

Elk River Watershed 2018 Data Compilation and Activities Report



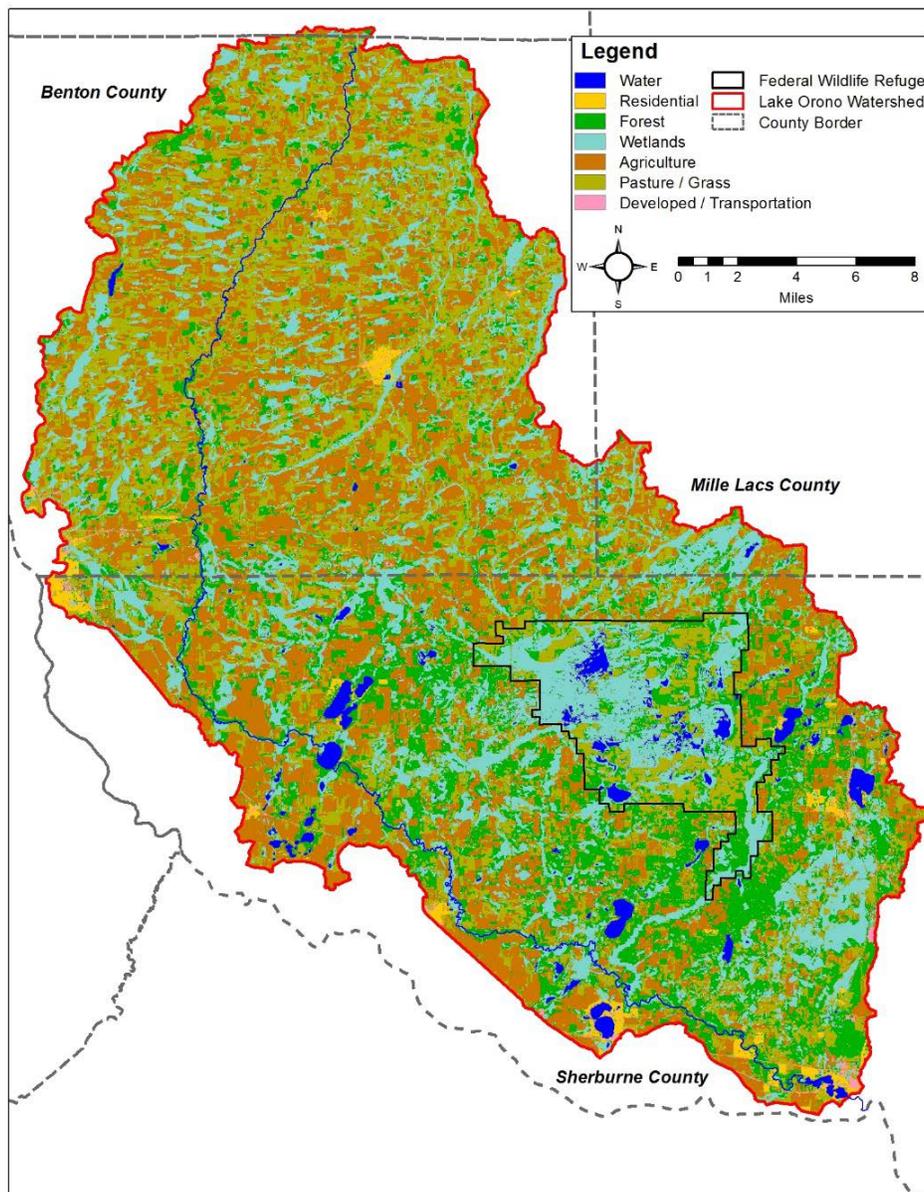
Elk River at County Road 15, Sherburne County

Sherburne Soil & Water Conservation District



Introduction

Draining a total of 392,320 acres (613 square miles), the Elk River Watershed covers much of Sherburne and Benton Counties as well as small portions of Mille Lacs and Morrison Counties in mid-Minnesota (Figure 1). The headwaters begin in northern Benton County before running south / southeast, collecting water from numerous sources before it spills into the Mississippi River within the City of Elk River. Along its path, the main stem Elk River runs through several lakes including Big Elk Lake (710141) and Lake Orono (710013). There are numerous tributary streams (Lily Creek, Battle Brook, Snake River, St. Francis River, Tibbets Creek, County ditches, etc.) and upstream lakes (Briggs, Julia, Rush, Eagle, Birch, Little Elk, Fremont, Big, Mitchell, etc.) within the watershed as well that drain to the Elk River. This entire land mass drains water that eventually spills through Lake Orono and then the Mississippi River.

