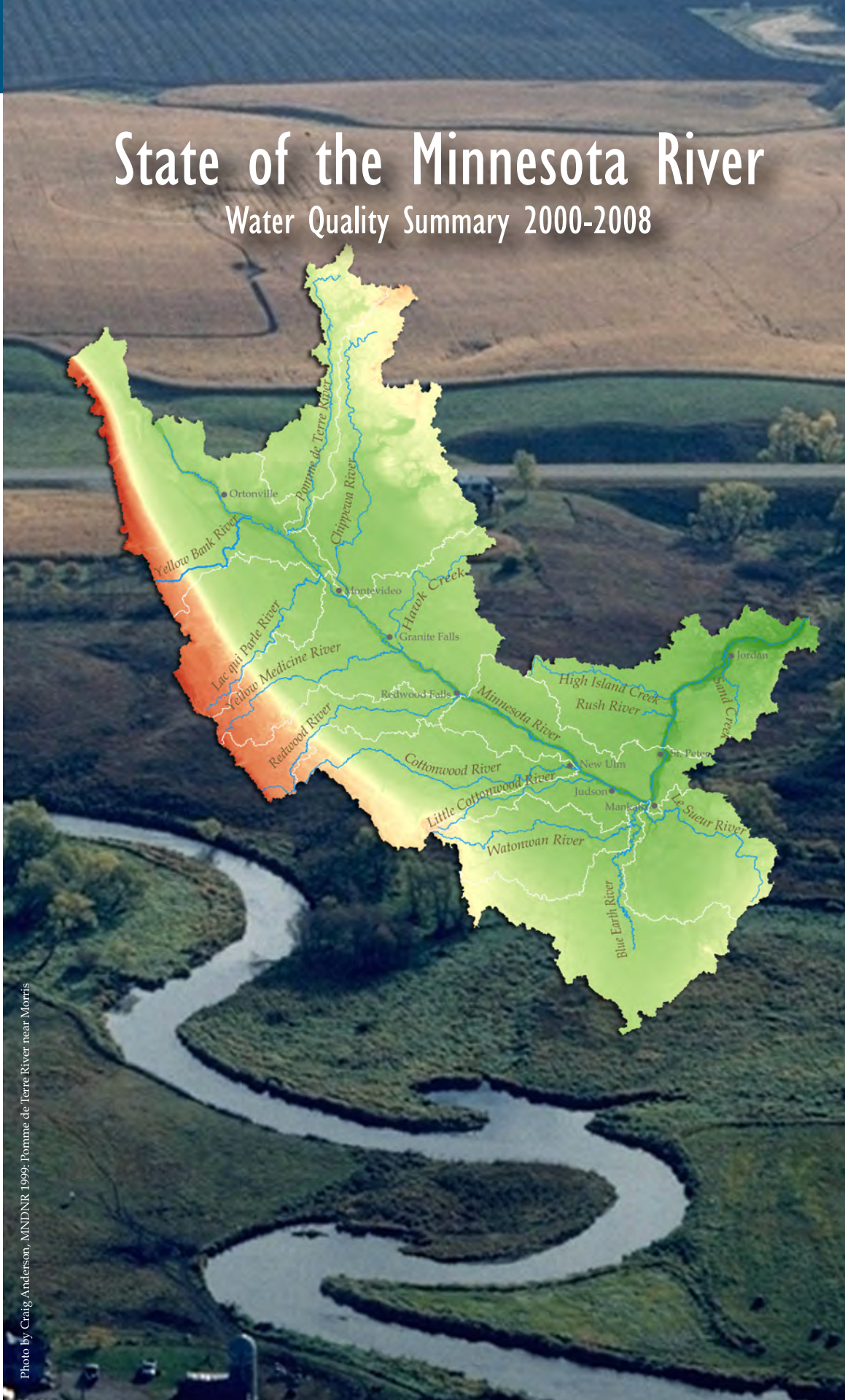


# Nutrient Enrichment

# Environmental Health



Kerr Baldwin



## State of the Minnesota River Water Quality Summary 2000-2008



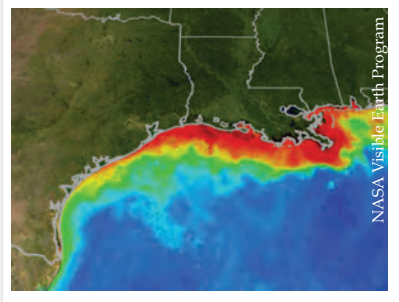
Photo by Craig Anderson, MNDNR 1999; Pomme de Terre River near Morris

### Nitrogen

The predominant form of nitrogen in Minnesota River Basin streams is nitrate. Like phosphorus, nitrate can stimulate excessive levels of algal growth in streams. In recent years, this problem has been particularly severe in the Gulf of Mexico where development of a hypoxic zone (hypoxia means "low oxygen") has been linked to elevated nitrate levels carried to the Gulf by the Mississippi River. Reduced oxygen levels in the hypoxic zone, brought on by decomposition of algae, have damaged the shellfish industry and continue to threaten the aquatic ecosystem of the Gulf Region. The Minnesota River has been identified as a substantial contributor of excess nitrate to the Mississippi River and the Gulf Region.



