
U.S. Department of the Interior
National Park Service

Great Lakes Network Office
Ashland, Wisconsin



Monitoring Water Quality of Large Rivers, 2008

Annual Summary Report

David VanderMeulen – Great Lakes Inventory and Monitoring Network



On the Cover: Left - Mississippi River public water intakes for Minneapolis and St. Paul, MN, at river mile 862 (Photo by D. VanderMeulen). Right – Wild River Bay Marina on the St. Croix River in St. Croix Falls, WI (Photo by D. VanderMeulen).

Suggested citation:

VanderMeulen, D. 2009. Monitoring water quality of large rivers, 2008: Annual summary report. National Park Service, Great Lakes Inventory and Monitoring Network Report GLKN/2009/03.

Monitoring Water Quality of Large Rivers, 2008

Annual Summary Report

Great Lakes Inventory and Monitoring Network Report GLKN/2009/03

David VanderMeulen

March 2009

U.S. Department of the Interior
National Park Service
Great Lakes Inventory and Monitoring Network
2800 Lake Shore Drive East
Ashland, WI 54806

Acknowledgements

Substantial support for the water quality work in 2008 was provided by staff of Mississippi National River and Recreational Area and St. Croix National Scenic Riverway. Material support included use of vehicles and boats, lab and office equipment and space, and field sampling equipment. I would like to extend special thanks to primary field staff from the parks (Lark Weller and Liz Peterson) and to Valena Hofman and Charly Kearns from the Great Lakes I&M Network. I would also like thank Dean Tucker from NPS-WRD in Ft. Collins, CO for his patience and guidance with water quality database issues. Lastly, I would like to thank Joan Elias, Tammy Keniry, and Valena Hofman from the Great Lakes I&M Network, and Kent Johnson from the Metropolitan Council Environmental Services in St. Paul, MN for their review and suggestions that significantly improved this document.

Abstract

The Great Lakes Inventory and Monitoring Network (Network or GLKN hereafter) monitored water quality at a number of sites on the Mississippi River, as well as sites on the St. Croix River and its tributaries. Water quality monitoring at the two national parks associated with these large rivers, Mississippi National River and Recreation Area and St. Croix National Scenic Riverway, is a subset of a larger water quality monitoring effort by Network staff at national parks in the western Great Lakes region. The primary objective of this monitoring program is to monitor water quality in order to describe the current status and trends of common limnological parameters on large rivers and select tributaries. We hope to be able to provide early warnings of change, which may then provide justification for increased monitoring, research, or management action.

We conducted water quality sampling at each site on the Mississippi River once a month throughout the open water season. Additional samples were collected at a backwater site on the Mississippi River in June, July, August, and September to support a one-year study on zebra mussel density and distribution. For the St. Croix River, samples were collected at all sites (mainstem and tributaries) in April, July, and November. Additional samples were collected at the most downstream mainstem site in June, August, and September to support the zebra mussel study.

Field measurements included depth profiles of temperature, pH, conductivity, and dissolved oxygen; and water clarity. Water samples were collected for laboratory analyses of nutrients (total phosphorus, total nitrogen, nitrate+nitrite-nitrogen, ammonium-nitrogen, dissolved silica), major ions (calcium, sodium, magnesium, potassium, sulfate, chloride), dissolved organic carbon, alkalinity, and total chlorophyll-*a*. When applicable, flow measurements at or nearby Network monitoring sites were obtained from active flow gages operated by the United States Geological Survey or the United States Army Corps of Engineers.

In this report results from 2008 are compared with past years, and when possible compared with monitoring results collected by staff from other agencies. Results are also compared with applicable federal and state water quality standards. All data collected in 2008 are included in appendices.

Results indicate that at the Mississippi National River and Recreation Area, relatively poor water quality conditions in the Minnesota River are negatively impacting water quality in the Mississippi River, causing exceedances of water quality standards at downstream sites. At the St. Croix National Scenic Riverway, there is little difference between average values for water quality parameters measured the past two years. For both rivers, flow in 2008 was above average in the spring, below average through the summer, and near average by late-fall.

Park-specific comments and recommendations relating to the sampling season are provided. We expect to continue monitoring at St. Croix National Scenic Riverway in 2009 and at Mississippi National River and Recreation Area in 2010.

Contents

	Page
Introduction.....	1
Methods.....	2
Sampling Locations	2
MISS.....	2
SACN	2
Field Methods.....	5
Analytical Laboratory.....	6
Data Handling.....	6
Quality Assurance and Quality Control.....	7
Results and Discussion	7
MISS.....	8
Flow.....	8
Water Quality	8
Comparisons with MCES Data	9
Designated Uses and Water Quality Standards.....	11
SACN.....	13
Flow.....	13
Water Quality	14
Comments and Recommendations.....	17
MISS.....	17
SACN.....	17
Literature Cited	18

Tables

	Page
Table 1. St. Croix National Scenic Riverway water quality monitoring sites	2
Table 2. Dates of water quality sampling in 2008	5
Table 3. Water quality parameters measured and abbreviations used in text	6
Table 4. Mean values of measured parameters at MISS in 2008	9
Table 5. Minnesota state water quality standards for monitored variables	13
Table 6. Active USGS streamflow gage sites at SACN	13
Table 7. Mean values of variables measured at SACN in 2007 and 2008.....	15

Figures

	Page
Figure 1. Location of water quality monitoring sites and flow gaging stations at MISS	3
Figure 2. Location of water quality monitoring sites at SACN	4
Figure 3. Mean monthly discharge at Anoka, MN	8
Figure 4. Comparisons of MCES and GLKN data for mean DO at MISS	10
Figure 5. Comparisons of MCES and GLKN data for mean TP at MISS	11
Figure 6. Comparisons of MCES and GLKN data for mean TSS at MISS	12
Figure 7. Historic and recent mean monthly river discharge at St. Croix Falls, WI	14

Appendixes

	Page
Appendix A. Water quality monitoring results for MISS in 2008.....	20
Appendix B. Water quality monitoring results for SACN in 2008.....	28

Introduction

The Great Lakes Inventory and Monitoring Network measured water quality variables and collected water samples for laboratory analysis at the Mississippi National River and Recreation Area (MISS) and the St. Croix National Scenic Riverway (SACN) in 2008. The Network's large rivers water quality monitoring protocol (Magdalene et al. 2008a) was first implemented at MISS 2006, with subsequent monitoring at SACN in 2007. Reports summarizing those efforts are described in Elias and Sieracki (2007) and VanderMeulen and Elias (2008), respectively.

The large rivers water quality monitoring protocol encompasses the following:

- core suite (temperature, dissolved oxygen, conductivity, pH, water clarity)
- water level/flow
- advanced suite (alkalinity, dissolved organic carbon, silica, chloride, sulfate, calcium, sodium, potassium, magnesium, total chlorophyll-*a*, total phosphorus, total nitrogen, ammonium-nitrogen, nitrate+nitrite-nitrogen)
- primary productivity (as estimated by total chlorophyll-*a* measurements)
- nutrient dynamics (as measured by the phosphorus and nitrogen species)
- diatoms (not included within the water quality monitoring protocol, but closely tied to it; Ramstack et al. 2008)

The overall goal of the monitoring program for water quality of large rivers is to contribute to an understanding of the health of ecosystems and provide insights on likely water resources issues in the parks. The Network's objectives for monitoring water quality of rivers, listed in order of priority, are:

1. Monitor flow to determine changes in mean monthly and mean annual flow.
2. Monitor mean annual concentrations of core and advanced suite parameters, accounting for seasonality in water quality conditions.
3. Relate current water quality conditions to known historical conditions.
4. Analyze water quality parameters for trends, and correlate any observed trends with potential causes (such as weather, climate, land use, point sources, exotic species, and atmospheric deposition).

Water quality monitoring is scheduled to alternate annually between MISS and SACN, but one-time funding provided by the St. Croix Valley Community Foundation allowed for quarterly monitoring on the St. Croix River and select tributaries in what would have been an off-year in 2008. This quarterly monitoring facilitates continuity of our sampling effort and will enhance our ability to analyze interannual variability in future years. Funding provided by the US Army Corps of Engineers (COE) allowed for additional monitoring on both the Mississippi and St. Croix Rivers to support an ongoing zebra mussel study.

This report summarizes the Network's activities related to water quality monitoring at MISS and SACN in 2008. Results from previous years (Elias and Sieracki 2007, VanderMeulen and Elias 2008) can be found on the GLKN website (<http://science.nature.nps.gov/im/units/glkn/index.cfm>).

Methods

Sampling Locations

MISS

The Network selected five sites for long-term monitoring (Figure 1). These sites are all located on the mainstem of the Mississippi River. The sites were selected in consultation with staff from other monitoring agencies, such as the Minnesota Pollution Control Agency (MPCA) and the Metropolitan Council Environmental Services (MCES), primarily to fill spatial gaps in monitoring coverage (Magdalene et al. 2008a). The sites identified by river mile UM880, UM868, etc., are described in detail in Magdalene et al. (2008a) and Elias and Sieracki (2007).

SACN

The Network originally selected 11 sites for long-term monitoring, and added two sites after the first month of sampling in 2007, for a total of 13 water quality monitoring sites (Table 1; Figure 2). During the site selection process, three upper SACN sites and three lower SACN sites on the St. Croix River were randomly chosen (Table 1). The remaining seven sites were chosen non-randomly in consultation with members of the St. Croix Basin Water Resources Team (Basin Team), which is composed of federal, state, and regional water resources professionals. Water quality monitoring at these seven sites is designed to fill spatial gaps in monitoring coverage, and to serve as integrator sites for contributions from select large tributaries. All SACN sites are described in detail by Magdalene et al. (2008a) and VanderMeulen and Elias (2008); and the site selection process is explained in Magdalene et al. (2008a).

Table 1. St. Croix National Scenic Riverway water quality monitoring sites.

Site	Description
SACNa	added in 2007; relatively pristine, integrator for upper St. Croix River
SACNb	added in 2007; relatively pristine, Namekagon River above Hayward, WI
SACN01	randomly selected; Namekagon River.
SACN02	randomly selected; integrator site
SACN03	Snake River; high priority tributary site
SACN04	randomly selected; integrator site
SACN05	integrator for river north of St. Croix Falls
SACN06	Apple River; high priority tributary site
SACN07	randomly selected site, Lake St. Croix (Bayport, MN)
SACN08	Willow River (Lake Mallalieu); high priority tributary site
SACN09	randomly selected site, Lake St. Croix (Hudson, WI)
SACN10	Kinnickinnic River; high priority tributary site
SACN11	randomly selected site; Lake St. Croix (Prescott, WI)

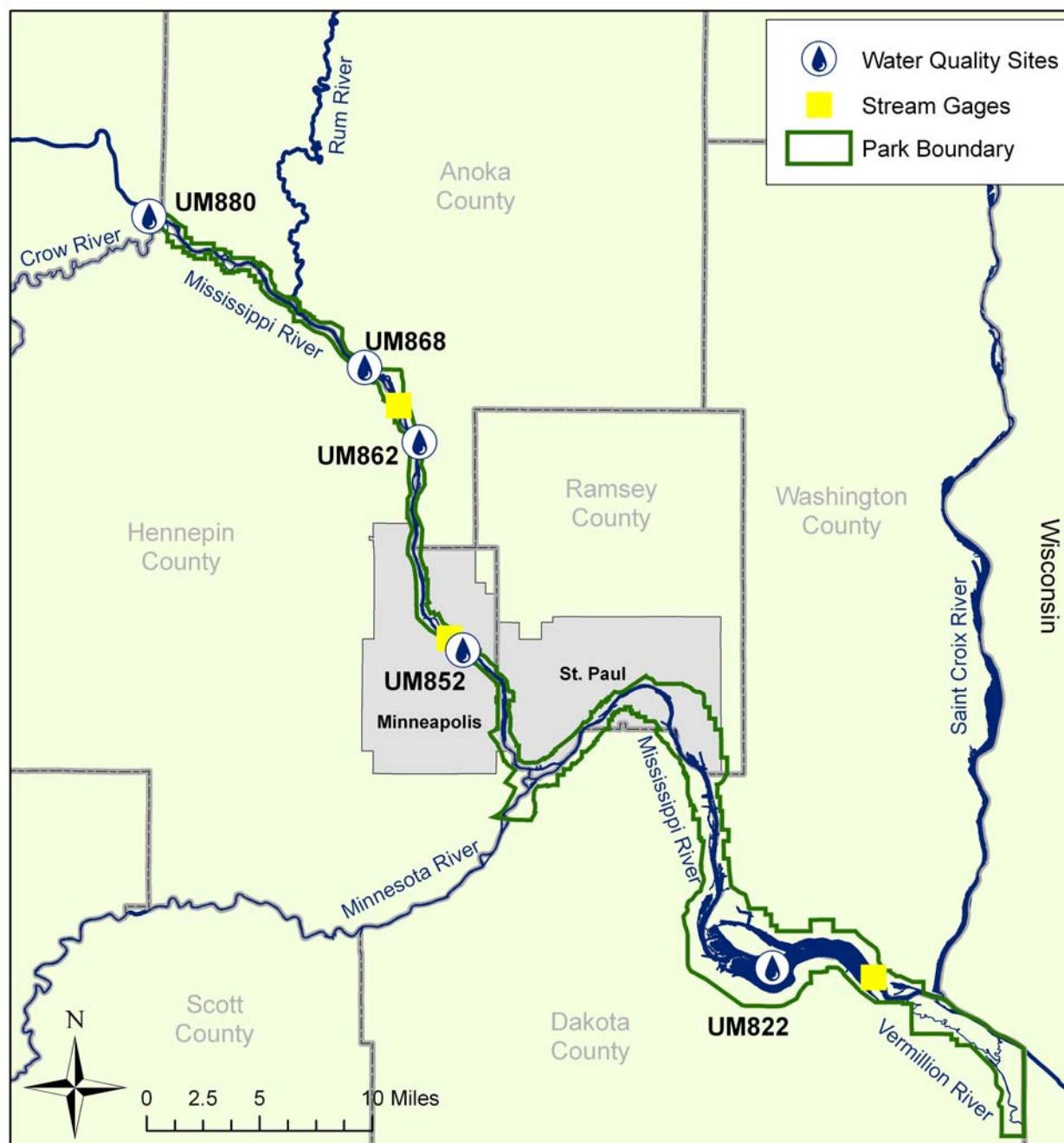


Figure 1. Location of water quality monitoring sites and streamflow gaging stations in the Mississippi National River and Recreation Area.

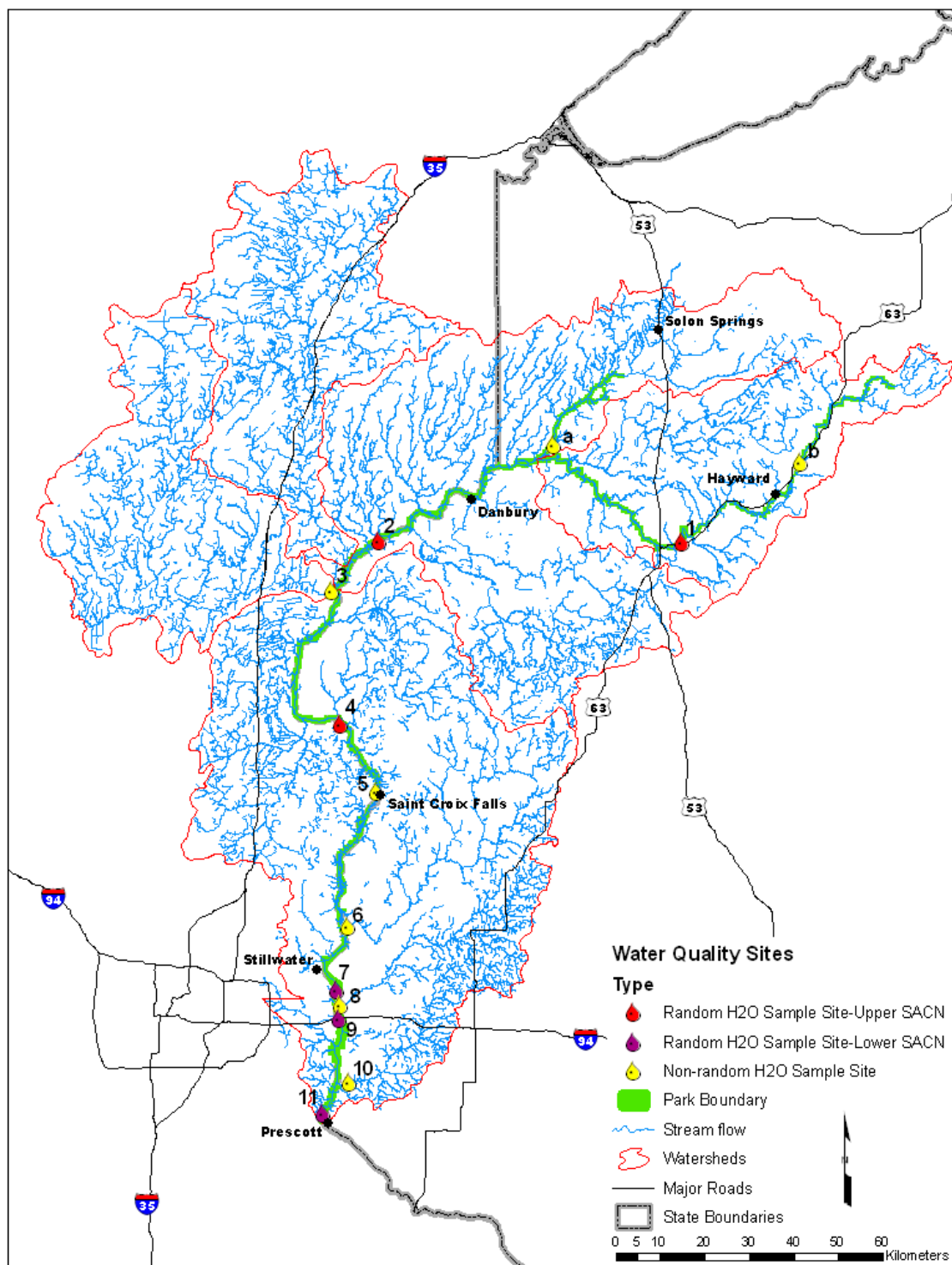


Figure 2. Location of water quality monitoring sites in St. Croix National Scenic Riverway, including sites on the Namekagon River (b,1), St. Croix River (a, 2,4,5), Snake River (3), Apple River (6), Lake St. Croix (7,9,11), Willow River (Lake Mallalieu-8) and the Kinnickinnic River (10).