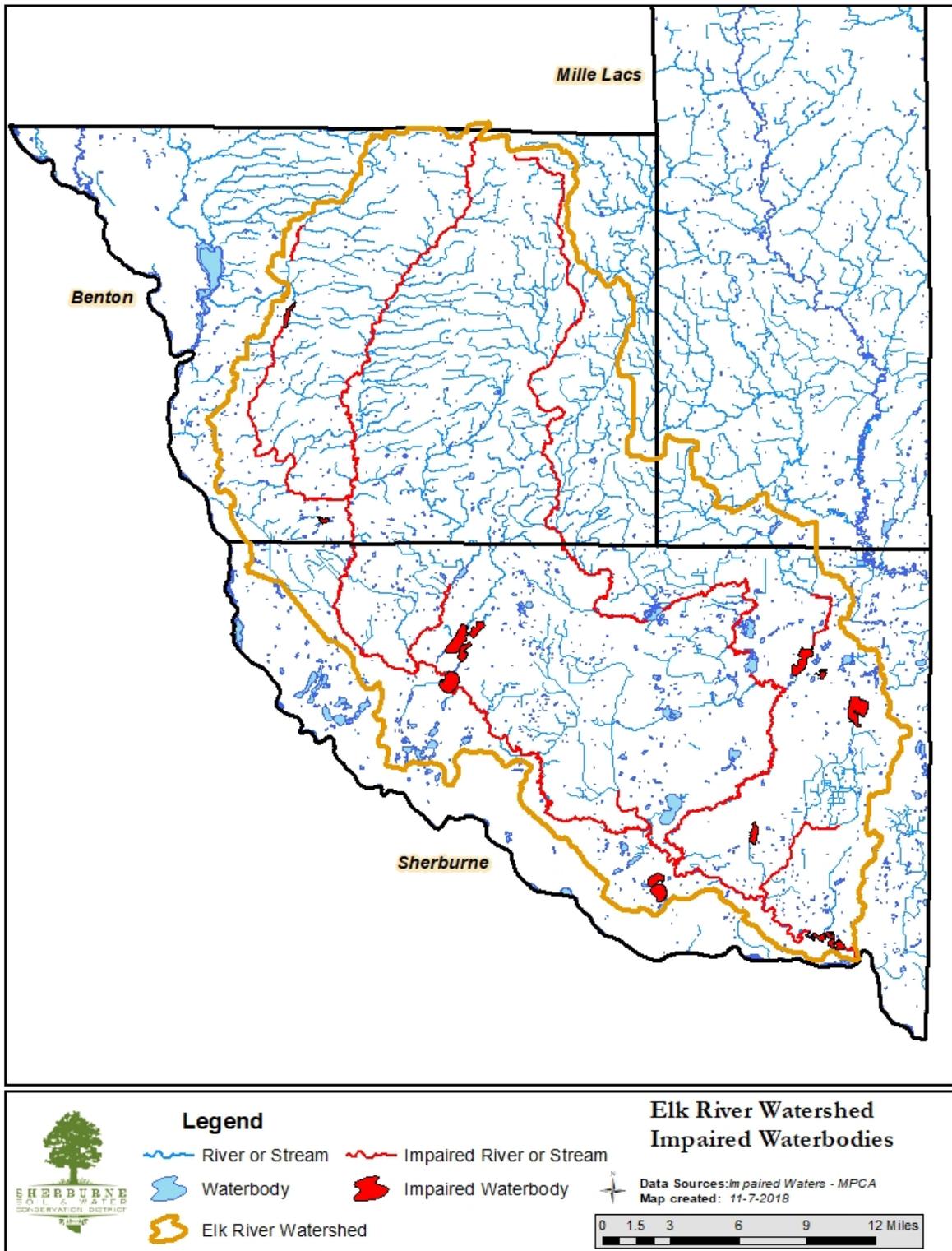


Map 1: Elk River Watershed land use.

Figure 1 also displays the distribution of different land classifications across this watershed, as extrapolated from aerial imagery. Much of the land has been altered from its original state and developed somehow. The water clarity and nutrient content of all streams and rivers change as they continue to flow downstream. As water moves downstream, the area of drainage increases. This in turn also increases the potential for eroding sources to contribute suspended sediments, nutrients, and other pollutants to the water. Thus, higher pollutant levels are expected at downstream versus at upstream locations. A lake such as Lake Orono, at the bottom of this large watershed, would be expected to receive abundant nutrients and sediment due to the tremendous size of the watershed – even if it was in a completely natural state. However, with development comes an increase in the potential for waterway pollution beyond what would normally occur.

Of the factors that determine how much pollution enters a stream or river, land use and precipitation are the most important. Land that is highly vegetated (wetlands, forests) reduces erosion and transport of sediment or pollutants because the leaves of plants reduce rainfall impact force, and root systems allow for infiltration of water into the ground. Land that is highly developed (pavement, lawns, bare soil, agricultural fields, etc.) lacks the capacity to quickly infiltrate water so more water runs off the land and carries soil or pollutant particles with it. Of the 613 square miles in the Elk River Watershed, roughly 27% would be considered agriculture, 20% forests, 18% pasture/grass, 17% wetlands, and single-digit percentages of residential and urban areas. When this area receives a small amount of rain (less than 1 inch for example) a portion of this water runs off the landscape and feeds the lakes and streams, while the rest is infiltrated. However, during larger rain events the amount of water that hits the landscape overcomes the infiltration capacity. More runoff occurs, wetlands fill and spill over, and soil erosion becomes visible from bare soil locations. The Elk River and other streams respond by increasing in height, increasing in velocity, and changing color from clear or transparent to a darker muddy color. This is an indication of the soil that was once on the landscape that is now being transported down the river.

The development of the watershed has unfortunately resulted in the impairment of several water resources. Section 303(d) of the Federal Clean Water Act requires the Minnesota Pollution Control Agency (MPCA) to identify waterbodies that do not meet water quality standards and to develop pollutant Total Maximum Daily Loads (TMDLs) for these waterbodies. A TMDL is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard. In completing these studies, pollutant contributions and recommended reductions are included from both point sources (wastewater treatment facilities) and non-point source areas (rural landscapes and stormwater). Map 2 shows the Impaired Waters within the Elk River Watershed.



Map 2. Elk River watershed impaired waterbodies.

Elk River Watershed Activities and Data Compilation

Sherburne SWCD regularly directs initiatives and participates in partnerships that result in the monitoring and restoration of the Elk River Watershed, as well as other areas in Sherburne County. The activities consist of efforts to quantify pollution parameters and address natural resources concerns with private property owners as well as public entities such as townships, cities, Sherburne County as well as other local and state governmental units. The bulleted lists that follow summarize efforts by the SWCD and of partner organizations.

Water Quality and Quantity Monitoring

Streams

- Currently volunteers monitor 17 locations along the Elk River, St. Francis River, Mayhew Creek, Stony Brook and Battle Brook for water clarity. All locations are within the Elk River Watershed.
- The Sherburne SWCD participates in the MPCA's Watershed Pollution Load Monitoring Network (WPLMN) which aims to quantify pollution and water quantity in select watersheds across the state. The Elk River gauging site is located where the river crosses Cty Rd 15. Water levels are continuously monitored by remote equipment and water chemistry samples are collected on a regular basis. Currently the program is in its 5th year and data are insufficient to determine if any trends exist. This data indicates that the river transports:
 - 140,000 to 213,000 acre-feet of water volume (280 to 420 cubic feet per second, continuously)
 - 40,000 to 60,000 pounds of phosphorus (nutrient that spurs plant / algae growth)
 - 3 to 7 million pounds of sediment
- Sherburne SWCD staff have monitored the river for bacteria content since 2012. The state chronic standard for bacteria (*Escherichia coli*, "e.coli") is 126 MPN/100mL. In 2012, 29 of 36 samples collected from the river exceeded this standard. However, since then the number of exceedances has steadily decreased in what might be considered a downward trend towards better water quality (Figure 1). For example, in 2017 only 4 of 24 samples exceeded the chronic standard limit. Also in 2017, the Sherburne and Stearns SWCD, City of Elk River, and University of Minnesota teamed up to analyze water samples for genetic content. During two sampling visits, samples came back as positive for human content and cows and at the Lake Orono beach birds as well (Figure 2). The study was small but provides some insight as to where the bacteria in the Elk River are originating from.

