METROPOLITAN COUNCIL

Environmental Services

2015

Stream Water Quality Summary for the Twin Cities Metropolitan Area

In 2015, Metropolitan Council Environmental Services (MCES) collaborated with various federal, state, and local groups including municipalities to carry out monitoring at 21 sites on 20 streams located in the Minnesota, Mississippi, and St. Croix River basins, as shown in Figure 1. Sampling efforts in 2015 resulted in 393 field visits, 1,673 field parameter readings, and over 9,500 laboratory results. The Crow River South station was discontinued in 2015. Results from Bluff Creek are not included in this summary because sampling has been suspended at the site since the end of 2013 due to a major bridge construction project. The Lower Bevens Creek station is not included in this report because it was damaged in early 2015 by a large storm event.

Stream monitoring is an important part of maintaining and understanding the water quality of a region. Streams in the seven-county Twin Cities metropolitan area (metro area) flow into the major rivers (Minnesota, Mississippi, St. Croix), directly impacting the water quality of those rivers. Streams are also used for a variety of recreational activities such as swimming, camping, fishing, and boating.

The results from the MCES stream monitoring program are used internally and externally to:

- Assess the amount of nonpoint source pollution traveling from tributaries into the Mississippi, Minnesota, and St. Croix Rivers.
- Evaluate how efficient current watershed management practices are at reducing nonpoint source pollution.
- Assess compliance with Minnesota water quality standards.
- Aid in the development of management plans to improve water quality of streams and rivers in the metro area.

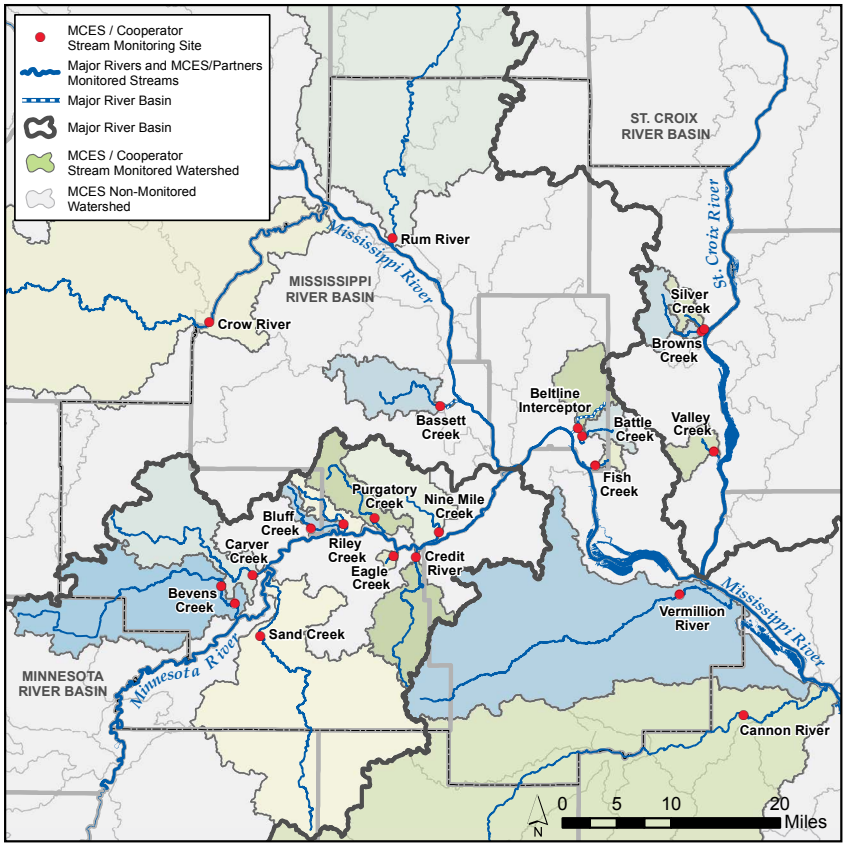


Figure 1: 2015 MCES Stream Monitoring Stations

Additionally, the monitoring program supports the regional policies established in the Metropolitan Council's Thrive MSP 2040 and 2040 Water Resources Policy Plan including the policy of assessing the condition of the region's lakes, streams, rivers and aquifers to evaluate the impact on regional water resources and to measure success in achieving regional water goals.

