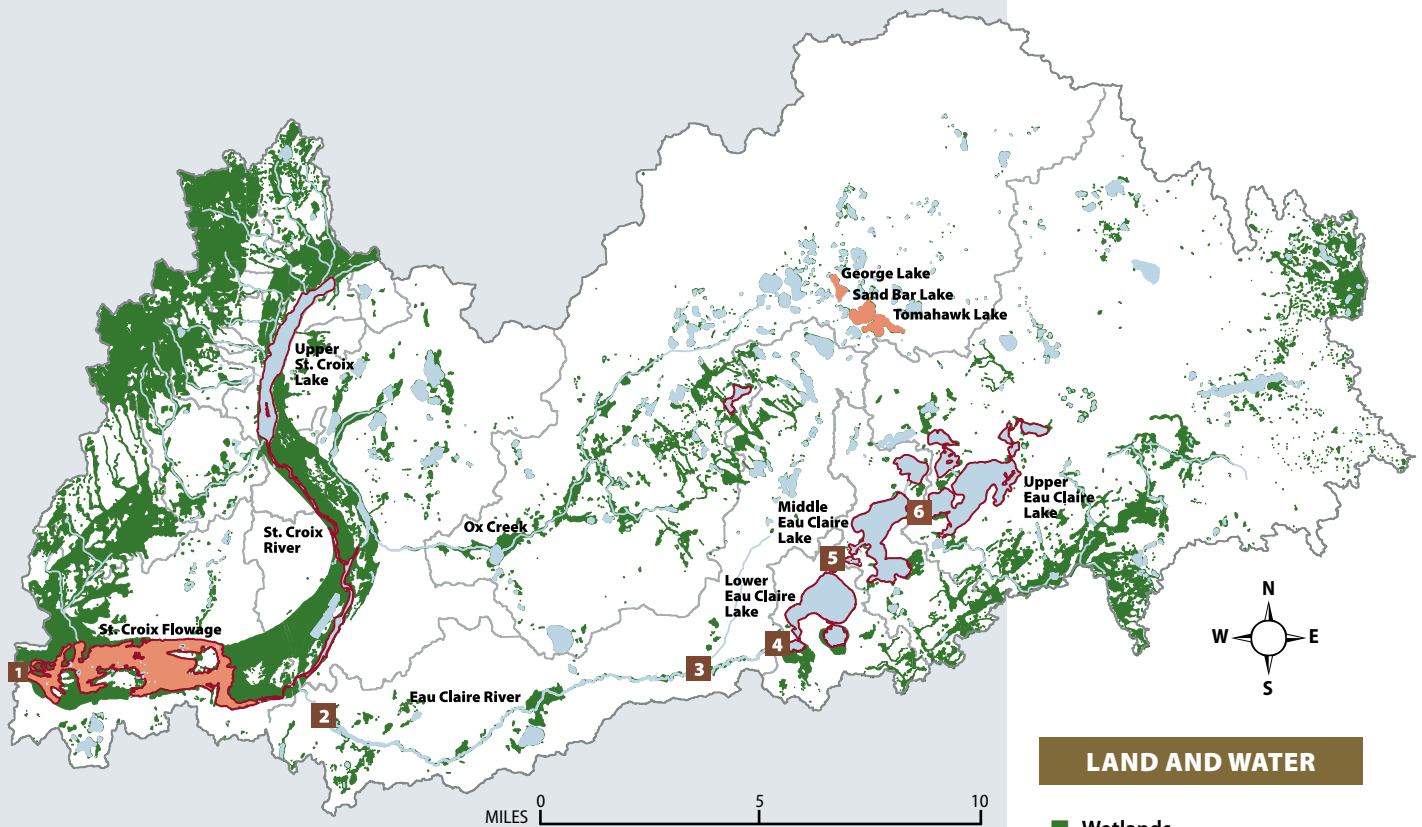
WDNR

Where were critical habitat areas identified?

Lake and river ecosystems provide important habitat. Unfortunately, conversion of natural riparian (lake and river shore) areas to residential use accelerated greatly in the past thirty years. Habitat and water quality continue to be impacted to this day.

Critical habitat designation formally identifies areas important to fish and wildlife within lakes and rivers. Habitat disturbance is the number one threat to our lakes nationally. These sensitive areas, public rights features, and resource protection features are all protected by regulation and management advice within the state of Wisconsin. The publicly-reviewed designations are used by the Wisconsin Department of Natural Resources and local governments to make decisions.

Critical habitat evaluations were performed on fourteen waterbodies in the Headwaters as shown in the map on page 7. Each waterbody report designates specific areas and includes management recommendations.



Where are aquatic invasive species present in the watershed?