Field Methods

At MISS we conducted monthly water quality sampling at each site throughout the open water season (Table 2). Additional samples were collected at site UM 814 in June, July, August, and September to support a one-year study on zebra mussel density and distribution. At SACN, quarterly (core and advanced suite) samples were collected at all sites in April, July, and October. Additional samples (core and advanced suite) were collected at site SACN 11 in June, August, and September to support the zebra mussel study. Samples were not collected in March (per Magdalene et al. 2008a) due to unsafe, iced-up conditions on the river. Whenever feasible, we conducted field sampling at approximately the deepest part of the channel and the centroid of flow. In a few instances high water, unsafe currents, or weather (lightning) prohibited sampling in the center of the channel, and sampling occurred closer to the riverbank.

Table 2. Dates of water quality sampling, 2008.

MISS	SACN
4/6 - 4/8*	4/7, 4/10, 4/14 – 4/15*
5/6 – 5/7	-
6/4 – 6/5, 6/10	6/10 **
7/7 – 7/9*	7/9 – 7/11, 7/14*
8/6 - 8/7	8/7 **
9/4 - 9/5	9/5 **
10/2 – 10/3*	10/6 – 10/9*
11/5 – 11/6	-

* Core and advanced suite

** Add'l sampling at SACN 11 only, in support of zebra mussel study

Profile data on temperature, dissolved oxygen concentration, specific conductance, and pH were collected near the surface and at 0.5 or 1 m intervals with a Hydrolab multiprobe. At each site, we also measured water clarity using a transparency tube and/or Secchi Disk, took a GPS reading, recorded environmental conditions (e.g., wind speed and direction, wave height, sky cover, air temperature), and noted field personnel and instrumentation.

The multiprobe was calibrated daily for specific conductance and pH, and prior to sampling at each site for dissolved oxygen and depth. The temperature probe was checked with a NIST-calibrated thermometer prior to the season and was found to read within acceptable limits (Ledder and Elias 2008). A brass chain with precise length markers was used to check previously marked depth increments on the nylon rope attached to the Secchi Disk.

We collected 0-2 m depth-integrated water samples for laboratory analyses using an integrated tube sampler (MPCA 2004; WDNR 2004). When the water was 1-2 m deep, we used the tube sampler on an angle to collect a sample from the full water column. When the water was < 1 m deep, an elbow-deep grab sample was collected. Water was composited in a 9 L high density polyethylene carboy that had been cleaned in the lab prior to sampling and rinsed three times with sample water on-site. See Magdalene et al. (2008b) for details on collection and handling of water samples.

Water samples were collected for analysis of nutrients, total chlorophyll-*a*, and total suspended solids during all site visits (Table 3). The remaining parameters were measured three times (April, July, and October) during the sampling season. Also, in July we collected a near-bottom water sample with a Van Dorn Sampler for analysis of total phosphorus. This sampling was only conducted at thermally-stratified lake-like sites at SACN.

Analytical Laboratory

We contracted with White Water Associates (WWA) and Natural Resource Research Institute (NRRI) for analytical laboratory services. WWA analyzed samples for major ions, dissolved organic carbon (DOC), dissolved silica (SiO₂), and total suspended solids (TSS); NRRI analyzed samples for nutrients and total chlorophyll-*a* (Chl-*a*). All samples were processed and handled according to standard operating procedures (Magdalene et al. 2008b) and as detailed in the 2007 annual water quality report (VanderMeulen and Elias 2008). Select duplicate samples were analyzed by the Wisconsin State Laboratory of Hygiene (WSLH), largely for GLKN confidence in other contracted lab results. Results from the WSLH are not included in this report.

Table 3. Parameters measured and abbreviations used in text. **Bold** font indicates parameters measured in April, July, and October; remaining parameters were measured monthly.

Parameter	Abbreviation	Parameter	Abbreviation
Alkalinity	Alk	Total Nitrogen	TN
Calcium	Ca⁺²	Ammonium-Nitrogen	NH ₄ -N
Chloride	Cl⁻	Nitrate+Nitrite-Nitrogen	NO ₃ +NO ₂ -N
Total Chlorophyll- <i>a</i>	Chl- <i>a</i>	Total Phosphorus-Hypolimnion	TP Hypo
Pheophytin	Pheo	Total Suspended Solids	TSS
Dissolved Organic Carbon	DOC	Specific Conductance	SC25
Magnesium	Mg⁺²	Dissolved Oxygen	DO
Potassium	K⁺	pH	pH
Silica	SiO₂	Temperature	Temp
Sodium	Na⁺	Secchi Disk Depth	Secchi
Sulfate	SO₄⁻²	Transparency Tube	T-tube
Total Phosphorus	TP		

Data Handling

Methods for using laboratory data below detection limit in statistical analyses are numerous and diverse (e.g., Helsel 1990, Helsel and Cohen 1988). Although statistical analyses were not conducted on water quality data collected in 2008, summary statistics such as mean and standard deviation were calculated. The following rules for censored data results were applied:

- For values < detection limit, value assigned = 0.5 x detection limit
- For values > detection limit but < lower reporting limit, values assigned = 0.5 x lower reporting limit
- For values > upper reporting limit (only applicable to transparency tube readings), values assigned = 1.1 x upper reporting limit

Data below detection or lower quantification limits were included in summary statistics for MISS on seven occasions; all for values below detection or lower quantification limits for $\text{NH}_4\text{-N}$ or $\text{NO}_3\text{+NO}_2\text{-N}$. Data below detection or lower quantification limits were included in summary statistics for SACN on four occasions; twice for TP values below lower quantification limits for TP, and once each for values below lower quantification limits for $\text{NO}_3\text{+NO}_2\text{-N}$ and K^+ .

Quality Assurance and Quality Control

Steps to ensure quality assurance and quality control (QA/QC) were undertaken routinely, according to standard operating procedures (Ledder and Elias 2008) for monitoring water quality. The measurement sensitivity of the Hydrolab sonde was calculated prior to the field season; the sonde was calibrated daily following acceptance criteria and a calibration log was maintained with the instrument; measurements taken in the field with the sonde were saved electronically and backed-up on paper data sheets; duplicate field measurements were taken at the rate of approximately 10%; duplicate water samples were collected at the rate of approximately 10%; and equipment blanks were obtained prior to and during the field season to ensure we were not introducing any contamination to the samples. In addition, the contract laboratories conducted their own QA/QC work, including blanks, duplicates, and spikes, and generated QA/QC reports that accompanied water sample results.

Network quality assurance criteria stipulate that analytical results for water sample duplicates should be within 10% of each other for all parameters except nutrients and total chlorophyll-*a*, which should be within 30% of each other (Ledder and Elias 2008). Most of our duplicates fell within the acceptable criteria. Those that did not meet quality assurance criteria were usually very close to laboratory detection or reporting limits. In such cases, actual small differences can result in large relative mean differences (e.g., the actual difference between 1 and 2 mg/L is small, but the relative mean difference is 67%). Values that do not meet our quality assurance criteria are flagged as such in the National Park Service database NPSTORET. Duplicate values are not included with this report, but are available through the Environmental Protection Agency's STORET database, including those that do not meet our quality assurance criteria.

Results and Discussion

Data relative to flow, general water quality results, and comparisons of 2008 data with past results collected by NPS and/or other agencies are presented below. For MISS, data from previously established long-term Network sites are compared with data from long-term sites established by the Metropolitan Council Environmental Services (MCES) within MISS boundaries, and with select USEPA reference criteria and Minnesota standards. For SACN, means of 2008 quarterly results are compared with equivalent data from 2007. Appendices A and B contain summaries of all data collected in 2008 for MISS and SACN. All data from 2008 and past years are posted in EPA's STORET database and can be accessed at http://www.epa.gov/storet/dw_home.html

MISS

Flow

Three streamflow gages currently operate on the mainstem of the Mississippi River within MISS park boundaries: near Anoka, Minnesota (UM 864); at St. Anthony Falls, Minnesota (UM 853) and at Lock & Dam #2 (UM 815) (Figure 1). The site near Anoka (site#05288500 is operated by the US Geological Survey, while the other two sites are controlled by the US Army Corps of Engineers. Flows at water quality monitoring sites UM 880, 868, and 862 are best represented by the streamflow gage near Anoka, while flows at sites UM 852 and 822 are approximated by the streamflow gages at UM 853 and 815, respectively.

Comparisons of long-term (1931-present) mean monthly flow conditions at the Anoka site with mean monthly flows in years when water quality was monitored by Network staff show that in 2006 and 2008 flow was near the long-term average in early spring, peaked well above the long-term average in May, and dropped well below average during the summer and fall periods (Figure 3). In 2006, flow remained well below average through the end of the monitoring season, but in 2008 had recovered to average conditions by November. Although not shown, this pattern for both years was also present at the two downstream COE streamflow gaging sites.

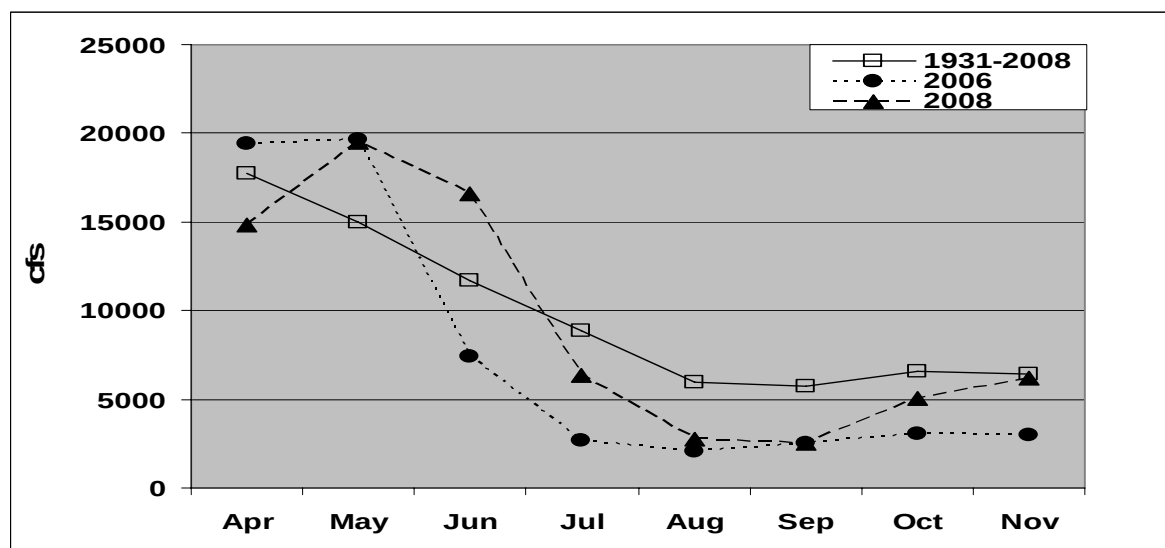


Figure 3. Mean monthly discharge at Anoka, MN during the 2006 and 2008 water quality monitoring season and during the period of flow record. cfs = cubic feet per second. Flow data from 2008 should be considered provisional.

Water Quality

At MISS ionic strength and buffering capacity are high, with average specific conductance ranging from 331 to 612 uS/cm, and average alkalinity ranging between 109 and 161 mg/L (Appendix A). Total suspended solids concentrations were generally highest in spring, while water clarity was greatest in fall. Total phosphorus and total chlorophyll-*a* concentrations were high in mid-summer (July), with mean values for all sites at 106 and 24 ug/L, respectively). The highest mean value (30 ug/L) of total chlorophyll-*a* across all sites occurred in November.

Seasonal patterns for total nitrogen and nitrogen species ($\text{NO}_3+\text{NO}_2\text{-N}$ and $\text{NH}_4\text{-N}$) are more complex, and are influenced by tributaries and site-specific channel morphology. Values and seasonal patterns for all parameters are comparable to those collected or measured in 2006 (Elias and Sieracki 2007).

Water quality at site UM822 differs substantially from that at the four upstream sites (Table 4). Concentrations of nutrients, ions, and total suspended solids were typically much higher at UM822, while T-tube measurements were consistently lower. UM822 is the only Network monitoring site located below the confluence with the Minnesota River, a tributary with high nutrient concentrations (Minnesota River Basin Data Center 2001), and 303(d)-listed for turbidity and dissolved oxygen (MPCA 2008). The Minnesota River contributes an additional 50% to the discharge of the Mississippi River at its confluence (Moody and Battaglin 1995).

Table 4. Mean values of measured parameters at Mississippi National River and Recreational Area in 2008 (2006 in parenthesis) for site UM822 compared with all sites except UM822. Near-surface values are used for pH, SC25, DO, and temperature. Asterisk (*) = censored data used to calculate mean.

Variable	UM822	All sites except UM822
Chl-a (ug/L)	19 (24)	18 (24)
TP(ug/L)	142 (135)	63 (62)
TN (ug/L)	3562 (4078)	1236 (1250)
$\text{NO}_3+\text{NO}_2\text{-N}$ (ug/L)	2847 (3221)	500* (523)
$\text{NH}_4\text{-N}$ (ug/L)	105 (101)	18* (13)
TSS (mg/L)	48 (45)	12 (11)
DOC (mg/L)	9 (8)	10 (8)
Alkalinity (mg/L)	161 (181)	144 (150)
Cl^- (mg/L)	32.3 (37.3)	16.4 (17.1)
SO_4^{-2} (mg/L)	78.4 (79.8)	19.2 (18.4)
Ca^{+2} (mg/L)	65.5 (63.2)	46.9 (45.7)
Mg^{+2} (mg/L)	28.4 (30.7)	17.3 (17.6)
K^+ (mg/L)	4.4 (4.0)	2.8 (2.6)
Na^+ (mg/L)	28.4 (25.5)	11.2 (10.2)
SiO_2 (mg/L)	9.1 (12.1)	5.5 (8.4)
T-Tube (cm)	30.1 (32.3)	66.5 (67.3)
pH (std. units)	8.1 (8.3)	8.2 (8.5)
SC25 ($\mu\text{S}/\text{cm}$)	617 (650)	361 (386)
DO (mg/L)	8.9 (8.7)	10.3 (9.8)
Temperature ($^{\circ}\text{C}$)	17.3 (17.7)	16.6 (18.2)

Comparisons with MCES Data

Metropolitan Council Environmental Services (MCES) has been conducting water quality monitoring in and near MISS for several decades. The locations of Network water quality monitoring sites at MISS are primarily designed to cover spatial and temporal monitoring gaps within the more comprehensive MCES monitoring effort inside the park (MCES 2009, Magdalene et al. 2008a). Within MISS, MCES categorizes its long-term monitoring sites as those above and below the confluence of the Minnesota River. Three sites (river mile 847.7,

862.8, and 871.6) are located above the confluence of the Minnesota River and five sites are located below (river mile 796.9, 815.6, 826.7, 831.0, and 839.1). We similarly categorized our sites, with GLKN sites UM880, 868, 862, and 852 above the confluence of the Minnesota River and one site (UM822) below, in order to evaluate differences between the two strata. Although MCES sampling frequency and site locations do not exactly match those of GLKN, water quality data collected at MCES sites (1998 to 2007) are also shown, to allow for a generalized comparison of water quality data collected by the two agencies. To minimize differences in seasonal timing of data collection we limited MCES data to sampling dates between April and November, to coincide with GLKN's sampling effort, although MCES samples are collected as often as once per week during these months.

