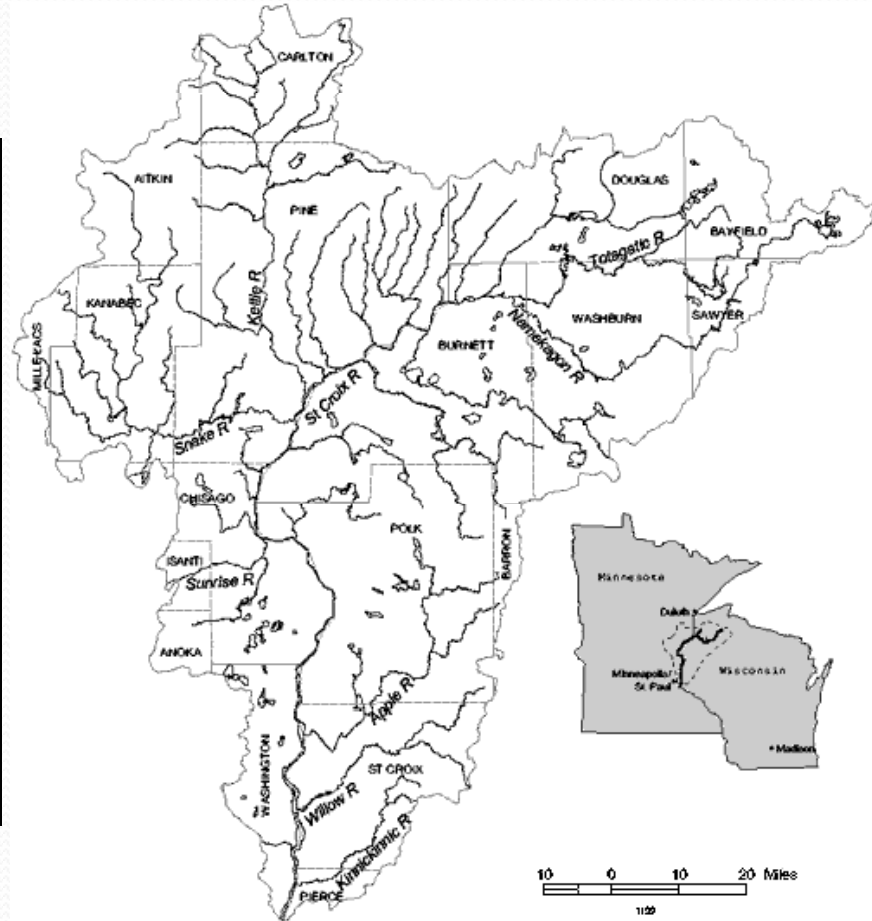


# Lake St. Croix Nutrient Loading and Ecological Health Assessment

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# Lake St. Croix: Integrator for a Watershed





# Why is this data needed?

- Not just a big river: deeper, with constrictions, creating a series of four lakes
- Comparison: lag of Tchl-a behind TP
- Flaw in previous model: assumption of oxic conditions
- Goal: Improved mass balance and understanding of trophic functions



