Appendix A

Suggested Criteria for Inclusion for 2001 -2003 State of the Minnesota River Reports

Criteria for Inclusion of Monitoring Data in the 2001 - 2003 State of the Minnesota River Reports

PURPOSE

The purpose of the criteria proposed below is to ensure that water quality monitoring data from critical locations in the Minnesota River Basin is collected and analyzed in a consistent fashion by all participating organizations. This effort is being undertaken to enhance the comparability of data collected from different locations and from year to year (spatial and temporal comparability). These criteria were established by a multi-agency team. All monitoring organizations are encouraged to follow these criteria whenever practical with all of their monitoring locations. Only if data collection efforts are coordinated and standardized, will there be a detailed, scientifically defensible assessment of the long-term trends in the Minnesota River Basin. As such, only data collected and analyzed in a fashion generally consistent with the criteria established below will be eligible for inclusion in future Minnesota River Monitoring Reports.

CRITERIA

1. **Monitor for the complete season**: A monitoring season is defined as April 1st (or ice out) to September 30th. For stations located at the mouths of major tributaries, a longer monitoring season is encouraged when possible. If this is a non-USGS site, start monitoring and collecting samples as soon as the channel bed is clear of ice. If the station is located at a USGS site, year round sampling is encouraged. The USGS will compute the shift in stage due to the ice in the channel and adjust the flows accordingly. Safety is paramount in late and early season sampling but there is value in samples collected during these periods if reasonable estimates of flow can be made. Samples collected during the middle of winter can be valuable for assessing true baseflow water quality conditions.

2. **Accurately characterize all flow periods**: During most years, an absolute minimum of 15 samples is necessary to begin characterizing all flow periods. In general, 15 to 25 samples should be collected during the monitoring season. In years with significant snow pack (spring floods), at least 3 grab samples should be collected on the rising limb of the snowmelt hydrograph in order to capture the initial sediment flush, followed by at least two samples weekly until the flood waters recede (up to 75% or more of the total seasonal volume of water may move through during a flood). During spring through midsummer baseflow periods, at least one sample every ten days should be collected. During late summer/early fall baseflow periods (after the crop canopy has closed), one sample every fourteen days should be collected if there are no rain events that result in changes to stage. During the major spring and summer storm events, projects should strive for a minimum of 3 samples collected over each hydrograph (rising limb, peak and recession limb). Extreme events should be sampled more to

correctly characterize the flow/concentration dynamics. For lesser events that result in little change in stage, collect one or two samples over the event, use your discretion.

3. **The stage/discharge relationship must be defined and maintained**: The existing rating curves must be verified with monthly flow measurements. Any stage shifts that have occurred must be computed and data adjusted accordingly. Data will not be allowed for inclusion in the report when the maximum seasonal stage level has exceeded the stage level of the highest flow measurement used in constructing the sites rating curve.

4. **Site visits**: Site visits to download data and verify the monitoring equipment are important. Visits should be no less frequent than once a week during periods of moderate to high flows and once every two weeks during baseflow periods. During floods, site visits should be more frequent to make sure debris is not piling up on (submerged transducers or bubblers) or under your transducer (ultrasonic transducers).

5. **Sampling Methods:** All organizations must utilize a State Certified laboratory. On larger river systems, it is generally best to collect grab samples from a bridge deck using an approved sampling vessel whenever possible. Ideally, sampling will occur on the downstream side of the bridge so the person sampling can see the sampling vessel to assess its condition. However, safety should be the primary consideration when working on or around traffic and bridges. Sample collection should occur near the center of flow in a well-mixed or turbulent portion of the river and should be depth integrated (represent water from the surface to the bottom of the water column) if possible.

   Wading sample collection may be possible on smaller streams. In these instances, sample collection should again occur near the center of flow in a turbulent stretch of the river and should be depth integrated if possible. Sample collection should occur upstream of the person sampling to avoid disturbance caused by wading. Again, safety should be the primary consideration when evaluating how best to collect the sample.

   In some instances sample collection from the bank may be the only safe collection option. In these instances, the person sampling should seek a turbulent or well-mixed portion of the river within reach of the bank. Use a dipper to extend the sampling reach if necessary. Sample collection from pools or backwater areas of the river should be avoided.

   Organizations utilizing automatic samplers for the collection of storm event samples must pay close attention to sample tube intake location. Specifically, sample tube intakes should always be located a minimum of 12 inches from the stream channel bottom and as close to the center of flow as possible. In addition, samples collected by automatic samplers during warm weather should not be

allowed to sit in the sampler for an extended period of time unless ice is added to the sampler base to cool the samples.

6. **Field Quality Control (QC):** Quality Control is an extremely important process when collecting any type of environmental sample. In addition to water quality samples, it is recommended that replicate samples be collected for approximately 5 to10 percent of the samples and that field and equipment blanks also be collected at a rate of approximately 5 to 10 percent.

Appendix B

FLUX

FLUX

FLUX is an interactive program developed by the U.S. Army Corps of Engineers that allows the user to estimate loadings from grab sample concentration data and continuous flow records. All participating organizations in the Summary Report used the Flux program, except where noted. Water quality data was derived from either composite or continuous sampling with sampling equipment, or grab sampling. These samples were paired with the flow data for that specific time period. Flow records for monitored sites were derived from continuous stage measurements.

Six alternative calculations methods are provided in the FLUX program. These calculations determine the flow/concentration relationship developed from the sample record onto the entire flow record to calculate total mass discharge and associated error statistics. The user selects the most appropriate method based on sampling design and flow dynamics for the specified time period.

For a complete discussion of FLUX, see U.S. Department of the Army, Corps of Engineers, Empirical Methods for Predicting Eutrophication in Impoundments, Report 4, Phase III: Application Manual, 1999.

Download the FLUX program free at http://www.wes.army.mil/el/elmodels/index.html

Appendix C

Glossary of Terms

Glossary of Terms

- **Load:** An estimate of pollutant or constituent mass, passing a specific location on a river during a specified interval of time.

- **Yield**: One way to assess pollutant contributions from watersheds of different sizes is to determine the **"yield"** or the mass per unit area (such as lbs./acre) of a constituent coming out of a watershed during a given time period (monitoring season in this report). Yield normalizes mass on the basis of area, and allows for more relative comparisons of pollutant contributions to be made between watersheds. Yield is calculated by dividing the total mass or load of a constituent by the area (acres) of the watershed.

- **Runoff-adjusted yield:** For many pollutants, the more precipitation that falls in a given watershed, the higher the pollutant loads and yields. To account for spatial differences in precipitation and resulting increases in runoff, the yield can be further divided by the number of inches of runoff for the watershed, giving a **"runoff-adjusted yield"** or yield per inch of runoff.

- **Flow-Weighted Mean Concentration:** Proportionately equivalent to runoff-adjusted yield, the **"flow-weighted mean concentration"** (FWMC) is calculated by dividing the total mass or load for the given time period by the total flow volume. The FWMC is mass for flow. Conceptually, a FWMC would be the same as routing all the flow that passed a monitoring site during a specific timeframe into a big, well-mixed pool, and collecting and analyzing one sample from the pool to give the average concentration.

- **Runoff:** Runoff is the part of precipitation which appears in rivers and streams, including baseflow, storm flow, flow from ground water, and flow from point sources. Essentially, runoff is all the flow passing a particular location on the river. To calculate monitoring season runoff, the total flow volume or the amount of water which passes by the station during the monitoring period is calculated and converted to acre-inches of water. This number is then divided by the total number of watershed acres to determine inches of runoff. Conceptually, this is equivalent to redistributing all the river flow equally over the watershed, then measuring that water depth in inches.

Appendix D

2003 Monitoring Project Methods

The following pages contain the methodologies for each watershed organization that contributed to the "2003 State of the Minnesota River Report." Each project submitted data based off of a provided outline.

Project summaries and 2003 monitoring season results were written by each individual project.

Yellow Bank River

Lac qui Parle-Yellow Bank Clean Water Partnership Diagnostic Studies
600 6th St,
Madison, MN 56265
Phone: (320) 598-3319
Contacts: Mary Homan
mahoman@mail.co.lac-qui-parle.mn.us

Monitoring Began: 2001

Project Summary

This is a cooperative partnership partially funded through a Clean Water Partnership Grant from the Minnesota Pollution Control Agency. There is assessment of the watershed through water quality monitoring and land use analysis. Major components include water quality monitoring, a citizen monitoring network and education/information components.

