METROPOLITAN COUNCIL

# Environmental Services

## 2012

# Stream Water Quality Summary for the Twin Cities Metropolitan Area

This document is a summary of the 2012 results from the stream monitoring program of Metropolitan Council Environmental Services (MCES). The Metropolitan Council has a long history of leadership in protecting the quality of water in the seven-county Twin Cities metropolitan area. As the metro area population continues to grow, it is the job of the Council to plan for and oversee growth that helps maintain the region's environmental integrity.

MCES began monitoring metro area streams in 1989 to determine the extent of nonpoint-source pollution loading from tributaries to the Mississippi, Minnesota, and St. Croix Rivers, to assist in developing management objectives, and to evaluate the effectiveness of watershed management practices for reducing nonpoint-source pollution and improving water quality in metro area streams and rivers. To carry out this monitoring, MCES collaborates with various federal, state, and local groups including municipalities, counties, watershed management organizations and districts, and local soil and water conservation districts. In 2012, MCES and its partners operated monitoring stations at 22 sites on 20 streams in the metro area, as shown in Figure 1.

**Figure 1:** 2012 MCES Stream Monitoring Stations

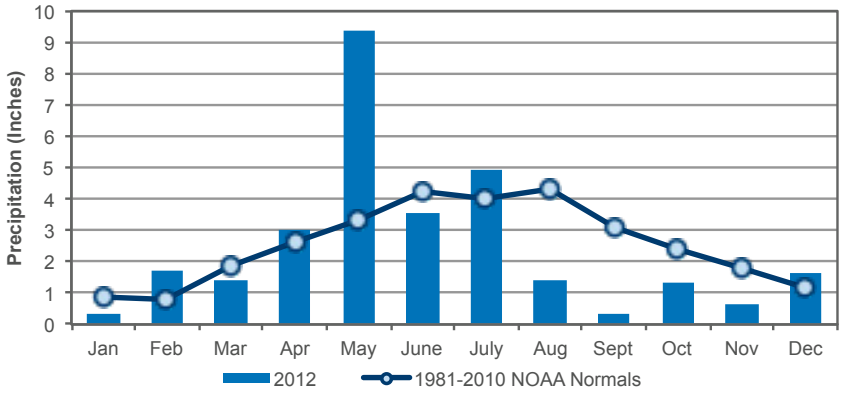
What follows is a summary of the 2012 average annual concentrations of key water quality variables in MCES monitored streams. The streams are grouped by major river basin: Minnesota, Mississippi, and St. Croix. In general streams in the same major river basin will have similar characteristics to each other because of predominant land uses and geology within the basin. However, even intra-basin, the monitored streams may have very different water quality, depending on a number of factors including watershed size, level of urbanization, and soil type.

To provide a historical perspective, 2012 average values are compared to 10-year average values for the 2003-2012 time period. Whether a 2012 average concentration is higher or lower than the 10-year average should not be taken as an indication of an increasing or decreasing trend in water quality, but rather as a comparison to normal stream conditions. Concentration in any given year is highly affected by the timing and quantity of stream flow. Concentrations are also compared to state water quality standards where applicable. Table 1 contains a summary of results by major river basin.

## Precipitation

**Description:** Regional precipitation is measured at the Minneapolis-St. Paul International Airport which is a good indicator of significant rainfall events because of its central location, even though actual precipitation varies throughout the metro area. During wet periods, nonpoint source pollutants are carried through storm sewer systems and smaller streams to the rivers, and higher flows can also cause stream bank erosion, habitat destruction and flooding. During dry periods, flows may be too low to sufficiently dilute pollution, sediment deposition increases, and habitat quality may be adversely affected.

**Annual Precipitation**




**2012 Results:** Precipitation in the metro area during 2012 was about 1 inch below the NOAA 1981-2010 normal precipitation for the area (a data set updated once every 10 years), though departures from normal differed greatly between the beginning and end of 2012. Precipitation in the metro area from January through July was 6.5 inches above normal. In May alone, the Twin Cities experienced over 9.3 inches of precipitation, an anomaly of approximately 6 inches. The second half of the year was a stark contrast with a drought beginning in late July that lasted through the winter, resulting in an August-December precipitation deficit of 7.5 inches.