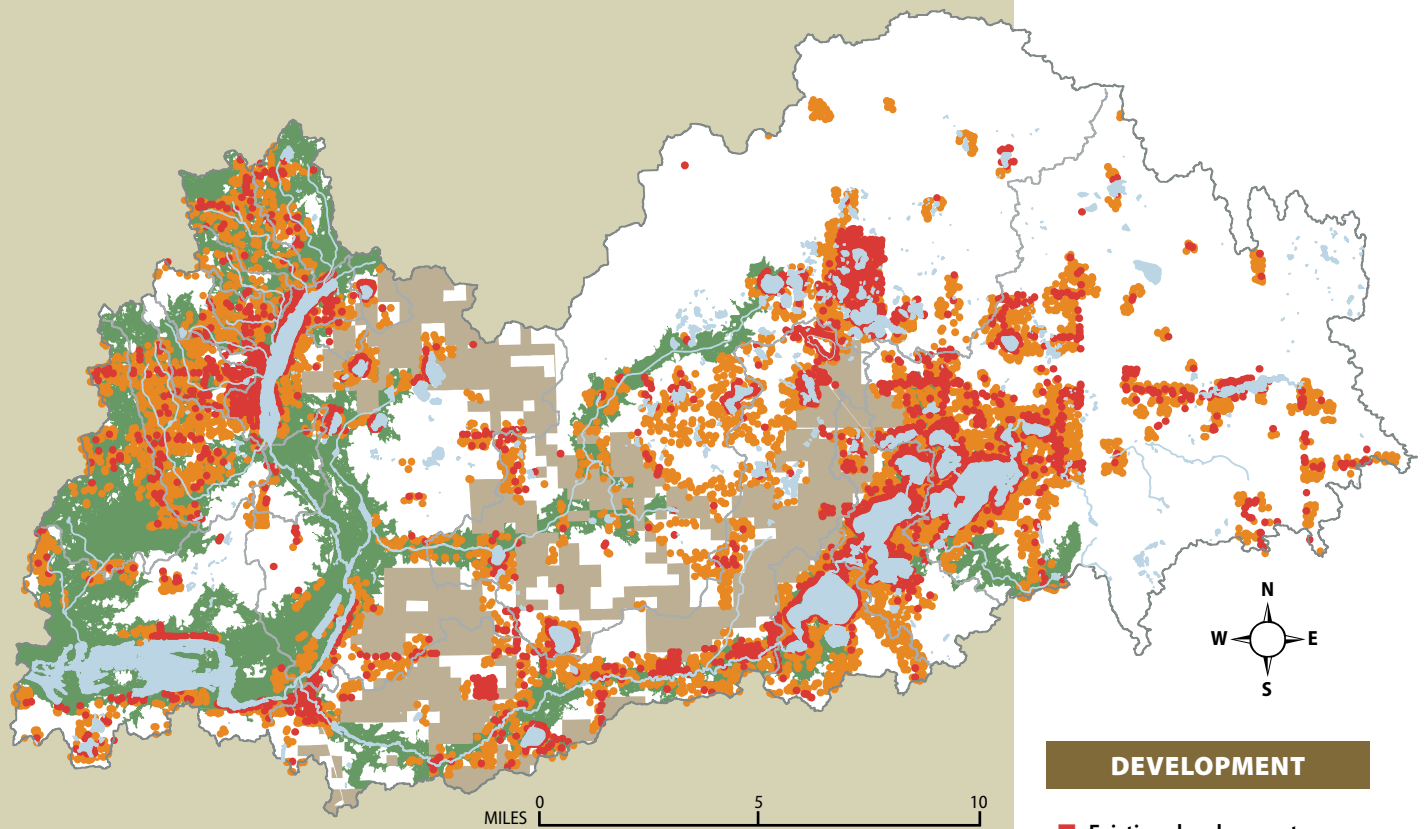
Aquatic invasive species (AIS) are a significant concern for area water resources. AIS can spread quickly displacing native species and altering ecosystems. AIS typically lack natural competitors or predators to keep their numbers in check. AIS can be transported and spread by boats and other equipment. They are most likely to be introduced in areas close to existing infestations with high use and development. Some AIS readily float downstream – a particular hazard in a river system. However, transport upstream across the dams along the St. Croix is unlikely.

Species of particular concern for the area include Eurasian water milfoil and zebra mussels. Eurasian water milfoil was first identified in the watershed in 2004 in Tomahawk and Sand Bar Lakes and has since spread to St. Croix Flowage and George Lake. Control measures are underway in these lakes. Zebra mussels generally establish in hard water lakes and so are a lower risk for the many soft water lakes of the Headwaters. However, lakes including the Eau Claire chain, Bony Lake, Pigeon Lake, Sweet Lake, Robinson Lake and Upper Ox Lake have greater hardness and may be more susceptible. Upper St. Croix Lake and the St. Croix Flowage could also support zebra mussels.



LAND AND WATER

- Wetlands
- Dams
 - 1 Gordon Dam
 - 2 Eau Claire Hydro Dam
 - 3 Ward Dam
 - 4 Mooney Dam
 - 5 Middle Eau Claire Lake Dam
 - 6 Upper Eau Claire Lake Dam
- Waters with Critical Habitat mapping
- Eurasian water milfoil present



WHAT WOULD LIKELY HAPPEN WITH INCREASED DEVELOPMENT?