There are a total of thirteen sites between the Lac qui Parle and Yellow Bank partnership. Water quality monitoring occurs April through September. Sampling happens twice a month for baseline grabs and during rain events as needed. Samples are analyzed for pH, temperature, specific conductivity, dissolved oxygen, transparency, nitrate-nitrite nitrogen, total kjeldahl nitrogen, orthophosphorus, total phosphorus, suspended volatile solids, total suspended solids and turbidity.

Site Location

The Yellow Bank River Site #8 is located at County Highway 40, 2 and ¾ miles south of Odessa, MN. The drainage area is 440 square miles or 281,456 acres.

2003 Monitoring Season Results

Results for 2003 are not included in the report.

Lac qui Parle River

Lac qui Parle-Yellow Bank Clean Water Partnership Diagnostic Studies
600 6th St,
Madison, MN 56265
Phone: (320) 598-3319
Contacts: Mary Homan
mahoman@mail.co.lac-qui-parle.mn.us

Monitoring Began: 2001

Project Summary

This is a cooperative partnership partially funded through a Clean Water Partnership Grant from the Minnesota Pollution Control Agency. There is assessment of the watershed through water quality monitoring and land use analysis. Major components include water quality monitoring, a citizen monitoring network and education/information components.

There are a total of thirteen sites between the Lac qui Parle and Yellow Bank partnership. Water quality monitoring occurs April through September. Sampling happens twice a month for baseline grabs and during rain events as needed. Samples are analyzed for pH, temperature, specific conductivity, dissolved oxygen, transparency, nitrate-nitrite nitrogen, total kjeldahl nitrogen, ortho-phosphorus, total phosphorus, suspended volatile solids, total suspended solids and turbidity.

Site Location

The Lac qui Parle River Site #9 is located at County Highway 31, 1 mile southwest of Lac qui Parle Village, MN. The drainage area is 961 square miles or 615,244 acres.

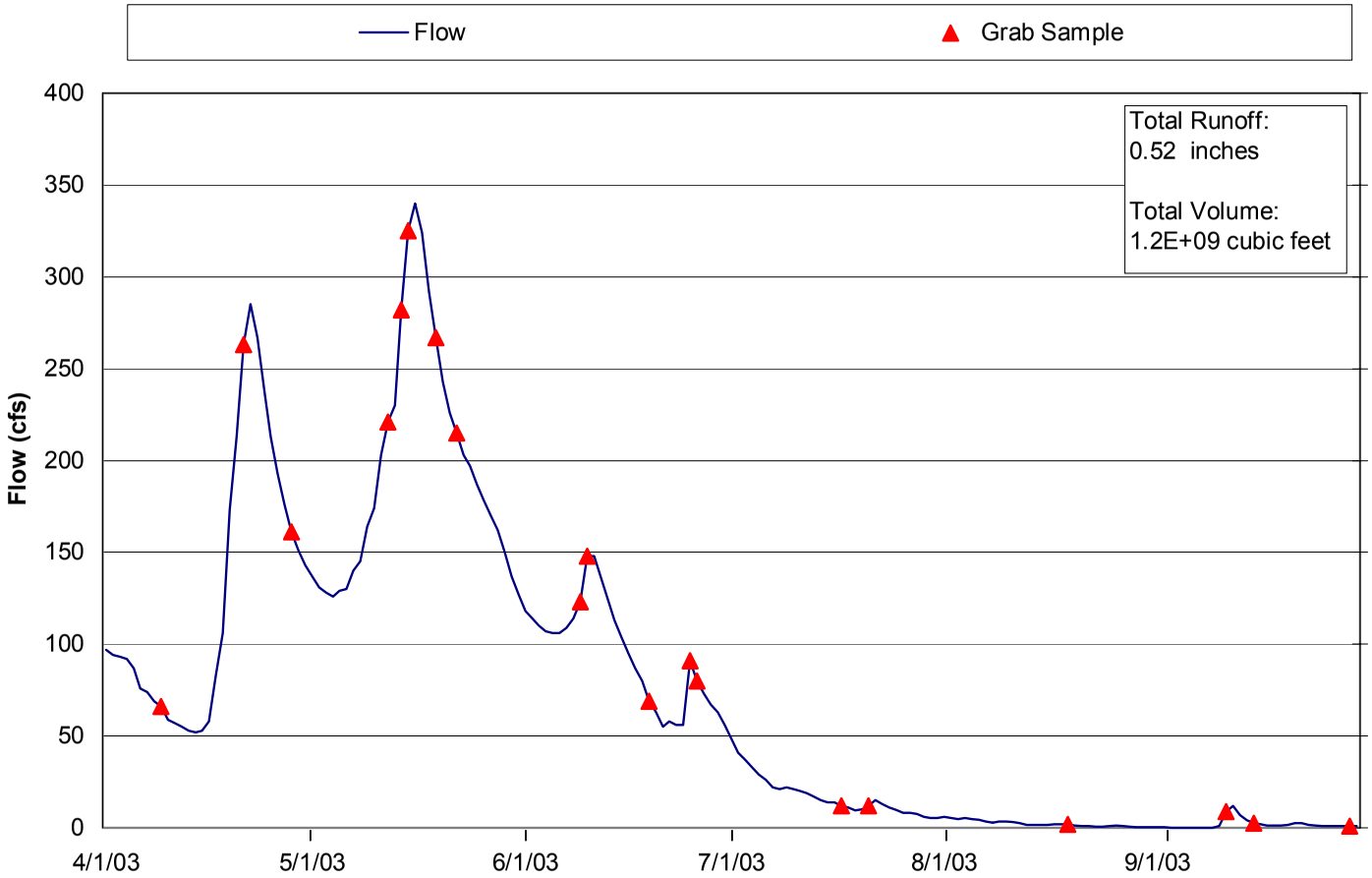
2003 Monitoring Season Results

This is the third year that the Lac qui Parle-Yellow Bank Clean Water Partnership collected samples in the watershed. All samples taken are grab samples and sent to ERA Laboratories in Duluth, MN. Both rising and falling limbs of the hydrograph are represented in the samples with good baseline samples. This monitoring site is the last site we monitor before the Lac qui Parle drains into Lac qui Parle Lake and the Minnesota River.

Sampling and Loading Results for the Lac qui Parle River

There were nineteen grab samples collected at the Lac qui Parle River Site #9 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2003 can be found at Appendix E. Figure D.01 presents the Lac qui Parle River hydrograph for 2003.

Figure D.01 Lac qui Parle River 2003 Hydrograph with Sampling Information



Chippewa River

Chippewa River Watershed Project
629 N. 11th Street
Montevideo, MN 56265
Phone: 320-269-2139 x116
Fax: 320-269-8593
Contacts: Kylene Olson, Watershed Project Coordinator
Kylene.Olson@mn.usda.gov
Paul Wymar, Watershed Technician
Paul.Wymar@mn.usda.gov

Monitoring Began: 1998

Project Summary

In 1998 CRWP began to monitor the Chippewa River. The overall goal of the CRWP was to improve the water quality and flooding problems in the Chippewa River Watershed Project while also promoting a healthy agricultural, industrial and recreation-based economy for the region.

The objective of the monitoring is to monitor and evaluate the variability of water quality and flow volume within the basin. The monitoring and assessment are used to identify which problems are present in each subregion, prioritize them, and then appropriate suits of best management practices are developed. To help achieve this objective, sampling is done using a three-pronged approach designated as Level 1, Level 2 and Level 3. Level 1 sampling involves the collection of continuous streamflow data and intensive collection of water-quality samples during runoff events. Level 2 sampling is designed to be synoptic and consists of sampling stream segments in a downstream order over a short period of time to collect baseline data that can document changes in water quality along a stream's course. Level 3 sites are those initiated through the Citizen Monitoring Network. These sites were mostly monitored for transparency tube readings and rainfall, but these readings are useful for isolating source areas in more detail than the widespread, costly Level 1 and Level 2 efforts.

