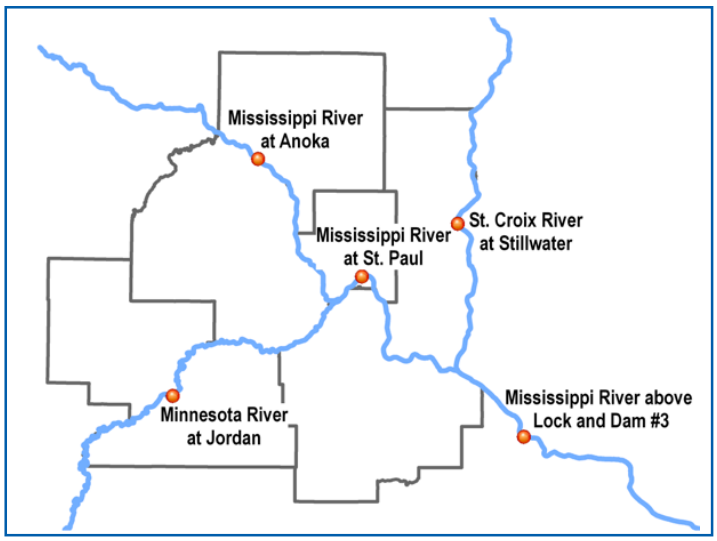
Metropolitan Council

Environmental Services

2011

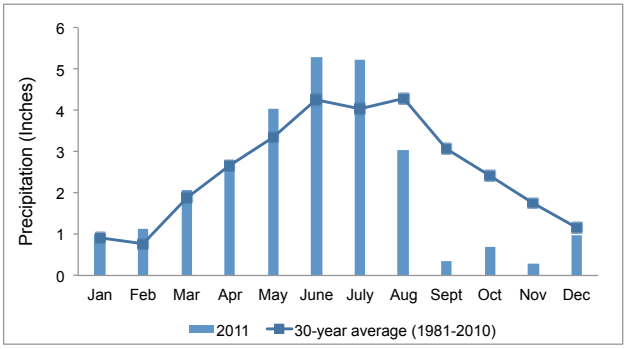
River Water Quality Summary for the Twin Cities Metropolitan Area



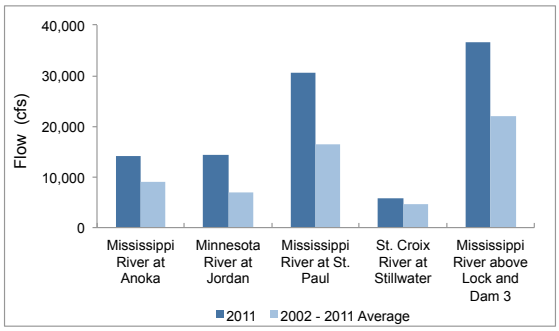
This document is a summary of the 2011 results from the Metropolitan Council Environmental Services (MCES) River Monitoring program. The river monitoring program began in 1927 after the Mississippi River was declared a public health hazard. Today the river monitoring program serves a wide array of needs, including determination of whether Twin Cities Metropolitan Area (Metropolitan Area) waters meet state water quality standards and criteria, assessment of the performance and effectiveness of MCES treatment plants, and documentation of long-term trends and changes in water quality. In 2011, river monitoring was conducted at 5 automated and 17 conventional sampling sites along the Mississippi, Minnesota, and St. Croix Rivers in the seven-county Metropolitan Area. Samples are collected four-five times per month during the open-water season (March through October) when more recreational activities are expected and the river environment changes more quickly, and one-two times per month during the remainder of the year. Below are the 2011 concentrations of key water quality variables at five critical locations throughout the Metropolitan Area: entering the Metropolitan Area at the Mississippi River at Anoka, Minnesota River at Jordan, and St. Croix River at Stillwater, after the Minnesota River enters the Mississippi River at downtown St. Paul, and leaving the Metropolitan Area on the Mississippi River above Lock and Dam #3 near Red Wing. To provide a historical perspective, 2011 values are compared to ten-year average values for the 2002-2011 period. Whether a 2011 concentration is higher or lower than the 10-year average should not be taken as an indication of increasing or decreasing water quality as concentration in any given year is highly affected by the timing and quantity of river flow. Concentrations are also compared to state water quality standards where applicable. Table 1 contains a summary of results.

Precipitation and River Flow

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 Metropolitan 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.



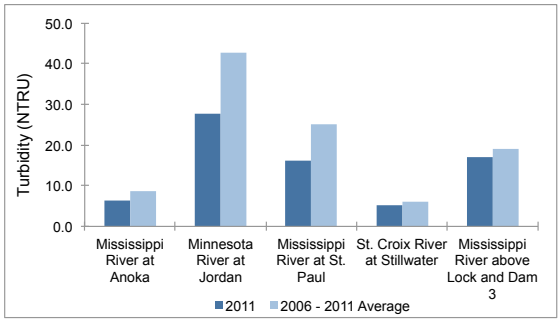
During dry periods, flows may be too low to sufficiently dilute pollution, sediment deposition increases, and habitat quality may be adversely affected.



