

MONITORING OVERVIEW

ASK *an* EXPERT
ABOUT THE MINNESOTA RIVER

Water Quality Trend Analysis

Since 2000, surface water quality data across the Basin has been collected and assembled in the State of the Minnesota River reports (produced every two years). These can be found on the Minnesota River Basin Data Center website: <http://mrbdc.mnsu.edu>. As the length of water quality records grew to a decade in many locations, there was sufficient data to run trend modeling programs to investigate if we can see any water quality trends in the Minnesota River mainstem, major tributary, and minor tributaries.

Minnesota State University, Mankato Water Resources Center recently completed a trend study headed by mathematics professor Deepak Sanjel and an interagency team. The study tested two trend models to examine water quality trends in the Minnesota River Basin: Seasonal Kendall trend model and the USGS Quality of Water trend program (QWTREND). Enough data was available to perform trend tests on 3 mainstem, 8 major tributary, and 4 minor tributary monitoring sites. Each monitoring site was analyzed for four primary water quality pollutants of concern: Total Suspended Sediment, Total Phosphorus, Nitrate-Nitrogen, and Orthophosphorus. A summary of results is presented in the table below.



- means decreasing trend/pollutant decreasing

+ means increasing trend/pollutant increasing

NT means no statistically significant trend

ID Insufficient data

mixed means trend tests vary

	Total Suspended Solids	Total Phosphorus	OrthoPhosphorus	Nitrate-Nitrogen
Mainstem				
Judson	-	-	-	mixed
Mankato (SSC)	-	ID	ID	ID
St. Peter	-	mixed	-	NT
Major Tributaries				
Chippewa River	mixed	NT	-	NT
Hawk Creek	-	NT	NT	NT
Redwood River	-	NT	NT	mixed
Cottonwood River	-	NT	-	+
Watowwan River	-	-	-	-
Blue Earth	NT	-	-	-
Le Sueur	+	-	-	-
High Island	NT	NT	NT	NT

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Water Quality

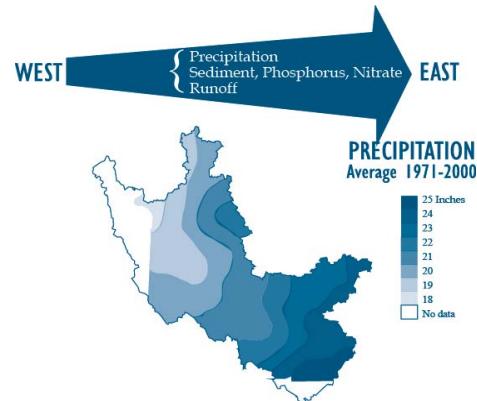
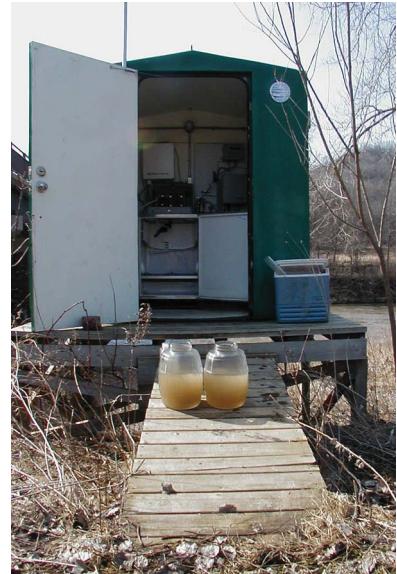
The Minnesota River flows more than 335 miles from its source near the Minnesota-South Dakota border to its confluence with the Mississippi River at Minneapolis/St. Paul. The Minnesota River is the state's largest tributary to the Mississippi River. The Minnesota River Basin, the land that drains into the Minnesota River, encompasses roughly 15,000 square miles and contains all or parts of 37 Minnesota counties. The river drains nearly 20 percent of Minnesota and winds through a predominantly agricultural landscape.

Researchers collect water quality samples from across the Minnesota River Basin. A multi-agency team reviews and evaluates water quality data every other year and prepares a State of the Minnesota River monitoring report which can be found online on the Minnesota River Basin Data Center website: <http://mrbdc.mnsu.edu>

This overview summarizes water quality monitoring at four Minnesota River mainstem locations and fourteen outlets of major tributary streams. The information represents results from more than 4,000 water-quality samples collected from 2000 to 2008. Team partners include state and county agencies and many watershed projects throughout the Basin.

Minnesota River Basin monitoring data from 2000 to 2008 indicate three major categories of water quality concerns: excessive sediment, nutrient enrichment and environmental health. Water quality data have been collected throughout the Minnesota River Basin during the past thirty years and studies have shown excessive nutrient and sediment concentrations. Large portions of the basin do not meet state water quality standards for bacteria, turbidity, dissolved oxygen, ammonia, and biota. You can learn more about these waters that do not meet state water quality standards (impaired waters) by visiting the Minnesota Pollution Control Agency's website: www.pca.state.mn.us/water/tmdl/index.html

Researchers have analyzed almost thirty years worth of water quality data from the Minnesota River at Jordan and Fort Snelling. Trend analyses indicate increasing nitrate-N concentrations in the last ten years. Decreasing trends in total suspended solids and total phosphorus were found over the entire period.



