METROPOLITAN COUNCIL

Environmental Services

2014

Stream Water Quality Summary for the Twin Cities Metropolitan Area

This document is a summary of the 2014 results of the Metropolitan Council Environmental Services (MCES) Stream Monitoring program. Streams in the seven-county Twin Cities metropolitan area (metro area) are used for a variety of recreational activities such as swimming, camping, fishing, and boating. They also flow into major rivers of the metro area (Minnesota, Mississippi, St. Croix), directly impacting the water quality of those rivers. Stream monitoring is an important part of maintaining and understanding the water quality of a region.

The results from the MCES stream monitoring program are used internally and externally for a variety of purposes. The information is primarily used to assess the amount of nonpoint-source pollution travelling from tributaries into the Mississippi, Minnesota, and St. Croix Rivers and to evaluate how efficient current watershed management practices are at reducing nonpoint-source pollution. The results are also used to assess compliance with Minnesota water quality standards and aid in the development of management plans to improve water quality of streams and rivers in the metro area. 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.

Figure 1: 2014 MCES Stream Monitoring Stations

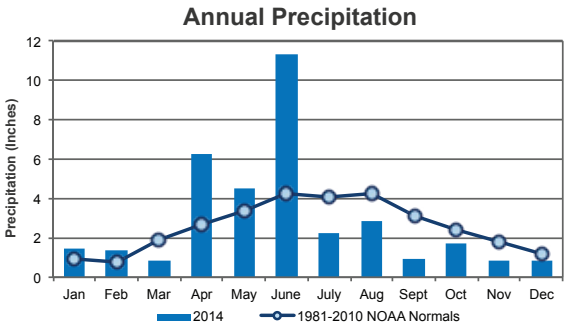
MCES collaborates with various federal, state, and local groups including municipalities to carry out monitoring at 22 sites on 21 streams located in the Minnesota, Mississippi, and St. Croix River basins, as shown in Figure 1. Monitoring of Purgatory Creek in Eden Prairie began in 2014 through a new partnership with Riley Purgatory Bluff Creek Watershed District, while monitoring of the Minnehaha Creek site was discontinued after 2013 because of a change in cooperators and an overlap of monitoring efforts with the Minnehaha Creek Watershed District. 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. Sampling efforts in 2014 resulted in 463 field visits, 2,211 field parameter readings, and over 11,100 laboratory results.

This report summarizes the 2014 stream monitoring by presenting 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, nearby land cover, and geology.

Finally, this report compares the 2014 average of each key water quality parameter at the monitoring sites to 10-year averages from 2005-2014. Since concentrations are highly affected by flow which can be very different between years, the comparison between 2014 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 2014, 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.