2011 Results: Precipitation in the Metropolitan Area during 2011 was about 3.7 inches below the National Climatic Data Center's 1981-2010 U.S. average for the area. 2011 river flows were all above the 10-year average. 2011 began with slightly above average precipitation and slightly below average temperatures, with the timing of snowmelt and ice out about average. Because of high snow pack and saturated soils, all three rivers reached flood stage during spring runoff, and stayed high throughout the summer due to above average precipitation in May, June, and July. In late July a drought began that lasted through the winter, resulting in an August-November rainfall deficit of more than 7 inches from normal. The year ended with below average flows, above average temperatures, low soil moisture, and little to no snowpack.

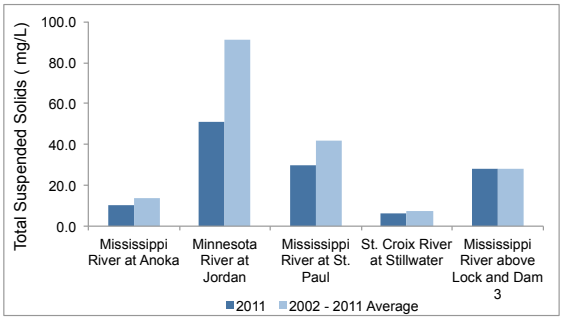
Turbidity and Total Suspended Solids (TSS)

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 in the water can be from a variety of sources including sediment which has eroded from stream banks or been carried into a river with urban or agricultural runoff or it can also be organic particulate such as decaying matter or algae. The amount of particulate matter in a river can be measured as turbidity or total suspended solids. Turbidity is an easier measurement but can be influenced by the presence of dissolved matter, temperature, and the shape of the particles.



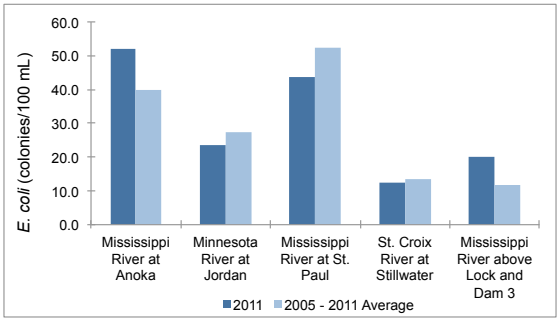
Standards:. The turbidity standard is a daily maximum of 25 Nephelometric Turbidity Units (NTU). The MCES lab has measured turbidity in Nephelometric Turbidity Ratio Units (NTRUs) since 2006, and the standard of 25 NTU has been approximated as 39 NTRU by the Minnesota Pollution Control Agency. At this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

2011 Results: Of the 206 turbidity samples taken in 2011, 12 were above the 39 NTRU threshold: eight samples from the Minnesota River at Jordan, three samples from the Mississippi River at St. Paul, and one sample from the Mississippi River above Lock and Dam 3. The 2011 average turbidity levels at the five monitoring points were all below the 6-year average NTRU levels, and the average TSS concentrations were also lower than the 10-year average at all five monitoring stations. As expected turbidity and TSS track well together. The Minnesota River is the primary TSS contributor within the Metropolitan Area.



E. coli Bacteria

Description: Suitability for recreation is determined by the level of *Escherichia coli (E. coli)* bacteria. High *E. coli* levels can indicate the presence of potentially dangerous pathogens such as typhoid fever, hepatitis and dysentery. Sources can include failing septic tanks, untreated wastewater, livestock, pets and wildlife.

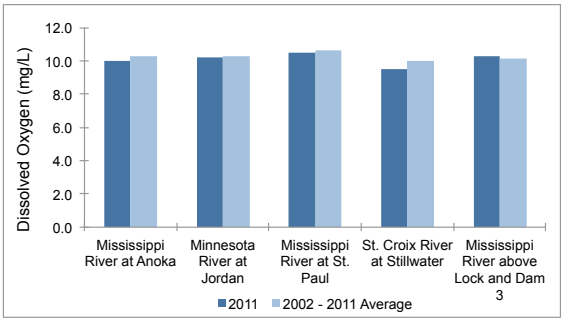


Standard: The average monthly counts between April 1 and October 31 cannot exceed 126 organisms/100ml based on at least five samples or 10% of monthly samples cannot exceed 1,260 organisms/100ml.

2011 Results: Average annual *E. Coli* concentrations were well below the average monthly water quality standard of 126 organisms/100ml at all points, indicating favorable conditions for recreational use. There were no samples within the April 1 to October 31 window in 2011 that exceeded 1,260 organisms/100 mL. *E. Coli* average annual concentrations exceeded the 7-year average at Mississippi River at Anoka and Mississippi River above Lock and Dam 3, but were below the 7-year average at Minnesota River at Jordan, Mississippi River at St. Paul, and St. Croix River at Stillwater.