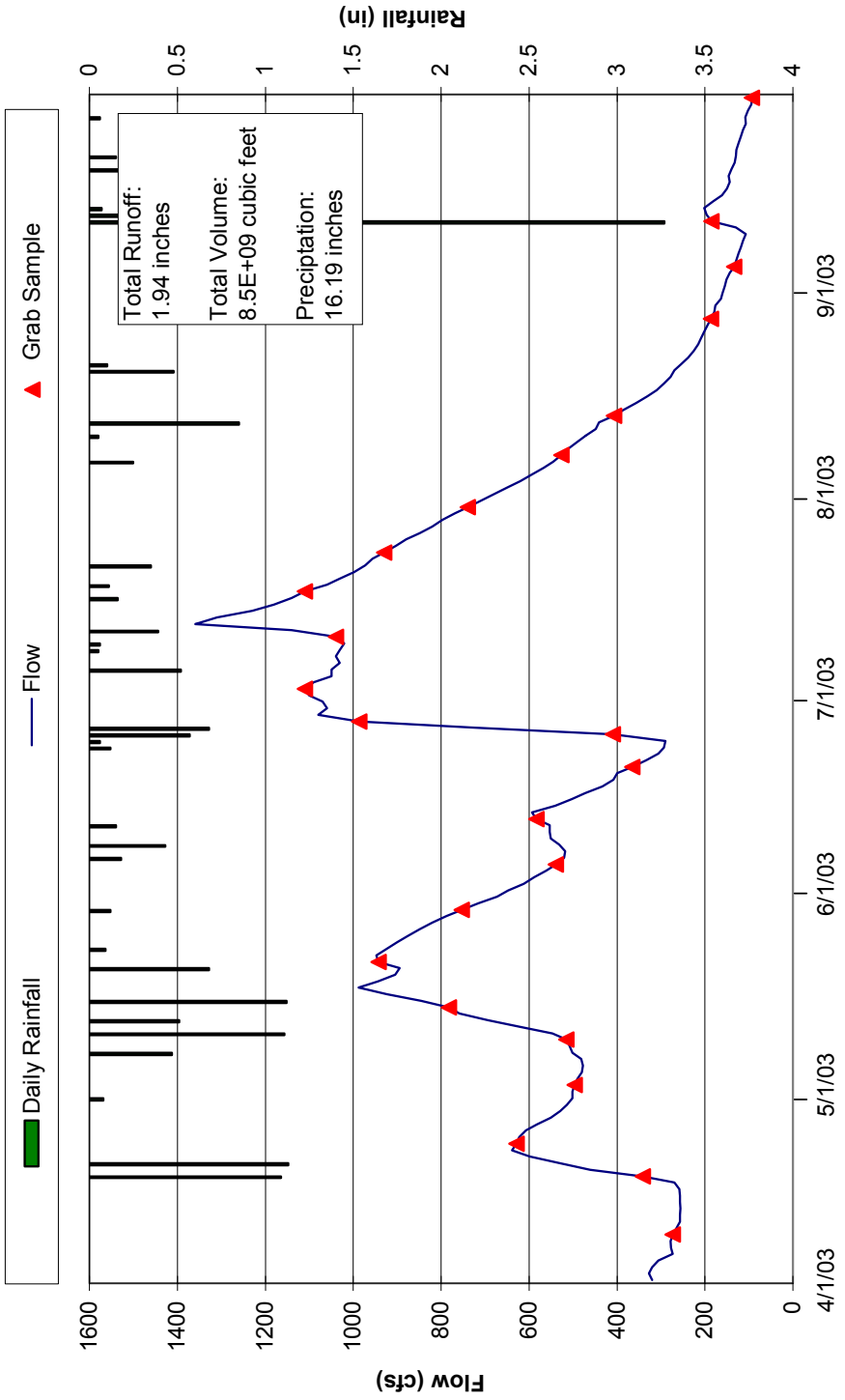
Site Location

The Chippewa River Site #18, at Hwy 40 Bridge near Milan, MN, is located in SE¼, SE¼, Sec.16, T.119 N., R.41 W., Chippewa County. This is also a USGS stream gaging site, station 05304500. This site is located on the right bank, 20 ft. downstream from State Highway 40 bridge, 2.0 miles upstream from small tributary, and 5.5 miles east of Milan. The drainage area is 1,880 square miles or 1,203,200 acres.

Sampling and Loading Results for the Chippewa River

There were twenty-four grab samples collected at the CRWP site18 station in 2003. Only samples collected during the defined monitoring season (4/1 – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 to 2003 can be found at Appendix E. Figure D.02 presents the Chippewa River hydrograph for 2003.

Figure D.02 Chippewa River 2003 Hydrograph with Rainfall and Sampling Information



Dry Weather Creek

Chippewa River Watershed Project
629 N. 11th Street
Montevideo, MN 56265
Phone: 320-269-2139 x116
Fax: 320-269-8593
Contacts: Kylene Olson, Watershed Project Coordinator
Kylene.Olson@mn.usda.gov
Paul Wymar, Watershed Technician
Paul.Wymar@mn.usda.gov

Monitoring Began: 1998

Project Summary

See the Chippewa River section on the previous two pages for a complete project summary.

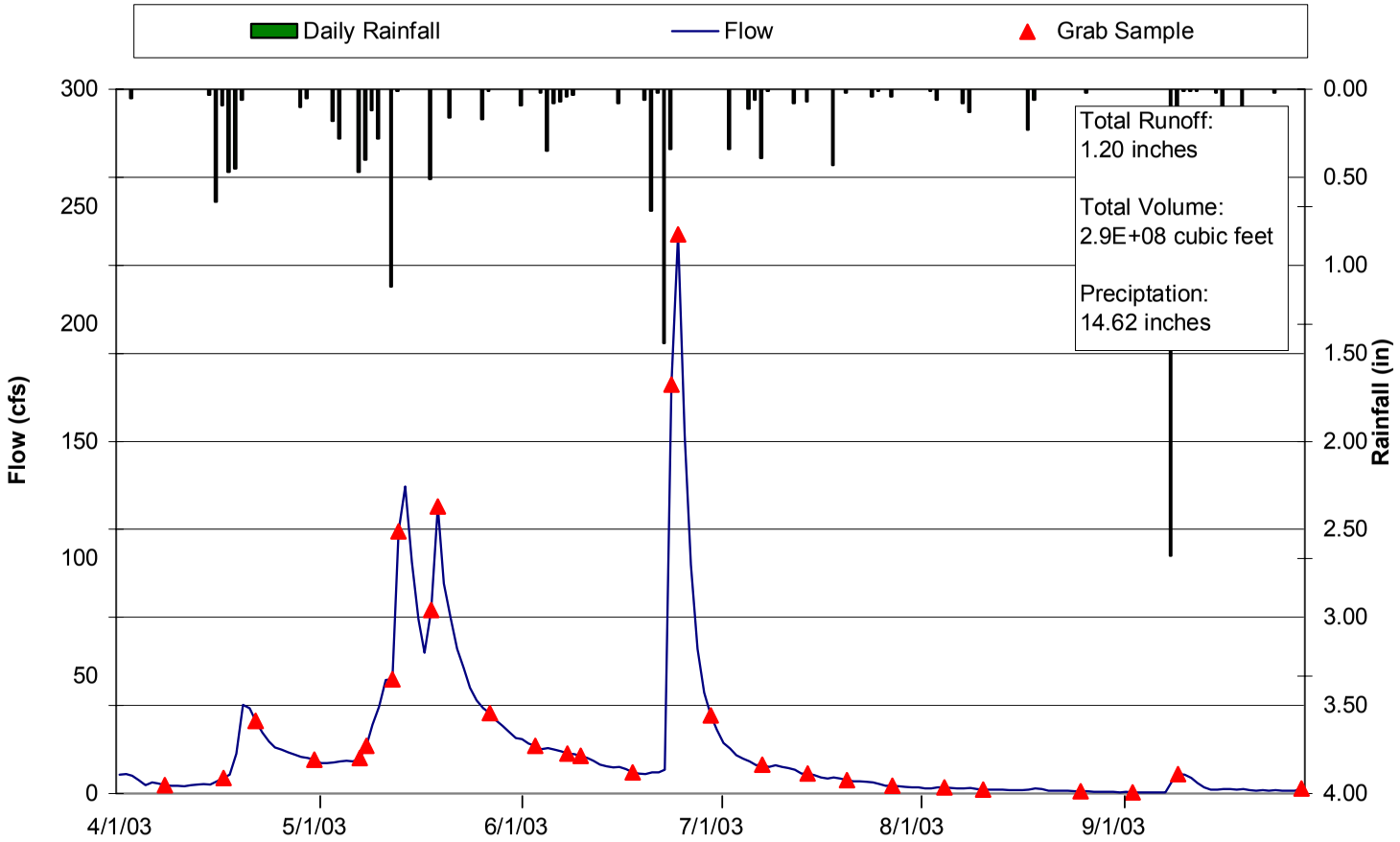
Site Location

The Dry Weather Creek Site #19, is about 4 miles NE of Watson on 85th Ave. NW, is located in Sec.11, T.118 N., R.41 W., Chippewa County. The drainage area is 106 square miles or 67,759 acres.