Nitrate-Nitrogen (nitrate-N) concentrations vary substantially across the Minnesota River Basin. Nitrate-N levels are lowest in the western part of the Basin, elevated in the central portion and greatest in agricultural watersheds in the most easterly part of the Basin. The watersheds shown in orange and red have concentrations that exceed the drinking water standard (10 mg/L). Most of the nitrate-N in the Minnesota River comes from fertilizer, manure, and agricultural drainage.



This image shows the hypoxic zone (sometimes referred to as the dead zone) in the Gulf of Mexico. Reds and orange indicate areas of low oxygen concentration. In July 2008, the hypoxic zone was mapped at 7,988 square miles – the second largest on record since measurements began in 1985. This is larger than the land area of the state of Massachusetts.

### Nitrate in Drinking Water

Elevated levels of nitrate in drinking water can cause methemoglobinemia, or blue-baby syndrome. Because of this, both State and Federal regulations limit nitrate in drinking water to 10 parts per million (ppm) to protect prenatal and infant children. During the 2000 to 2008 monitoring period, several tributary streams in the Minnesota River Basin periodically exceeded the 10 ppm standard. The City of Mankato draws drinking water from a shallow aquifer that is connected to, and partially recharged by, the Blue Earth River. Nitrate-N levels in the Blue Earth River strongly influence nitrate levels in Mankato's water intake supply.



MDA

**Pesticides** The Minnesota Department of Agriculture (MDA) is the lead state agency for most aspects of pesticide and fertilizer regulatory functions. The MDA Monitoring Unit collects pesticide samples from multiple stream locations in the Minnesota River Basin. Pesticide monitoring data indicate the seasonal presence of several chemicals sometimes at levels of concern. Two waterways were included on the 2008 Impaired Waters List for elevated levels of the pesticide Acetochlor. For more information, see the MDA website for the latest information and reports: <http://www.mda.state.mn.us/chemicals/pesticides/default.htm>

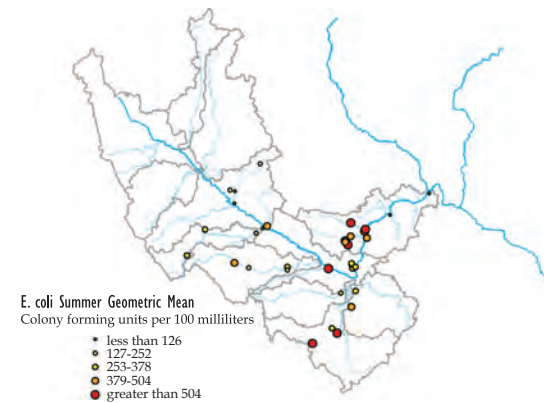
**Mercury** In Minnesota, mercury contamination of fish is a well-documented problem. Mercury is tightly bound to proteins in all fish tissue, including muscle. There is no way to reduce the amount of mercury in a fish through cooking or cleaning it. The Minnesota Department of Health advises people to restrict their fish consumption due to mercury accumulation in sport fish from lakes and rivers. Large amounts of mercury in your body may harm your nervous system. For more information, see the Minnesota Department of Health's guideline on fish consumption at <http://www.health.state.mn.us/divs/eh/fish/index.html>



Minnesota Pollution Control Agency

### Bacteria

*E. coli* bacteria concentration in colony forming units per 100 milliliters. Map includes sites with at least 20 samples. State Water Quality Standards for *E. coli* is 126 cfu/100 ml



The presence of indicator bacteria (*E. coli* and fecal coliform) indicate the potential presence of disease-causing organisms. Indicator bacteria levels are elevated across the entire Basin with greater than 90 percent of monitored streams exceeding health standards for bacteria. Data show the highest concentrations in the eastern portion of the Basin (see map). Many streams require an 80 to 90 percent reduction in levels to meet standards.

For more information, visit the Minnesota River Basin Data Center website: <http://mrbdc.mnsu.edu>  
Research and photos courtesy of the Minnesota Pollution Control Agency (MPCA), Metropolitan Council Environmental Services (MCES), Minnesota Department of Agriculture (MDA), Minnesota Department of Natural Resources (MNDNR), and NASA Visible Earth Program  
Produced by Minnesota State University, Mankato Water Resources Center - 9/09

Total Nitrate-Nitrogen  
Average Flow-Weighted Mean Concentrations in milligrams per liter