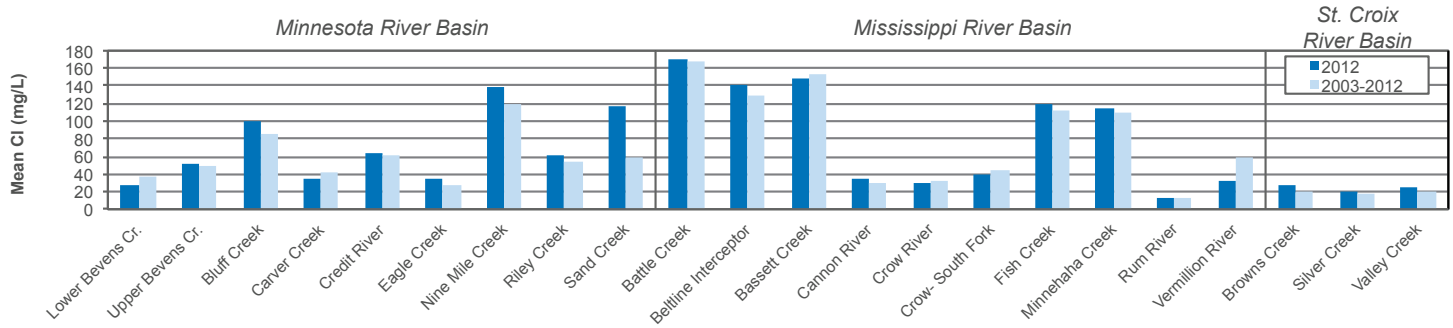
## Chloride (Cl)

**Description:** Excess levels of chloride can be toxic to aquatic and terrestrial organisms. Although some chloride is derived from natural sources, the majority of chloride in the metro area is from urban sources such as road deicing and water softening.

**Standard:** Chloride concentration must not exceed a 4 day average of 230 mg/l or a one hour average of 860 mg/l.

**2012 Results:** 2012 average chloride concentrations were generally above their 10-year averages in streams in the Minnesota and St. Croix basins. Within the Mississippi River Basin the more urbanized streams had 2012 average concentrations above their 10-year averages, while the streams in larger and more agricultural/rural watersheds had concentrations below their 10-year averages. The three streams in the St. Croix River Basin have traditionally had low average concentrations, and this was true again in 2012. Battle Creek in the Mississippi River Basin had the highest 2012 average concentration of MCES monitored streams. Although not directly comparable to the chloride standard, Bassett Creek (3 samples), Battle Creek (3), Beltline Interceptor (1), Upper Bevens (1), Nine Mile Creek (4), and Sand Creek (4) all had samples exceed 230 mg/L.