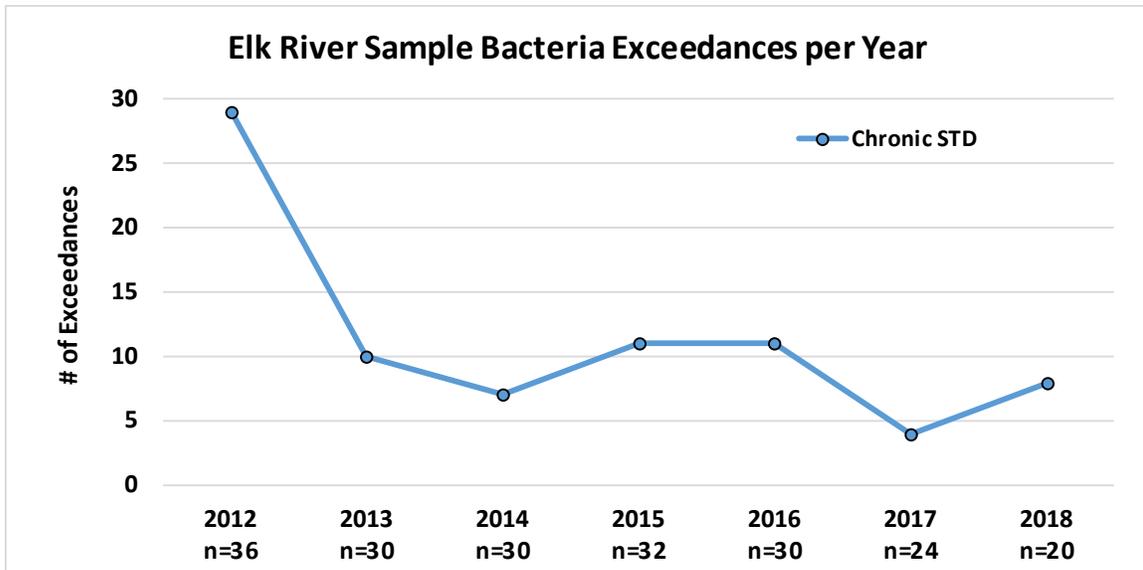


Figure 1: Bacteria (e.coli) state standard exceedance summary, 2012-2018. Graph indicates the number of samples that have exceeded the state chronic standard (126 MPN/100 mL).

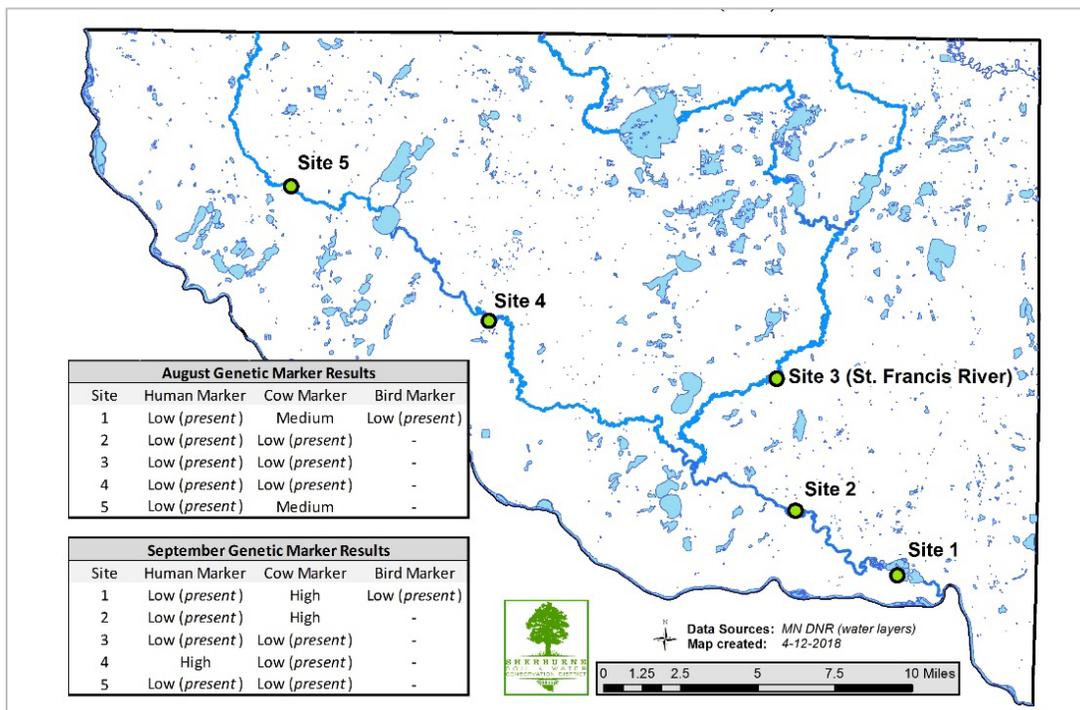


Figure 2: Bacteria (e.coli) genetic marker study, 2017.

Elk River stream transparency may be showing some improvement at specific sites. “Elk River Transparency, All Years” shows the clarity measurements taken at six locations along the Elk River spanning back from 2000 to present. The data varies substantially but shows a general trend of reduced clarity downstream of Big Elk Lake at CR-53 / 54. Improvements in clarity are observed as water continues further downstream to CSAH-23, CSAH-5, etc. In the graphs that follow, transparency is plotted by year at each site. Much variability exists so trends are not apparent. Data from 2017 and 2018 are not available from MPCA for some sites at this time.