# What are project tasks?

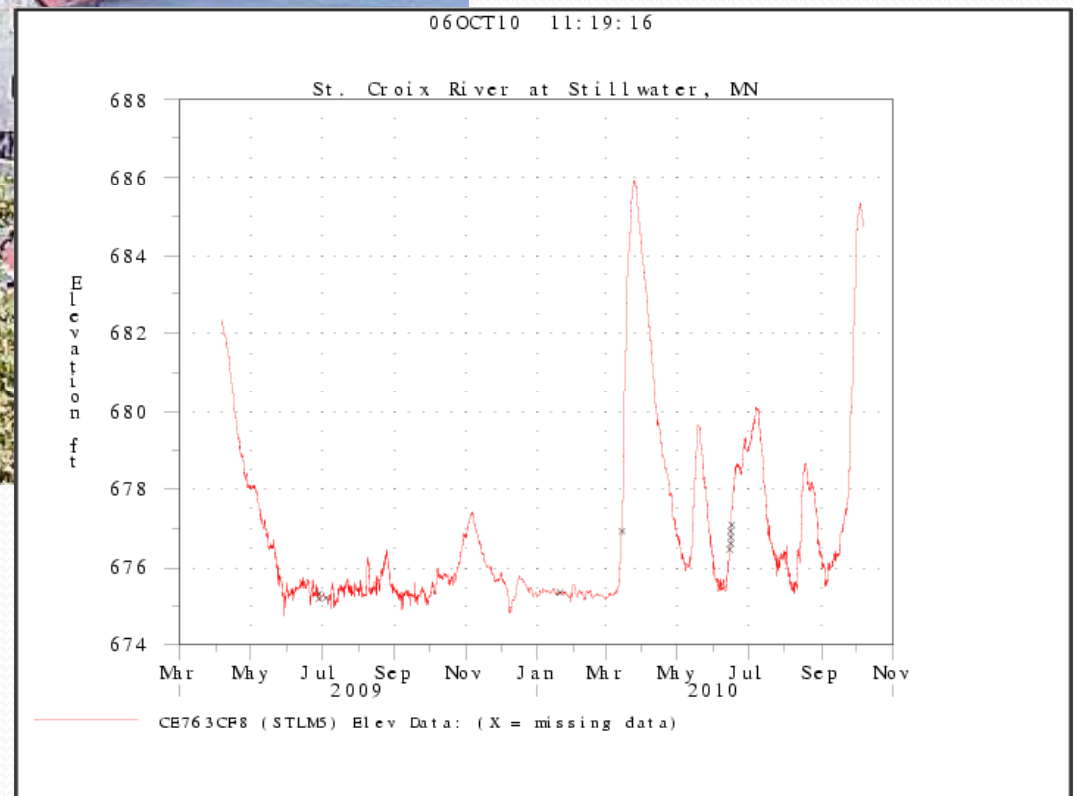
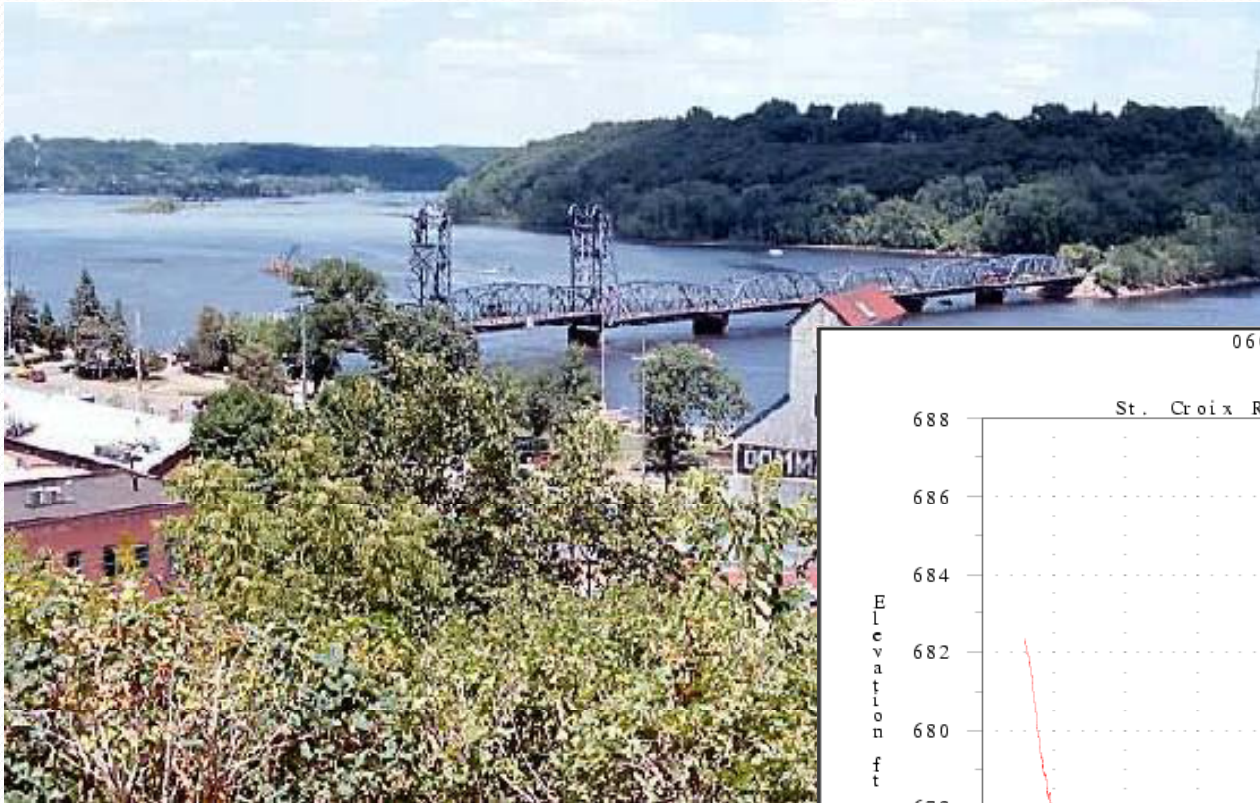
- Task 1: Flow Gage on the St. Croix River at Stillwater, MN
- Task 2: Monthly Depth Profiles at Seven Sites Within Lake St. Croix
- Task 3: Lake St. Croix Water Quality Monitoring
- Task 4: Ecological Health Functioning of Lake St. Croix
- Task 5: Data Analysis, Integration, and Accessibility
- Task 6: Progress Reporting and Final Project Reporting