Sampling and Loading Results for the Dry Weather Creek

There were twenty-eight grab samples collected at the Dry Weather Creek Station in 2003. Only samples collected during the defined monitoring season (4/1 – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2002 to 2003 can be found at Appendix E. Figure D.03 presents the Dry Weather Creek hydrograph for 2003.

Figure D.03 Dry Weather Creek 2003 Hydrograph with Rainfall and Sampling Information



Yellow Medicine River

Yellow Medicine River Watershed
122 North Jefferson Street P.O. Box 267
Minneota, MN 56262
Phone: (507)-872-6720
Contacts: Terry Renken and Cindy Potz
ymrw@starpoint.net
Website: www.ymrw.com/YMRW.html

Monitoring Began: 1999

Project Summary

The Yellow Medicine River Watershed District is involved in a Phase II Implementation Phase of a Clean Water Partnership, with Project Partners being Minnesota Pollution Control Agency, Lincoln, Lyon and Yellow Medicine Soil and Water Conservation Districts, Lincoln, Lyon and Yellow Medicine NRCS agencies, Area II MN River Basin Projects, and MN BSWR. The project was designed to determine the nutrient loads of the water in the Yellow Medicine River and its tributaries. Through the three-year Phase I diagnostic study, specific areas were chosen in the Yellow Medicine River Watershed to have extremely high or moderately high levels of nitrate-nitrites, phosphorus, and total suspended solids. These areas became our priority sites.

The Implementation Phase began in March of 2001, with a focused plan of action, that being to address the priority sites diagnosed in the previous diagnostic study. Several best management practice options were discussed at our technical committee meetings, along with comments and suggestions from the committee as to what practices would most likely be accepted and what programs were offered to financially assist the landowners in becoming involved in the best management practices. Funds were requested and received through the CWP MPCA grant, in order for the Yellow Medicine River Watershed GYMR Phase II project to allocate an incentive payment to the involved landowners, based on the number of acres signed into the best management practices project.

In the initial Phase I project, 15 sites were periodically monitored through each season, with grab samples taken every two weeks, and storm event sampling taken after significant storms.

In the Implementation Program, Phase II, monitoring began in April of 2001, beginning with a spring runoff grab sampling event. The spring runoff monitoring is a valuable tool in assessing the erosion sediments, and assessing snow melt effects on the river, including the nutrient loads carried from the soil into the river. Monitoring continued throughout the season, from April until October, on a more scaled down level, at the eight primary sites, 1-8 in central locations throughout the watershed. Site 1 is designates as a USGS site, and data relating to that site was taken from the USGS online water data information system in addition to the watersheds monitoring teams' grab sampling events

and storm events. All other sites 2-8 were monitored for water quality through grab sample events, and quantity through flow rating measurements and CR10X datalogger systems recordings with the use of Instrumentation Northwest pressure transducers.

As we progress into the implementation phase, we anticipate that the monitoring results will reflect the effects of the best management practices now being put into place. Numerous filter strips, basins and waterways have been and continue to be funded, as well as the utilization of a nutrient management specialist, employed by the Yellow Medicine River Watershed District, through the Clean Water Partnership grant program. These projects should have a positive effect on the quantity and quality of the water in the Yellow Medicine River. As the Yellow Medicine River Watershed District has submitted results of their programs to MPCA and the Minnesota River Basin Data Center in Mankato, various information about our Clean Water Partnership Program can be found on their websites. See http://www.mrbdc.mankato.msus.edu and http://www.pca.state.mn.us for more information.

The Yellow Medicine River Watershed District also has available on their website a 130 page final report of the Phase I diagnostic study which will cover in great detail the results of our Phase I Clean Water Partnership, and upon its approval by MCPA, brought us into the application for a grant for the Implementation Phase. See www.ymrw.com/YMRW.html for more information.

The Yellow Medicine River Watershed District follows closely the efforts of all local watershed districts in their clean water partnerships, and has met with their staff at various times, to share methods of data collection and reporting. We are all working towards the same end results, of restoring and maintaining the quality of our rivers and streams in our watershed districts. These projects in return should benefit the efforts of those working towards the goal of restoring the quality of the water in the Minnesota River. Our specific goal is that in the next six years, we intend to ascertain that the quality of the Yellow Medicine River becomes improved by at least 25%. We hope to ensure that the Yellow Medicine River water entering the Minnesota River will be better in fact than that of the Minnesota River. We are proud to be involved with everyone working towards the goal of cleaner lakes and rivers in Minnesota.

Site Location

The Yellow Medicine River Site #1 is located between sections 34 and 35 of Minnesota Falls Township, Yellow Medicine County. This is a USGS station 05313500 near Granite Falls, MN. The drainage area is 664 square miles or 424,958 acres.

Sampling and Loading Results for the Yellow Medicine River

There were nine grab samples collected at the Yellow Medicine River Site#1 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 to 2003 can be found at Appendix E. Figure D.04 presents the Yellow Medicine River hydrograph for 2003.

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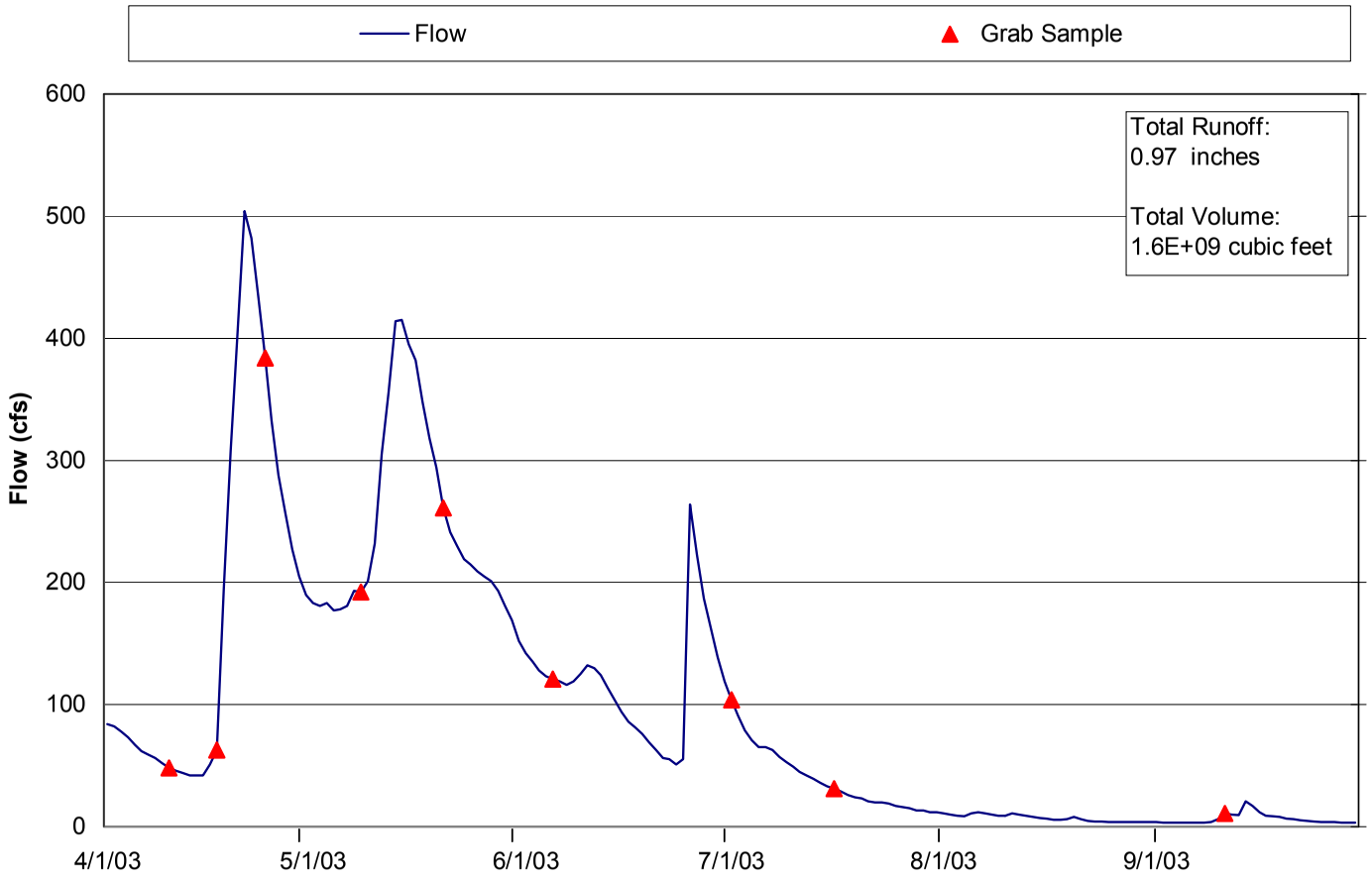
Figure D.04 Yellow Medicine River 2003 Hydrograph with Rainfall and Sampling Information