In general, mean DO levels measured by both MCES and GLKN are similar above and below the confluence with the Minnesota River, with minimal differences between MCES and GLKN results (Figure 4). Mean DO levels at all sites within park boundaries are above 5 mg/L, which is a critical low threshold necessary to sustain many aquatic organisms. The slightly higher DO values for the MCES downstream sites is potentially a function of the longer time period, which includes some years with higher flow. The summers of 2006 and 2008 were characterized by lower-than-normal flows, with the Minnesota River exerting a relatively greater influence on downstream DO levels.

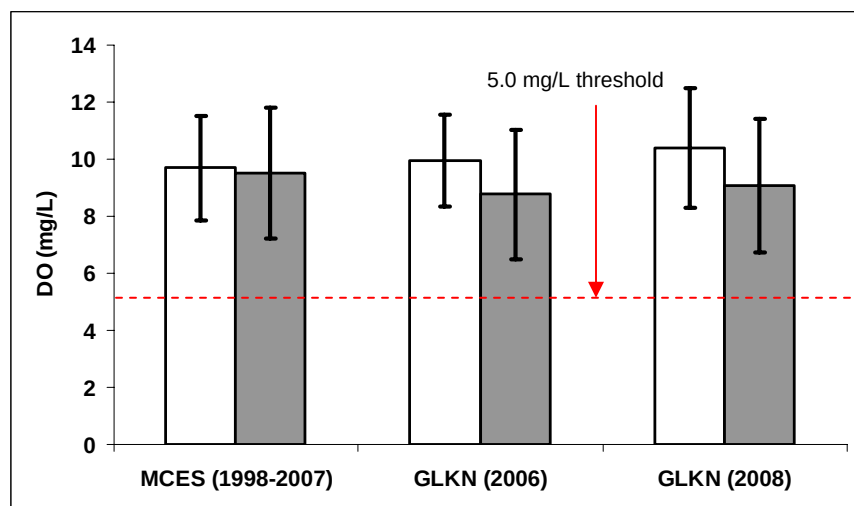


Figure 4. Comparisons of MCES and GLKN data for mean DO in Mississippi National River and Recreation Area. White and gray bars represent sites above and below the confluence with the Minnesota River, respectively. Mean and ± 1 SD calculated from data collected April through November, 1998-2007 (MCES), and 2006 and 2008 (GLKN). Dashed line indicates minimum DO level necessary to sustain many aquatic organisms.

As expected, mean TP levels were substantially higher and more variable at MCES and GLKN sites downstream of the Minnesota River compared to upstream (Figure 5). Mean TP levels measured by GLKN are generally lower than those of MCES. Since TP concentrations are positively correlated with flow, the lower TP values measured by GLKN may in part be due to

relatively low-flow years in 2006 and 2008. In addition, lower TP values at the GLKN downstream site might be partially a result of recent improvements in TP removal from wastewater treatment facilities (MPCA 2007). The EPA recommended reference criteria for TP (28.75 ug/L for upper sites, EPA2000a; 118.13 ug/L for lower sites; EPA 2000b) were exceeded at all upper and lower sites on average. The Minnesota Pollution Control Agency is in the process of developing nutrient standards (including a TP standard) for rivers in Minnesota, which will be applied to GLKN sites once established.

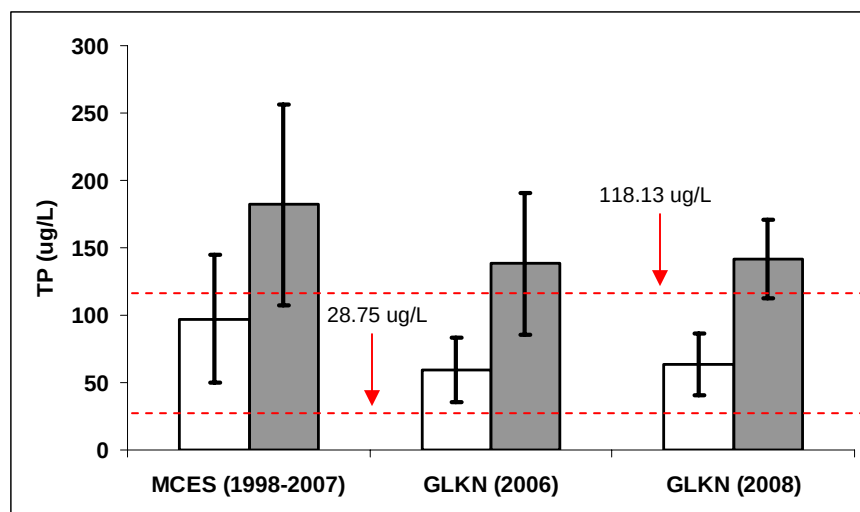


Figure 5. Comparisons of MCES and GLKN data for mean TP in Mississippi National River and Recreation Area. White and gray bars represent sites above and below the confluence with the Minnesota River, respectively. Mean and ± 1 SD calculated from data collected April through November, 1998-2007 (MCES), and 2006 and 2008 (GLKN). Values above the dashed lines indicate mean TP levels greater than the USEPA reference criteria (USEPA 2000a, b)

Mean TSS levels and variability were much higher at sites located downstream of the confluence with the Minnesota River compared with those upstream (Figure 6). As stated earlier, TSS at lower sites is strongly influenced by the input of a high TSS load from the Minnesota River. MPCA has established maximum TSS threshold values of 60 and 100 mg/L for monitoring sites located above (northern central hardwood forests ecoregion) and below (western cornbelt plains ecoregion) the confluence of the Minnesota River, respectively (MPCA 2007). These threshold values are based on a 10-year relationship between turbidity and TSS. Mean TSS values for all GLKN sites were below these thresholds in 2006 and 2008. However, the 100 mg/L threshold is routinely exceeded during early spring runoff and after large storm events, especially at sites downstream of the Minnesota River.

Designated Uses and Water Quality Standards

The State of Minnesota has designated beneficial uses for all surface waters in the state, as defined in Minn. R. 7050.0200 (MPCA: <http://www.revisor.leg.state.mn.us/arule/7050/>). The sections of the Mississippi River where our sampling sites are located have multiple

designations, as do all surface waters. Sites UM880, UM868, and UM862 are designated Class 1C, 2Bd, and 3B waters, protected for drinking water uses due to the municipal water intakes for the cities of Minneapolis and St. Paul, which are located at UM862. Sites UM852 and UM822 are designated Class 2B, 3B, 4A, 4B, 5, and 6 waters.

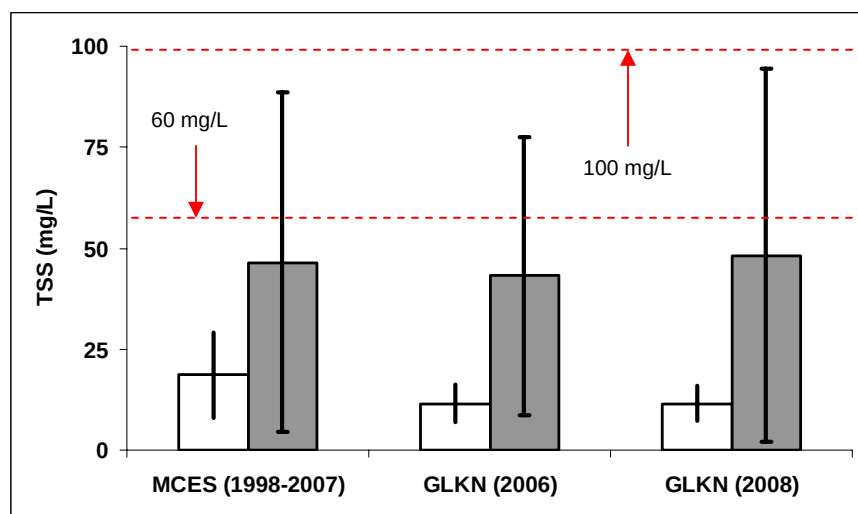


Figure 6. Comparisons of MCES and GLKN data for mean TSS in Mississippi National River and Recreation Area. White and gray bars represent sites above and below the confluence with the Minnesota River, respectively. Mean and ± 1 SD calculated from data collected April through November, 1998-2007 (MCES), and 2006 and 2008 (GLKN). Values above the dashed lines indicate TSS levels greater than the MPCA threshold values (MPCA 2008).

The State of Minnesota has also established water quality standards for some water quality parameters to ensure that the designated uses for state waters are met (MnRule 7050.0220). Within MISS, sections of the Mississippi River are on the 2008 303(d) List of Impaired Waters for Minnesota, due to water quality standard exceedances for turbidity and fecal coliform bacteria (MPCA 2008, Magdalene et al. 2008a, NPS 1995). Land use in the vicinity of MISS is heavily urbanized and suburbanized with major tributaries flowing from areas with intense agricultural use. As such, nonpoint source runoff from these land uses is currently contributing to the water quality impairments identified. State water quality standards that apply to sampling sites within MISS (Table 5) were exceeded several times in 2008. Although turbidity was not measured, using T-tube and TSS measurements as proxies (MPCA 2007), the turbidity standard was exceeded at UM 822 on several instances, especially in early spring.

Table 5. Minnesota state water quality standards (MnRule 7050.0220) for monitored variables, based on designated use classifications (MnRule 7050.0200) that apply to MISS sampling sites. All limits are maximum values, except dissolved oxygen (DO), which is a minimum allowable value, and pH, which is an allowable range of values.

Water Quality Parameter	Designated Water Use Classifications	
	1C, 2Bd, 3B (sites 880, 868, 862)	2B, 3B, 4A, 4B, 5, 6 (sites 852, 822)
temperature (°F)	within 5 °F of natural	within 5 °F of natural
pH (SU)	6.5-9.0	6.5-8.5
dissolved oxygen (mg/L)	5 daily min	5 daily min *
turbidity (NTU)	25	25
nitrate+nitrite nitrogen (ug/L-N)	10,000	
ammonia, unionized (ug/L-N)	40	40
chloride (mg/L)	230	230
* The standard is not less than 5 mg/l as a daily average from 4/1 through 11/30, and not less than 4 mg/l at other times.		

SACN

Flow

Eight USGS streamflow gages currently operate within or near SACN park boundaries (Table 6). In addition, staff from MCES are measuring St. Croix River flow at Stillwater Minnesota, and will use water elevation data collected by the COE to develop a discharge rating curve for the river as it enters Lake St. Croix.

Table 6. Active USGS streamflow gage sites at St. Croix National Scenic Riverway.

Site #	Period of Record	Location
05331833	1996-present	Namekagon River near Leonards, WI
05332500	1927-present	Namekagon River near Trego, WI
05333500	1914-present	St. Croix River at Danbury, WI
05336000	2008-present	St. Croix River near Grantsburg, WI
05340500	1902-present	St. Croix River at St. Croix Falls, WI
05341500	1914-1970, 1986-present	Apple River near Somerset, WI
05342000	1916-present	Kinnickinnic River near River Falls, WI
05344490	2008-present	St. Croix River at Prescott, WI

Comparisons of SACN 2007 and 2008 flow data with the long-term mean at St. Croix Falls show similar seasonal patterns, with highest flows in spring, low flows in summer, and slightly higher flows again in fall (Figure 7). In 2007, the flow was lower than average, with a higher spike in October. In 2008, however, the flow was higher than average in spring. Summer flows were below average in both 2007 and 2008. In general, these patterns observed at St. Croix Falls in 2007 and 2008 are typical of flow conditions at other sites throughout the Riverway.

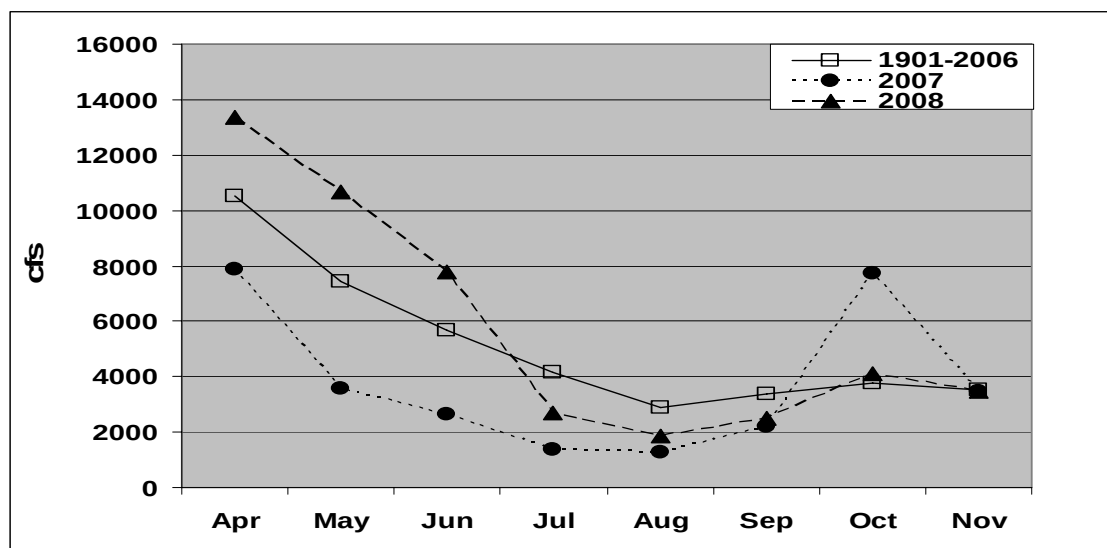


Figure 7. Historic (1901-2006) and more recent (2007 and 2008) mean monthly discharge at St. Croix Falls, Wisconsin. cfs = cubic feet per second. Data from 2008 should be considered provisional.

Water Quality

Comparisons of 2007 and 2008 data show mean values for many parameters to be similar, especially conductivity, alkalinity and specific ions (Table 7). Nutrient concentrations tended to be different between years, with TP and TN generally higher in 2007. Mean water temperature was also higher in 2007, while DO was lower. The differences in nutrients, temperature, and DO may be attributable to lower flows in spring of 2007 and a late spring thaw in 2008.

Many of these variables measured are influenced by flow, and although monthly mean flows in 2007 and 2008 are roughly the same, differences in water quality parameters between the two years can probably be attributed in part to flow conditions on or near the days in which sampling was conducted. The quarterly sampling conducted in 2008 will contribute to our understanding of interannual variability of the system.

Water Quality of Large Rivers – 2008 Annual Report

Table 7. Mean values (N=3) of field and laboratory variables measured at St. Croix National Scenic Riverway in April, July, and October in 2007 and 2008. Near-surface values were used for pH, specific conductance, DO, and temperature. Sites SACNa and SACNb are not shown due to incompatibility of early season sampling between years (see Appendix B for data). Dash (-) = not measured, calculated, or available. * = includes censored data. ** = Mean values are not shown due to a high number of censored values.