**Chloride (Cl) Concentration**

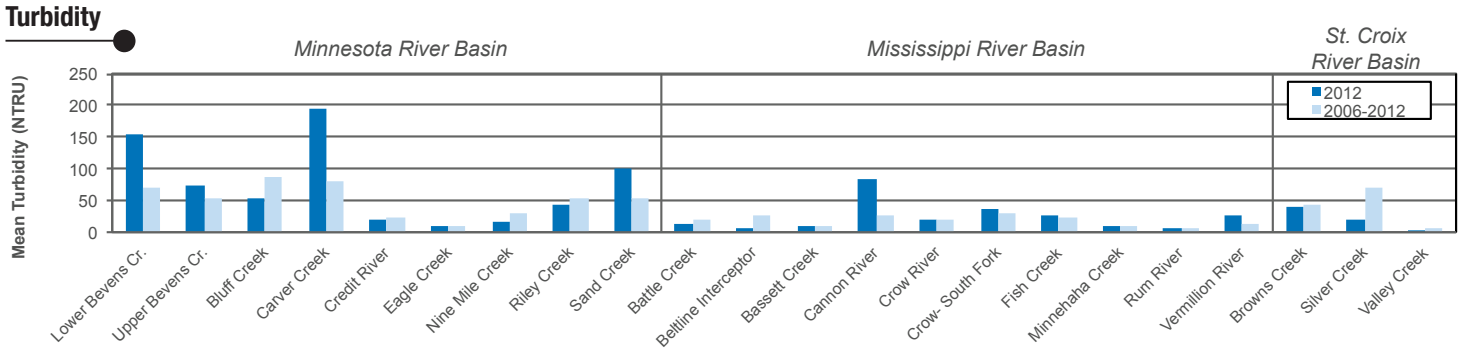


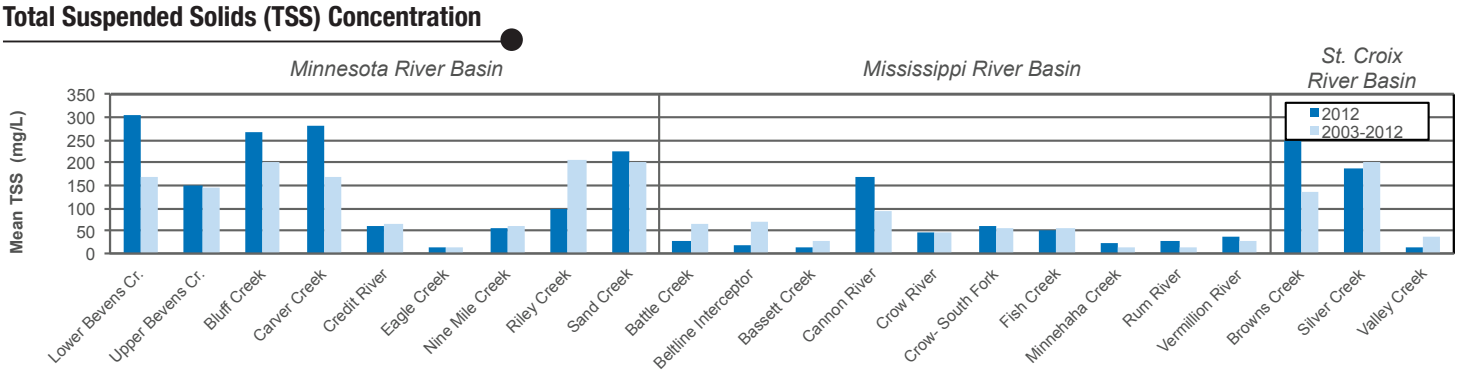
## Turbidity and Total Suspended Solids (TSS)

**Description:** Particulate matter in the water may harm aquatic life by decreasing the light available for plant growth, increasing water temperature, clogging gills of aquatic inhabitants and covering habitat. Suspended solids can also negatively affect user perception of water quality and decrease swimmability. Particulate matter usually enters the streams as sediment eroded from stream banks or decaying organic matter. The amount of particulate matter in a river can be measured as turbidity or total suspended solids. Turbidity is an easier measurement that can be done in the field, but is harder to compare between sites because readings can be influenced by the presence of dissolved matter, temperature, and the shape of the particles.

**Standard:** The turbidity standard is a daily maximum of 25 Nephelometric Turbidity Units (NTU). The MCES lab has measured turbidity in Nephelometric Turbidity Ratio Units (NTRUs) since 2006, and the standard of 25 NTU has been approximated as 39 NTRU by the Minnesota Pollution Control Agency. No TSS river standard exists.

**2012 Results:** 2012 average turbidity and TSS concentrations in streams in all three basins showed no particular trend in comparison with their 10-year averages. At some sites turbidity and TSS had similar relationships to their 10-year averages but not at other sites. In the Minnesota River basin, Lower Bevens Creek and Carver Creek had 2012 averages that were much higher than their 10-year averages for both turbidity and TSS. Sand Creek's 2012 average turbidity was significantly above its 10-year average, but average TSS concentration was only slightly above its 10-year average. Riley Creek's 2012 average TSS concentration was significantly below its 10-year average, but average turbidity was only slightly below its 10-year average. In the Mississippi River basin, the Cannon River had significantly larger 2012 average turbidity and TSS concentration than its 10-year averages. In the St. Croix basin, Browns Creek's 2012 average TSS concentration was significantly above its 10-year average, while its average turbidity was slightly lower than its 10-year average. All monitored streams except Bassett, Eagle, Minnehaha and Valley Creeks and Rum River had at least one sample above the approximate turbidity standard of 39 NTRU. Upper Bevens, Lower Bevens, Bluff, Browns, Carver, Fish and Sand Creeks had 8 or more exceedences of the turbidity standard.