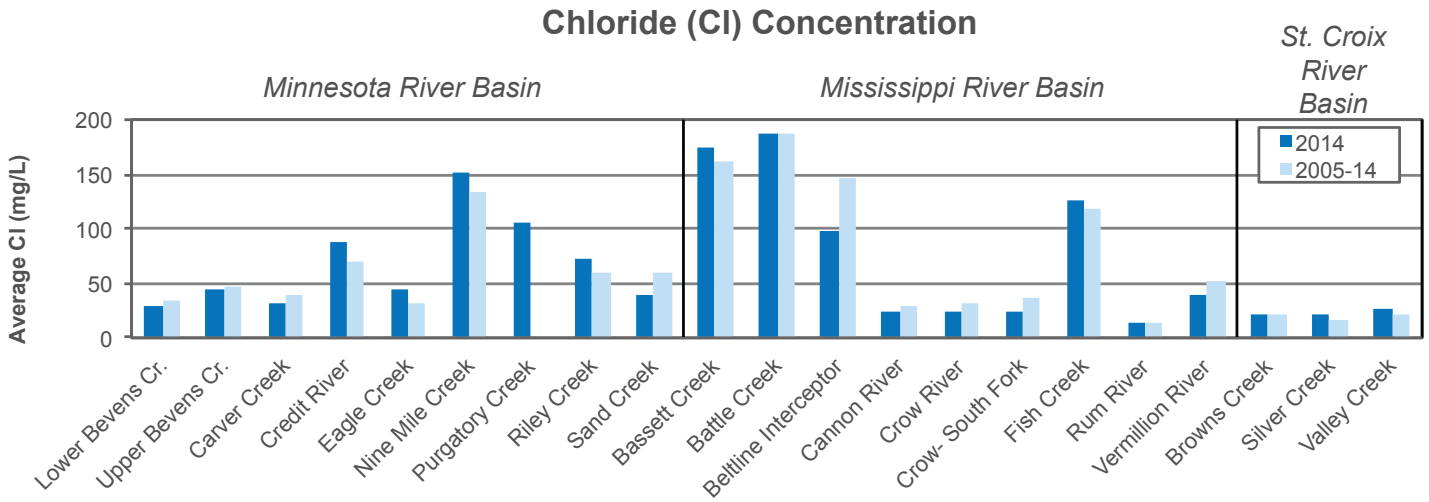


2014 Results: Precipitation in the metropolitan region during 2014 was almost 5 inches above the normal precipitation for the area, as defined by NOAA 1981-2010 Climate Normals (a data set updated every 10 years). The first half of the year (January through June) was fairly wet, experiencing 12.0 inches of precipitation above normal. The month of June was especially wet, reaching more than 7 inches above normal and going on record as the wettest June since 1874! In contrast, the second half of the year (July through December) was fairly dry, having a precipitation deficit of 7.2 inches compared to normal.

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.

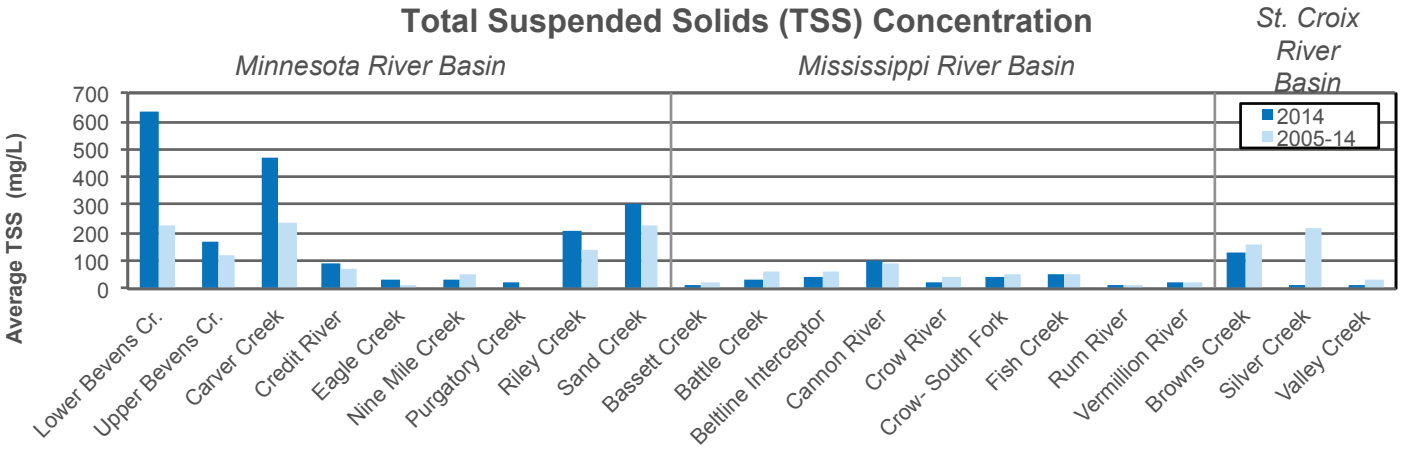
2014 Results: The Mississippi basin had the streams with the highest (Battle Creek) and lowest (Rum River) 2014 Cl concentrations. The three streams in the St. Croix River Basin traditionally have had low average Cl concentrations, and this was true again in 2014. There were no overall patterns when comparing 2014 averages to their 10-year averages, with eight steams having higher Cl concentrations in 2014, eight having lower, and four about the same. However, the more urban streams (e.g. Nine Mile, Bassett, and Battle Creeks) had the highest concentrations of Cl and generally had 2014 averages which were slightly higher than their 10-year averages.



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.

