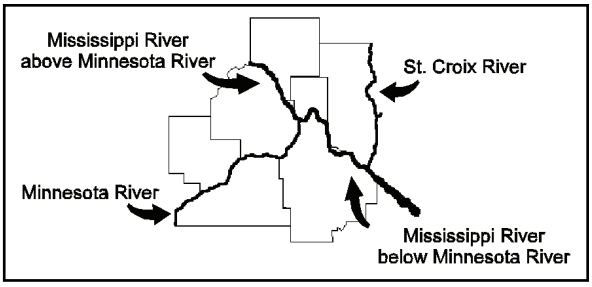
Metropolitan Council

Environmental Services

2010

River Water Quality Summary for the Twin Cities Metropolitan Area

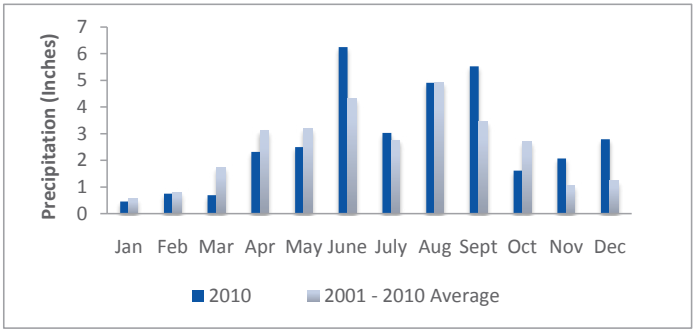


This document is a summary of the results from the Metropolitan Council Environmental Services (MCES) River Monitoring program. The river monitoring program began in 1927 after the Mississippi River was declared a public health hazard. Today the river monitoring program serves a wide array of needs, including monitoring to ensure Twin Cities Metropolitan Area (Metropolitan area) waters meet the 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 2010, river monitoring was conducted at 5 automated and 18 conventional sampling sites along the Mississippi, Minnesota, and St. Croix Rivers in the seven-county Metropolitan Area. The Mississippi River above the Minnesota River is regulated for (1C) drinking water, (2Bd) aquatic life and recreation, and (3C) industrial use and cooling; the Mississippi River below the Minnesota River is regulated for (2C) aquatic life and recreation and (3C) industrial use and cooling; the Minnesota River is regulated for (2C) aquatic life and recreation and (3C) industrial use and cooling; and the St. Croix River is regulated for (1C) drinking water, (2Bd) aquatic life and recreation, and (3C) industrial use and cooling. The results below are the 2010 and 10-year average (2001-2010) concentrations of water quality variables within the four separate river reaches. Concentrations of variables can be compared to state water quality standards where applicable. Table 1 contains a summary of results.

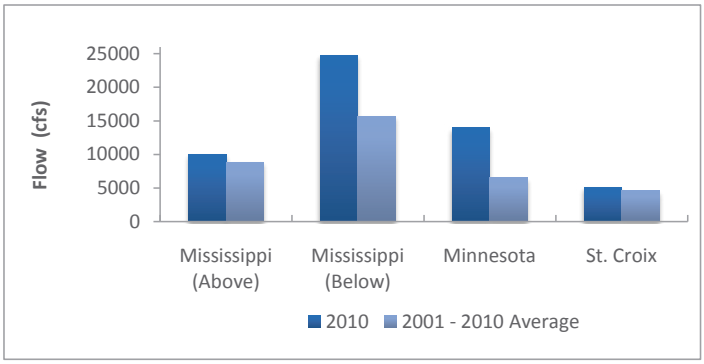
Precipitation and River Flow

Importance: Flooding; nutrient and sediment transport and concentration; habitat integrity

Description: Regional precipitation is measured at the Minneapolis-St. Paul International Airport which is a good indicator of significant runoff events because of its central location, even though actual precipitation varies throughout the Metropolitan Area. During wet periods, nonpoint source pollutants are carried to 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.



2010 Results: Precipitation in the Metropolitan Area during 2010 was about 3.5 inches above normal. 2010 started out with a dry spring with above normal temperatures, earlier than normal snowmelt and ice out, and low precipitation but finished wet with above normal precipitation in September, November, and December. Flows were high in early spring due to the high temperatures and fast snowmelt, then low in late spring and early summer, and then high throughout late summer and fall. The ground was saturated going into fall and so much of the precipitation received became runoff especially in the Minnesota and Mississippi River basins. Near record high flows were experienced in November and December.