To summarize 2015 stream water quality, MCES compared the average annual concentration of four key water quality parameters at each stream: chloride (Cl), total suspended solids (TSS), total phosphorus (TP), and nitrate-nitrogen (NO_3). These annual averages include concentration results taken from all types of flow conditions (low, normal, and high). Streams are grouped by major river basin, since streams in the same basins often share similar characteristics. However, even within the same basin, streams may have very different water quality due to a combination of factors such as watershed size, land cover, and geology.

MCES also compared the 2015 average of each key water quality parameter at the sampling sites to 10-year averages from 2006-2015. Since concentrations are highly affected by flow which can be very different between years, the comparison between 2015 and the previous decade should not be taken as an indication of increasing or decreasing water quality, but rather as a snapshot comparison to conditions of recent years. Monitoring in Purgatory Creek started in 2015, so it is not yet possible to calculate a 10-year average at that stream.

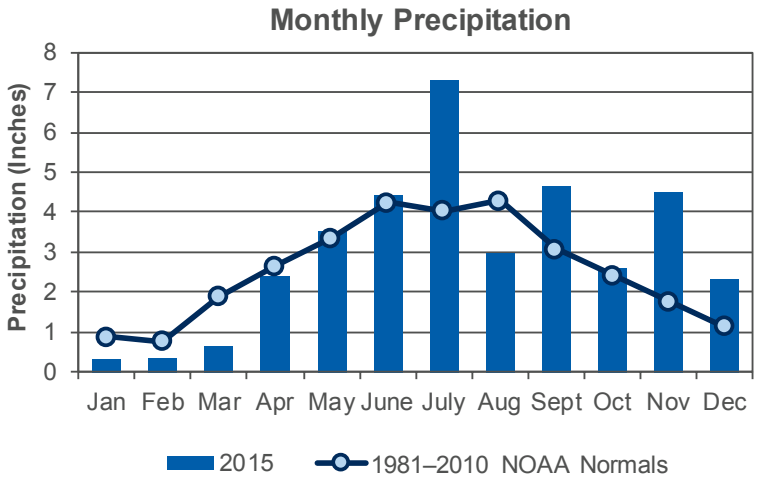
Precipitation

Description

Regional precipitation is measured at the Minneapolis-St. Paul International Airport, which is a good indicator of significant rainfall events in the metro area because of its central location. River flow, or the rate of water flowing in a river, affects aquatic life and is influenced by precipitation amounts. During wet periods, nonpoint source pollutants are carried through storm sewer systems to lakes and smaller streams and ultimately most often to the major rivers. The higher flows can cause stream bank erosion, habitat destruction, and flooding. During dry periods, low flows can result in more concentrated river pollution, increased sediment deposition, and lower habitat quality.

2015 Results

Precipitation in the metro area during 2015 was 5.5 inches above the normal precipitation, as defined by NOAA 1981-2010 Climate Normals (a data set updated every 10 years). The first half of the year (January through June) was fairly dry, with a deficit of 2.1inches of precipitation below normal. In contrast, the second half of the year (July through December) was fairly wet, experiencing 7.6 inches of precipitation above normal. The month of July was especially wet, reaching more than 7 inches above normal and going on record as the seventh wettest July since 1871!