Variable	SACN01		SACN02		SACN03		SACN04		SACN05		SACN06	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Temperature (°C)	14.0	11.1	13.2	11.4	14.0	12.3	13.5	12.2	14.4	12.7	13.9	12.6
DO (mg/L)	8.9	10.9	9.3	9.5	10.6	10.5	8.5	10.2	8.9	9.3	9.8	10.9
pH (std. units)	7.4	7.7	7.4	7.3	7.6	7.9	7.4	7.5	7.5	7.5	7.8	7.9
SC25 (µS/cm)	148.7	157.3	120.3	114.6	171.7	187.4	132.0	128.1	148.5	143.9	251.2	255.9
TSS (mg/L)	8.3	8.0	7.7	10.0	7.7	7.7	11.7	13.3	10.0	9.7	6.0	5.3
T-Tube (cm)	**	**	7.08*	77.6	78.8	93.3*	83.7	63.8	71.8	86.5	**	99.7*
Secchi (m)	-	-	-	-	-	-	-	-	-	-	-	-
TP (µg/L)	37.7	25.3	44.7	38.0	87.3	84.3	70.0	51.3	75.7	50.0	76.7	62.3
Site Depth (m)	0.9	0.7	1.6	2.1	-	0.9	1.7	1.7	5.5	6.0	-	0.5
Chl a (ug/L)	-	4.4		4.2	-	10.2	-	4.2	-	5.2	-	15.9
TN (µg/L)	682	458.3	860	693.7	1228	1204	1027	832.3	1020	855.7	1317	1310
NO ₃ +NO ₂ -N (µg/L)	148.0	166.3	157.3	146.3	249.7	297.3	169.0	190.3	201.3	246.3	753.7	846.3
NH ₄ -N (µg/L)	20.7	26.7	44.3	32.3	47.0	57.3	59.3	42.3	66.3	51.7	52.0	61.0
DOC (mg/L)	9.9	5.2	11.8	10.9	14.7	16.2	12.5	12.1	12.1	11.5	5.9	5.0
Alkalinity (mg/L)	64.3	70.3	53.7	51.0	74.7	75.0	54.3	55.0	61.0	61.0	112.3	114.7
Cl ⁻ (mg/L)	4.1	4.7	3.3	3.4	6.1	6.3	4.8	4.4	5.2	4.9	8.2	8.9
SO ₄ ⁻² (mg/L)	5.2	4.8	5.5	4.3	5.2	4.6	6.4	4.4	5.7	5.0	5.6	5.7
Ca ⁺² (mg/L)	19.6	20.8	15.0	15.4	20.5	23.6	16.8	16.4	17.9	18.3	28.7	30.1
Mg ⁺² (mg/L)	6.0	6.4	5.2	5.3	8.24	9.1	6.0	5.9	6.5	6.6	12.5	12.9
K ⁺ (mg/L)	0.9	0.8	1.1	0.8	2.5	2.1	1.8	1.2	1.7	1.3	1.7	1.6
Na ⁺² (mg/L)	3.2	3.5	2.7	2.8	4.2	4.3	3.5	3.2	3.7	3.5	4.3	4.4
SiO ₂ (mg/L)	10.5	10.3	7.6	8.7	7.7	7.5	7.6	8.3	8.0	8.0	12.4	10.5

Water Quality of Large Rivers – 2008 Annual Report

Table 7(continued). Mean values (N=3) of field and laboratory variables measured at St. Croix National Scenic Riverway in April, July, and October in 2007 and 2008. Near-surface values were used for pH, specific conductance, DO, and temperature. Sites SACNa and SACNb are not shown due to incompatibility of early season sampling between years (see Appendix B for data). Dash (-) = not measured, calculated, or available. * = includes censored data. ** = Mean values are not shown due to a high number of censored values.

Variable	SACN07		SACN08		SACN09		SACN10		SACN11	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Temperature (°C)	14.3	14.7	14.9	13.2	14.8	14.5	9.8	12.5	15.5	15.1
DO (mg/L)	9.6	9.4	9.6	10.8	9.7	8.5	11.5	11.1	9.3	8.0
pH (std. units)	7.6	7.6	8.1	8.2	7.7	7.6	7.9	8.2	7.9	7.6
SC25 (µS/cm)	176.9	171.9	319	322.2	185.8	179.4	482.2	482.4	206	194.1
TSS (mg/L)	4.7	3.0	7.3	11.3	5.3	3.3	2.7	2.7	4.0	2.3
T-Tube (cm)	74.3	65.9*	-	63.5	-	99.8*	> 120	> 120	-	**
Secchi (m)	1.0	1.5	0.8	1.0	1.2	1.7	-	-	-	2.0
TP (µg/L)	58.0	45.0	99.0	53.8	51.0	51.7	38.7	23.8*	55.0	75.3
Site Depth (m)	12.0	10.4	3.1	2.9	8.2	5.9	0.6	0.5	15.9	14.5
Chl a (ug/L)	-	6.4	-	49.8	-	5.7	-	1.8	-	4.2
TN (µg/L)	1039	941	2409	2565	1016	1067	5043	5081	1093	1107
NO ₃ +NO ₂ -N (µg/L)	277	284.3	1708	1852	277.3	436.7	4957	4998	456.7	571.7
NH ₄ -N (µg/L)	93.0	110.0	125.3	136.7	58.0	111.0	9.0	11.0	66.7	66.6
DOC (mg/L)	10.7	10.9	5.7	5.0	9.4	10.2	3.4	2.6	7.7	10.9
Alkalinity (mg/L)	72.0	74.0	131.0	137.3	79.7	77.3	184.3	189.3	88.1	82.7
Cl ⁻ (mg/L)	6.6	6.5	13.5	13.9	7.0	7.3	20.9	21.3	7.0	7.5
SO ₄ ⁻² (mg/L)	6.1	5.2	9.5	10.2	6.3	5.4	17.7	17.5	6.4	5.8
Ca ⁺² (mg/L)	21.0	20.9	31.1	34.9	22.3	22.4	54.4	55.4	24.12	23.3
Mg ⁺² (mg/L)	7.9	8.0	18.9	19.2	8.7	8.7	26.1	25.9	9.9	8.7
K ⁺ (mg/L)	3.8	1.4	2.8	2.6	1.8	1.5	1.7	1.6	1.8	1.4
Na ⁺² (mg/L)	4.2	4.2	5.2	5.2	4.3	4.3	7.7	7.9	4.7	4.3
SiO ₂ (mg/L)	8.7	7.9	11.6	9.8	8.2	7.6	11.1	9.5	7.5	8.1

Comments and Recommendations

MISS

All sampling took place as scheduled at MISS in 2008, with additional sampling conducted at a backwater site on the Mississippi River just upstream of the confluence with the St. Croix River. Sampling at this site was supported by SACN as part of an ongoing zebra mussel study. All data results from 2008 and 2006 are available to the public through the EPA's STORET database.

Water quality results from both 2006 and 2008 were compared with results collected by MCES staff from 1998 to 2007 in nearby areas of the river. Patterns in water quality were best described by grouping sites into two categories: those above and below the confluence of the Minnesota River. Mean TP concentrations for data collected by the Network were somewhat lower than the ten-year mean concentrations measured by MCES. This may be a result of variability in mean monthly flows during years in which data was collected, and potentially due to improved efficiency in removal of TP from effluent released by wastewater treatment plants.

In 2009, we expect to receive a report exploring trends in water quality at MISS over a thirty-year period (Lafrancois et al. in preparation). In addition, a Total Maximum Daily Load (TMDL) study for Lake Pepin is scheduled for completion in 2009, and will serve as a foundation document with respect to water quality for the upper Mississippi River, including the portion of the river within MISS boundaries. The Network will continue to monitor water quality in MISS, with the next full season of water quality monitoring scheduled to take place in 2010.

SACN

As a result of funding provided by the St. Croix Valley Community Foundation, water quality sampling took place at SACN in April, July, and October 2008, in what normally would have been an off-year. Additional sampling also took place near the terminus of the river (SACN 11) to support an ongoing zebra mussel study. All data results from 2008 and 2007 are available to the public through the EPA's STORET database.

The sampling in April, July, and October 2008 allowed for a comparison of 2008 water quality data with water quality data from the same months in 2007. Mean values from the two years were similar, especially for more conservative parameters such as conductivity, alkalinity, and specific ions. It is likely that flow conditions throughout the monitoring season and at the time of sampling are an important factor for these and other water quality parameters.

SACN and Network staff will continue to be involved in the development of the TMDL for Lake St. Croix, scheduled for completion in 2010. The water quality data collected by the Network will be used in the development of the TMDL and will provide a means of assessing efficacy of future water quality improvement actions in the St. Croix Basin. Monthly sampling during the open-water season is scheduled to take place at all 13 sites in 2009. We plan to compare the results with those from 2007 and 2008, as well as applicable state water quality standards.

Literature Cited

- Elias, J. E., and J. L. Sieracki. 2007. Report on 2006 water quality sampling at Mississippi National River and Recreation Area. Great Lakes Inventory and Monitoring Network Annual Report GLKN/2007/07.
- Helsel, D. R. 1990. Less than obvious: Statistical treatment of data below detection limit. *Environmental Science and Technology* **24**:1766-1774.
- Helsel, D. R., and T. A. Cohn. 1988. Estimation of descriptive statistics for multiply censored water quality data. *Water Resources Research* **24**:1997-2004.
- Lafrancois B. M., S. Magdalene, and K. Johnson. In preparation. Analysis of water quality trends and current conditions in Mississippi National River and Recreational Area.
- Ledder T., and J. Elias. 2008. Standard operating procedure #12: Quality assurance/quality control. *in* Magdalene S., D.R. Engstrom, and J. Elias. 2008. Large rivers water quality monitoring protocol, Version 1.0. National Park Service, Great Lakes Network, Ashland, Wisconsin. NPS/GLKN/NRR—2008/060. National Park Service, Fort Collins, Colorado.
- Magdalene S., D. R. Engstrom, and J. Elias. 2008a. Large rivers water quality monitoring protocol, Version 1.0. National Park Service, Great Lakes Network, Ashland, Wisconsin. NPS/GLKN/NRR—2008/060. National Park Service, Fort Collins, Colorado.
- Magdalene, S., D. R. Engstrom, and J. Elias. 2008b. Standard operating procedure #7: Processing water samples and analytical laboratory requirements. *in* Magdalene, S., D.R. Engstrom, and J. Elias. 2008. Large rivers water quality monitoring protocol, Version 1.0. National Park Service, Great Lakes Network, Ashland, Wisconsin. NPS/GLKN/NRR - 2008/060. National Park Service, Fort Collins, Colorado.
- Metropolitan Council Environmental Services (MCES). 2009. Environmental Information System Management Database. Available at <http://es.metc.state.mn.us/eims-dev/index.asp>. Accessed 02/10/2009.
- Moody, J. A., and W. A. Battaglin. 1995. Setting: Chemical character of the Mississippi River. *In* Contaminants in the Mississippi River, 1987-92: U.S. Geological Survey Circular 1133. Meade, R.H., editor. Reston, Virginia. Available at <http://pubs.usgs.gov/circ/circ1133/>.
- Minnesota River Basin Data Center. 2001. State of the Minnesota River: Executive summary: Surface water quality monitoring. Mankato, Minnesota. Available at http://mrbdc.mnsu.edu/mnbasin/fact_sheets/stateofriver_2001.html. Accessed 02/23/2007.
- MPCA (Minnesota Pollution Control Agency). Minnesota Rules Chapter 7050: Waters of the state. Available at <http://www.revisor.leg.state.mn.us/arule/7050/>. Accessed 02/23/2007.

Water Quality of Large Rivers – 2008 Annual Report

- MPCA (Minnesota Pollution Control Agency). 2008. 2008 Final TMDL list of impaired waters. Minnesota Pollution Control Agency. Saint Paul, Minnesota.
<http://www.pca.state.mn.us/water/tmdl/index.html>.
- MPCA (Minnesota Pollution Control Agency). 2007. Guidance manual for assessing the quality of Minnesota surface waters for determination of impairment. 205(b) report and 303(d) list. Minnesota Pollution Control Agency, St. Paul, Minnesota.
- MPCA (Minnesota Pollution Control Agency). 2004. Minnesota's water quality monitoring strategy 2004-2014. Minnesota Pollution Control Agency, St. Paul, Minnesota.
<http://www.pca.state.mn.us/publications/reports/p-gen1-10.pdf>.
- NPS (National Park Service). 1995. National Park Service. 1995. Baseline water quality data inventory and analysis: Mississippi National River and Recreation Area. Technical Report NPS/NRWRD/NRTR-95/61. National Park Service, Water Resources Division, Fort Collins, Colorado.
- Ramstack, J. M., M. B. Edlund, D. R. Engstrom, B. M. Lafrancois, and J. E. Elias. 2008. Diatom monitoring protocol, Version 1.0. National Park Service, Great Lakes Network, Ashland, Wisconsin. NPS/GLKN/NRR—2008/068. National Park Service, Fort Collins, Colorado.
- USEPA (U.S. Environmental Protection Agency). 2000a. Ambient water quality criteria recommendations: Information supporting the development of state and tribal nutrient criteria for rivers and streams in nutrient ecoregion VII. Office of Water, Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C. EPA-822-B-00-018.
- USEPA (U.S. Environmental Protection Agency). 2000b. Ambient water quality criteria recommendations: Information supporting the development of state and tribal nutrient criteria for rivers and streams in nutrient ecoregion VI. Office of Water, Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C. EPA-822-B-00-017.
- VanderMeulen, D., and J. E. Elias. 2008. Water Quality Sampling at St. Croix National Scenic Riverway, 2007. Great Lakes Inventory and Monitoring Network Annual Monitoring Report GLKN/2008/03.
- WDNR (Wisconsin Department of Natural Resources). 2004. Lakes partnership website.
<http://www.dnr.state.wi.us/org/water/fhp/lakes/selfhelp/equipment.htm>.

Appendix A

Field and Laboratory Results for Mississippi National River and Recreation Area

Water quality results for sites on the Mississippi River are shown for 2008. At least nine observations are required for calculating percentiles and ± 1 standard deviation.



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM814

Station Name: King's Cove Marina, Conley Lake

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO ₃	6/10/2008 - 9/5/2008	4	0	4	168	204	192.8	---	16.76	---	---	---	---
Ammonium	µg/l	6/10/2008 - 9/5/2008	4	0	4	9	114	40.25	---	49.63	---	---	---	---
Calcium	mg/l	6/10/2008 - 9/5/2008	3	0	3	58.5	60.3	59.13	---	1.012	---	---	---	---
Chl_a	ppb	6/10/2008 - 9/5/2008	4	0	4	33.46	166.1	111.8	---	58.47	---	---	---	---
Chl_a/Pheophytin	%	6/10/2008 - 9/5/2008	4	0	4	290.2	444.9	356.1	---	69.67	---	---	---	---
Chloride	mg/l	6/10/2008 - 9/5/2008	4	0	4	26.3	43.1	33.17	---	7.683	---	---	---	---
DO Concentration	mg/l	6/10/2008 - 9/5/2008	11	0	11	6.75	15.01	10.95	10.79	3.005	6.818	7.13	13.57	14.9
DO Saturation	%	6/10/2008 - 9/5/2008	11	0	11	73	170.3	128.5	135.4	36.41	75.4	85	164.3	169.6
DOC	mg/l	6/10/2008 - 9/5/2008	4	0	4	11.4	14	12.88	---	1.204	---	---	---	---
Magnesium	mg/l	6/10/2008 - 9/5/2008	3	0	3	26.9	29.2	28.23	---	1.193	---	---	---	---
Nitrate+Nitrite	µg/l	6/10/2008 - 9/5/2008	4	1	4	1.5	1462	557.4	---	699.1	---	---	---	---
pH	None	6/10/2008 - 9/5/2008	11	0	11	8.18	8.94	8.576	8.65	0.2677	8.186	8.27	8.8	8.918
converted pH	None					8.18	8.94	8.495	8.658	0.002	8.187	8.268	5.083	5.087
H+ computed from pH	µeq/l					0.0011	0.0066	0.0032	0.0022	0.002	0.0012	0.0016	0.0054	0.0065
Potassium	mg/l	6/10/2008 - 9/5/2008	4	0	4	3.4	3.75	3.61	---	0.1551	---	---	---	---
Silicate	mg/l	6/10/2008 - 9/5/2008	4	0	4	1.2	6.9	3.275	---	2.505	---	---	---	---
Site Depth	m	6/10/2008 - 9/5/2008	4	0	4	0.6	2.5	1.3	---	0.8524	---	---	---	---
Sodium	mg/l	6/10/2008 - 9/5/2008	4	0	4	17	26.1	20.52	---	4.364	---	---	---	---
Specific Conductivity	µS/cm	6/10/2008 - 9/5/2008	11	0	11	534.3	615.1	578.7	587.8	30.13	535.4	549.5	604.9	613.4
Sulfate	mg/l	7/9/2008 - 9/5/2008	3	0	3	56.5	64.6	60.23	---	4.087	---	---	---	---
Temperature	°C	6/10/2008 - 9/5/2008	11	0	11	19.09	27.99	23.04	21.34	3.279	19.18	20.6	27.18	27.87
Total Nitrogen	µg/l	6/10/2008 - 9/5/2008	4	0	4	2133	3132	2476	---	448.8	---	---	---	---
Total Phosphorus	µg/l	6/10/2008 - 9/5/2008	4	0	4	173	497	382.8	---	150.8	---	---	---	---
Total Suspended Solids	mg/l	6/10/2008 - 9/5/2008	4	0	4	28	88	60.25	---	28.89	---	---	---	---
Transparency Tube	cm	6/10/2008 - 9/5/2008	4	0	4	8.91	25.35	15.26	---	7.701	---	---	---	---