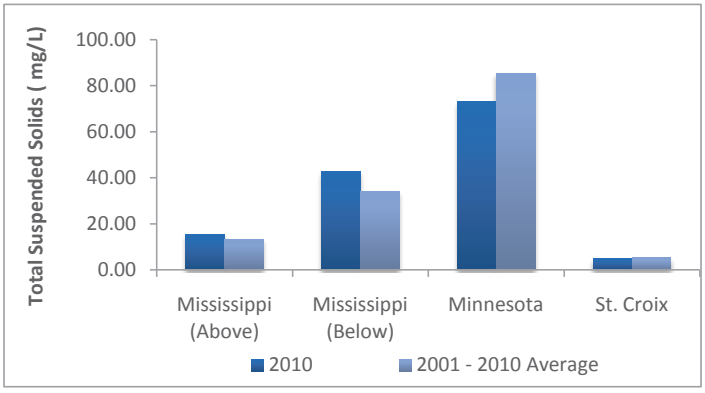


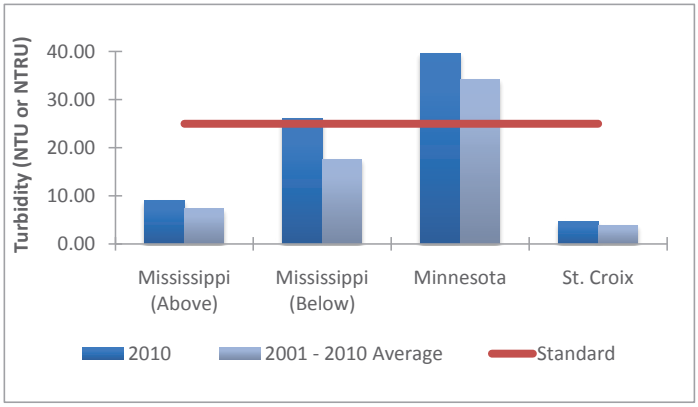
Turbidity and Total Suspended Solids (TSS)

Importance: User perception and usability; aquatic life and habitat

Standards: TSS – No river standard or MCES WWTP Permit Limit exists; Turbidity – Class 2Bd waters and MCES Permit limit is a daily maximum of 25 NTU; Class 2A waters limit is a daily maximum of 10 NTU.

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.



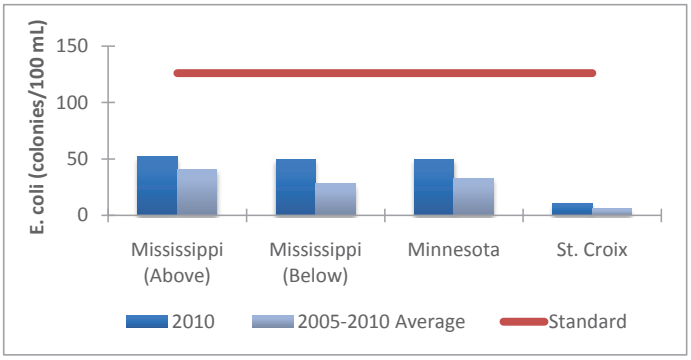


The Mississippi (Above) and the St. Croix have turbidity levels below than the standard; the Mississippi (Below) and the Minnesota have turbidity levels over the allowable level set by the standard.

2010 Results: The 2010 average daily turbidity levels within the four river reaches monitored were above the 10-year average level. Both the Minnesota River and the Mississippi River below the confluence with the Minnesota River exceeded the daily turbidity water quality standard of 25 NTU. The average daily TSS concentrations were lower than the 10-year average for the Minnesota and St. Croix rivers and above average for both reaches of the Mississippi River. The Minnesota River is the primary TSS contributor within the Metropolitan Area.

E. coli Bacteria

Importance: Recreation and human health



All four rivers have *E.coli* levels below the maximum level allowed by the standard.

Standard: River Standard – 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; MCES WWTP Permit Limit - Average monthly count of 200 organisms/100ml.

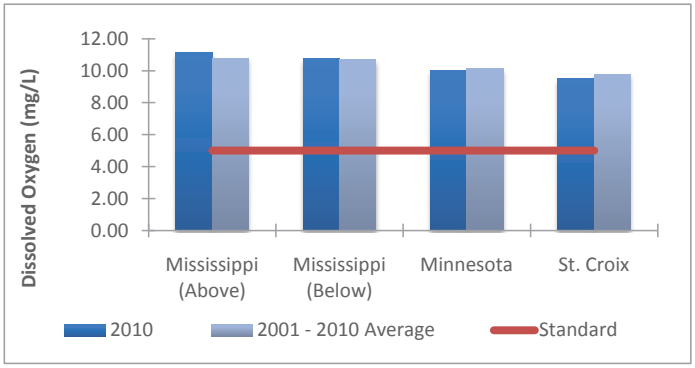
Description: Suitability for recreation is determined by the level of *Escherichia coli (E. coli)* bacteria. High *E. coli* levels can indicate the presence of potentially dangerous pathogens such as typhoid fever, hepatitis and dysentery. Sources can include failing septic tanks, untreated wastewater,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

2010 Results: Average monthly concentrations were well below the average monthly water quality standard (although monthly values are only based on four samples), indicating favorable conditions for recreational use at these locations. Of the 606 samples collected, eight samples exceeded 1,260 organisms/100 mL. Five of these were on the Minnesota River and three were on the Mississippi River.

