River Water Quality Summary for the Twin Cities Metropolitan Area
- Background -

Metropolitan Council Environmental Services monitors water quality in the region to protect public health and the environment, in compliance with state laws and the federal Clean Water Act (CWA). The goals of the CWA are to eliminate the discharge of pollutants into navigable waters and to attain, whenever possible, water clean enough to support fish, shellfish, wildlife and recreational activities. Historically, the terms "fishable" and "swimmable" waters have been used to describe the goals of the CWA. This report presents an annual "snapshot" for water quality in four reaches of the major metro-area rivers (upper and lower Mississippi, Minnesota and St. Croix) using several common environmental indicators. These indicators include the amount of dissolved oxygen present as an indicator of "fishable" conditions; bacterial levels as an indicator of "swimmable" conditions; and total suspended solids and phosphorus as indicators of both. These indicators are described in more detail below.

Water quality is affected by the combined impacts of point and nonpoint sources of pollution. River systems are quite resilient to moderate changes; however, extreme conditions can threaten a river's ability to support aquatic life. To provide a historical perspective, 2009 information is compared to ten-year average values during the 2000-2009 period.

River monitoring is conducted at strategically located sampling stations. Samples are collected four 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 twice per month during the remainder of the year.

Variable or Indicator	General Significance
Precipitation and River Flow	*Precipitation results in runoff and carries nonpoint source pollution from urban and agricultural areas to area rivers. It also increases river flow, which may affect fate and effects of pollutants in the river system. Regional precipitation is measured at the Minneapolis-St. Paul International Airport, and is a good indicator of significant runoff events because of its central location, even though actual precipitation varies throughout the metro area. During wet periods, nonpoint source pollutants are carried to rivers, and higher flows can also cause streambank 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.*
Dissolved Oxygen Fishable	*Living organisms need oxygen to survive, and the amount of dissolved oxygen in a river determines whether it can support aquatic life. Dissolved oxygen is reduced through the decomposition of organic material in the water, which may come from wastewater treatment plants or agricultural and urban nonpoint source runoff. Dissolved oxygen levels of 5 mg/l and greater are generally adequate to support aquatic life. However, fish consumption advisories may exist due to other contaminants (mainly PCBs and mercury).*
Bacteria Swimmable	*One measure of a river's recreational value is its suitability for swimming (i.e. all water contact activities), and one measure of this is the level of Escherichia coli (E. coli) bacteria. E. coli is a subgroup of fecal coliform bacteria, the former water quality standard for bacteria. These bacteria are found in the wastes of warm-blooded animals, including people, dogs and cattle, and may indicate the presence of potentially dangerous pathogens such as typhoid fever, hepatitis and dysentery. E. coli bacteria levels with a monthly geometric mean below 126 organisms/100 ml per month and no more than 10% of all samples in a month above 1260 organisms/100 ml are generally considered to be safe for human contact.*
Suspended Solids Fishable/Swimmable	*Particulate matter in the water can be determined by measuring suspended solids. These particles may harm aquatic life by decreasing light available for plant growth, increasing water temperature, clogging gills of aquatic inhabitants and covering habitat. Suspended solids are also related to swimmability because they are closely correlated to user perception of water quality.*
Phosphorus Fishable/Swimmable	*Aquatic plants provide food, oxygen and habitat for river organisms. However, an excess of plant growth can lead to unsightly algae blooms, and oxygen depletion and odor upon decaying, making the water unpleasant for recreational activities and unsuitable for aquatic life. Phosphorus, a common component of wastewater treatment plant discharges and urban and agricultural runoff, can stimulate excessive plant growth when levels in rivers are too high.*

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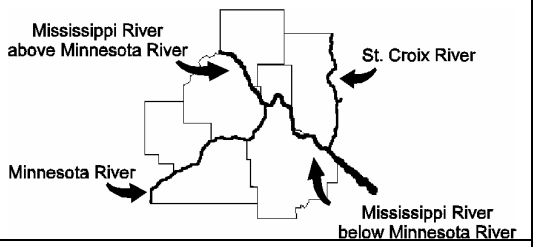
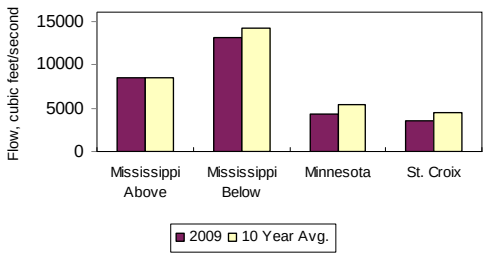
- 2009 -