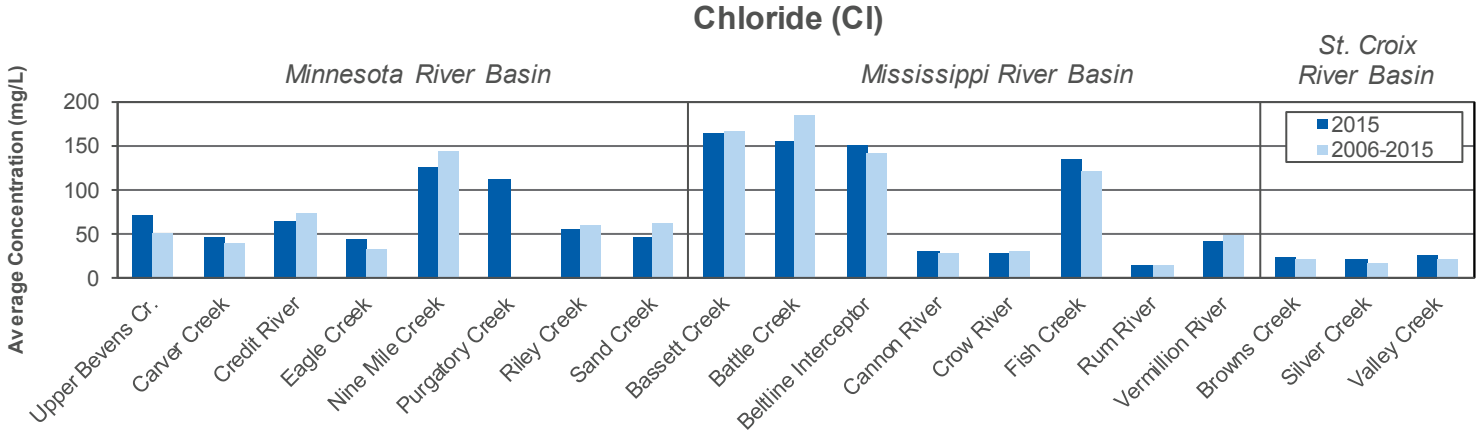
Chloride (Cl)

Description

Chloride, one component of salt, is typically used for winter maintenance of roads, sidewalks, and parking lots; and for home water softening. Excess levels of Cl in the environment can be toxic to aquatic and terrestrial organisms.

2015 Results

The Mississippi River basin had the streams with the highest (Bassett Creek) and lowest (Rum River) 2015 Cl concentrations. The three streams in the St. Croix River Basin traditionally have had low average Cl concentrations, and this was true again in 2015. In general almost all streams showed the same or higher Cl concentration when comparing 2015 averages to their 10-year averages. Only five streams had statistically significant lower Cl concentrations compared to the 10-year averages – Battle, Riley, and Sand Creeks, and the Credit and Vermillion Rivers. The more urban streams (e.g. Bassett, Battle, Fish, Nine Mile, Purgatory Creeks, and Beltline Interceptor) had the highest average Cl concentrations in 2015.



Total Suspended Solids (TSS)