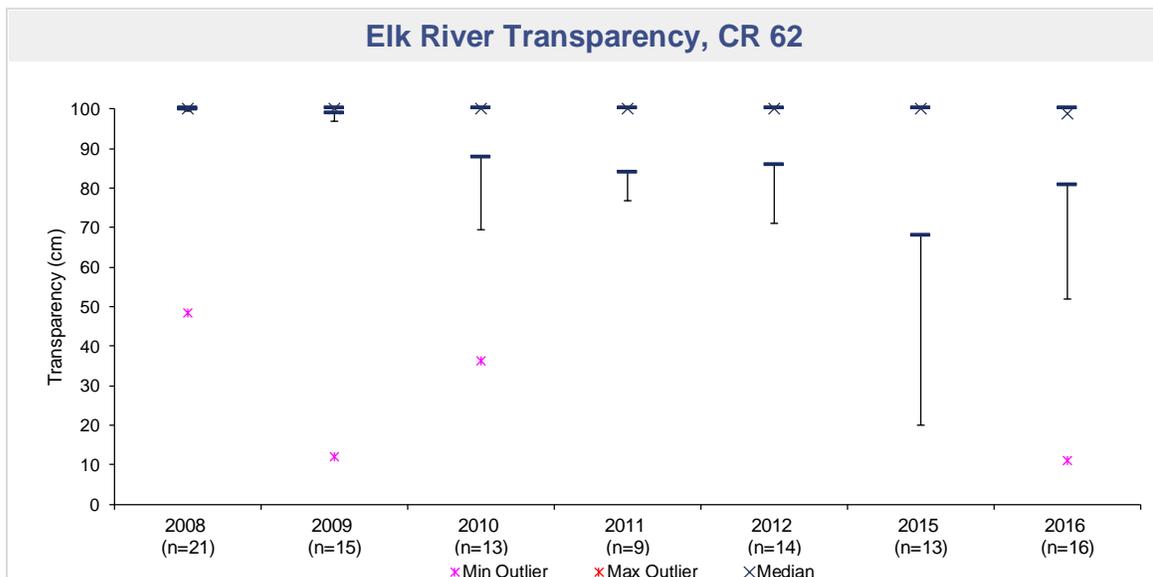
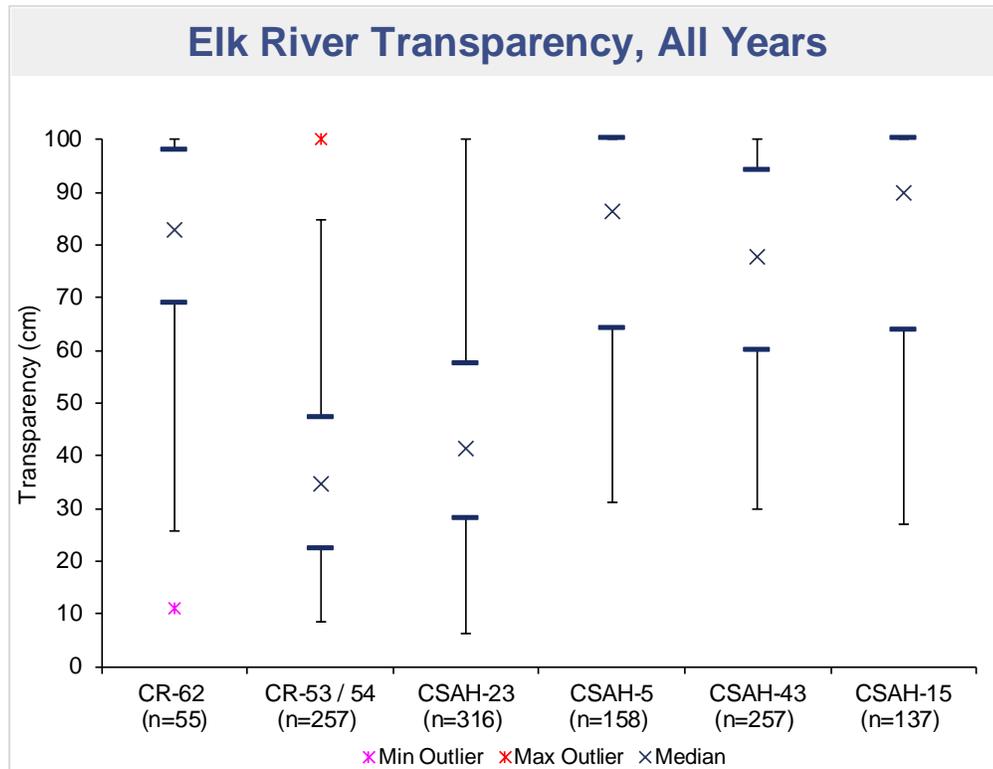


Figure 3: Elk River transparency, six site locations and site CR-62 over time.

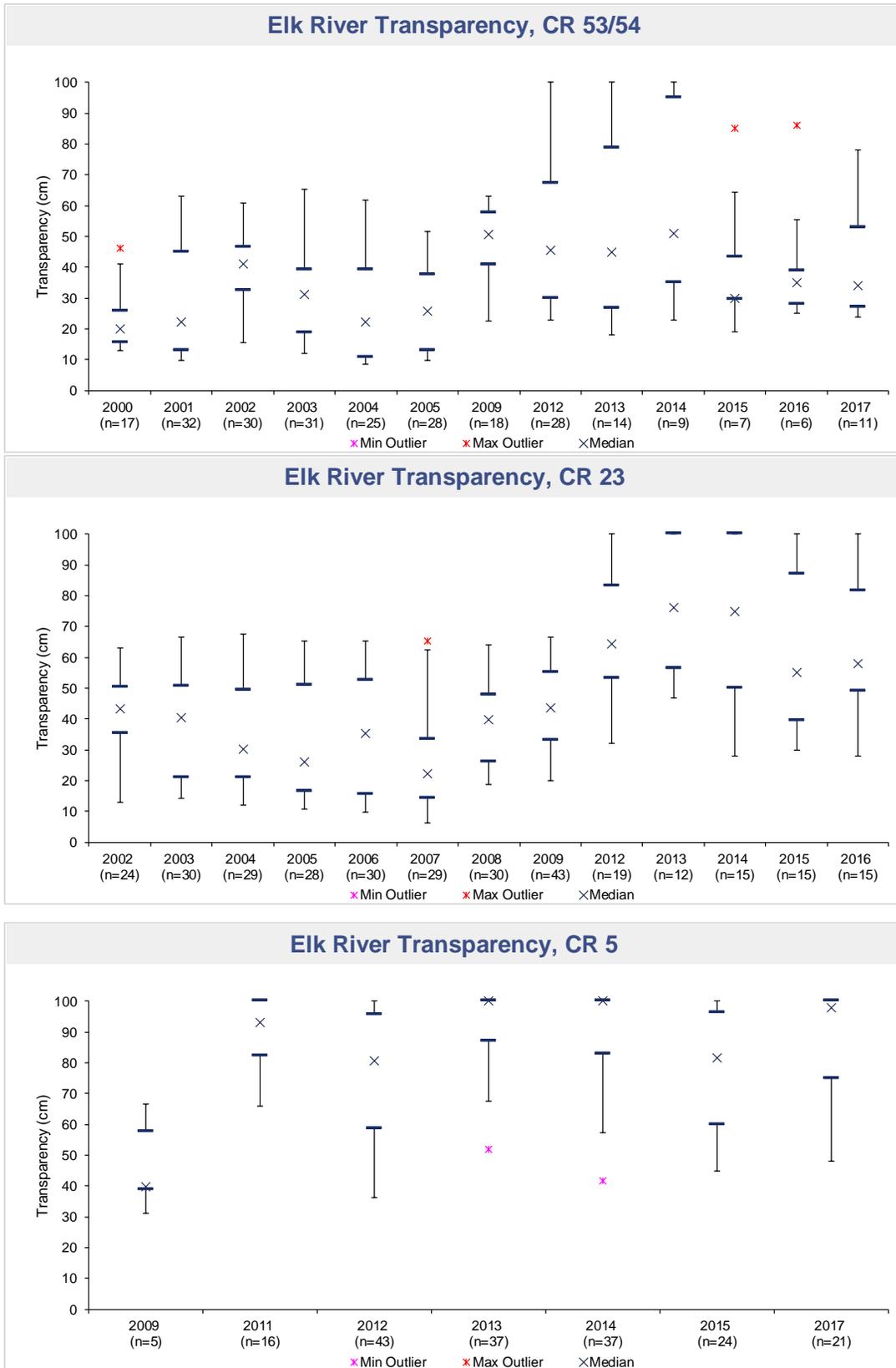


Figure 4: Elk River transparency, sites CR 53/54, CR 23 and CR 5 over time.