Station ID: MISS_UM822

Station Name: Mississippi River next to Spring Lake

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO ₃	4/8/2008 - 10/3/2008	3	0	3	96	207	161	---	57.89	---	---	---	---
Ammonium	µg/l	4/8/2008 - 11/6/2008	8	0	8	17	226	104.9	---	88.8	---	---	---	---
Calcium	mg/l	4/8/2008 - 10/3/2008	2	0	2	54.6	67.2	60.9	---	8.91	---	---	---	---



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM822

Station Name: Mississippi River next to Spring Lake

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Chl_a	ppb	4/8/2008 - 11/6/2008	8	0	8	10.1	32	19.4	---	8.171	---	---	---	---
Chl_a/Pheophytin	%	4/8/2008 - 11/6/2008	8	0	8	82.28	366.1	200.9	---	99.89	---	---	---	---
Chloride	mg/l	4/8/2008 - 10/3/2008	3	0	3	27.3	34.8	32.27	---	4.302	---	---	---	---
DO Concentration	mg/l	4/8/2008 - 11/6/2008	36	0	36	4.79	12.95	9.083	8.81	2.342	5.109	7.775	10.82	12.23
DO Saturation	%	4/8/2008 - 11/6/2008	36	0	36	54.5	103.3	89.87	96.4	14.59	58.16	79.88	99.75	101.4
DOC	mg/l	4/8/2008 - 10/3/2008	3	0	3	7.2	12.4	9.133	---	2.845	---	---	---	---
Magnesium	mg/l	4/8/2008 - 10/3/2008	2	0	2	23.5	24.7	24.1	---	0.8485	---	---	---	---
Nitrate+Nitrite	µg/l	4/8/2008 - 11/6/2008	8	0	8	1048	5986	2847	---	1889	---	---	---	---
pH	None	4/8/2008 - 11/6/2008	36	0	36	7.8	8.26	8.097	8.13	0.1062	7.911	8.057	8.17	8.18
converted pH	None					7.8	8.26	8.081	8.131	0.0024	7.91	8.056	5.094	5.102
H+ computed from pH	µeq/l					0.0055	0.0158	0.0083	0.0074	0.0024	0.0066	0.0068	0.0088	0.0123
Potassium	mg/l	4/8/2008 - 10/3/2008	3	0	3	4.2	4.49	4.363	---	0.1484	---	---	---	---
Silicate	mg/l	7/8/2008 - 10/3/2008	2	0	2	7.8	9.41	8.605	---	1.138	---	---	---	---
Site Depth	m	4/8/2008 - 11/6/2008	8	0	8	2.3	3.6	2.938	---	0.5397	---	---	---	---
Sodium	mg/l	4/8/2008 - 10/3/2008	3	0	3	21.4	41.4	28.43	---	11.24	---	---	---	---
Specific Conductivity	µS/cm	4/8/2008 - 11/6/2008	36	0	36	522	697.4	612.2	619	58.01	522.6	551	650.4	696.6
Sulfate	mg/l	4/8/2008 - 10/3/2008	3	0	3	57.8	111	78.37	---	28.58	---	---	---	---
Temperature	°C	4/8/2008 - 11/6/2008	36	0	36	5.74	26.18	16.09	16.68	6.79	5.74	11.66	21.65	25.64
Total Nitrogen	µg/l	4/8/2008 - 11/6/2008	8	0	8	1872	6234	3562	---	1679	---	---	---	---
Total Phosphorus	µg/l	4/8/2008 - 11/6/2008	8	0	8	94	195	141.5	---	29.26	---	---	---	---
Total Suspended Solids	mg/l	4/8/2008 - 11/6/2008	8	0	8	16	151	48.25	---	46.21	---	---	---	---
Transparency Tube	cm	4/8/2008 - 11/6/2008	8	0	8	12.5	42.3	30.06	---	9.14	---	---	---	---

Station ID: MISS_UM852

Station Name: Mississippi River near East River Flats Park in Minneapolis

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/8/2008 - 10/3/2008	3	0	3	70	153	108.7	---	41.79	---	---	---	---
Ammonium	µg/l	4/8/2008 - 11/6/2008	8	2	8	3	95	20.5	---	30.67	---	---	---	---
Calcium	mg/l	4/8/2008 - 10/3/2008	2	0	2	46.7	51.5	49.1	---	3.394	---	---	---	---
Chl_a	ppb	4/8/2008 - 11/6/2008	8	0	8	10.2	30.3	21.74	---	7.19	---	---	---	---
Chl_a/Pheophytin	%	4/8/2008 - 11/6/2008	8	0	8	185.6	320	248.1	---	56.49	---	---	---	---
Chloride	mg/l	4/8/2008 - 10/3/2008	3	0	3	13.5	22.8	16.83	---	5.179	---	---	---	---



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM852

Station Name: Mississippi River near East River Flats Park in Minneapolis

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
DO Concentration	mg/l	4/8/2008 - 11/6/2008	50	0	50	8.04	15.02	10.91	10.64	2.212	8.221	9.27	11.99	14.63
DO Saturation	%	4/8/2008 - 11/6/2008	50	0	50	93.9	116.9	107.2	108.6	5.998	98.35	100.2	111.6	114.6
DOC	mg/l	4/8/2008 - 10/3/2008	3	0	3	7.6	15	10.37	---	4.038	---	---	---	---
Magnesium	mg/l	4/8/2008 - 10/3/2008	2	0	2	17	18.6	17.8	---	1.131	---	---	---	---
Nitrate+Nitrite	µg/l	4/8/2008 - 11/6/2008	8	1	8	1.5	1500	476.3	---	499.5	---	---	---	---
pH	None	4/8/2008 - 11/6/2008	50	0	50	7.83	8.73	8.235	8.09	0.2793	7.971	8.02	8.59	8.673
converted pH	None					7.83	8.73	8.161	8.092	0.0035	7.971	8.022	5.096	5.098
H+ computed from pH	µeq/l					0.0019	0.0148	0.0069	0.0081	0.0035	0.0021	0.0026	0.0095	0.0107
Potassium	mg/l	4/8/2008 - 10/3/2008	3	0	3	2.2	3.8	2.887	---	0.8237	---	---	---	---
Silicate	mg/l	7/8/2008 - 10/3/2008	2	0	2	5.2	6	5.6	---	0.5657	---	---	---	---
Site Depth	m	4/8/2008 - 11/6/2008	8	0	8	3.8	5.1	4.2	---	0.444	---	---	---	---
Sodium	mg/l	4/8/2008 - 10/3/2008	3	0	3	9.5	15	12.37	---	2.757	---	---	---	---
Specific Conductivity	µS/cm	4/8/2008 - 11/6/2008	50	0	50	286.2	424.3	376	376.1	42.23	288.9	361.6	412.1	422.6
Sulfate	mg/l	4/8/2008 - 10/3/2008	3	0	3	15.2	23.5	20.17	---	4.384	---	---	---	---
Temperature	°C	4/8/2008 - 11/6/2008	50	0	50	3.64	27.11	15.77	16.49	7.792	3.65	12.48	23.02	26.9
Total Nitrogen	µg/l	4/8/2008 - 11/6/2008	8	0	8	819	2335	1274	---	519.5	---	---	---	---
Total Phosphorus	µg/l	4/8/2008 - 11/6/2008	8	0	8	22	109	69	---	27.11	---	---	---	---
Total Suspended Solids	mg/l	4/8/2008 - 11/6/2008	8	0	8	8	19	12.25	---	3.694	---	---	---	---
Transparency Tube	cm	4/8/2008 - 11/6/2008	8	0	8	36.7	68.35	50.69	---	10.31	---	---	---	---

Station ID: MISS_UM862

Station Name: Mississippi River near St. Paul Water Works Pumping Station

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/9/2008 - 10/2/2008	3	0	3	155	167	159	---	6.928	---	---	---	---
Ammonium	µg/l	4/9/2008 - 11/5/2008	8	1	8	3	83	17.12	---	26.76	---	---	---	---
Calcium	mg/l	4/9/2008 - 10/2/2008	2	0	2	44.4	50.1	47.25	---	4.031	---	---	---	---
Chl_a	ppb	4/9/2008 - 11/5/2008	8	0	8	12.6	27	19.1	---	5.671	---	---	---	---
Chl_a/Pheophytin	%	4/9/2008 - 11/5/2008	8	0	8	149.6	429.5	252.7	---	87.05	---	---	---	---
Chloride	mg/l	4/9/2008 - 10/2/2008	3	0	3	13.8	20.1	17.83	---	3.502	---	---	---	---
DO Concentration	mg/l	4/9/2008 - 11/5/2008	32	0	32	9.25	14.87	11	10.92	1.367	9.363	9.698	12.15	12.57
DO Saturation	%	4/9/2008 - 11/5/2008	32	0	32	90.6	122.9	110.6	113.4	9.441	93.23	105.5	117.8	121.6
DOC	mg/l	4/9/2008 - 10/2/2008	3	0	3	7.5	15.2	10.47	---	4.143	---	---	---	---



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM862

Station Name: Mississippi River near St. Paul Water Works Pumping Station

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Magnesium	mg/l	4/9/2008 - 10/2/2008	2	0	2	16.8	17.9	17.35	---	0.7778	---	---	---	---
Nitrate+Nitrite	µg/l	4/9/2008 - 11/5/2008	8	0	8	116	1511	552.4	---	523.5	---	---	---	---
pH	None	4/9/2008 - 11/5/2008	32	0	32	7.95	8.68	8.318	8.34	0.2359	8.019	8.11	8.545	8.664
converted pH	None					7.95	8.68	8.26	8.337	0.0028	8.018	8.108	5.091	5.096
H+ computed from pH	µeq/l					0.0021	0.0112	0.0055	0.0046	0.0028	0.0022	0.0029	0.0078	0.0096
Potassium	mg/l	4/9/2008 - 10/2/2008	3	0	3	2.4	3.6	2.853	---	0.6516	---	---	---	---
Silicate	mg/l	7/7/2008 - 10/2/2008	2	0	2	5.35	6	5.675	---	0.4596	---	---	---	---
Site Depth	m	4/9/2008 - 11/5/2008	8	0	8	1.8	4	2.538	---	0.721	---	---	---	---
Sodium	mg/l	4/9/2008 - 10/2/2008	3	0	3	9	13.7	11.07	---	2.401	---	---	---	---
Specific Conductivity	µS/cm	4/9/2008 - 11/5/2008	32	0	32	292.6	410.7	367.6	368.2	36.35	297.1	350.9	398.4	410.5
Sulfate	mg/l	4/9/2008 - 10/2/2008	3	0	3	15.3	23.3	20.23	---	4.314	---	---	---	---
Temperature	°C	4/9/2008 - 11/5/2008	32	0	32	3.19	26.57	15.97	15.9	7.591	3.212	11.75	21.14	26.32
Total Nitrogen	µg/l	4/9/2008 - 11/5/2008	8	0	8	827	2279	1322	---	545.3	---	---	---	---
Total Phosphorus	µg/l	4/9/2008 - 11/5/2008	7	0	7	23	110	66.14	---	27.54	---	---	---	---
Total Suspended Solids	mg/l	4/9/2008 - 11/5/2008	8	0	8	6	20	12.38	---	4.438	---	---	---	---
Transparency Tube	cm	4/9/2008 - 11/5/2008	8	0	8	41.45	82.6	59.35	---	11.75	---	---	---	---

Station ID: MISS_UM868

Station Name: Mississippi River upstream of the Coon Rapids Dam

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/9/2008 - 10/2/2008	3	0	3	151	164	156	---	7	---	---	---	---
Ammonium	µg/l	4/9/2008 - 11/5/2008	8	1	8	3	78	16.5	---	24.96	---	---	---	---
Calcium	mg/l	4/9/2008 - 10/2/2008	2	0	2	45.6	49.9	47.75	---	3.041	---	---	---	---
Chl_a	ppb	4/9/2008 - 11/5/2008	8	0	8	5.9	30.2	18.11	---	8.594	---	---	---	---
Chl_a/Pheophytin	%	4/9/2008 - 11/5/2008	8	0	8	162.4	430	270.7	---	96.11	---	---	---	---
Chloride	mg/l	4/9/2008 - 10/2/2008	3	0	3	13.7	20.2	17.2	---	3.279	---	---	---	---
DO Concentration	mg/l	4/9/2008 - 11/5/2008	35	0	35	7.36	13.04	9.673	9.81	1.768	7.416	8	10.92	12.8
DO Saturation	%	4/9/2008 - 11/5/2008	35	0	35	83.1	112.5	97.23	98.8	6.15	88.18	94	100.8	103.1
DOC	mg/l	4/9/2008 - 10/2/2008	3	0	3	7.1	15.1	10.2	---	4.293	---	---	---	---
Magnesium	mg/l	4/9/2008 - 10/2/2008	2	0	2	16.4	18.8	17.6	---	1.697	---	---	---	---
Nitrate+Nitrite	µg/l	4/9/2008 - 11/5/2008	8	0	8	219	1403	543.8	---	427.8	---	---	---	---



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM868

Station Name: Mississippi River upstream of the Coon Rapids Dam

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
pH	None	4/9/2008 - 11/5/2008	35	0	35	7.76	8.58	8.233	8.27	0.2446	7.872	8.04	8.45	8.58
converted pH	None					7.76	8.58	8.167	8.268	0.0039	7.873	8.041	5.095	5.104
H+ computed from pH	µeq/l					0.0026	0.0174	0.0068	0.0054	0.0039	0.0026	0.0035	0.0091	0.0134
Potassium	mg/l	4/9/2008 - 10/2/2008	3	0	3	2.4	3.4	2.837	---	0.5119	---	---	---	---
Silicate	mg/l	7/7/2008 - 10/2/2008	2	0	2	5.5	6.2	5.85	---	0.495	---	---	---	---
Site Depth	m	4/9/2008 - 11/5/2008	8	0	8	1.5	3.5	2.725	---	0.6692	---	---	---	---
Sodium	mg/l	4/9/2008 - 10/2/2008	3	0	3	9.1	14.2	10.9	---	2.862	---	---	---	---
Specific Conductivity	µS/cm	4/9/2008 - 11/5/2008	35	0	35	276.9	406.5	364.2	368.8	41.78	278.1	334.1	399.9	406.4
Sulfate	mg/l	4/9/2008 - 10/2/2008	3	0	3	15.9	22.8	19.83	---	3.55	---	---	---	---
Temperature	°C	4/9/2008 - 11/5/2008	35	0	35	2.74	25.88	16.43	15.5	7.143	2.756	11.43	21.16	25.83
Total Nitrogen	µg/l	4/9/2008 - 11/5/2008	8	0	8	878	2148	1237	---	402.6	---	---	---	---
Total Phosphorus	µg/l	4/9/2008 - 11/5/2008	8	0	8	22	97	64.12	---	24.26	---	---	---	---
Total Suspended Solids	mg/l	4/9/2008 - 11/5/2008	8	0	8	6	20	12.75	---	5.285	---	---	---	---
Transparency Tube	cm	4/9/2008 - 11/5/2008	8	0	8	40.95	85.1	67.28	---	14.73	---	---	---	---

Station ID: MISS_UM880

Station Name: Mississippi River just above the Crow River Confluence

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/9/2008 - 10/2/2008	3	0	3	143	160	151.7	---	8.505	---	---	---	---
Ammonium	µg/l	4/9/2008 - 11/5/2008	8	2	8	3	60	16.25	---	18.49	---	---	---	---
Calcium	mg/l	4/9/2008 - 10/2/2008	2	0	2	43.4	43.7	43.55	---	0.2121	---	---	---	---
Chl_a	ppb	4/9/2008 - 11/5/2008	7	0	7	3.9	48.5	13.8	---	15.78	---	---	---	---
Chl_a/Pheophytin	%	4/9/2008 - 11/5/2008	8	0	8	116.8	463.2	213.5	---	123.4	---	---	---	---
Chloride	mg/l	4/9/2008 - 10/2/2008	3	0	3	9.9	17.7	13.77	---	3.9	---	---	---	---
DO Concentration	mg/l	4/9/2008 - 11/5/2008	35	0	35	6.82	14.26	9.837	8.88	2.42	6.966	7.95	11.46	13.93
DO Saturation	%	4/9/2008 - 11/5/2008	35	0	35	82.4	107.9	94.14	93.9	8.035	85.18	87	102.3	105.5
DOC	mg/l	4/9/2008 - 10/2/2008	3	0	3	6.8	15.9	10.47	---	4.8	---	---	---	---
Magnesium	mg/l	4/9/2008 - 10/2/2008	2	0	2	14.8	18.2	16.5	---	2.404	---	---	---	---
Nitrate+Nitrite	µg/l	4/9/2008 - 11/5/2008	8	0	8	276	980	429.2	---	231.3	---	---	---	---
pH	None	4/9/2008 - 11/5/2008	35	0	35	7.7	8.4	8.05	8.04	0.214	7.768	7.86	8.14	8.38
converted pH	None					7.7	8.4	8	8.041	0.0046	7.767	7.86	5.105	5.11
H+ computed from pH	µeq/l					0.004	0.02	0.01	0.0091	0.0046	0.0042	0.0072	0.0138	0.0171