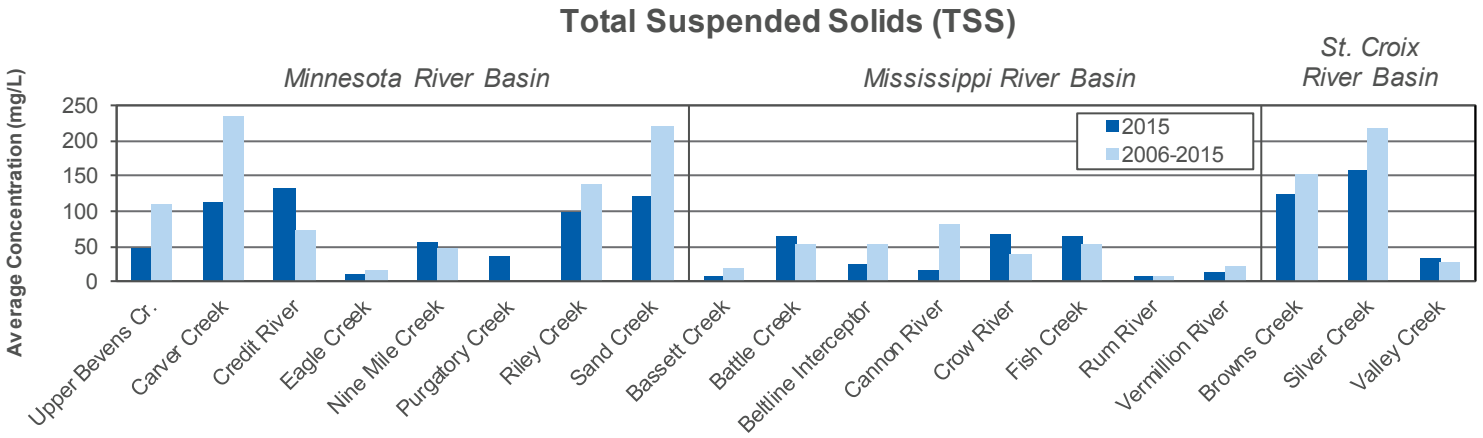
Description

TSS is any material suspended in water which can be removed with a filter. TSS has a variety of sources including eroded sediment from stream banks, lawns, construction sites, and agricultural fields as well as organic particulate such as decaying matter and algae. High levels of TSS in rivers may harm aquatic life by decreasing the light available for plant growth, increasing water temperature, clogging gills of aquatic inhabitants, and covering habitat. High TSS levels can also affect recreational use by decreasing water clarity and creating unfavorable swimming conditions.

2015 Results

The highest 2015 TSS concentrations were observed in streams of the Minnesota and St. Croix River basins. The Minnesota River basin has younger geology that is more susceptible to erosion than the Mississippi and St. Croix River basins. Silver

Creek, in the St. Croix River basin, had the highest TSS concentrations. This most likely is due to erosion caused by Fairy Falls, a waterfall directly upstream of our monitoring station. Overall, most of the streams had similar or lower 2015 TSS concentrations compared to their 10-year averages. Only three streams (Credit River, Battle Creek, Crow River) had statistically significant higher 2015 concentrations when compared to the 10-year averages. The largest departures from the 10-year average occurred in Carver Creek (52% lower) and Credit River (87% higher).



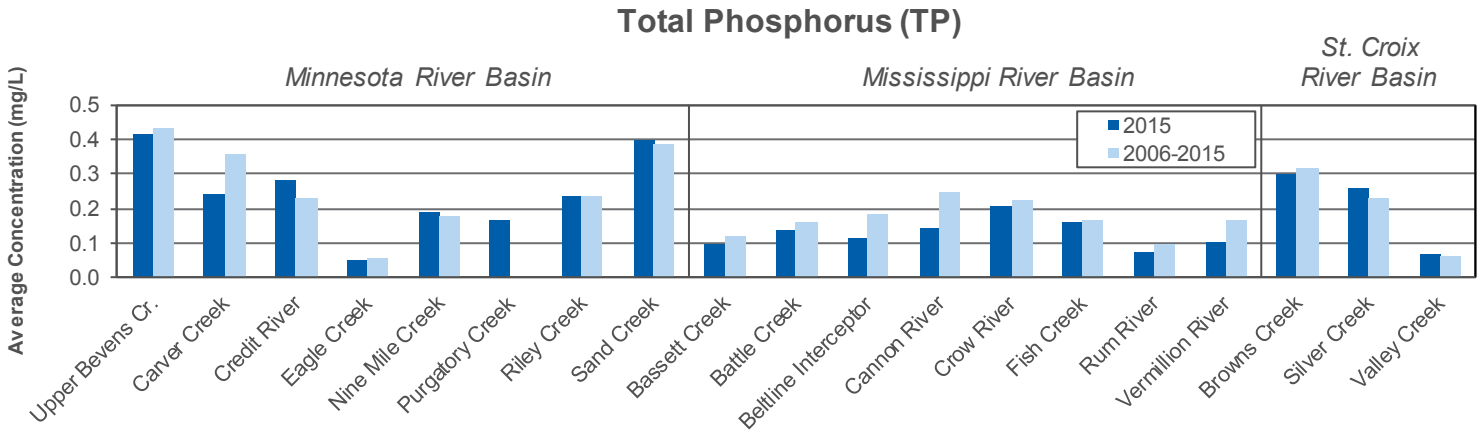
Nutrients: Total Phosphorus (TP)

Description

Phosphorus is an essential nutrient necessary for the growth of aquatic organisms. Nutrients cycle naturally in the environment, but elevated levels of TP in rivers can be caused by the erosion of fertilized soils. High levels of TP can stimulate excess growth of aquatic plants, causing algae blooms which reduce the oxygen levels in the water. This creates uninhabitable conditions for most aquatic life and generally makes the water unusable for recreational activities.