Precipitation and River Flows

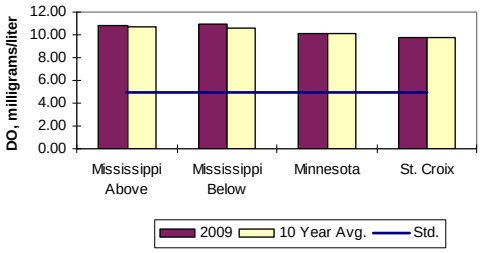
Precipitation in the Twin Cities Metropolitan Area during 2009 was about 4.5 inches below normal, continuing the drought trend started in 2006. Annual river flows in the Mississippi River below the Minnesota, the Minnesota and St. Croix Rivers were lower than the 10-year average, due in part to below normal precipitation in west central Minnesota as well as in the Metro Area. The river flow in the Mississippi River above the Minnesota River was near normal in 2009.



Source: United States Geological Survey

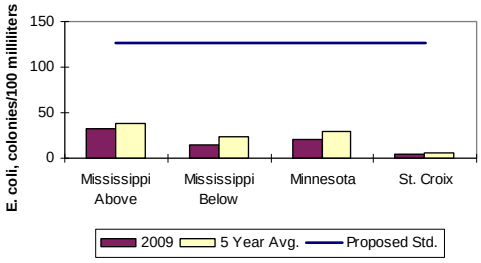
Dissolved Oxygen

Annual average dissolved oxygen (DO) levels in all three rivers were higher than the water quality standard of 5 mg/L in 2009 and were comparable to the 10-year average levels. High oxygen levels provide healthy conditions for a diverse fish population, indicating fishable conditions. Higher dissolved oxygen levels indicate better water quality.



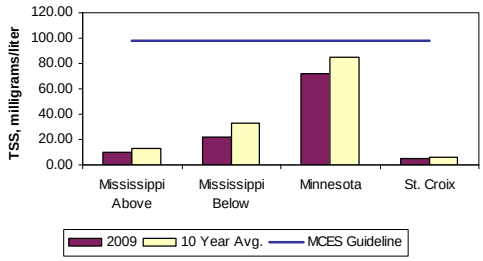
E. Coli Bacteria

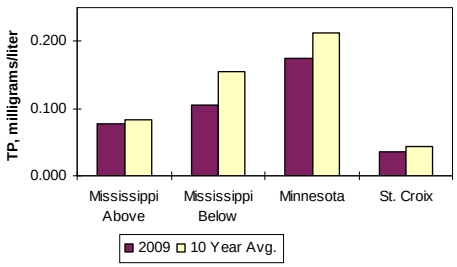
In May 2008, the Minnesota Pollution Control Agency adopted the EPA's change in water quality standards for bacteria from fecal coliform to E. coli bacteria. MCES began analyzing samples for E. coli in 2005 in anticipation of the standards change. Annual average bacteria levels in all three rivers were lower than the water quality standard of 126 organisms/100 ml for E. Coli and below the 5-year (2005-2009) averages in 2009, indicating favorable conditions for swimming. Of 385 values, only one result in 2009 exceeded the individual standard of 1260 organisms/100 ml and it was in the Minnesota River near Jordan. Lower bacteria values indicate better water quality.



Suspended Solids

Annual average total suspended solids (TSS) levels in the Mississippi, Minnesota and St. Croix Rivers were at or below the 10-year averages in 2009. There is no water quality standard for suspended sediments in the rivers, but too many particles in the water can degrade water quality and aesthetic perception. MCES has estimated a maximum "guideline" value of 98 mg/L for TSS in the Mississippi, Minnesota and St. Croix rivers based upon a 10-year turbidity/TSS relationship. Annual average TSS values fell below that guideline level in 2009. Lower suspended sediment levels indicate better water quality.



Phosphorus

Annual average total phosphorus (TP) levels in the Metro Area Rivers in 2009 were below the 10-year averages. Although there is no water quality standard yet for phosphorus in rivers, too much phosphorus in the water can lead to impairment of fishable and swimmable conditions, due to algae growth.