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Station ID: MISS_UM880

Station Name: Mississippi River just above the Crow River Confluence

Analysis for 2008

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Potassium	mg/l	4/9/2008 - 10/2/2008	3	0	3	2.59	2.9	2.697	---	0.1762	---	---	---	---
Silicate	mg/l	7/7/2008 - 10/2/2008	2	0	2	4.6	5.13	4.865	---	0.3748	---	---	---	---
Site Depth	m	4/9/2008 - 11/5/2008	8	0	8	1.8	3.9	2.6	---	0.7251	---	---	---	---
Sodium	mg/l	4/9/2008 - 10/2/2008	3	0	3	8.2	12.9	10.33	---	2.38	---	---	---	---
Specific Conductivity	µS/cm	4/9/2008 - 11/5/2008	35	0	35	226.8	391	331.2	351	54.63	227.3	306.8	359.2	390.2
Sulfate	mg/l	4/9/2008 - 10/2/2008	3	0	3	11	20	16.57	---	4.864	---	---	---	---
Temperature	°C	4/9/2008 - 11/5/2008	35	0	35	2.48	25.34	14.71	15.79	7.507	2.506	10.76	20.14	24.97
Total Nitrogen	µg/l	4/9/2008 - 11/5/2008	8	0	8	899	1703	1111	---	249.3	---	---	---	---
Total Phosphorus	µg/l	4/9/2008 - 11/5/2008	7	0	7	35	67	53.43	---	12.2	---	---	---	---
Total Suspended Solids	mg/l	4/9/2008 - 11/5/2008	8	0	8	5	16	8.875	---	3.441	---	---	---	---
Transparency Tube	cm	4/9/2008 - 11/5/2008	8	0	8	40.6	116	88.54	---	23.54	---	---	---	---



NPSTORET Descriptive Statistics - Annual



Filtered Results, Grouped by Station

Results filtered for:

Organization = MISS: Mississippi National River and Recreation Area

Station = Include All Station Visit Results

Activities with Characteristic = Alkalinity

- or Ammonium
- or Calcium
- or Chl_a*
- or Chl_a/Pheophytin*
- or Chloride
- or DO Concentration*
- or DO Saturation*
- or DOC
- or Magnesium
- or Nitrate+Nitrite
- or pH*
- or Potassium
- or Silicate
- or Site Depth*
- or Sodium
- or Specific Conductivity*
- or Sulfate
- or Temperature*
- or Total Nitrogen
- or Total Phosphorus
- or Total Suspended Solids
- or Transparency Tube

Only display results that meet characteristic criteria

* Indicates Analytical Group Within Organization

** Indicates Analytical Group Across Organizations

Include Only Samples Not Checked as QC

Result Remark = (none)

Date (>=4/1/2008 and <=12/1/2008)

Censored Data Substitutions: *Non-detect=0.5* DetectionLimit, *Present >QL=1.1 * UpperQuantificationLimit, *Present <QL=0.5 * LowerQuantificationLimit

Missing Statistic Codes:

--- Computation requires 9 observations

Appendix B

Field and Laboratory Results for St. Croix National Scenic Riverway

Water quality results for sites on the St. Croix River and select tributaries are shown for 2008. At least nine observations are required for calculating percentiles and ± 1 standard deviation.



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_01

Station Name: Namekagon River at North Road Just West of Earl, WI

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/7/2008 - 10/6/2008	3	0	3	58	77	70.33	---	10.69	---	---	---	---
Ammonium	µg/l	4/7/2008 - 10/6/2008	3	0	3	8	62	26.67	---	30.62	---	---	---	---
Calcium	mg/l	4/7/2008 - 10/6/2008	3	0	3	18.6	21.9	20.77	---	1.877	---	---	---	---
Chl_a	ppb	4/7/2008 - 10/6/2008	3	0	3	1.3	9.08	4.36	---	4.147	---	---	---	---
Chl_a/Pheophytin	%	4/7/2008 - 10/6/2008	3	0	3	84.71	108.4	93.88	---	12.68	---	---	---	---
Chloride	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.5	4.8	4.667	---	0.1528	---	---	---	---
DO Concentration	mg/l	4/7/2008 - 10/6/2008	7	0	7	7.24	13.63	10.33	---	2.083	---	---	---	---
DO Saturation	%	4/7/2008 - 10/6/2008	7	0	7	80.7	105.9	93.1	---	7.461	---	---	---	---
DOC	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.3	6.1	5.2	---	0.9	---	---	---	---
Magnesium	mg/l	4/7/2008 - 10/6/2008	3	0	3	5.36	7.33	6.473	---	1.01	---	---	---	---
Nitrate+Nitrite	µg/l	4/7/2008 - 10/6/2008	3	0	3	89	258	166.3	---	85.41	---	---	---	---
pH	None	4/7/2008 - 10/6/2008	7	0	7	7.33	7.94	7.684	---	0.2487	---	---	---	---
converted pH	None					7.33	7.94	7.618	---	0.0151	---	---	---	---
H+ computed from pH	µeq/l					0.0115	0.0468	0.0241	---	0.0151	---	---	---	---
Potassium	mg/l	4/7/2008 - 10/6/2008	3	0	3	0.6	0.9	0.7933	---	0.1677	---	---	---	---
Silicate	mg/l	4/7/2008 - 10/6/2008	3	0	3	5.8	14.12	10.31	---	4.203	---	---	---	---
Sodium	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.3	3.6	3.463	---	0.1518	---	---	---	---
Specific Conductivity	µS/cm	4/7/2008 - 10/6/2008	7	0	7	133	170.3	159.5	---	17.75	---	---	---	---
Sulfate	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.31	5.3	4.797	---	0.4952	---	---	---	---
Temperature	°C	4/7/2008 - 10/6/2008	7	0	7	4.21	19.37	10.92	---	6.282	---	---	---	---
Total Nitrogen	µg/l	4/7/2008 - 10/6/2008	3	0	3	346	676	458.3	---	188.5	---	---	---	---
Total Phosphorus	µg/l	4/7/2008 - 10/6/2008	3	0	3	15	39	25.33	---	12.34	---	---	---	---
Total Suspended Solids	mg/l	4/7/2008 - 10/6/2008	3	0	3	2	18	8	---	8.718	---	---	---	---
Transparency Tube	cm	4/7/2008 - 10/6/2008	3	2	3	88.05	132	117.4	---	25.37	---	---	---	---
Water Level	m	4/7/2008 - 10/6/2008	3	0	3	-5.178	-4.94	-5.096	---	0.1352	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_02

Station Name: St. Croix River Just Upstream from Norway Point Boat Landing

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/10/2008 - 10/9/2008	3	0	3	37	64	51	---	13.53	---	---	---	---
Ammonium	µg/l	4/10/2008 - 10/9/2008	3	0	3	9	77	32.33	---	38.7	---	---	---	---
Calcium	mg/l	4/10/2008 - 10/9/2008	3	0	3	11.6	19.2	15.43	---	3.8	---	---	---	---
Chl_a	ppb	4/10/2008 - 10/9/2008	3	0	3	3.5	4.7	4.2	---	0.6245	---	---	---	---
Chl_a/Pheophytin	%	4/10/2008 - 10/9/2008	3	0	3	118	139.1	131.4	---	11.63	---	---	---	---
Chloride	mg/l	4/10/2008 - 10/9/2008	3	0	3	3.1	3.6	3.367	---	0.2517	---	---	---	---
DO Concentration	mg/l	4/10/2008 - 10/9/2008	10	0	10	7.18	12.76	9.6	8.32	2.461	7.181	7.272	12.31	12.73
DO Saturation	%	4/10/2008 - 10/9/2008	10	0	10	72.8	93.2	83.54	83.35	7.193	72.89	76.25	89.85	92.97
DOC	mg/l	4/10/2008 - 10/9/2008	3	0	3	8.7	15	10.93	---	3.528	---	---	---	---
Magnesium	mg/l	4/10/2008 - 10/9/2008	3	0	3	3.82	6.81	5.313	---	1.495	---	---	---	---
Nitrate+Nitrite	µg/l	4/10/2008 - 10/9/2008	3	0	3	38	351	146.3	---	177.3	---	---	---	---
pH	None	4/10/2008 - 10/9/2008	10	0	10	6.78	7.65	7.228	7.305	0.3557	6.785	6.86	7.642	7.65
converted pH	None					6.78	7.65	7.106	7.305	0.0575	6.785	6.86	5.164	5.168
H+ computed from pH	µeq/l					0.0224	0.166	0.0784	0.0495	0.0575	0.0224	0.0228	0.1381	0.1642
Potassium	mg/l	4/10/2008 - 10/9/2008	3	0	3	0.6	1	0.8	---	0.2	---	---	---	---
Silicate	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.6	11.55	8.717	---	3.648	---	---	---	---
Sodium	mg/l	4/10/2008 - 10/9/2008	3	0	3	2.4	3.1	2.77	---	0.3517	---	---	---	---
Specific Conductivity	µS/cm	4/10/2008 - 10/9/2008	10	0	10	83	144.7	111.9	115.5	26.24	83.1	84.75	143.6	144.7
Sulfate	mg/l	4/10/2008 - 10/9/2008	3	0	3	3.57	5.07	4.337	---	0.7506	---	---	---	---
Temperature	°C	4/10/2008 - 10/9/2008	10	0	10	2.07	21.33	10.5	10.88	8.394	2.071	2.088	21.3	21.33
Total Nitrogen	µg/l	4/10/2008 - 10/9/2008	3	0	3	397	943	693.7	---	276.1	---	---	---	---
Total Phosphorus	µg/l	4/10/2008 - 10/9/2008	3	0	3	29	44	38	---	7.937	---	---	---	---
Total Suspended Solids	mg/l	4/10/2008 - 10/9/2008	3	0	3	5	15	10	---	5	---	---	---	---
Transparency Tube	cm	4/10/2008 - 10/9/2008	3	0	3	70.65	87.3	77.6	---	8.659	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_03

Station Name: Snake River Approx. 1/2 Mile Upstream of the St. Croix River

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/7/2008 - 10/6/2008	3	0	3	72	80	75	---	4.359	---	---	---	---
Ammonium	µg/l	4/7/2008 - 10/6/2008	3	0	3	25	120	57.33	---	54.28	---	---	---	---
Calcium	mg/l	4/7/2008 - 10/6/2008	3	0	3	21.4	26.5	23.57	---	2.635	---	---	---	---
Chl_a	ppb	4/7/2008 - 10/6/2008	3	0	3	8.4	11.6	10.23	---	1.65	---	---	---	---
Chl_a/Pheophytin	%	4/7/2008 - 10/6/2008	3	0	3	188.5	348.8	244.5	---	90.39	---	---	---	---
Chloride	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.8	8	6.3	---	1.609	---	---	---	---
DO Concentration	mg/l	4/7/2008 - 10/6/2008	5	0	5	7.92	12.64	10.78	---	1.83	---	---	---	---
DO Saturation	%	4/7/2008 - 10/6/2008	5	0	5	85.7	104.9	94.74	---	8.004	---	---	---	---
DOC	mg/l	4/7/2008 - 10/6/2008	3	0	3	10.3	23.5	16.2	---	6.71	---	---	---	---
Magnesium	mg/l	4/7/2008 - 10/6/2008	3	0	3	8.1	10.5	9.117	---	1.241	---	---	---	---
Nitrate+Nitrite	µg/l	4/7/2008 - 10/6/2008	3	0	3	164	534	297.3	---	205.5	---	---	---	---
pH	None	4/7/2008 - 10/6/2008	5	0	5	7.19	8.33	7.816	---	0.5739	---	---	---	---
converted pH	None					7.19	8.33	7.538	---	0.0312	---	---	---	---
H+ computed from pH	µeq/l					0.0047	0.0646	0.029	---	0.0312	---	---	---	---
Potassium	mg/l	4/7/2008 - 10/6/2008	3	0	3	1.5	3	2.123	---	0.7814	---	---	---	---
Silicate	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.9	12	7.51	---	4.121	---	---	---	---
Sodium	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.8	4.66	4.253	---	0.4319	---	---	---	---
Specific Conductivity	µS/cm	4/7/2008 - 10/6/2008	5	0	5	172.1	210	190	---	18.44	---	---	---	---
Sulfate	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.48	6.22	4.64	---	1.417	---	---	---	---
Temperature	°C	4/7/2008 - 10/6/2008	5	0	5	1.1	22.01	10.35	---	9.089	---	---	---	---
Total Nitrogen	µg/l	4/7/2008 - 10/6/2008	3	0	3	1044	1398	1204	---	179.4	---	---	---	---
Total Phosphorus	µg/l	4/7/2008 - 10/6/2008	3	0	3	53	104	84.33	---	27.43	---	---	---	---
Total Suspended Solids	mg/l	4/7/2008 - 10/6/2008	3	0	3	5	12	7.667	---	3.786	---	---	---	---
Transparency Tube	cm	4/7/2008 - 10/6/2008	3	1	3	65.25	132	93.33	---	34.61	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_04

Station Name: St. Croix River About 1 Mile Above Nevers Dam Boat Landing

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/10/2008 - 10/9/2008	3	0	3	37	70	55	---	16.7	---	---	---	---
Ammonium	µg/l	4/10/2008 - 10/9/2008	3	0	3	6	111	42.33	---	59.5	---	---	---	---
Calcium	mg/l	4/10/2008 - 10/9/2008	3	0	3	11.8	19.3	16.43	---	4.05	---	---	---	---
Chl_a	ppb	4/10/2008 - 10/9/2008	3	0	3	3.5	4.7	4.233	---	0.6429	---	---	---	---
Chl_a/Pheophytin	%	4/10/2008 - 10/9/2008	3	0	3	106.6	233.2	165.8	---	63.68	---	---	---	---
Chloride	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.3	4.6	4.4	---	0.1732	---	---	---	---
DO Concentration	mg/l	4/10/2008 - 10/9/2008	9	0	9	7.96	13.51	10.9	12.54	2.478	7.96	8.075	12.97	13.51
DO Saturation	%	4/10/2008 - 10/9/2008	9	0	9	75.5	97.6	90.83	93.2	6.669	75.5	87.95	94.4	97.6
DOC	mg/l	4/10/2008 - 10/9/2008	3	0	3	9.7	14.4	12.1	---	2.352	---	---	---	---
Magnesium	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.15	7.26	5.9	---	1.591	---	---	---	---
Nitrate+Nitrite	µg/l	4/10/2008 - 10/9/2008	3	0	3	45	427	190.3	---	206.7	---	---	---	---
pH	None	4/10/2008 - 10/9/2008	9	0	9	6.97	7.92	7.333	7.05	0.4012	6.97	7.01	7.735	7.92
converted pH	None					6.97	7.92	7.201	7.05	0.0415	6.97	7.01	5.154	5.157
H+ computed from pH	µeq/l					0.012	0.1072	0.063	0.0891	0.0415	0.012	0.0198	0.0977	0.1072
Potassium	mg/l	4/10/2008 - 10/9/2008	3	0	3	0.8	1.6	1.157	---	0.407	---	---	---	---
Silicate	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.2	11.77	8.29	---	3.822	---	---	---	---
Sodium	mg/l	4/10/2008 - 10/9/2008	3	0	3	2.7	3.5	3.21	---	0.4431	---	---	---	---
Specific Conductivity	µS/cm	4/10/2008 - 10/9/2008	9	0	9	94	153.9	116.7	94	27.61	94	94	145	153.9
Sulfate	mg/l	4/10/2008 - 10/9/2008	3	0	3	3.62	5.72	4.427	---	1.131	---	---	---	---
Temperature	°C	4/10/2008 - 10/9/2008	9	0	9	1.94	22.73	8.769	1.95	8.956	1.94	1.94	17.3	22.73
Total Nitrogen	µg/l	4/10/2008 - 10/9/2008	3	0	3	529	1170	832.3	---	321.9	---	---	---	---
Total Phosphorus	µg/l	4/10/2008 - 10/9/2008	3	0	3	34	66	51.33	---	16.17	---	---	---	---
Total Suspended Solids	mg/l	4/10/2008 - 10/9/2008	3	0	3	5	18	13.33	---	7.234	---	---	---	---
Transparency Tube	cm	4/10/2008 - 10/9/2008	3	0	3	48.35	86.4	63.83	---	19.99	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_05