2015 Results

The 2015 TP results generally mirrored the 2015 TSS results, meaning streams with higher TP also had higher TSS (e.g. Silver, Browns, and Sand Creeks), and streams with lower TP had lower TSS (e.g. Rum, Eagle, and Valley Creeks), relative to the other monitored streams. Upper Bevens was an exception, where there was a statistically significant lower TSS concentration compared to the 10-year average, but no statistically significant difference in TP concentration. TP and TSS commonly have similar trends because phosphorus tends to bind to sediments and particulates in the stream. In the Minnesota River basin, most streams had 2015 TP concentrations similar to or above their 10-year averages, with the exception of Carver and Eagle Creeks. In the Mississippi River basin, most stream 2015 TP concentrations were below their 10-year averages. In the St. Croix River basin, all three sites were similar to the last decade.



Nutrients: Nitrate – Nitrogen (NO_3)

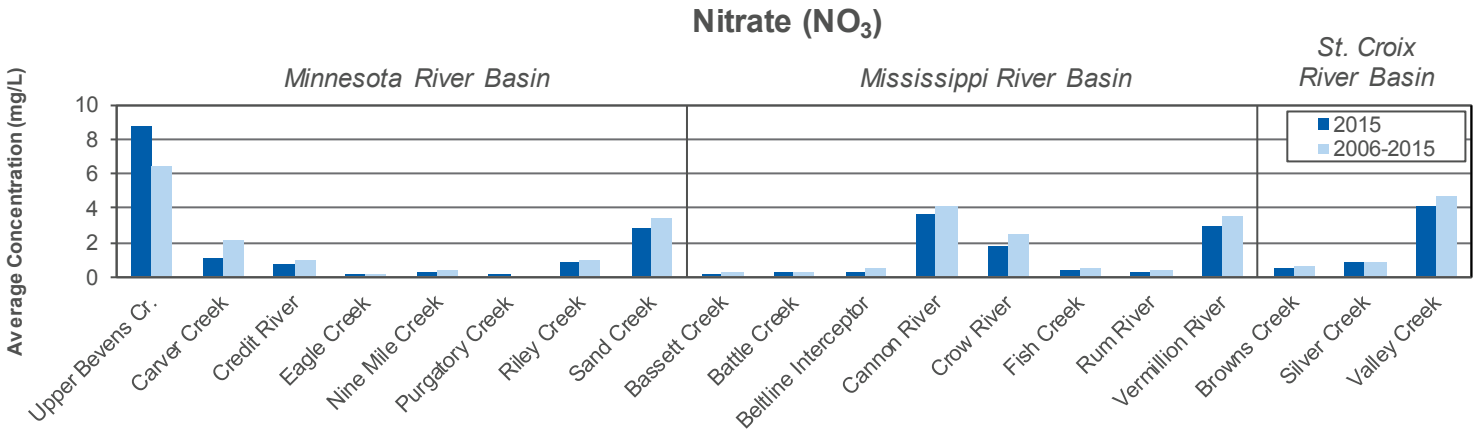
Description

Nitrogen is an essential nutrient necessary for the growth of aquatic organisms. Aside from natural processes, common sources of NO_3 include fertilizers, plant debris, and septic and municipal wastewater treatment systems. High NO_3 levels can cause the same problems associated with high phosphorous concentrations and additionally can lead to methemoglobinemia, a blood condition typically affecting infants which impairs the ability of red blood cells to efficiently transport oxygen throughout the body.