## Nutrients

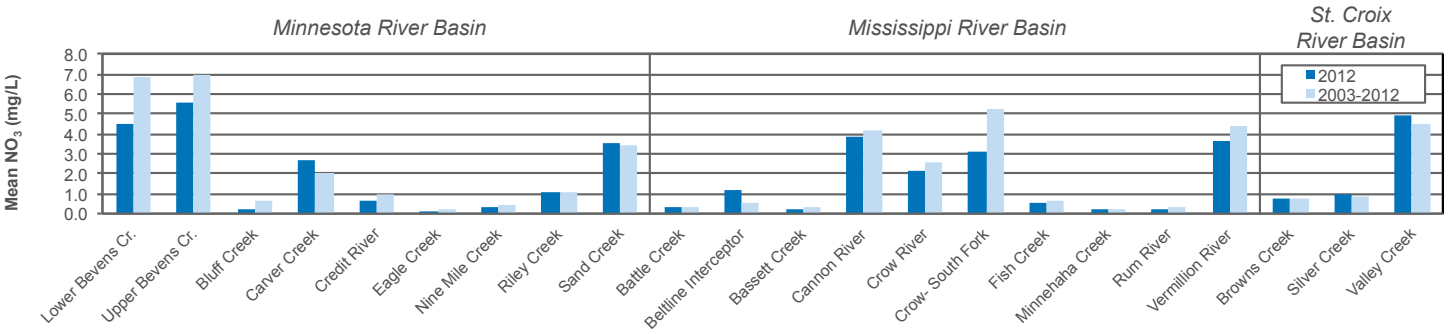
**Description:** Aquatic plants provide food, oxygen and habitat for river organisms. However, an excess of plant growth can lead to unsightly algae blooms, oxygen depletion, and odor upon decaying, making the water unpleasant for recreational activities and unsuitable for aquatic life. Nitrogen and phosphorus are essential nutrients for plant growth and individually or combined are often the limiting nutrient(s) in aquatic systems. Nitrogen and phosphorus are common components of wastewater treatment plant discharges and urban and agricultural runoff. They can stimulate excessive plant growth when levels in rivers are too high.

**Standards:** Class 2Bd drinking waters cannot exceed 10 mg/l nitrate-nitrogen. No river standard for total phosphorus exists.

## Nitrate – Nitrogen ($NO_3$)

**2012 Results:** 2012 average nitrate concentrations in all three basins were generally very close to their 10-year averages. The Bevens Creek sites (upper and lower) in the Minnesota River Basin had significantly lower 2012 average nitrate concentrations compared to their 10-year averages. Additionally, the Crow-South Fork 2012 average concentration was significantly lower than its 10-year average.

**Nitrate - Nitrogen ($NO_3$) Concentration**




## Total Phosphorus (TP)

**2012 Results:** 2012 average phosphorus concentrations in all three basins were generally lower than their 10-year averages. In the Minnesota River Basin, Carver Creek's 2012 average concentration was significantly higher than its 10-year average. In the Mississippi River Basin, Beltline Interceptor and the Vermillion River had 2012 average concentrations significantly below their 10-year averages. In the St. Croix River Basin, Silver Creek and Valley Creek also had 2012 average concentrations significantly below their 10-year averages.

**Total Phosphorus (TP) Concentration**

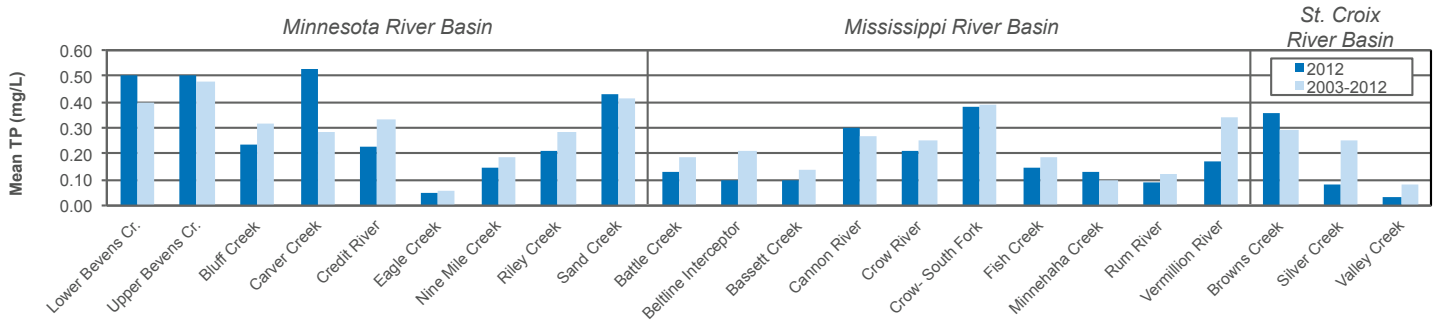



**Table 1: 2012 water quality by river basin as compared to the 10-year average (2003 – 2012)**

| Basin | Chloride | Turbidity[a] | TSS | Nitrate | Phosphorus |
|---|---|---|---|---|---|
| Minnesota River | Higher | Varies | Higher | Lower | Varies |
| Mississippi River | Varies | Varies | Varies | Lower | Lower |
| St. Croix River | Higher | Lower | Varies | Higher | Varies |

"Higher" or "Lower" indicate that a large majority of sites in the basin were either higher or lower than the 10-year average by more than a 1% difference. "Varies" indicates no clear majority.

[a]Average is based on data from 2006 – 2012.

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METROPOLITAN COUNCIL

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

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