Station Name: St. Croix River Just Upstream from the St. Croix Falls Dam

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/10/2008 - 10/9/2008	3	0	3	38	77	61	---	20.42	---	---	---	---
Ammonium	µg/l	4/10/2008 - 10/9/2008	3	0	3	10	130	51.67	---	67.88	---	---	---	---
Calcium	mg/l	4/10/2008 - 10/9/2008	3	0	3	13.5	21.4	18.3	---	4.215	---	---	---	---
Chl_a	ppb	4/10/2008 - 10/9/2008	3	0	3	3.4	7	5.233	---	1.801	---	---	---	---
Chl_a/Pheophytin	%	4/10/2008 - 10/9/2008	3	0	3	111.3	266.3	184.9	---	77.78	---	---	---	---
Chloride	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.6	5.4	4.933	---	0.4163	---	---	---	---
DO Concentration	mg/l	4/10/2008 - 10/9/2008	22	0	22	7.26	11.6	9.131	8.655	1.696	7.426	7.582	11.3	11.56
DO Saturation	%	4/10/2008 - 10/9/2008	22	0	22	79.8	92.1	84.97	83.65	4.318	80.26	81.1	90.35	91.4
DOC	mg/l	4/10/2008 - 10/9/2008	3	0	3	10	13	11.5	---	1.5	---	---	---	---
Magnesium	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.7	7.99	6.617	---	1.711	---	---	---	---
Nitrate+Nitrite	µg/l	4/10/2008 - 10/9/2008	3	0	3	114	461	246.3	---	187.6	---	---	---	---
pH	None	4/10/2008 - 10/9/2008	22	0	22	6.97	7.96	7.519	7.56	0.3605	7.028	7.08	7.902	7.941
converted pH	None					6.97	7.96	7.378	7.561	0.034	7.027	7.08	5.15	5.153
H+ computed from pH	µeq/l					0.011	0.1072	0.0419	0.0275	0.034	0.0115	0.0125	0.0832	0.0939
Potassium	mg/l	4/10/2008 - 10/9/2008	3	0	3	0.9	1.8	1.26	---	0.4762	---	---	---	---
Secchi Depth	m	7/11/2008 - 10/9/2008	2	0	2	1.425	1.65	1.538	---	0.1591	---	---	---	---
Silicate	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.9	10.48	7.993	---	2.839	---	---	---	---
Sodium	mg/l	4/10/2008 - 10/9/2008	3	0	3	3	3.8	3.503	---	0.4382	---	---	---	---
Specific Conductivity	µS/cm	4/10/2008 - 10/9/2008	22	0	22	101	175.3	145.8	155.8	31.52	101.3	103	175.1	175.2
Sulfate	mg/l	4/10/2008 - 10/9/2008	3	0	3	4.41	6.05	4.957	---	0.9469	---	---	---	---
Temperature	°C	4/10/2008 - 10/9/2008	22	0	22	2.15	23.61	13.08	12.05	9.02	2.16	2.178	23.56	23.61
Total Nitrogen	µg/l	4/10/2008 - 10/9/2008	3	0	3	609	1258	855.7	---	351.4	---	---	---	---
Total Phosphorus	µg/l	4/10/2008 - 10/9/2008	3	0	3	34	78	50	---	24.33	---	---	---	---
Total Suspended Solids	mg/l	4/10/2008 - 10/9/2008	3	0	3	4	21	9.667	---	9.815	---	---	---	---
Transparency Tube	cm	4/10/2008 - 10/9/2008	3	0	3	51.55	109.1	86.48	---	30.69	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_06

Station Name: Apple River Approx. 1/2 Mile Upstream of the St. Croix River

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO ₃	4/14/2008 - 10/7/2008	3	0	3	82	136	114.7	---	28.73	---	---	---	---
Ammonium	µg/l	4/14/2008 - 10/7/2008	3	0	3	7	123	61	---	58.41	---	---	---	---
Calcium	mg/l	4/14/2008 - 10/7/2008	3	0	3	23.8	34.5	30.07	---	5.581	---	---	---	---
Chl_a	ppb	4/14/2008 - 10/7/2008	3	0	3	3.7	37	15.9	---	18.35	---	---	---	---
Chl_a/Pheophytin	%	4/14/2008 - 10/7/2008	3	0	3	82.85	647.7	309.2	---	298.7	---	---	---	---
Chloride	mg/l	4/14/2008 - 10/7/2008	3	0	3	8.4	9.1	8.867	---	0.4041	---	---	---	---
DO Concentration	mg/l	4/14/2008 - 10/7/2008	6	0	6	7.96	13.75	10.71	---	2.347	---	---	---	---
DO Saturation	%	4/14/2008 - 10/7/2008	6	0	6	93	103.7	98.53	---	3.647	---	---	---	---
DOC	mg/l	4/14/2008 - 10/7/2008	3	0	3	4.2	5.5	5.033	---	0.7234	---	---	---	---
Magnesium	mg/l	4/14/2008 - 10/7/2008	3	0	3	9.1	15.2	12.93	---	3.338	---	---	---	---
Nitrate+Nitrite	µg/l	4/14/2008 - 10/7/2008	3	0	3	732	997	846.3	---	136.2	---	---	---	---
pH	None	4/14/2008 - 10/7/2008	6	0	6	7.45	8.35	7.96	---	0.3837	---	---	---	---
converted pH	None					7.45	8.35	7.818	---	0.0133	---	---	---	---
H+ computed from pH	µeq/l					0.0045	0.0355	0.0152	---	0.0133	---	---	---	---
Potassium	mg/l	4/14/2008 - 10/7/2008	3	0	3	1.1	2.5	1.623	---	0.764	---	---	---	---
Silicate	mg/l	4/14/2008 - 10/7/2008	3	0	3	7.6	12.84	10.48	---	2.658	---	---	---	---
Sodium	mg/l	4/14/2008 - 10/7/2008	3	0	3	4.1	4.78	4.427	---	0.3408	---	---	---	---
Specific Conductivity	µS/cm	4/14/2008 - 10/7/2008	6	0	6	195	290.2	256	---	47.36	---	---	---	---
Sulfate	mg/l	4/14/2008 - 10/7/2008	3	0	3	5.26	5.89	5.65	---	0.3407	---	---	---	---
Temperature	°C	4/14/2008 - 10/7/2008	6	0	6	3.87	21.61	12.63	---	7.935	---	---	---	---
Total Nitrogen	µg/l	4/14/2008 - 10/7/2008	3	0	3	1230	1395	1310	---	82.61	---	---	---	---
Total Phosphorus	µg/l	4/14/2008 - 10/7/2008	3	0	3	60	66	62.33	---	3.215	---	---	---	---
Total Suspended Solids	mg/l	4/14/2008 - 10/7/2008	3	0	3	4	7	5.333	---	1.528	---	---	---	---
Transparency Tube	cm	4/14/2008 - 10/7/2008	3	1	3	76.3	132	99.65	---	28.92	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_07

Station Name: Pool #1 of Lake St. Croix near Bayport, MN

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/15/2008 - 10/8/2008	3	0	3	48	90	74	---	22.72	---	---	---	---
Ammonium	µg/l	4/15/2008 - 10/8/2008	3	0	3	21	212	110	---	96.16	---	---	---	---
Calcium	mg/l	4/15/2008 - 10/8/2008	3	0	3	14.9	24.5	20.93	---	5.254	---	---	---	---
Chl_a	ppb	4/15/2008 - 10/8/2008	3	0	3	4.4	8.8	6.433	---	2.219	---	---	---	---
Chl_a/Pheophytin	%	4/15/2008 - 10/8/2008	3	0	3	169.2	252.5	221	---	45.21	---	---	---	---
Chloride	mg/l	4/15/2008 - 10/8/2008	3	0	3	6	7	6.5	---	0.5	---	---	---	---
DO Concentration	mg/l	4/15/2008 - 10/8/2008	34	0	34	0.83	12.94	8.691	8.195	3.346	5.105	6.165	12.54	12.8
DO Saturation	%	4/15/2008 - 10/8/2008	34	0	34	9.5	96.1	78.92	81.95	18.83	60.8	72.65	93.4	95.3
DOC	mg/l	4/15/2008 - 10/8/2008	3	0	3	8.5	15.1	10.93	---	3.625	---	---	---	---
Magnesium	mg/l	4/15/2008 - 10/8/2008	3	0	3	5.22	9.52	7.977	---	2.393	---	---	---	---
Nitrate+Nitrite	µg/l	4/15/2008 - 10/8/2008	3	0	3	94	482	284.3	---	194.1	---	---	---	---
pH	None	4/15/2008 - 10/8/2008	34	0	34	7.03	8.02	7.443	7.475	0.2923	7.1	7.15	7.672	7.895
converted pH	None					7.03	8.02	7.357	7.475	0.0258	7.1	7.15	5.146	5.149
H+ computed from pH	µeq/l					0.0095	0.0933	0.044	0.0335	0.0258	0.0127	0.0213	0.0708	0.0795
Potassium	mg/l	4/15/2008 - 10/8/2008	3	0	3	1.17	1.7	1.357	---	0.2977	---	---	---	---
Secchi Depth	m	4/15/2008 - 10/8/2008	3	0	3	0.875	2	1.458	---	0.5637	---	---	---	---
Silicate	mg/l	4/15/2008 - 10/8/2008	3	0	3	5	9.63	7.943	---	2.558	---	---	---	---
Sodium	mg/l	4/15/2008 - 10/8/2008	3	0	3	3.4	4.75	4.183	---	0.7006	---	---	---	---
Specific Conductivity	µS/cm	4/15/2008 - 10/8/2008	34	0	34	118	207.3	170.6	189.5	37.97	120	121	203.8	207.2
Sulfate	mg/l	4/15/2008 - 10/8/2008	3	0	3	4.34	6.03	5.243	---	0.851	---	---	---	---
Temperature	°C	4/15/2008 - 10/8/2008	34	0	34	2.19	25.57	13.64	14.34	9.119	2.545	2.948	24.26	24.74
Total Nitrogen	µg/l	4/15/2008 - 10/8/2008	3	0	3	764	1157	941	---	199.4	---	---	---	---
Total Phosphorus	µg/l	4/15/2008 - 10/8/2008	3	0	3	30	59	45	---	14.53	---	---	---	---
Total Phosphorus VANDORN	µg/l	7/9/2008 - 7/9/2008	1	0	1	60	60	60	---	...	---	---	---	---
Total Suspended Solids	mg/l	4/15/2008 - 10/8/2008	3	0	3	2	4	3	---	1	---	---	---	---
Transparency Tube	cm	4/15/2008 - 10/8/2008	3	1	3	65.9	132	96.37	---	33.35	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_08

Station Name: Lake Mallalieu (Willow River) Just East of Pub. Boat Launch

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/14/2008 - 10/7/2008	3	0	3	85	170	137.3	---	45.79	---	---	---	---
Ammonium	µg/l	4/14/2008 - 10/7/2008	3	0	3	11	387	136.7	---	216.8	---	---	---	---
Calcium	mg/l	4/14/2008 - 10/7/2008	3	0	3	24.1	43.6	34.9	---	9.918	---	---	---	---
Chl_a	ppb	4/14/2008 - 10/7/2008	3	0	3	2.1	135.2	49.83	---	74.1	---	---	---	---
Chl_a/Pheophytin	%	4/14/2008 - 10/7/2008	3	0	3	132.1	380.9	271.6	---	127.2	---	---	---	---
Chloride	mg/l	4/14/2008 - 10/7/2008	3	0	3	11.2	15.4	13.87	---	2.318	---	---	---	---
DO Concentration	mg/l	4/14/2008 - 10/7/2008	15	0	15	8.94	11.07	10.54	10.84	0.7173	9.054	10.41	10.99	11.06
DO Saturation	%	4/14/2008 - 10/7/2008	15	0	15	80.9	121.1	95.22	102.5	13.88	81.02	81.6	105.8	114.2
DOC	mg/l	4/14/2008 - 10/7/2008	3	0	3	2.8	6.8	4.967	---	2.021	---	---	---	---
Magnesium	mg/l	4/14/2008 - 10/7/2008	3	0	3	10.7	23.7	19.2	---	7.365	---	---	---	---
Nitrate+Nitrite	µg/l	4/14/2008 - 10/7/2008	3	0	3	1230	2357	1852	---	572.5	---	---	---	---
pH	None	4/14/2008 - 10/7/2008	15	0	15	7.42	8.7	8.034	8.41	0.5045	7.456	7.53	8.48	8.574
converted pH	None					7.42	8.7	7.796	8.409	0.0143	7.455	7.53	5.123	5.128
H+ computed from pH	µeq/l					0.002	0.038	0.016	0.0039	0.0143	0.0027	0.0033	0.0295	0.0351
Potassium	mg/l	4/14/2008 - 10/7/2008	3	0	3	1.53	4.6	2.577	---	1.753	---	---	---	---
Secchi Depth	m	4/14/2008 - 10/7/2008	3	0	3	0.55	1.25	1.017	---	0.4041	---	---	---	---
Silicate	mg/l	4/14/2008 - 10/7/2008	3	0	3	6.4	13.05	9.817	---	3.329	---	---	---	---
Sodium	mg/l	4/14/2008 - 10/7/2008	3	0	3	4	5.75	5.15	---	0.9962	---	---	---	---
Specific Conductivity	µS/cm	4/14/2008 - 10/7/2008	15	0	15	223	396.2	304.2	347.4	79.05	223.6	224	395.1	395.8
Sulfate	mg/l	4/14/2008 - 10/7/2008	3	0	3	9.2	12	10.15	---	1.6	---	---	---	---
Temperature	°C	4/14/2008 - 10/7/2008	15	0	15	3.39	22.38	11.07	13.52	7.974	3.432	3.51	21.59	21.98
Total Nitrogen	µg/l	4/14/2008 - 10/7/2008	3	0	3	1959	3009	2565	---	543.4	---	---	---	---
Total Phosphorus	µg/l	4/14/2008 - 10/7/2008	3	0	3	43	150	100	---	53.84	---	---	---	---
Total Suspended Solids	mg/l	4/14/2008 - 10/7/2008	3	0	3	4	24	11.33	---	11.02	---	---	---	---
Transparency Tube	cm	4/14/2008 - 10/7/2008	3	0	3	25.75	83.25	63.53	---	32.73	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_09

Station Name: Pool #2 on Lake St. Croix Downstream of I94 Bridge in Hudson

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/14/2008 - 10/8/2008	3	0	3	50	98	77.33	---	24.68	---	---	---	---
Ammonium	µg/l	4/14/2008 - 10/8/2008	3	0	3	7	179	111	---	91.48	---	---	---	---
Calcium	mg/l	4/14/2008 - 10/8/2008	3	0	3	16.5	27.4	22.43	---	5.514	---	---	---	---
Chl_a	ppb	4/14/2008 - 10/8/2008	3	0	3	4.5	7	5.733	---	1.25	---	---	---	---
Chl_a/Pheophytin	%	4/14/2008 - 10/8/2008	3	0	3	160	282.5	205	---	67.43	---	---	---	---
Chloride	mg/l	4/14/2008 - 10/8/2008	3	0	3	6.7	7.9	7.3	---	0.6	---	---	---	---
DO Concentration	mg/l	4/14/2008 - 10/8/2008	21	0	21	4.65	11.17	8.386	7.92	2.307	5.156	6.27	10.96	11.1
DO Saturation	%	4/14/2008 - 10/8/2008	21	0	21	54.6	81.5	75.22	78.4	7.304	61.26	73.3	79.35	81.02
DOC	mg/l	4/14/2008 - 10/8/2008	3	0	3	6.8	15.5	10.23	---	4.631	---	---	---	---
Magnesium	mg/l	4/14/2008 - 10/8/2008	3	0	3	6.21	10.6	8.683	---	2.247	---	---	---	---
Nitrate+Nitrite	µg/l	4/14/2008 - 10/8/2008	3	0	3	150	707	436.7	---	278.9	---	---	---	---
pH	None	4/14/2008 - 10/8/2008	21	0	21	7.17	7.93	7.49	7.65	0.2533	7.182	7.195	7.68	7.748
converted pH	None					7.17	7.93	7.42	7.65	0.0216	7.182	7.195	5.143	5.144
H+ computed from pH	µeq/l					0.0117	0.0676	0.038	0.0224	0.0216	0.0179	0.0209	0.0638	0.0658
Potassium	mg/l	4/14/2008 - 10/8/2008	3	0	3	1.2	2.2	1.537	---	0.5745	---	---	---	---
Secchi Depth	m	4/14/2008 - 10/8/2008	3	0	3	1	2.35	1.667	---	0.6752	---	---	---	---
Silicate	mg/l	4/14/2008 - 10/8/2008	3	0	3	4.6	9.41	7.637	---	2.642	---	---	---	---
Sodium	mg/l	4/14/2008 - 10/8/2008	3	0	3	3.5	5.06	4.287	---	0.7801	---	---	---	---
Specific Conductivity	µS/cm	4/14/2008 - 10/8/2008	21	0	21	121	225.6	172.9	184.9	44.41	121	121	219.4	225.3
Sulfate	mg/l	4/14/2008 - 10/8/2008	3	0	3	4.47	6.42	5.427	---	0.9755	---	---	---	---
Temperature	°C	4/14/2008 - 10/8/2008	21	0	21	1.78	24.9	12.83	15.35	9.487	1.79	1.815	23.46	24.38
Total Nitrogen	µg/l	4/14/2008 - 10/8/2008	3	0	3	825	1430	1067	---	320.1	---	---	---	---
Total Phosphorus	µg/l	4/14/2008 - 10/8/2008	3	0	3	37	71	51.67	---	17.47	---	---	---	---
Total Suspended Solids	mg/l	4/14/2008 - 10/8/2008	3	0	3	2	5	3.333	---	1.528	---	---	---	---
Transparency Tube	cm	4/14/2008 - 10/8/2008	3	1	3	59.55	132	99.82	---	36.9	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_10