## Task 1: Flow Gage on the St. Croix River at Stillwater, MN



USGS gage on St. Croix at Prescott, WI, September 2007, photo by David VanderMuelen, NPS  
On-going monitoring conducted in cooperation by USGS and MCES

# Task 1: Flow Gage on the St. Croix River at Stillwater, MN







## Task 3: Lake St. Croix Water Quality Monitoring

The objectives of this task are to:

- 1) oversee work done by contracted observers,
- 2) 2) analyze total phosphorus and phytoplankton samples collected by contracted and other volunteer observers from the pools of Lake St. Croix, including two seasons (2009-2010) of phytoplankton samples from Lake St. Croix pools,
- 3) collect and analyze water quality samples from the St. Croix River at Stillwater and Prescott,
- 4) analyze water quality samples collected from three Washington County tributaries, and
- 5) conduct loading analysis, using FLUX, for the two river and three tributary sites.

Principal: Kent Johnson, Metropolitan Council Environmental Services



## Task 4: Ecological Health Functioning of Lake St. Croix

The objectives of this task are to:

- 1) assess the phytoplankton nutrient-dependent growth rates to determine baseline response to an increased concentration of the limiting nutrient,
- 2) assess the seasonal intensity of zooplankton grazing mortality on phytoplankton,
- 3) assess the use of particulate nutrient ratios (i.e., carbon : nitrogen : phosphorus ratios) to document the pattern of nutrient limitation,
- 4) estimate algal biomass loss rates based on zooplankton grazing, and
- 5) estimate the potential for internal nutrient loading using short-term sediment core incubations.

Principal: Richard Kiesling, Ph.D., U.S. Geological Survey



## Task 5: Data Analysis, Integration, and Accessibility

The objectives of this task are to:

- 1) correlate new USGS flow data with USACE stage data, back-calculate historical flows from historical stage data, and assess accuracy of previous flow estimates scaled from St. Croix Falls record,
- 2) update historical nutrient loading at Stillwater, 3) update phosphorus mass balance of Lake St. Croix, using updated mainstem inflows and updated internal loading (no change to tributary inflows),
- 3) develop new framework for reporting annual Lake St. Croix assessments, enabling more timely progress reports to TMDL stakeholders,
- 4) initiate coordinated inter-agency water monitoring database for Lake St. Croix, likely within MSAccess, and
- 5) improve public access to Lake St. Croix monitoring data, possibly through a map interface on a basin website.



# How does it fit together?

## Lake functioning model....

The computational model BATHTUB  
can handle a series of four basins, but does not route Tchl-a.



# Summary

There are physical, chemical, and biological things going on with the lake that we have yet to understand.