Dissolved Oxygen (DO)

Importance: Aquatic Life

Standards: River Standard – Dissolved oxygen must not be below 5 mg/L for a daily average; MCES WWTP Permit Limit – Not below 6 - 9 mg/L depending on flow conditions.



DO values in all four rivers are above the minimum required by the standard.

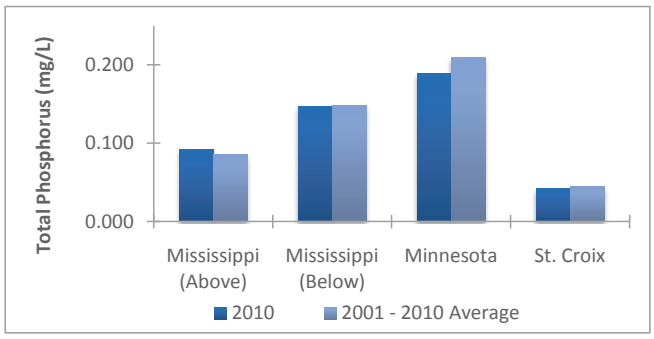
Description: Living organisms need oxygen to survive so the amount of dissolved oxygen in a river determines whether it can support aquatic life. Dissolved oxygen can come into an aquatic system from the atmosphere but it is also produced in aquatic systems through photosynthesis. DO concentrations can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

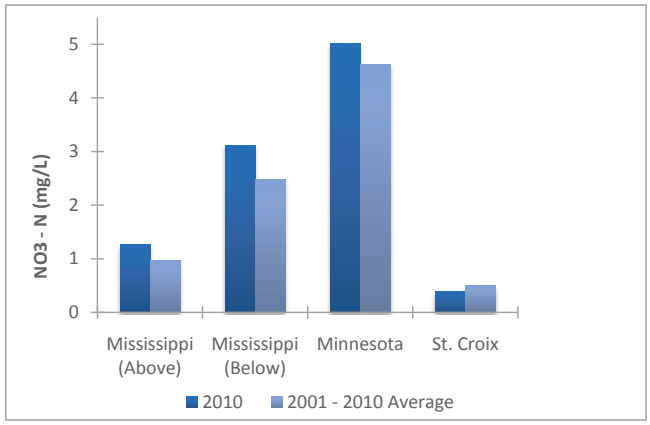
2010 Results: Annual average DO levels in all three rivers were higher than the water quality standard of 5 mg/L in 2010 and were comparable to the 10-year average levels. High oxygen levels provide healthy conditions for a diverse fish population, indicating fishable conditions. No daily DO measurements in 2010 were below the 5 mg/L threshold.

Nutrients – Total Phosphorus and Nitrate – Nitrogen

Importance: Aquatic life; recreation and usability; aesthetics; human health

Standards: Total phosphorus - No river standard exists, MCES WWTP Permit limit is 1 mg/L; Nitrate – Nitrogen – Class 2Bd drinking waters cannot exceed 10 mg/L, no MCES WWTP Permit Limits exist.





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.

2010 Results: The average 2010 total phosphorus concentrations for the Mississippi and St. Croix rivers are similar to the ten year average. There was a decrease in the total phosphorus concentration in the Minnesota River compared to the ten year average. Phosphorus is often transported with particles so this reduction may be due, in part, to the lower TSS values measured in the Minnesota River. Nitrate-nitrogen concentrations were up in 2010 in the Mississippi and Minnesota Rivers compared to the ten year average. Only in the St. Croix River did nitrate-nitrogen levels decrease in 2010. The Mississippi River above the confluence with the Minnesota River 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. Both rivers meet the drinking water standard.

Table 1. A summary of 2010 water quality as compared to the 10 year average (2001 – 2010).

	Flow	Turbidity	TSS	*E.coli**	DO	Phosphorus	Nitrate-N
Mississippi (Above)	Higher	Higher	Higher	Higher	Higher	Higher	Higher
Mississippi (Below)	Higher	Higher	Higher	Higher	Same	Same	Higher
Minnesota	Higher	Higher	Lower	Higher	Same	Lower	Higher
St. Croix	Higher	Higher	Same	Higher	Lower	Lower	Lower

Turbidity levels exceed the allowable level set by the standard

*Average is based on data from 2005 – 2010

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