Station Name: Kinnickinnic River at County Highway F Bridge

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/15/2008 - 10/7/2008	3	0	3	187	191	189.3	---	2.082	---	---	---	---
Ammonium	µg/l	4/15/2008 - 10/7/2008	3	0	3	6	17	11	---	5.568	---	---	---	---
Calcium	mg/l	4/15/2008 - 10/7/2008	3	0	3	55	55.6	55.37	---	0.3215	---	---	---	---
Chl_a	ppb	4/15/2008 - 10/7/2008	3	0	3	1	3.5	1.833	---	1.443	---	---	---	---
Chl_a/Pheophytin	%	4/15/2008 - 10/7/2008	3	0	3	39.66	86.73	67.37	---	24.62	---	---	---	---
Chloride	mg/l	4/15/2008 - 10/7/2008	3	0	3	21.1	21.6	21.3	---	0.2646	---	---	---	---
DO Concentration	mg/l	4/15/2008 - 10/7/2008	6	0	6	10.07	12.22	11.03	---	0.9261	---	---	---	---
DO Saturation	%	4/15/2008 - 10/7/2008	6	0	6	94.3	111.5	103.9	---	7.057	---	---	---	---
DOC	mg/l	4/15/2008 - 10/7/2008	3	0	3	1.8	3.9	2.633	---	1.115	---	---	---	---
Magnesium	mg/l	4/15/2008 - 10/7/2008	3	0	3	24.7	27.7	25.93	---	1.57	---	---	---	---
Nitrate+Nitrite	µg/l	4/15/2008 - 10/7/2008	3	0	3	4817	5322	4998	---	281.5	---	---	---	---
pH	None	4/15/2008 - 10/7/2008	6	0	6	8.09	8.39	8.21	---	0.1346	---	---	---	---
converted pH	None					8.09	8.39	8.194	---	0.0018	---	---	---	---
H+ computed from pH	µeq/l					0.0041	0.0081	0.0064	---	0.0018	---	---	---	---
Potassium	mg/l	4/15/2008 - 10/7/2008	3	0	3	1.4	1.7	1.587	---	0.1629	---	---	---	---
Silicate	mg/l	4/15/2008 - 10/7/2008	3	0	3	6.4	12.84	9.547	---	3.223	---	---	---	---
Sodium	mg/l	4/15/2008 - 10/7/2008	3	0	3	7.7	8.1	7.933	---	0.2082	---	---	---	---
Specific Conductivity	µS/cm	4/15/2008 - 10/7/2008	6	0	6	471	493.9	482.6	---	9.979	---	---	---	---
Sulfate	mg/l	4/15/2008 - 10/7/2008	3	0	3	16.1	18.3	17.5	---	1.217	---	---	---	---
Temperature	°C	4/15/2008 - 10/7/2008	6	0	6	8.27	16.94	12.5	---	3.878	---	---	---	---
Total Nitrogen	µg/l	4/15/2008 - 10/7/2008	3	0	3	4954	5290	5081	---	182.2	---	---	---	---
Total Phosphorus	µg/l	4/15/2008 - 10/7/2008	3	1	3	5.5	37	23.83	---	16.37	---	---	---	---
Total Suspended Solids	mg/l	4/15/2008 - 10/7/2008	3	0	3	1	4	2.667	---	1.528	---	---	---	---
Transparency Tube	cm	4/15/2008 - 10/7/2008	3	3	3	132	132	132	---	0	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_11

Station Name: Pool #1 on Lake St. Croix near Prescott, WI

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/15/2008 - 10/8/2008	6	0	6	66	103	85	---	16.37	---	---	---	---
Ammonium	µg/l	4/15/2008 - 10/8/2008	6	0	6	7	139	55	---	50.88	---	---	---	---
Calcium	mg/l	4/15/2008 - 10/8/2008	6	0	6	19.7	28.6	24.2	---	3.706	---	---	---	---
Chl_a	ppb	4/15/2008 - 10/8/2008	6	0	6	2.9	14	6.35	---	4.266	---	---	---	---
Chl_a/Pheophytin	%	4/15/2008 - 10/8/2008	6	0	6	128.8	299.3	231.5	---	78.56	---	---	---	---
Chloride	mg/l	4/15/2008 - 10/8/2008	6	0	6	6	9.3	7.7	---	1.23	---	---	---	---
DO Concentration	mg/l	4/15/2008 - 10/8/2008	94	0	94	0.21	9.72	6.226	6.745	2.605	1.955	4.915	8.082	9.535
DO Saturation	%	4/15/2008 - 10/8/2008	94	0	94	2.3	109.5	62.97	69.5	24.11	21.5	56.65	71.82	82.45
DOC	mg/l	4/15/2008 - 10/8/2008	6	0	6	5.5	21.1	11.17	---	5.695	---	---	---	---
Magnesium	mg/l	4/15/2008 - 10/8/2008	6	0	6	7.11	11.3	9.167	---	1.854	---	---	---	---
Nitrate+Nitrite	µg/l	4/15/2008 - 10/8/2008	6	0	6	267	693	457.3	---	161.6	---	---	---	---
pH	None	4/15/2008 - 10/8/2008	94	0	94	7.02	8.33	7.489	7.41	0.2998	7.18	7.3	7.67	7.765
converted pH	None					7.02	8.33	7.407	7.41	0.0217	7.18	7.3	5.137	5.144
H+ computed from pH	µeq/l					0.0047	0.0955	0.0392	0.0389	0.0217	0.0172	0.0214	0.0501	0.0661
Potassium	mg/l	4/15/2008 - 10/8/2008	6	0	6	1.09	2	1.38	---	0.3318	---	---	---	---
Secchi Depth	m	4/15/2008 - 10/8/2008	6	0	6	1.625	2.33	1.847	---	0.2891	---	---	---	---
Silicate	mg/l	4/15/2008 - 10/8/2008	6	0	6	4.2	11	8.117	---	2.402	---	---	---	---
Sodium	mg/l	4/15/2008 - 10/8/2008	6	0	6	3.43	4.96	4.402	---	0.5297	---	---	---	---
Specific Conductivity	µS/cm	4/15/2008 - 10/8/2008	94	0	94	149.9	321.1	198.8	181.2	37.76	156.2	162.7	233.2	244.2
Sulfate	mg/l	4/15/2008 - 10/8/2008	6	0	6	4.13	6.82	5.903	---	1.01	---	---	---	---
Temperature	°C	4/15/2008 - 10/8/2008	94	0	94	2.24	25.69	17.37	18.74	7.618	2.285	17.32	22.58	24.67
Total Nitrogen	µg/l	4/15/2008 - 10/8/2008	6	0	6	919	1208	1042	---	134	---	---	---	---
Total Phosphorus	µg/l	4/15/2008 - 10/8/2008	6	0	6	25	133	51.33	---	41.32	---	---	---	---
Total Phosphorus VANDORN	µg/l	7/9/2008 - 7/9/2008	1	0	1	95	95	95	---	...	---	---	---	---
Total Suspended Solids	mg/l	4/15/2008 - 10/8/2008	6	0	6	1	5	3	---	1.414	---	---	---	---
Transparency Tube	cm	4/15/2008 - 10/8/2008	6	3	6	85.35	132	112.9	---	21.52	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_A

Station Name: Upper St. Croix River at CCC Bridge

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/7/2008 - 10/6/2008	3	0	3	26	48	34.67	---	11.72	---	---	---	---
Ammonium	µg/l	4/7/2008 - 10/6/2008	3	1	3	3	115	44	---	61.73	---	---	---	---
Calcium	mg/l	4/7/2008 - 10/6/2008	3	0	3	8.84	14.9	12.65	---	3.315	---	---	---	---
Chl_a	ppb	4/7/2008 - 10/6/2008	3	0	3	0.7	2.7	1.5	---	1.058	---	---	---	---
Chl_a/Pheophytin	%	4/7/2008 - 10/6/2008	3	0	3	44.14	124.1	82.61	---	40.09	---	---	---	---
Chloride	mg/l	4/7/2008 - 10/6/2008	3	0	3	1.8	2.5	2.233	---	0.3786	---	---	---	---
DO Concentration	mg/l	4/7/2008 - 10/6/2008	3	0	3	8.07	14.51	11.44	---	3.231	---	---	---	---
DO Saturation	%	4/7/2008 - 10/6/2008	3	0	3	94.5	107.6	101.7	---	6.637	---	---	---	---
DOC	mg/l	4/7/2008 - 10/6/2008	3	0	3	6.7	9.5	8.2	---	1.411	---	---	---	---
Magnesium	mg/l	4/7/2008 - 10/6/2008	3	0	3	2.72	4.73	3.853	---	1.029	---	---	---	---
Nitrate+Nitrite	µg/l	4/7/2008 - 10/6/2008	3	1	3	3	288	100.7	---	162.3	---	---	---	---
pH	None	4/7/2008 - 10/6/2008	3	0	3	7.1	7.82	7.563	---	0.402	---	---	---	---
converted pH	None					7.1	7.82	7.429	---	0.0366	---	---	---	---
H+ computed from pH	µeq/l					0.0151	0.0794	0.0372	---	0.0366	---	---	---	---
Potassium	mg/l	4/7/2008 - 10/6/2008	3	1	3	0.2	0.8	0.5933	---	0.3408	---	---	---	---
Silicate	mg/l	4/7/2008 - 10/6/2008	3	0	3	2.7	8.77	6.423	---	3.261	---	---	---	---
Sodium	mg/l	4/7/2008 - 10/6/2008	3	0	3	1.9	2.6	2.32	---	0.3704	---	---	---	---
Specific Conductivity	µS/cm	4/7/2008 - 10/6/2008	3	0	3	61	107.2	90.47	---	25.6	---	---	---	---
Sulfate	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.31	5.66	4.473	---	1.175	---	---	---	---
Temperature	°C	4/7/2008 - 10/6/2008	3	0	3	0.95	22.27	11.5	---	10.66	---	---	---	---
Total Nitrogen	µg/l	4/7/2008 - 10/6/2008	3	0	3	323	949	556	---	342.3	---	---	---	---
Total Phosphorus	µg/l	4/7/2008 - 10/6/2008	3	0	3	15	47	29	---	16.37	---	---	---	---
Total Suspended Solids	mg/l	4/7/2008 - 10/6/2008	3	0	3	1	17	6.333	---	9.238	---	---	---	---
Transparency Tube	cm	4/7/2008 - 10/6/2008	3	2	3	66.5	132	110.2	---	37.82	---	---	---	---
Water Level	m	4/7/2008 - 10/6/2008	3	0	3	-3.594	-3.145	-3.407667	---	0.234	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Station ID: SACN_B

Station Name: Namekagon River at Phipps Landing

Local Name	Units	Period of Record	Count	Cens.	Incl.	Min.	Max.	Mean	Median	Std Dev	10th per.	25th per.	75th per.	90th per.
Alkalinity	mg/l CaCO3	4/7/2008 - 10/6/2008	3	0	3	48	75	59	---	14.18	---	---	---	---
Ammonium	µg/l	4/7/2008 - 10/6/2008	3	0	3	12	34	19.67	---	12.42	---	---	---	---
Calcium	mg/l	4/7/2008 - 10/6/2008	3	0	3	17.8	22.2	20.13	---	2.212	---	---	---	---
Chl_a	ppb	4/7/2008 - 10/6/2008	3	0	3	0.7	2.5	1.467	---	0.9292	---	---	---	---
Chl_a/Pheophytin	%	4/7/2008 - 10/6/2008	3	0	3	49.32	62.66	57.7	---	7.292	---	---	---	---
Chloride	mg/l	4/7/2008 - 10/6/2008	3	0	3	1.9	3.2	2.667	---	0.6807	---	---	---	---
DO Concentration	mg/l	4/7/2008 - 10/6/2008	6	0	6	8.73	12.33	10.54	---	1.301	---	---	---	---
DO Saturation	%	4/7/2008 - 10/6/2008	6	0	6	90.9	100.2	94.2	---	3.92	---	---	---	---
DOC	mg/l	4/7/2008 - 10/6/2008	3	0	3	3.1	5.2	4.1	---	1.054	---	---	---	---
Magnesium	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.82	6.42	5.857	---	0.8989	---	---	---	---
Nitrate+Nitrite	µg/l	4/7/2008 - 10/6/2008	3	0	3	31	323	160	---	148.9	---	---	---	---
pH	None	4/7/2008 - 10/6/2008	6	0	6	7.36	7.79	7.628	---	0.179	---	---	---	---
converted pH	None					7.36	7.79	7.595	---	0.0114	---	---	---	---
H+ computed from pH	µeq/l					0.0162	0.0437	0.0254	---	0.0114	---	---	---	---
Potassium	mg/l	4/7/2008 - 10/6/2008	3	0	3	0.6	0.78	0.6933	---	0.0902	---	---	---	---
Silicate	mg/l	4/7/2008 - 10/6/2008	3	0	3	6.6	13.26	10.62	---	3.538	---	---	---	---
Sodium	mg/l	4/7/2008 - 10/6/2008	3	0	3	2.6	2.77	2.69	---	0.0854	---	---	---	---
Specific Conductivity	µS/cm	4/7/2008 - 10/6/2008	6	0	6	125	157.4	145.5	---	15.92	---	---	---	---
Sulfate	mg/l	4/7/2008 - 10/6/2008	3	0	3	4.56	5.89	5.323	---	0.6865	---	---	---	---
Temperature	°C	4/7/2008 - 10/6/2008	6	0	6	4.39	16.48	9.83	---	5.485	---	---	---	---
Total Nitrogen	µg/l	4/7/2008 - 10/6/2008	3	0	3	231	579	351.7	---	197	---	---	---	---
Total Phosphorus	µg/l	4/7/2008 - 10/6/2008	3	1	3	5.5	20	13.83	---	7.489	---	---	---	---
Total Suspended Solids	mg/l	4/7/2008 - 10/6/2008	3	0	3	1	3	2.333	---	1.155	---	---	---	---
Transparency Tube	cm	4/7/2008 - 10/6/2008	3	3	3	132	132	132	---	0	---	---	---	---



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Results filtered for:

Organization = SACN: St. Croix National Scenic Riverway

Station = Include All Station Visit Results

Activities with Characteristic = Alkalinity

- or Ammonium
- or Calcium
- or Chl_a*
- or Chl_a/Pheophytin*
- or Chloride
- or DO Concentration*
- or DO Saturation*
- or DOC
- or Magnesium
- or Nitrate+Nitrite
- or pH*
- or Potassium
- or Secchi Depth
- or Silicate
- or Site Depth*
- or Sodium
- or Specific Conductivity*
- or Sulfate
- or Temperature*
- or Total Nitrogen
- or Total Phosphorus
- or Total Phosphorus VANDORN
- or Total Suspended Solids
- or Transparency Tube
- or Water Level

Only display results that meet characteristic criteria

* Indicates Analytical Group Within Organization

** Indicates Analytical Group Across Organizations

Include Only Samples Not Checked as QC

Date ($\geq 4/1/2008$ and $\leq 12/30/2008$)



NPSTORET Descriptive Statistics - Period of Record



Filtered Results, Grouped by Station

Censored Data Substitutions: *Non-detect=0.5* DetectionLimit, *Present >QL=1.1 * UpperQuantificationLimit, *Present <QL=0.5 * LowerQuantificationLimit

Missing Statistic Codes:

--- Computation requires 9 observations

... Computation requires more than 1 observation