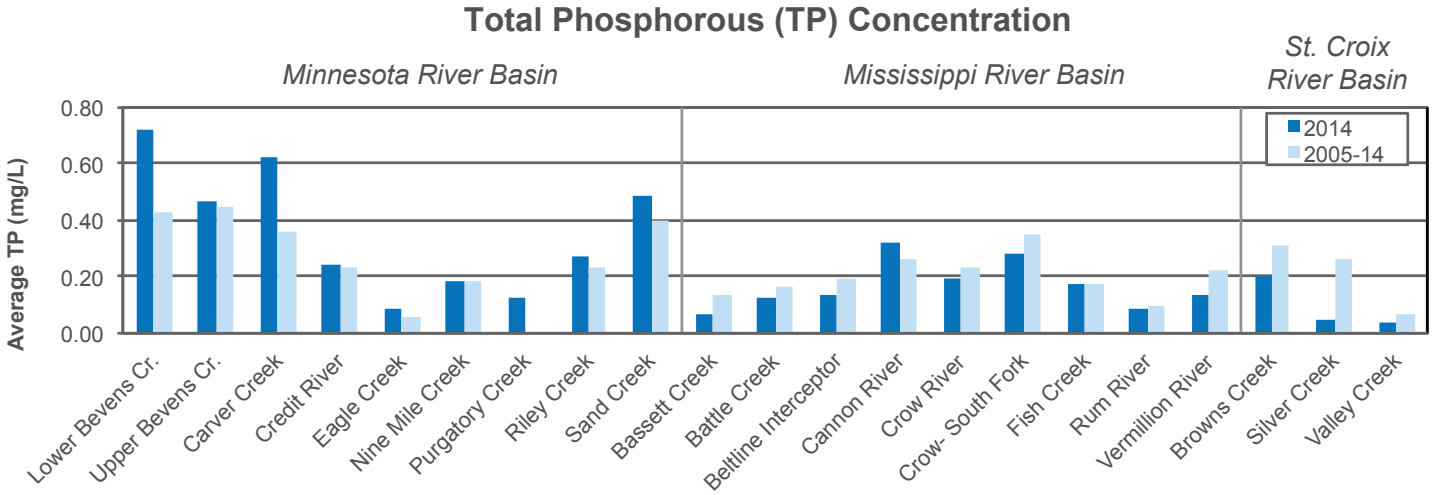
2014 Results: The highest 2014 TSS concentrations were observed in streams of the Minnesota River basin, which has geology that is more susceptible to erosion than the Mississippi and St. Croix River basins. In the Minnesota River basin, most of the streams had higher 2014 TSS concentrations compared to their 10-year averages. In contrast, most of the streams in the Mississippi and St. Croix River basins had 2014 TSS concentrations below or similar to their 10-year averages. The largest differences from the previous decade occurred in Lower Bevens and Carver Creeks where 2014 concentrations were much higher and in Silver Creek where the 2014 concentration was much lower.



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.

2014 Results: The 2014 TP results generally mirrored the 2014 TSS results, meaning streams with higher TP also had higher TSS (e.g. Lower Bevens, Carver, and Sand Creeks), and streams with lower TP had lower TSS (e.g. Basset, Silver, and Valley Creeks), relative to the other monitored streams. 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 2014 TP concentrations similar to or above their 10-year averages. This pattern was reveresed in the Mississippi and St. Croix River basins, where most stream 2014 TP concentrations were below their 10-year averages.