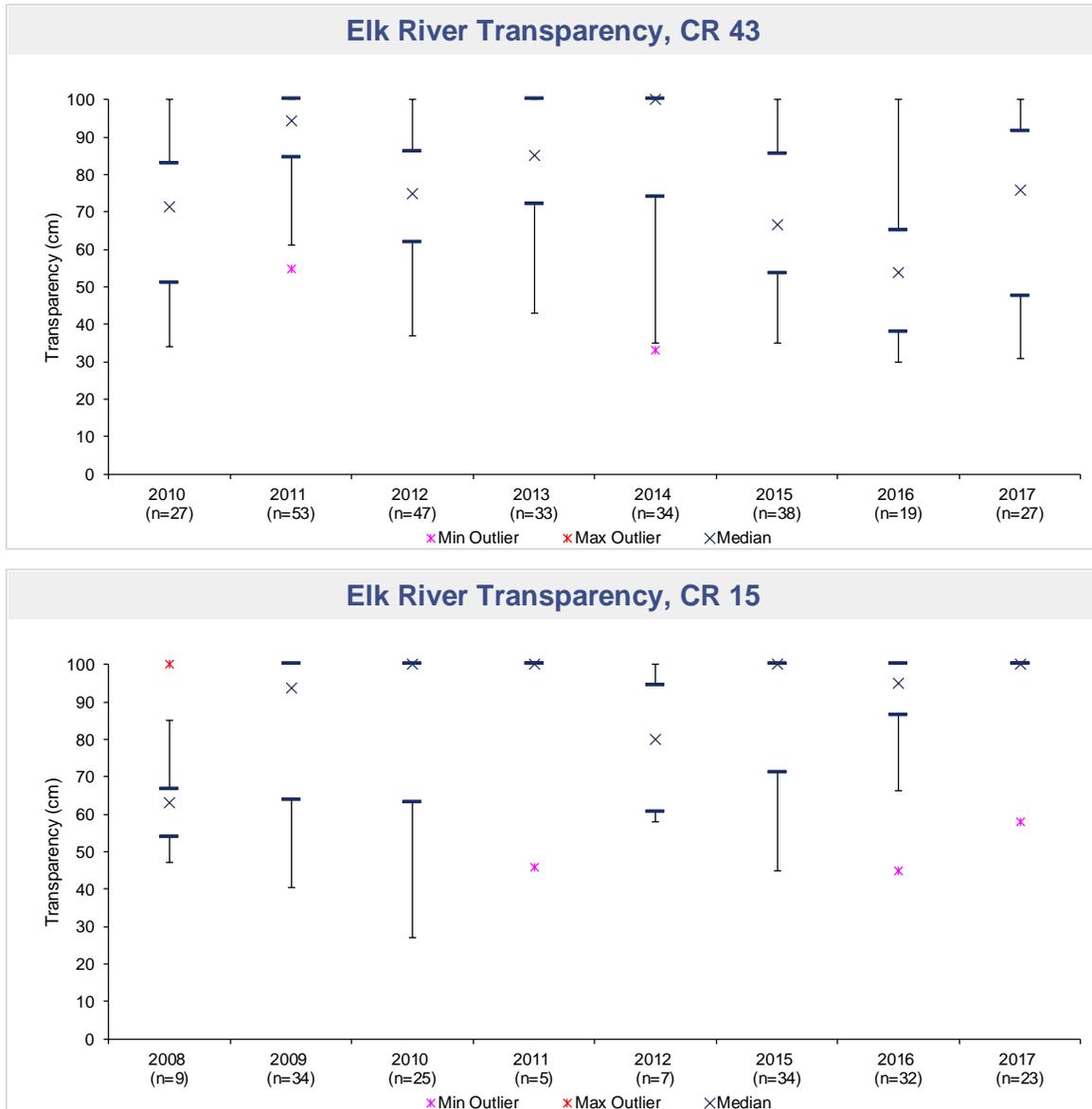


Figure 5: Elk River transparency, sites CR 43 and CR 15 over time.

Lakes

- Volunteers collect lake water quality data for the Minnesota Pollution Control Agency’s (MPCA) Citizen Lake Monitoring Program. Volunteers are trained to collect clarity measurements and water quality samples from lakes. Data is housed by MPCA on easily accessible online websites. Currently 12 county lakes regularly monitor either water clarity, water quality or both. Data summaries for Briggs Lake Chain lakes and Lake Orono are presented in Figure 6.