Hawk Creek

Hawk Creek Watershed Project
Renville County Courthouse, Lower Level
500 East DePue Avenue
Olivia, MN 56277
Fax: 320-523-3668
Contact: Loren Engelby, Project Coordinator
Phone: 320-523-3672
loren_e@co.renville.mn.us

Monitoring Began: 1999

Project Summary

Prompted by concern over suspected and known water quality and quantity issues in the Hawk Creek Watershed, a group of concerned citizens and local, state and federal representatives from the three counties in the watershed began meeting in February of 1997 to work together to address these issues. Known as the Hawk Creek Watershed Committee, the group determined their long-term goal to be improving the water quality and quantity issues in watershed while also promoting a healthy agricultural, industrial and recreation-based economy for the region.

A Phase I Diagnostic Study was established in 1999 to determine present water quality conditions and identify stream segments that were not supporting designated uses. This study had 27 sites throughout the watershed, six of which had CR10 sampling stations. Phase II Diagnostic Study began in 2001 and will end in 2004. This study only monitored the water quality and quantity at the six primary sites that had sampling stations. During Phase I and Phase II, the project monitored for fecal coliform, ammonia nitrogen, nitrate + nitrite nitrogen, total kjeldahl nitrogen, ortho phosphorus, total phosphorus, total suspended solids, and transparency. The Phase II 2002 sampling season added dissolved oxygen, conductivity, and pH to the monitoring routine.

Site Location

Site 19 is located near the mouth of the Hawk Creek in Renville County at a bridge on County Road 52. The drainage area is 505 square miles or 323,199 acres.

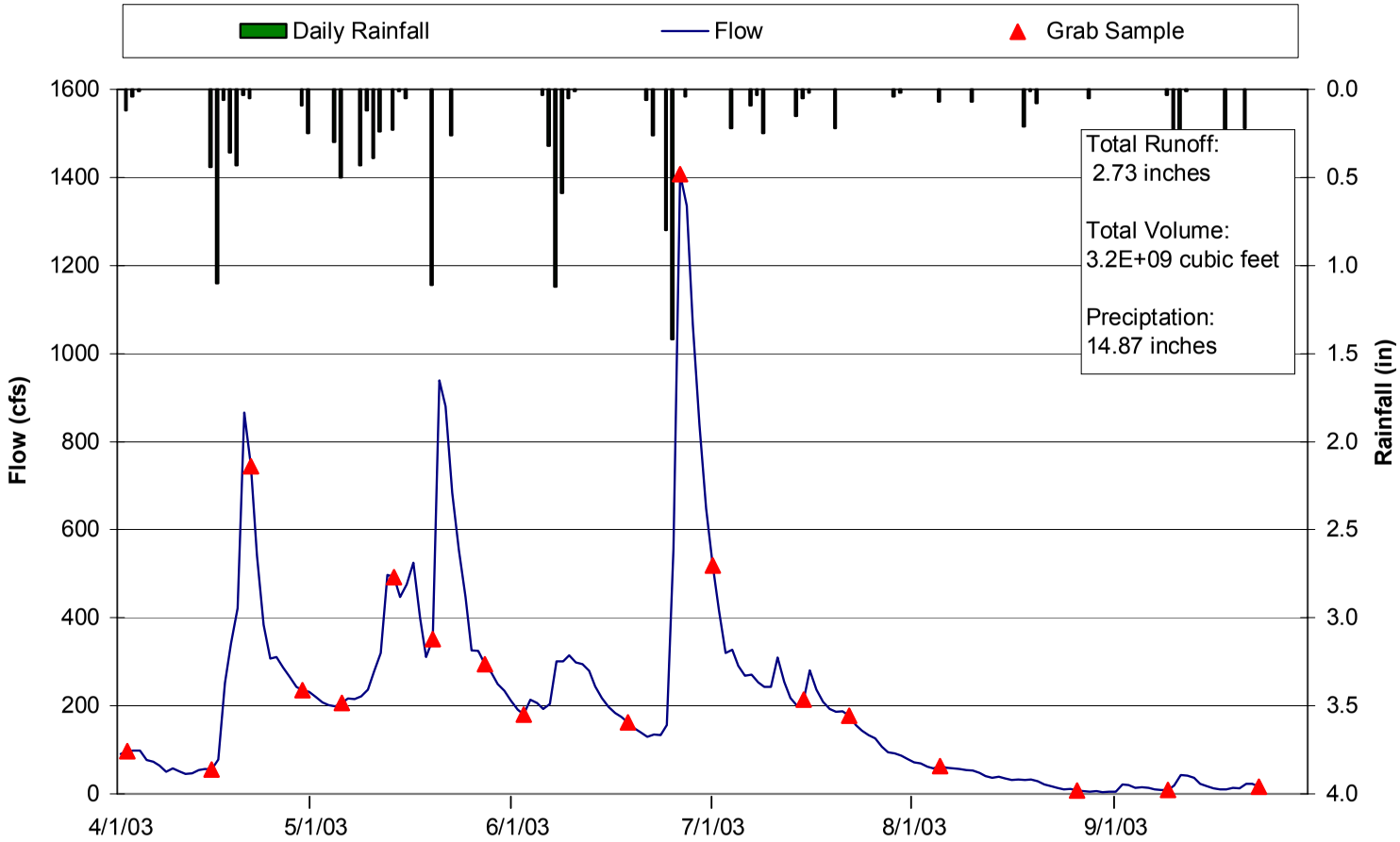
2003 Monitoring Season Results

There was very little snow melt runoff in the spring of 2003. There was an occasional "timely" rain during April and May but for the most part flows remained relatively low. One big event occurred on 6/25/03. After that, it was one of the driest summers on record, very little rain during the late summer and fall

Sampling and Loading Results for Hawk Creek

There were eighteen grab samples collected at the Hawk Creek site #19 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 to 2003 can be found at Appendix E. Figure D.05 presents the Hawk Creek hydrograph for 2003.

Figure D.05 Hawk Creek 2003 Hydrograph with Rainfall and Sampling Information



West Fork Beaver Creek

Hawk Creek Watershed Project
Renville County Courthouse, Lower Level
500 East DePue Avenue
Olivia, MN 56277
Fax: 320-523-3668
Contact: Loren Engelby, Project Coordinator
Phone: 320-523-3672
loren_e@co.renville.mn.us

Stephanie Klamm, Water Quality & Education/Outreach Technician
Phone: 320-523-3673
hawkcreeksteph@redred.com

Monitoring Began: 1999

Project Summary

See Hawk Creek section on the previous three pages for complete project summary.