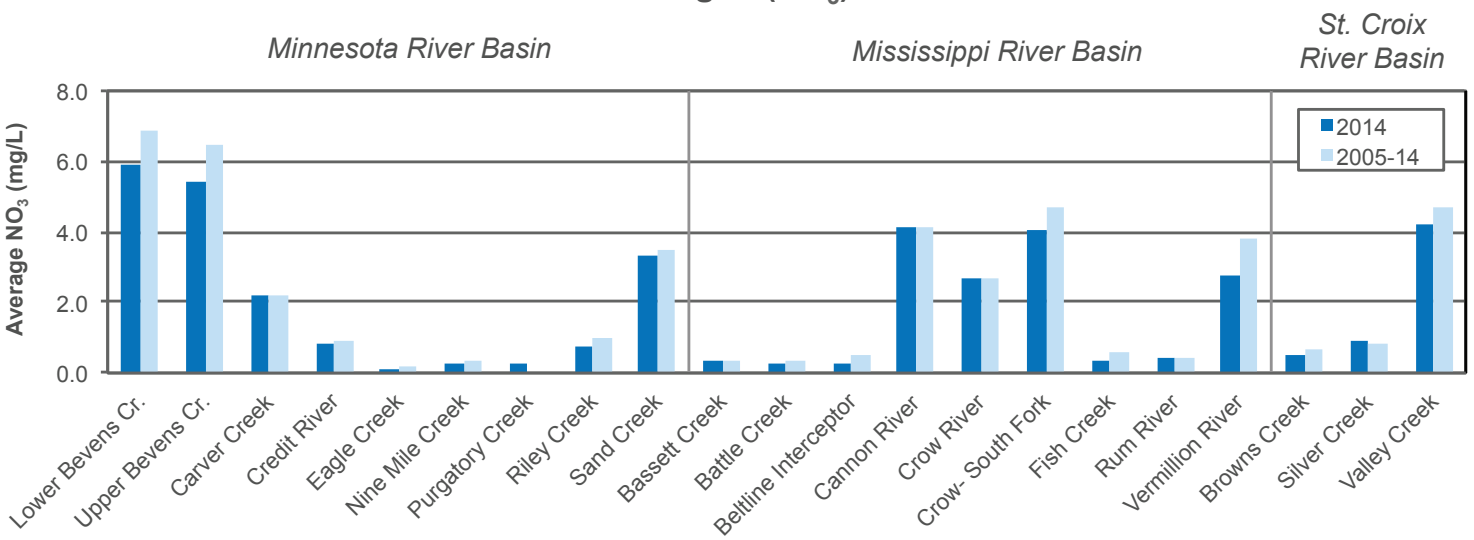


Nutrients: Nitrate – Nitrogen (NO_3)

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.

2014 Results: The Minnesota basin contained the streams with the highest (Lower Bevens Creek) and lowest (Eagle Creek) 2014 NO_3 concentrations. The highest 2014 NO_3 concentrations occurred in streams in areas where agriculture was the dominant land use. (e.g. Crow – South Fork, Lower and Upper Bevens Creeks, and Cannon River). 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 polluted the groundwater which now feeds the creek. Most streams in all three basins had 2014 NO_3 concentrations below or similar to their 10-year averages.

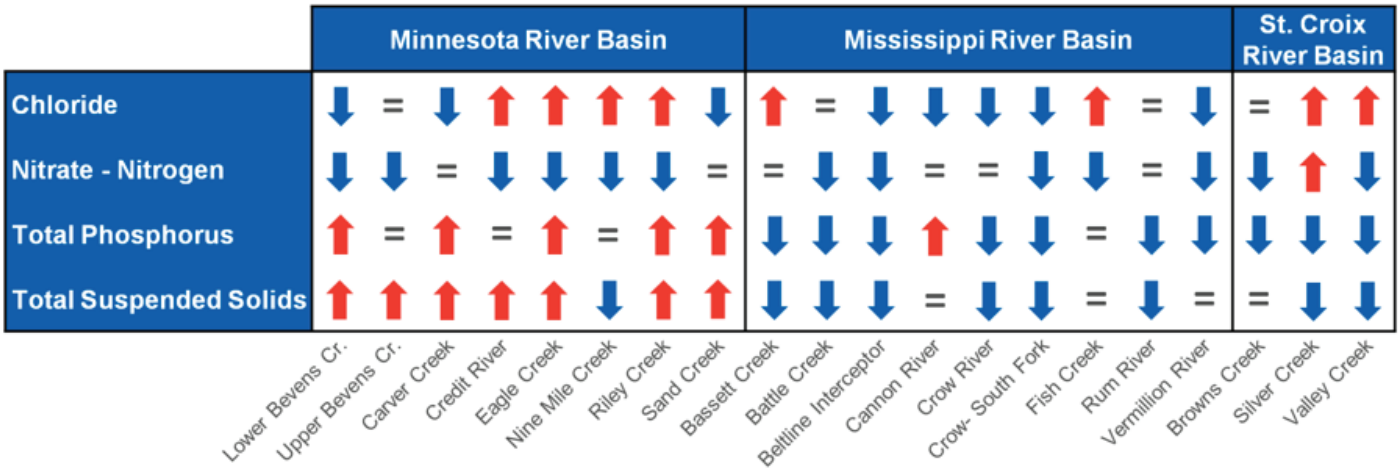
Nitrate - Nitrogen (NO_3) Concentration



Concluding Remarks

Overall, the concentrations of the water quality parameters in the monitored streams appear to be greatly affected by the above normal precipitation in 2014. 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 showed similar patterns, with the highest concentrations occuring in streams of the Minnesota River basin. Concentrations of nitrate-nitrogen were higher in streams located in agriculturally dominant areas.

The table below is a summary comparing the 2014 concentrations to their 10-year averages at each stream. For total suspended solids and total phosphorus, almost all streams that had higher 2014 concentrations compared to 10-year averages were in the Minnesota River basin, while most streams in the Mississippi and St. Croix River basins had lower 2014 concentrations. No overall patterns were observed with chloride, while 2014 nitrate concentration were lower or similar to 10-year averages at almost all monitored stream sites.



A red upwards arrow means the 2014 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 2014 average was below the 10-year 95% confident interval, and an equal sign means the 2014 average was within the 10-year 95% confidence interval.

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

METROPOLITAN COUNCIL

390 Robert Street North
Saint Paul, MN 55101-1805
(651) 602-1000

September 2015