Precipitation, runoff and pollutants generally increase in a west-to-east pattern.

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Water Quality Monitoring

State and federal agencies have collected water quality data at various times in various locations throughout the Minnesota River Basin during the past thirty years. The most comprehensive study of water quality in the Minnesota River Basin, the Minnesota River Assessment Project, was conducted 1989-1994. The study concluded that the Minnesota River was impaired by excessive nutrient and sediment concentrations. Subsequent to those findings, considerable attention and support have been given to clean up efforts. Today, large portions of the Basin do not meet state water quality standards for bacteria, turbidity, dissolved oxygen, ammonia, and biota and are listed on Impaired Waters List (303(d) List). Learn more about Impaired waters on the MPCA website: <http://www.pca.state.mn.us/water/tmdl/index.html>.

Minnesota River Trend Studies have been performed by Minnesota Pollution Control Agency (Christopherson, 2002), University of Minnesota (Johnson, 2006), and Minnesota State University, Mankato Water Resources Center (Sanjel, 2009). The table at left illustrates that the trend studies all found reduction in TSS and TP in numerous mainstem sites during various time frames. For Nitrate-N, the studies indicated no trends or found mixed results. Taken together, these studies would suggest that at least some aspects of water quality in the mainstem of the Minnesota River have improved and continue to improve.



River Clarity Improving

Another statistical and graphical analysis was performed on data collected as part of Minnesota Pollution Control Agency's volunteer Citizen Stream Monitoring Program (CSMP). The study concluded that streams within the Minnesota River Basin (shown in blue below) had increasing water clarity over the study period 1999-2006 (Le, 2009).

Minnesota River Basin Water Quality Links

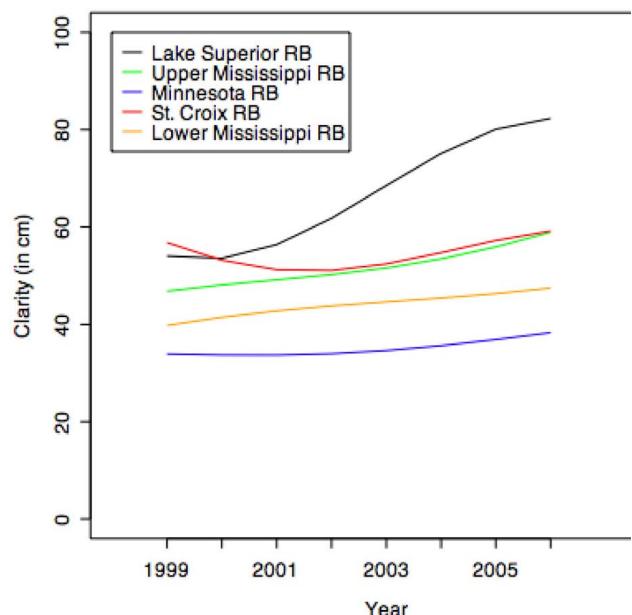
State of the Minnesota River Reports
<http://mrbdc.mnsu.edu/mnbasin/state/index.html>

Environmental Data Access – Water Quality Data
<http://www.pca.state.mn.us/data/eda/>

DNR/MPCA Cooperative Stream Gaging
<http://www.dnr.state.mn.us/waters/csg/index.html>

MPCA Impaired Waters
<http://www.pca.state.mn.us/water/tmdl/>

Water Clarity Trends Major River Basins of Minnesota



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Comparison of Trend Studies

Percent overall change over time period indicated (Seasonal Kendall Trend Test)

Total Suspended Solids

	Fort Snelling 1976-2001	Jordan 1976-2001*	Blue Earth 1967-2001	St. Peter 1971-2006	Judson 1998-2008
MPCA (Christopherson)	-40%	-31%	-49%	n/a	n/a
University of Minnesota (Johnson)	-48%	-39%	-52%	n/a	n/a
MSU,M Water Resources Center (Sanjel)	n/a	n/a	No Trend	-30%	-28%

Nitrate-Nitrogen

	Fort Snelling 1976-2001	Jordan 1976-2001	Blue Earth 1974-2001	St. Peter 1971-2006	Judson 1998-2008
MCPA	No Trend	No Trend	No Trend	n/a	n/a
University of Minnesota	No Trend	-39% (76-01) -29% (76-02)	No Trend	n/a	n/a
MSU,M Water Resources Center	n/a	n/a	No Trend	-14%	+37

Total Phosphorus

	Fort Snelling 1976-2001	Jordan 1976-2001	Blue Earth 1967-2001	St. Peter 1971-2006	Judson 1998-2008
MCPA	-35%	No Trend	-47%	n/a	n/a
University of Minnesota	-37%	-24% (76-01) -22% (76-02)	-52%	n/a	n/a
MSU,M Water Resources Center	n/a	n/a	-45% (99-08)	-30% (98-08) -47% (71-06)	No trend

* For the Jordan Site, For TSS MPCA analyzed 1976-2001 and U of M analyzed 1976-2002. For Nitrate-N and TP: MCPA 1979-2001, U of M 1979-2002

"Ask an Expert about the Minnesota River" project profiles scientists and citizens answering questions about the health of the Minnesota River. More answers to questions about the Minnesota River can be found at: mrbdc.mnstate.edu/learn
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