2015 Results

The Minnesota River basin contained the streams with the highest (Upper Bevens Creek) and lowest (Eagle Creek) 2015 NO_3

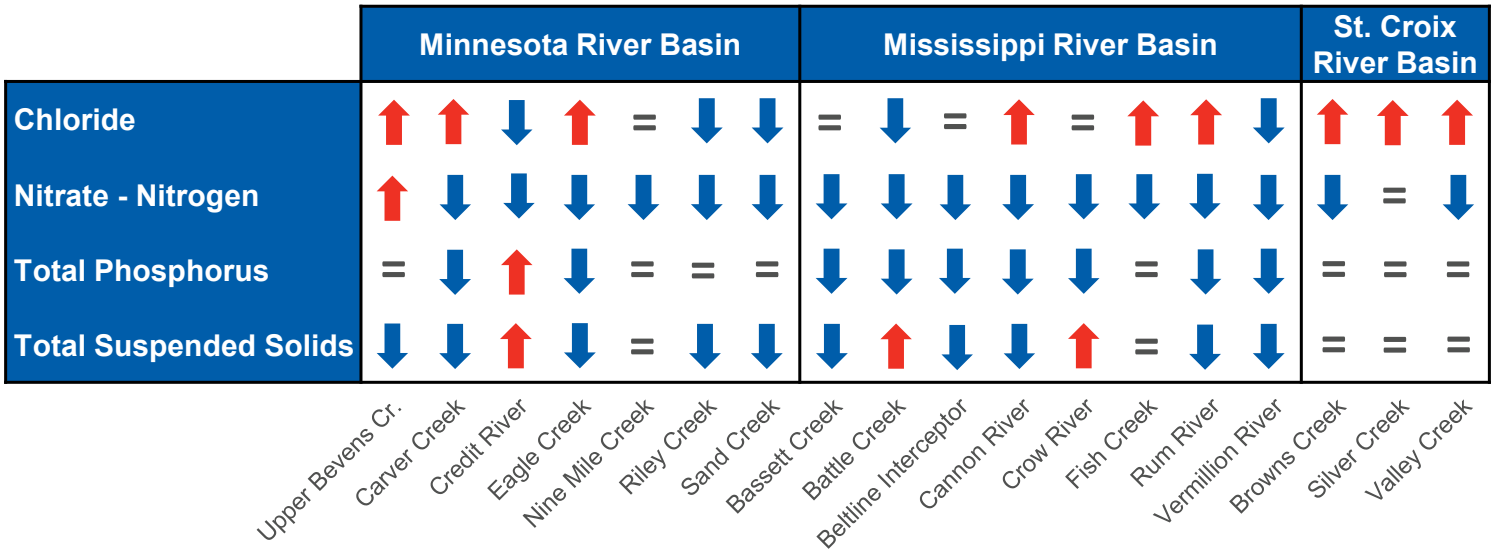
concentrations. The highest 2015 NO_3 concentrations occurred in streams in more agricultural areas (e.g. Upper Bevens and Sand Creeks, the Crow, Vermillion and Cannon Rivers). The groundwater fed Valley Creek is the exception to this observation. The current land use around Valley Creek is not as agricultural as it once was, but it is believed the past use of fertilizer on farm lands infiltrated into the groundwater which now feeds the creek. All streams except Upper Bevens had 2015 NO_3 concentrations below or similar to their 10-year averages.



Concluding Remarks

Overall, the concentrations of the water quality parameters in the monitored streams appear to be affected by the above normal precipitation in 2015. Chloride concentrations were higher in streams of more urban areas and lowest in the three streams of the St. Croix River basin. Concentrations of total suspended solids and total phosphorus were the highest in streams of the Minnesota River and St. Croix River basins. Concentrations of nitrate-nitrogen were higher in streams located in agriculturally dominant areas.

The table below is a summary comparing the 2015 concentrations to their 10-year averages at each stream. For total suspended solids and total phosphorus, almost all streams had lower or similar 2015 concentrations compared to 10-year averages in the Minnesota, Mississippi, and St. Croix River basins. No overall patterns were observed with chloride, while 2015 nitrate concentration were lower compared to 10-year averages at almost all monitored stream sites.



A red upwards arrow means the 2015 average was above the 95% confidence interval (a statistical tool used to represent how spread out the data is) of the 10-year average, a blue down arrow means the 2015 average was below the 10-year 95% confident interval, and an equal sign means the 2015 average was within the 10-year 95% confidence interval.

Visit **www.metrocouncil.org** for more information about the Council.

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