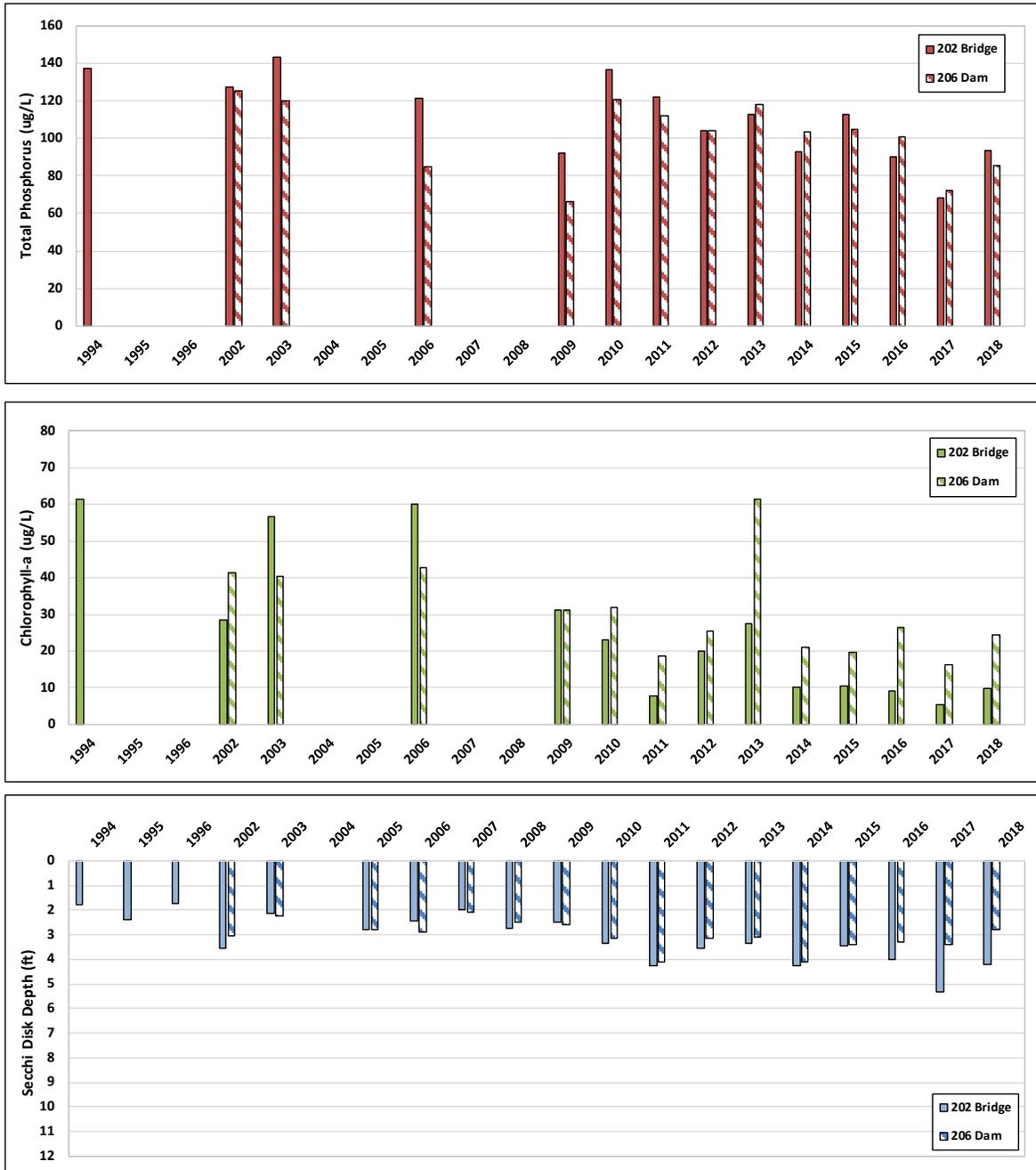


Figure 6: Lake Orono phosphorus, chlorophyll-a and Secchi disc annual summer averages.

Lake Data Summaries:

Lake Orono - Water quality has been monitored through several state-sponsored programs over the years, as well as a bulk of the information coming from volunteers from the Lake Orono Improvement Association. In most years, two sites have been monitored, one in the northern basin above the US Hwy 10 bridge and one in the southern basin downstream of the bridge. Over time, total phosphorus has shown a visible decrease in average annual concentrations. Chlorophyll-a concentrations have also significantly decreased in the northern basin but have shown some variability in the southern basin (not a statistically significant difference). Secchi disc clarity has increased over time, corresponding to the decrease in chlorophyll-a. The lake is classified as a Shallow Lake by the DNR and it routinely exceeds the given phosphorus standard of 60 ug/L for this classification. Current phosphorus levels are however close to or sometimes even under the river standard of 100 ug/L. It might be argued that since Lake Orono is a reservoir that dams the Elk River it might be more of a riverine system. If this were the case, the lake would be close to meeting the river phosphorus standard.

Briggs Lake Chain – Figures 7 and 8 show annual average water quality data that has been collected by Briggs Chain volunteers since 2006. The data sets show variability by lake, by parameter and by year. The Briggs Chain system is quite complex with a number of intermittent and perennial inlet streams and likely influences from internal sources of nutrients. Furthermore, Briggs, Rush and Big Elk Lake are all influenced heavily by the lakes that are located upstream.

Of the four lakes, Briggs Lake is considered a Deep Lake classification by the DNR while the other three are classified as Shallow Lakes. Deep Lakes are given a 40 ug/L standard for phosphorus while Shallow Lakes are given a 60 ug/L standard. Of the four lakes Julia Lake comes close to reaching this standard. In the past 13 years, it has exceeded 60 ug/L six times and fell below it seven times. Rush Lake has neared this 60 ug/L standard twice in recent years (64 ug/L in 2016 and 66 ug/L in 2018). Briggs and Big Elk routinely exceed their given standards. However, like Lake Orono, Big Elk Lake might be considered a large pool within a riverine system due to the Elk River running through it. If Big Elk Lake were to be held to the riverine phosphorus standard of 100 ug/L, it would have been within 8 ug/L each of the past three years.

Table 1 below provides a summary interpretation of water quality parameters for the four lakes. These interpretations are based upon visual observations of the data and have not been tested by statistical analysis.

	TP	CHLa	SD
Julia	No trend	No trend	Increasing
Briggs	No trend	Slightly decreasing	Increasing
Rush	Slightly decreasing	Decreasing	Slightly Increasing
BEL	Slightly decreasing	Decreasing	Increasing

Table 1: Briggs Chain water quality parameter trend interpretation. Interpretations are based upon visual observations and do not reflect a statistical analysis.