Site Location

Site 25 is located in Henryville township in Renville County, approximately 8 miles north of Redwood Falls on MN Hwy 71 and then approximately 1.3 miles west on Renville Cty Rd 4. The drainage area is 96 square miles or 61,326 acres.

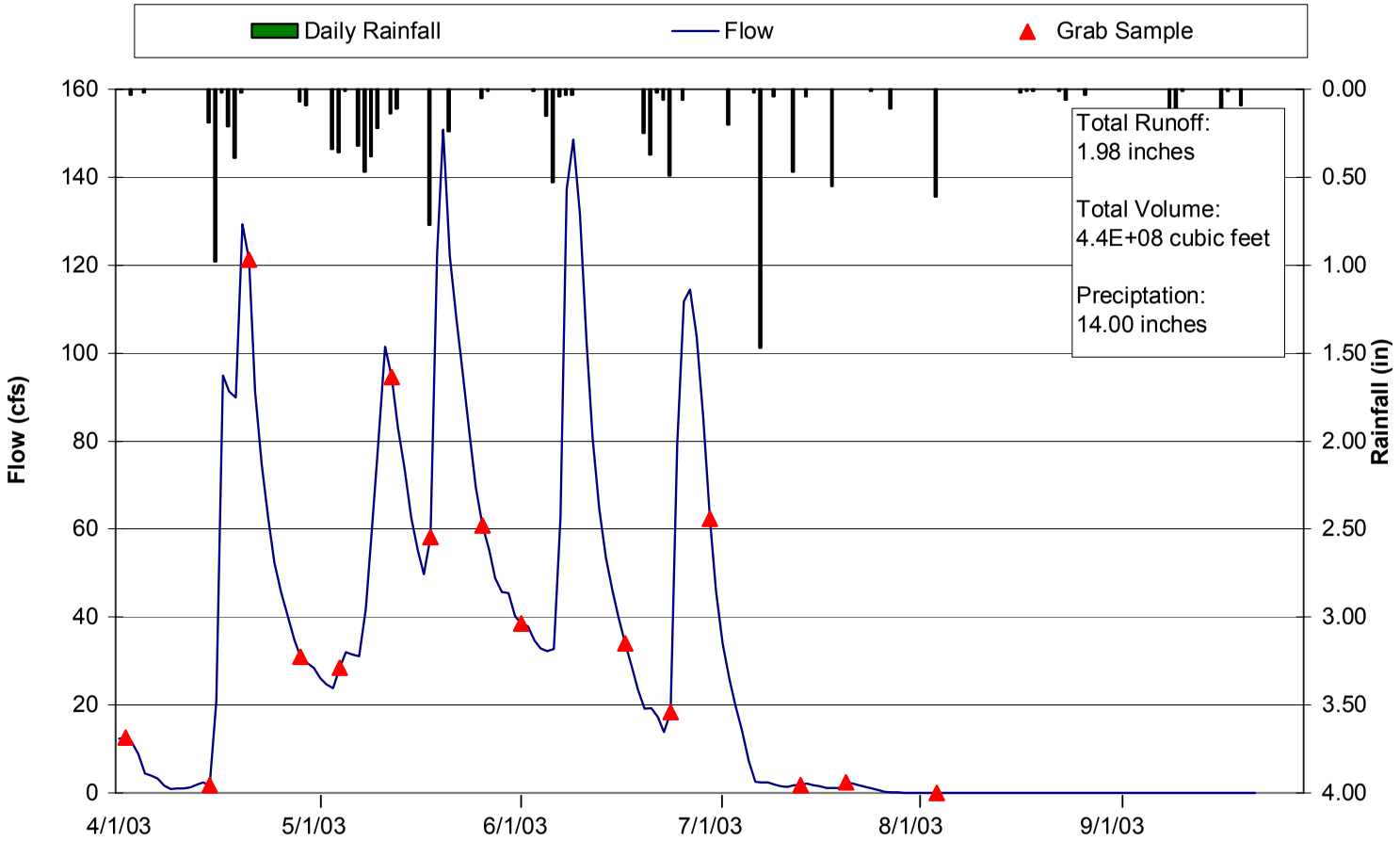
2003 Monitoring Season Results

There was very little snow melt runoff in the spring of 2003. There was an occasional "timely" rain during April and May but for the most part flows remained relatively low. One big event occurred on 6/25/03. After that, it was one of the driest summers on record, very little rain during the late summer and fall

Sampling and Loading Results for West Fork Beaver Creek

There were fifteen grab samples collected at the West Fork Beaver Creek site #25 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2003 can be found at Appendix E. Figure D.06 presents the West Fork Beaver Creek hydrograph for 2003.

Figure D.06 West Fork Beaver Creek 2003 Hydrograph with Rainfall and Sampling Information



Redwood River

Redwood River Clean Water Project
Redwood-Cottonwood Rivers Control Area (RCRCA)
1241 E. Bridge St.
Redwood Falls, MN 56283
Phone: (507) 637-2142 ext. 4
www.rcrca.com
Contacts: Jim Doering, Executive Director
Jim.doering@mn.usda.gov
Douglas A. Goodrich
douglas.goodrich@mn.usda.gov

Monitoring Began: 1989 (exception is 1993)

Project Summary

The monitoring program is designed to be a continuation of water quality data collection procedures initiated during the diagnostic study phase of the Redwood River Clean Water Project. Information gathered through the program improves loading estimate accuracy, and also helps to assess water quality trends within the watershed as wells as communicate project activities to the general public.

Monthly base flow samples are collected at each station between May and September. At least two storm events equal to a five-year frequency will be sampled at each location. At the main stem location, monthly base flow samples are carried on throughout the year. Retrieving samples each month will help with the Flux estimation of loading and will allow the Project to accurately predict annual loading.

Each monthly base flow sample is analyzed for total suspended solids, nitrate/nitrite, total phosphorus, orthophosphate and fecal coliform. Storm samples are analyzed for the same with exception of fecal coliform. Field analysis includes monthly testing on temperature, conductivity, dissolved oxygen, pH and both storm and monthly with the transparency tube.