Dissolved Oxygen (DO)

Description: Living organisms need oxygen to survive so the amount of dissolved oxygen in a river determines whether it can support aquatic life. Dissolved oxygen can come into an aquatic system from the atmosphere but it is also produced in aquatic systems through photosynthesis. DO concentrations can be reduced through high temperatures, low flow, increased pollution, and the decomposition of organic material in the water.

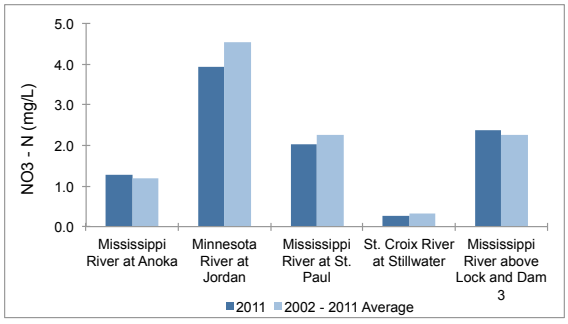


Standard: Dissolved oxygen must not be below 5 mg/L for a daily minimum.

2011 Results: High oxygen levels provide healthy conditions for a diverse fish population, indicating fishable conditions. No individual sample measurements in 2011 at any of the five sites were below 5 mg/L. Dissolved oxygen levels were slightly below the 10-year average at Mississippi River at Anoka, Mississippi River at St. Paul, and St. Croix River at Stillwater and above the 10-year average at Mississippi River above Lock and Dam 3, while meeting the 10-year average at the Minnesota River at Jordan.

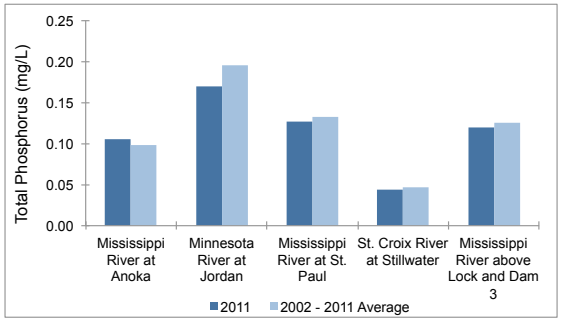
Nutrients – Nitrate – Nitrogen and Total Phosphorus

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.



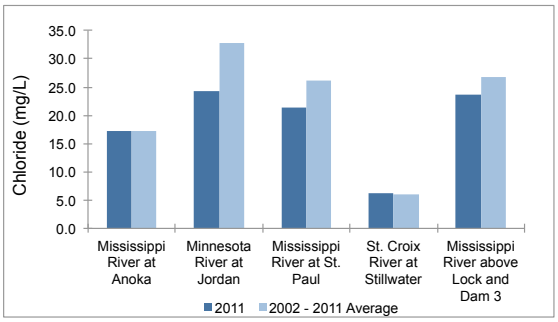
Standards: Class 2Bd drinking waters cannot exceed 10 mg/l nitrate-nitrogen. No river standard for total phosphorus exists.

2011 Results: The Mississippi River above the Upper St. Anthony Falls and the St. Croix River are used directly for drinking water and therefore the nitrate-nitrogen concentration must not exceed 10 mg/L to protect human health at the Mississippi River at Anoka and St. Croix River at Stillwater. All 2011 samples met the drinking water standard. The average 2011 nitrate and total phosphorus concentrations were below the 10-year average for the Minnesota River at Jordan, Mississippi River at St. Paul, and St. Croix River at Stillwater and above the 10-year average for the Mississippi River at Anoka. At the Mississippi River above Lock and Dam 3 nitrate concentration was above the 10-year average but phosphorus was below the 10-year average.



Chloride

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 Metropolitan Area rivers is from urban sources such as road deicing and water softening.



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

2011 Results: No samples at any site exceeded the 4 day average standard of 230 mg/l. Chloride concentrations were below the 10-year average at the Minnesota River at Jordan, the Mississippi River at St. Paul, and the Mississippi River above Lock and Dam 3. The chloride concentration was slightly above the 10-year average at the St. Croix River at Stillwater and met the 10-year average at the Mississippi River at Anoka.

Table 1: A summary of 2011 water quality as compared to the 10 year average (2002 – 2011).

	Flow	Turbidity[a]	TSS	*E.coli*[b]	DO	Phosphorus	Nitrate-N	Chloride
Mississippi River at Anoka	Higher	Lower	Lower	Higher	Lower	Higher	Higher	Same
Minnesota River at Jordan	Higher	Lower	Lower	Lower	Same	Lower	Lower	Lower
Mississippi River at St. Paul	Higher	Lower	Lower	Lower	Lower	Lower	Lower	Lower
St. Croix River at Stillwater	Higher	Lower	Lower	Lower	Lower	Lower	Lower	Higher
Mississippi River above Lock and Dam 3	Higher	Lower	Lower	Higher	Higher	Lower	Higher	Lower

[a]Average is based on data from 2006 – 2011
[b]Average is based on data from 2005 – 2011

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