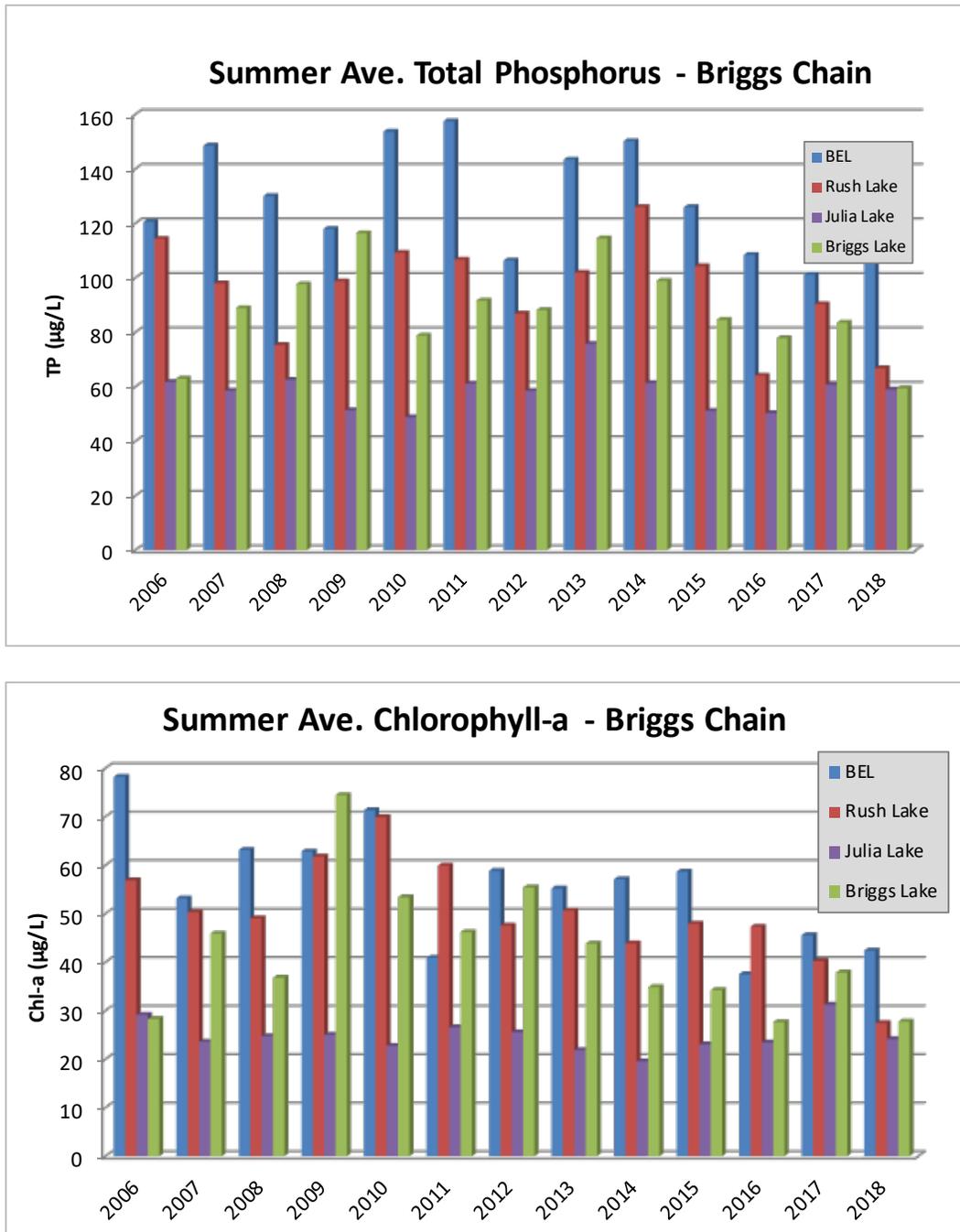


Figure 7: Briggs Chain phosphorus and chlorophyll-a annual summer averages.

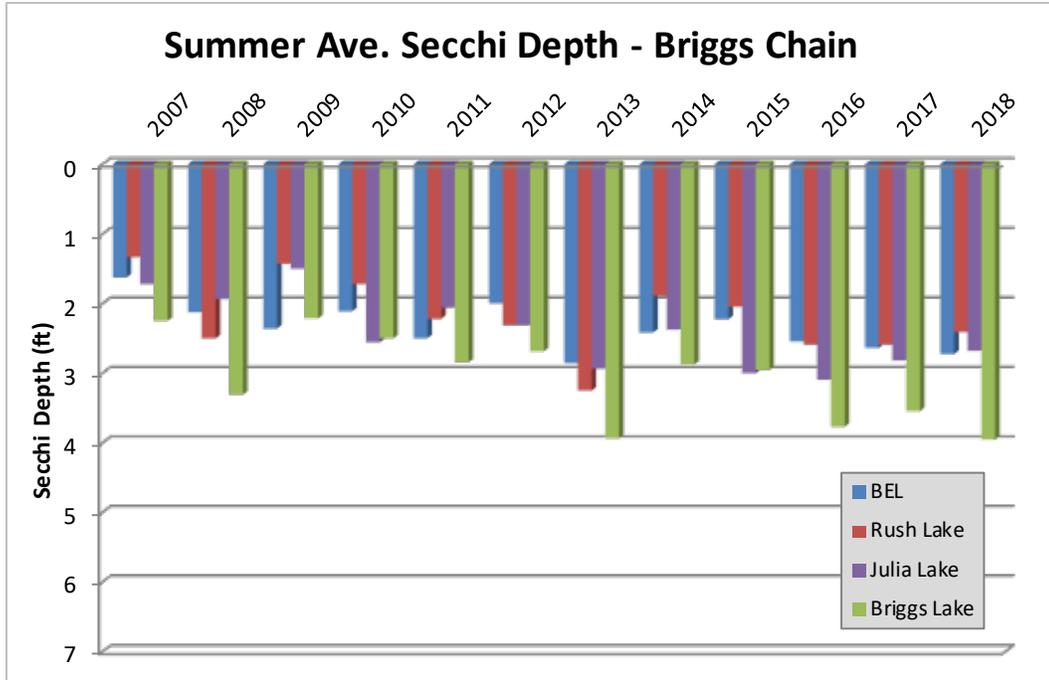


Figure 8: Briggs Chain Secchi disc annual summer averages.

To date, approximately 260 BMPS have been implemented in the Elk River watershed to target soil erosion, manure management, stormwater management, water infiltration and storage, as well as other concerns.

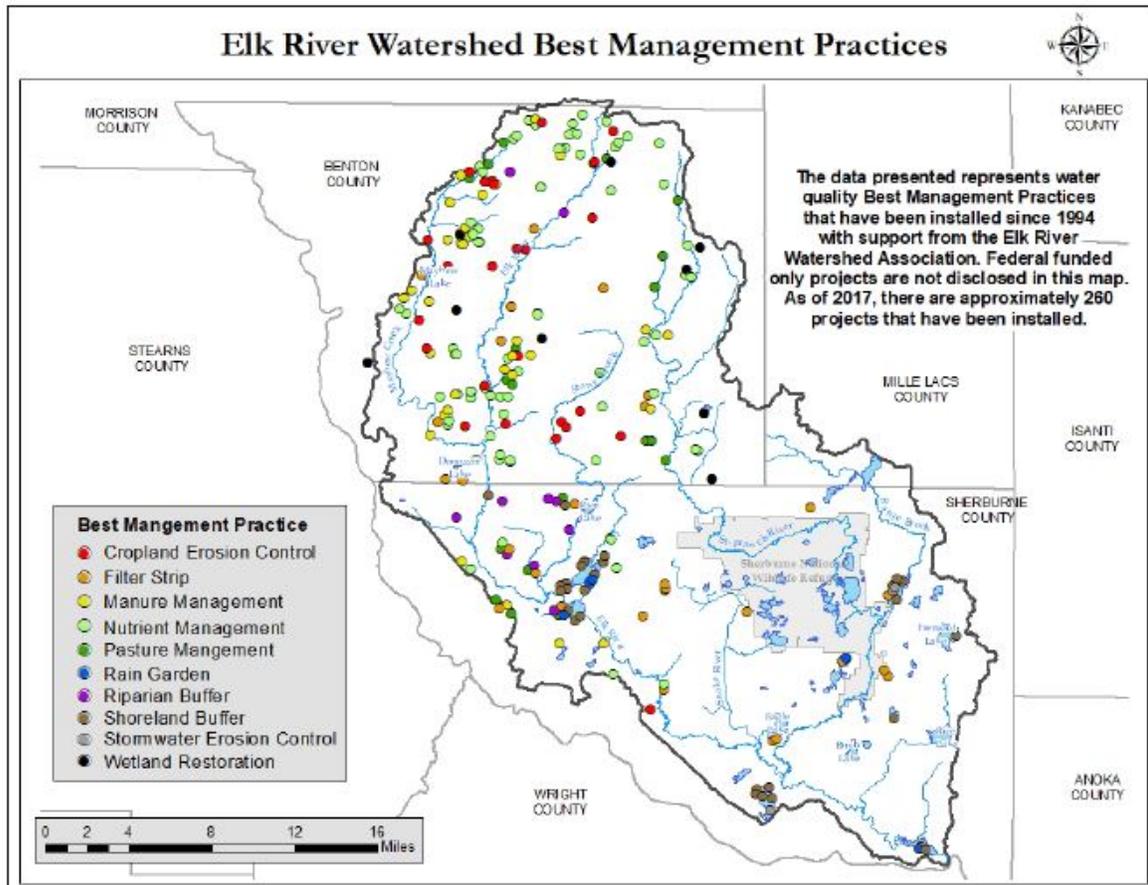


Figure 4: Elk River Watershed BMP Installations. Map created by Benton SWCD.