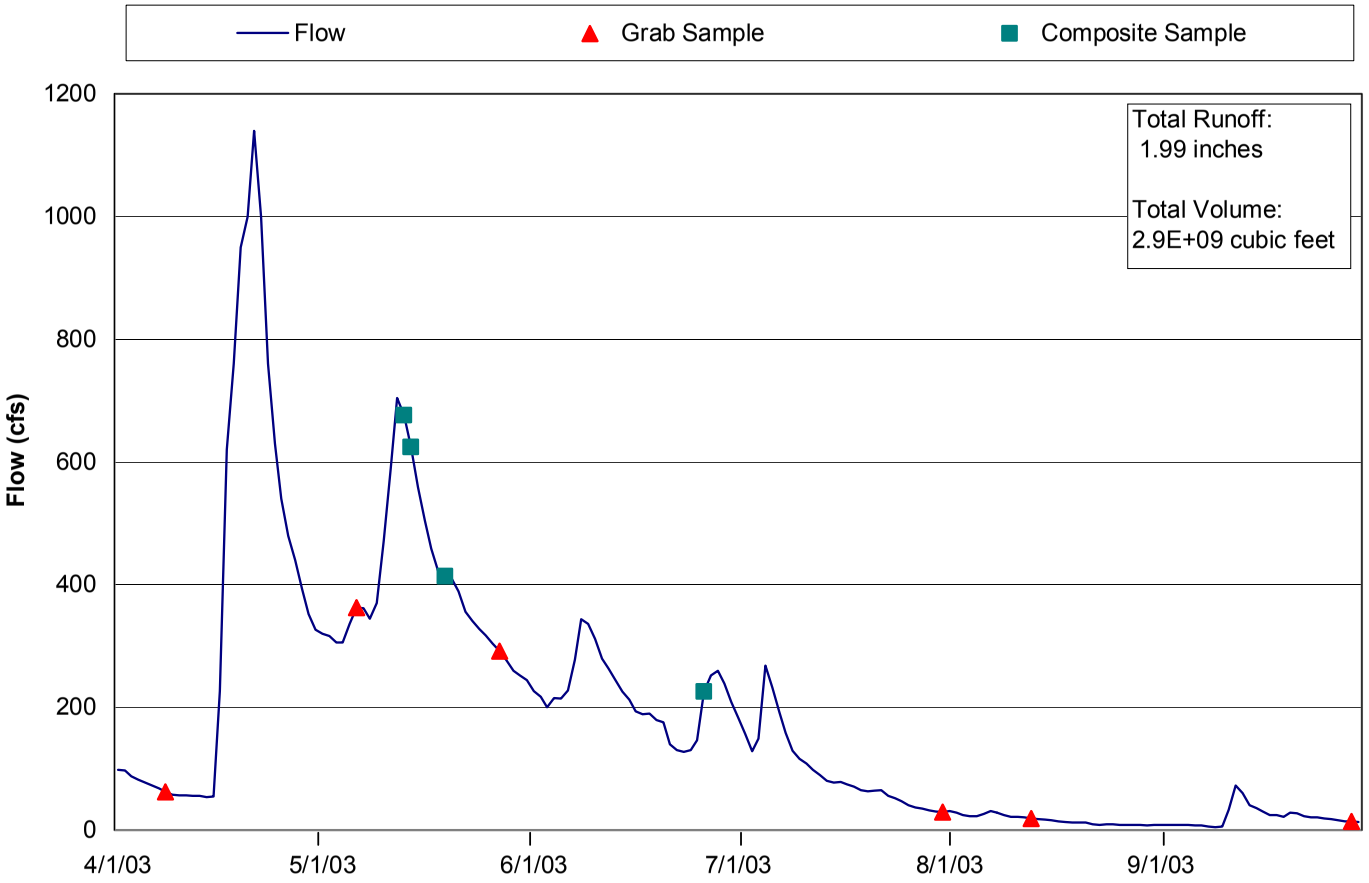
Site Location

The Redwood River site, RR1, is located at Sec. 9, T112N, R36W, on CSAH 17, 3 miles south west of Redwood Falls, MN. This is also a USGS stream gaging site, station 05316500. The drainage area is 629 square miles or 402,560 acres.

Sampling and Loading Results for the Redwood River

There were ten samples collected at the Redwood River site RR1 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000, 2002 and 2003 can be found at Appendix E. Figure D.07 presents the Redwood River hydrograph for 2003.

Figure D.07 Redwood River 2003 Hydrograph with Sampling Information



Clear Creek

Redwood River Clean Water Project
Redwood-Cottonwood Rivers Control Area (RCRCA)
1241 E. Bridge St.
Redwood Falls, MN 56283
Phone: (507) 637-2142 ext. 4
www.rcrca.com
Contacts: Jim Doering, Executive Director
Jim.doering@mn.usda.gov
Douglas A. Goodrich
douglas.goodrich@mn.usda.gov

Monitoring Began: 1990

Project Summary

See Redwood River section on the previous two pages for complete project summary.

Site Location

The Clear Creek Site, RWR003, is located at SE ¼, NW ¼, section 29, T112N, R37W , on CR-56, 1/3 mile from the confluence with the Redwood River on the NE edge of Seaforth. The drainage area is 77 square miles or 49,280 acres.

Sampling and Loading Results for Clear Creek

There were nine samples collected at Clear Creek Site RWR003 in 2003. However, the datalogger was not working properly and no flow data were available to calculate loads. Loading results for 2000 - 2002 can be found at Appendix E.

Cottonwood River

Cottonwood River Restoration Project
Redwood-Cottonwood Rivers Control Area (RCRCA)
1241 E. Bridge St.
Redwood Falls, MN 56283
Phone: (507) 637-2142 ext. 4
www.rcrca.com
Contacts: Jim Doering, Executive Director
jrd@mnredwoodf.fsc.usda.gov
Douglas A. Goodrich
douglas.goodrich@mn.usda.gov

Monitoring Began: 1997

Project Summary

The monitoring program is designed to be a continuation of water quality data collection procedures initiated during the diagnostic study phase of the Cottonwood River Restoration Project. Information gathered through the program improves loading estimate accuracy, and also helps to assess water quality trends within the watershed as wells as communicate project activities to the general public.

Monthly base flow samples are collected at each station between May and September. At least two storm events equal to a five-year frequency will be sampled at each location. At the main stem location, Cottonwood River at New Ulm monthly base flow samples will be carried on throughout the year. Retrieving samples each month will help with the Flux estimation of loading and will allow the Project to accurately predict annual loading.

Each monthly base flow sample is analyzed for total suspended solids, nitrate/nitrite, total phosphorus, orthophosphate and fecal coliform. Storm samples are analyzed for the same with exception of fecal coliform. Field analysis includes monthly testing on temperature, conductivity, dissolved oxygen, pH and both storm and monthly with the Transparency Tube.

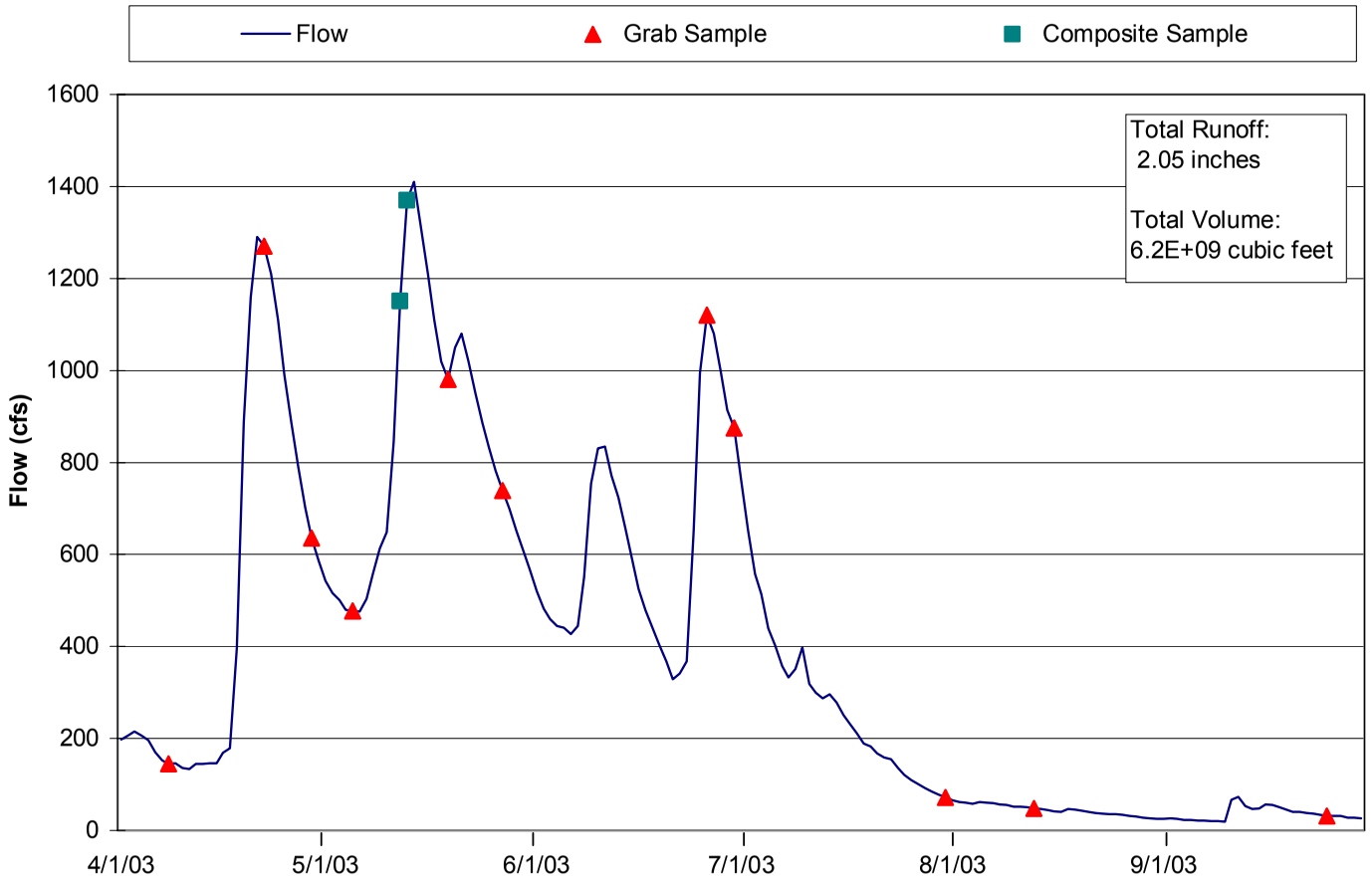
Site Location

The Cottonwood River site, PLC001, is located in SW ¼, NE ¼ Section 33 T. 110N, R. 30W, Brown County, within the city of New Ulm, MN. This site is approximately 500 yards downstream from the USGS stream gaging station 05317000. The drainage area is 1,312 square miles or 840,000 acres.