DEVELOPMENT

- Existing development
- Potential new development
- Tier 1 watershed areas
- Brule-St. Croix Legacy Forest, Phase I

Existing development is shown on the map above with red dots. Potential new building development based on current zoning regulations, public land ownership, and site constraints is shown with orange dots. Unfortunately, much of this projected development is in the directly connected Tier 1 areas where the greatest impacts to rivers, streams, lakes, and wetlands will occur. Development impacts occur when impervious surfaces increase and wetlands and habitat are lost.

If maximum development were to occur in the areas indicated, there would be an estimated 25 to 50 percent increase in phosphorus loading to the Headwaters. This increased loading is predicted to lead to a 35 percent increase in phosphorus concentrations in surface water. Lakes with existing impairments, likely future development, and high impervious surface levels are at a high risk for further water quality impairment. Cold water streams like Park Creek are vulnerable to changes in fish community and declining water quality as impervious surfaces increase. Another impact of development is the loss of wetlands and their critical flood prevention, water quality, and habitat functions.

It is important to note that the analysis assumed that industrial forest lands would not be developed. However, large paper companies could sell off land for private residential development resulting in additional impacts that have not been considered.



WDNR

SUGGESTED HEADWATERS GOALS

Water Quality

Preserve the excellent water quality of the St. Croix Basin Headwaters.

Work to improve water quality for water bodies that exceed water quality impairment thresholds.

Decrease watershed load by five percent as a measure of safety for future water quality and to contribute to overall St. Croix River goals.

Wetlands

No Net Loss of Wetlands – by both acreage and wetland type (or function).

Restore areas of historic wetland loss.

Aquatic and Riparian Habitat

Protect and restore critical aquatic and riparian (shoreland) habitat.

Aquatic Invasive Species

Prevent aquatic invasive species spread into and within the Headwaters.



RYAN RODGERS

RECOMMENDATIONS

Recommendations for action from the Headwaters Watershed Report follow on page 10. We ask that each reader consider and make a commitment to selecting and undertaking actions to keep the Headwaters the special place that it is.

Most of the recommendations involve changes to local land use policy and regulations. For the most part, Douglas and Bayfield Counties and the Village of Solon Springs have jurisdiction over these. While there are also nine towns within the Headwaters, few towns in Northern Wisconsin are equipped to take on land use oversight responsibilities by implementing zoning and stormwater regulations. Towns can and do work in partnership with county zoning to create water quality and habitat protection tools.

Citizens play a role in both the development and implementation of these land regulation changes. More citizen voices can be added to the dedicated few who tend to participate in advisory panels, planning and zoning committee meetings, and public hearings. Citizens can also participate in public process by acting as watch dogs when regulations are implemented serving as the eyes and ears to local staff and elected officials charged with implementation.

Lake and river organizations can offer strong, coordinated voices as land use policies and regulations are modified to protect the Headwaters. These organizations can lead educational programs to inform citizens about actions we can all take to protect the Headwaters. Lake and river organizations can also lead restoration and monitoring projects. Individual citizens can commit to taking personal action for water quality and habitat.



ELLIOT STEFANIK

EDUCATION AND INCENTIVES

- Develop education and incentive programs to encourage actions which protect the Headwaters. Target audiences may include homeowners - both on the waterfront and off, farmers, and forest owners.
- Continue and expand youth educational partnerships.
- Implement resource friendly actions on my own property.

HEADWATERS COORDINATION and MONITORING

- Consider how your organization will be involved as recommendations from the Headwaters plan are implemented.
- Develop a strategic plan for Headwaters project implementation.
- Participate in a watershed coordination team, coordinating and tracking efforts toward reaching Headwaters goals.
- Continue or expand Water Action Volunteer and Citizen Lake Monitoring for aquatic invasive species and water quality — especially for lakes and streams which lack information.

Choose to protect water quality at home, school, church, the office, and in your community

- Use only phosphorus free fertilizers and cleaning products
- Dispose of pet waste properly
- Properly maintain septic systems
- Conserve water
- Compost yard waste
- Keep leaves and grass away from storm drains
- Minimize hard surfaces like roofs, sidewalks, driveways and parking areas
- Vegetate or cover bare soil to prevent erosion
- Plant native trees, shrubs, grasses and flowers or allow them to grow
- Infiltrate runoff using rain gardens, native vegetation or rock infiltration
- Leave aquatic vegetation and fallen trees in the water
- Consider restoring in-lake woody habitat

What are you or your organization already doing?

What are you willing to take on?

What resources do you need to do the job?

Who can help you be successful?



EAU CLAIRE LAKES AREA POA



PHOTOS: CLOCKWISE FROM TOP LEFT: RYAN RODGERS, ELLIOT STEFANIK, JEAN HEDREN, ELLIOT STEFANIK

For more information about the St. Croix Headwaters Watershed Study, or to download a copy of the 2013 Watershed Study Report, please visit the Wisconsin DNR website <http://dnr.wi.gov/lakes/publications/stcroix/>

Writer: Cheryl Clemens, Harmony Environmental

Designer: Karen Engelbretson, KJE Design LLC

Reviewers: Elliott Stefanik, U.S. Army Corp of Engineers; Pamela Toshner, Wisconsin Department of Natural Resources

JUNE 2013