Sherburne SWCD Landowner Cost-Share Assistance and Grant Programs

Erosion Control State Cost-Share Program

- The Sherburne SWCD receives funding from the State of Minnesota to share the costs of erosion control and water quality improvement on private and public properties within the county. In 2018, the SWCD was able to fund a total of 14 conservation practices as part of 10 projects with Sherburne County landowners using \$34,500 in funding. All projects occurred within the Elk River Watershed, and consisted of:
 - French drains (2)
 - Rain gardens (2)
 - Native plantings (4)
 - Shoreline restoration (6)

Bacteria Reduction Grant

- Following the Elk River being listed as impaired for bacteria by the state, the SWCD began an aggressive campaign to reduce bacteria transport to the river. Two Clean Water Fund grants have been awarded (2014 and 2018) to address manure from small hobby farms in the watershed. To date 9 projects have been completed (manure compost, pasture management, stormwater management) to reduce transport of manure into the river and 3 more are in design stage.



Figure 3: French drain stormwater BMP installed in a horse pasture, 2017.

Forestry Programs

- The gravel bed tree program has been providing plant materials for urban tree planting since 2014. Trees have been used in Elk River Parks, Blvds and ROWs – helping to mitigate stormwater, save energy and improve aesthetics. In 2018, 37 trees were provided.
- The Citizen Pruner Program has been assisting in the maintenance of trees since 2014, performing structural pruning to increase the long-term structural integrity of this important green infrastructure. Volunteers are trained through the U of M Urban Forestry Department and are led by SWCD staff at organized events. In 2017 volunteers pruned at 10 Elk River locations, giving 78 hours to prune 182 trees.
- Private onsite consultations for tree health are performed at no charge to County Residents by the SWCD Forest Resource Specialist. In 2018, 31 Elk River Properties received technical assistance with tree and forest management/pest and disease control.

Healthy trees and forests can infiltrate stormwater, reduce erosion, and reduce rainfall-soil impact velocity which means less polluted runoff making its way into lakes and streams. In fact, SWCD staff have estimated that the Elk River tree community mitigates 4.3 million gallons of stormwater each year, along with providing over \$85,000 in economic value.

Agricultural Programs

- Cover crops are beneficial plants that are put in place on a field either between crop rows or at times when crop are not planted (following harvest, prior to planting). These cover crops may be harvested for use of some type, but their main benefit is the role they play in nutrient retention and soil erosion reduction. This is a reoccurring program in which the SWCD and federal partners implement roughly 340 acres of cover crops each year.
- SWCD staff work with the Board of Water and Soil Resources (BWSR) to oversee compliance related to the Minnesota Buffer Law (MN Statutes section 103B.101), along with providing technical / financial assistance to landowners. Minnesota Buffer Initiative requires a 16.5 foot buffer from all public drainage ditches and a 50 foot average buffer on public waters. Sherburne SWCD has worked with landowners to reach 99.9% county-wide compliance ahead of the November 1st, 2018 deadline. BWSR will be overseeing enforcement matters if any arise.

Prairie Program

- The SWCD assists landowners with design and financing to establish diverse, native prairie on our sandy soils. Prairies reduce soil erosion, reduce greenhouse gases, increase pollinator habitat, are low maintenance and drought tolerant. Special funding is available to projects which incorporate plant species that are preferred by monarch butterflies. In 2018, Sherburne SWCD assisted 14 county property owners with prairie establishment projects.

Conservation Partnerships

Mississippi River St Cloud (MRSC) Watershed Partners

- The MRSC Watershed encompasses portions of Benton, Clearwater Watershed District, Sherburne, Stearns and Wright Counties along with smaller areas of Mille Lacs, Morrison and Meeker Counties. This group has collaborated on watershed wide monitoring and TMDL studies.
- As previously mentioned, Benton SWCD is a strategic partner through the Elk River Watershed Association and other initiatives. The ERWA's boundaries lie within the MRSC Watershed. This group's focus is the drainage area to the Elk River specifically. The group meets monthly during the year and most recently has collaborated to fund a watershed technician position.

Sherburne County Coalition of Lake Associations (SC COLA)

- The SC COLA was formed in 2017 to protect and enhance the quality of the county's waters, their economic and recreational values, and promote safe and responsible use. The SC COLA works with the SWCD to improve education of county residents on water resource protection and has begun several initiatives to improve lake monitoring, recreational use, and overall conditions.

Federal Partnerships

- Staff from the Natural Resource Conservation Service (NRCS) and Farm Service Agency (FSA) work within the watershed and other areas to implement federal programs on agricultural land. These programs provide cover crops to stabilize soil, incentive payments to take marginal crop land out of production, and cost-share practices such as livestock waste systems or nutrient management.

Metro Conservation District JPA

- The 11 County metro area has formed a joint powers agreement to provide funding for these county SWCDs to complete conservation work. The MCD funding goes towards conservation practice engineering as well as other feasibility studies. This funding was utilized to complete a sub-watershed analysis of the Lake Orono stormwater drainage area within the City of Elk River.

Sherburne County Cities

- Cities and the SWCD routinely partner on initiatives that map and quantify tree populations, restore tree canopy health, improve stormwater pollutant mitigation, increase lake monitoring, improve shoreland condition, and increase pollinator habitat. The relationship with Elk River City staff has resulted in numerous partnerships for tree management, lake management, stormwater feasibility studies, and groundwater conservation.

Sherburne County Townships

- Sherburne County Townships have partnered with the SWCD for a variety of initiatives that benefit the environment. In the past 5 years the SWCD has partnered with several townships to address stormwater and erosion on 4 separate projects within the Elk River Watershed.

Education and Outreach

Elementary and High School Education

- Sherburne SWCD regularly participates in educational outreach events with local schools. The District oversees an annual poster contest and conducts annual aquatic invasive species presentations. This past year, the District also presented to local girl scouts and a Lego League group on water issues.

Lake Association / Improvement District Presentations

- Lake association and lake improvement district meetings are great opportunities to educate stakeholders and discuss ways to protect lake health and property values.

Stormwater – Elected Officials and Township / City Staff

- The SWCD has held several NEMO (Non-point Education for Municipal Officials) events in the past few years. An event held in February of 2018 focused on the importance of stormwater work and reporting, examples of ways communities are improving stormwater quality, and discussing how local officials can be proactive.

Elk River Watershed Cleanup

- This year celebrates the 10th year the Elk River Watershed Cleanup has been occurring. Since 2008, volunteers have gathered in the fall to visit the river at road crossings and pickup accumulated trash. In this time over 4,000 pounds of trash have been collected. Aside from the impact of removing trash, the event is a strong educational tool to directly engage nearly 20 volunteers each year about pollution in our waters.