Sampling and Loading Results for the Cottonwood River

There were thirteen samples collected at the Cottonwood site PLC001 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000, 2002 and 2003 can be found at Appendix E. Figure D.08 presents the Cottonwood River hydrograph for 2003.

Figure D.08 Cottonwood River 2003 Hydrograph with Sampling Information



Little Cottonwood River

Little Cottonwood River Watershed Project
Brown Nicollet Cottonwood Water Board
322 So. Minnesota Ave.
St Peter, MN 56082
Phone: 507-934-4140
Fax: 507-934-8958
Contact: Kevin Kuehner, Program Director
kuehnbnc@mnic.net
Scott MacLean
maclebnc@mnic.net

Monitoring Began: 1998

Project Summary

Three water quality monitoring sites were established on the Little Cottonwood River in 1989 as part of the Brown-Nicollet-Cottonwood Groundwater Quality Analysis Project. These sites were monitored until 1994. In 1996, monitoring efforts intensified as part of a resource investigation project titled Middle/Lower Minnesota Assessment Project. Four monitoring sites were established. The Little Cottonwood River Restoration Project received Clean Water Partnership funds from the MNPCA in 1997 to perform a diagnostic study. Following completion of the four year diagnostic study, the LCR project received Phase II funding in 2001 from the MNPCA. For the implementation phase of the project, water quality samples are still taken at two of the four monitoring sites.

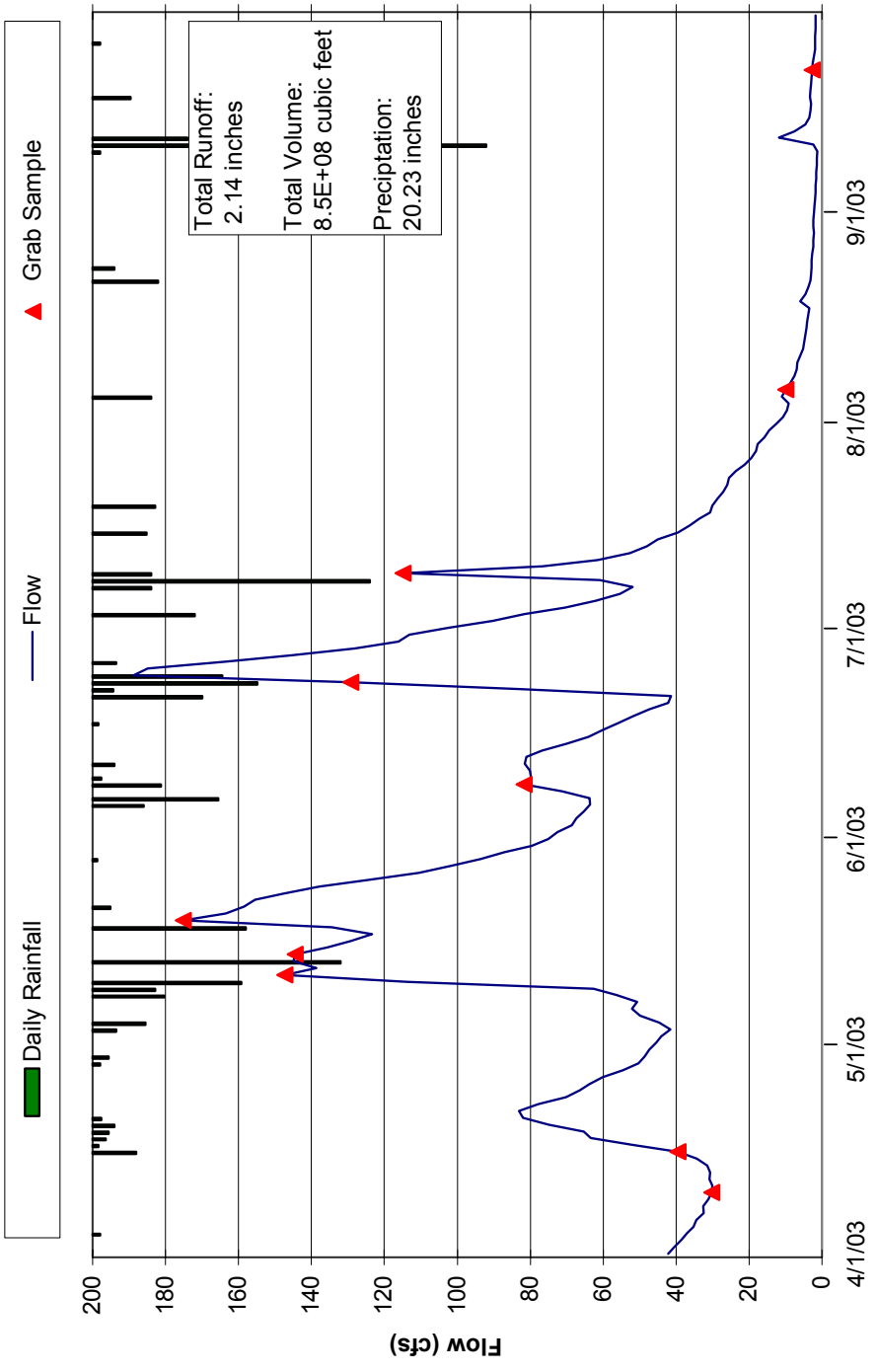
Site Location

Site 4 is located in SW ¼, NE ¼, Sec 17 T.109N, R. 29W, which is two miles south of Courtland, MN on unnamed Blue Earth County gravel road, just off of MN Highway 68. This is a USGS stream gaging station 05317200 that is slated for discontinuation on Oct. 1, 2003. This site has a drainage area of 170 square miles or 108,760 acres.

Sampling and Loading Results for the Little Cottonwood River

There were ten samples collected at the Little Cottonwood Site 4 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2002 and 2003 can be found at Appendix E. Figure D.09 presents the Little Cottonwood River hydrograph for 2003.

Figure D.09 Little Cottonwood River 2003 Hydrograph with Rainfall and Sampling Information



Watonwan River

Watonwan River Phase II CWP
1230 South Victory Drive
Mankato, MN 56001
Phone: 507-389-1648
Fax: 507-389-5422
Contact: Pat Baskfield, Minnesota Pollution Control Agency
Pat.baskfield@pca.state.mn.us

Monitoring Began: 2000

Project Summary

During 2000, the Watonwan River entered the second phase of the Clean Water Partnership. Five sites were re-established along the Watonwan River to monitor the North Fork of the Watonwan, the western Mainstem, Butterfield and St. James Creeks, the South Fork and the Outlet by Garden City. Electronic monitoring equipment was installed to measure stage, several flow measurements were taken to update or verify existing rating curves and many grab samples were collected throughout the season so nutrient loads and concentrations could be computed. The additional information collected is being used to gain additional knowledge and gain a better understanding of the long term water quality and quantity trends of the Watonwan River.

The spring of 2003 marked the fourth year of the second phase of the Watonwan River Clean Water Partnership.

Site Location

The Watonwan Outlet (WO) is located in SW¼ NE¼ Sec.28, T.107 N., R.28 W, Blue Earth County. This site was previously referred to as WP1 during the Phase I CWP. This site is located on the left bank 25 ft downstream from bridge on Blue Earth County Rd 13, 1.5 miles west of Garden City, 7.3 miles upstream from mouth, and 9.2 miles downstream from Perch Creek. This is also a USGS stream gaging station 05319500. Drainage area for the entire watershed is approximately 812 square miles or 544,533 acres.

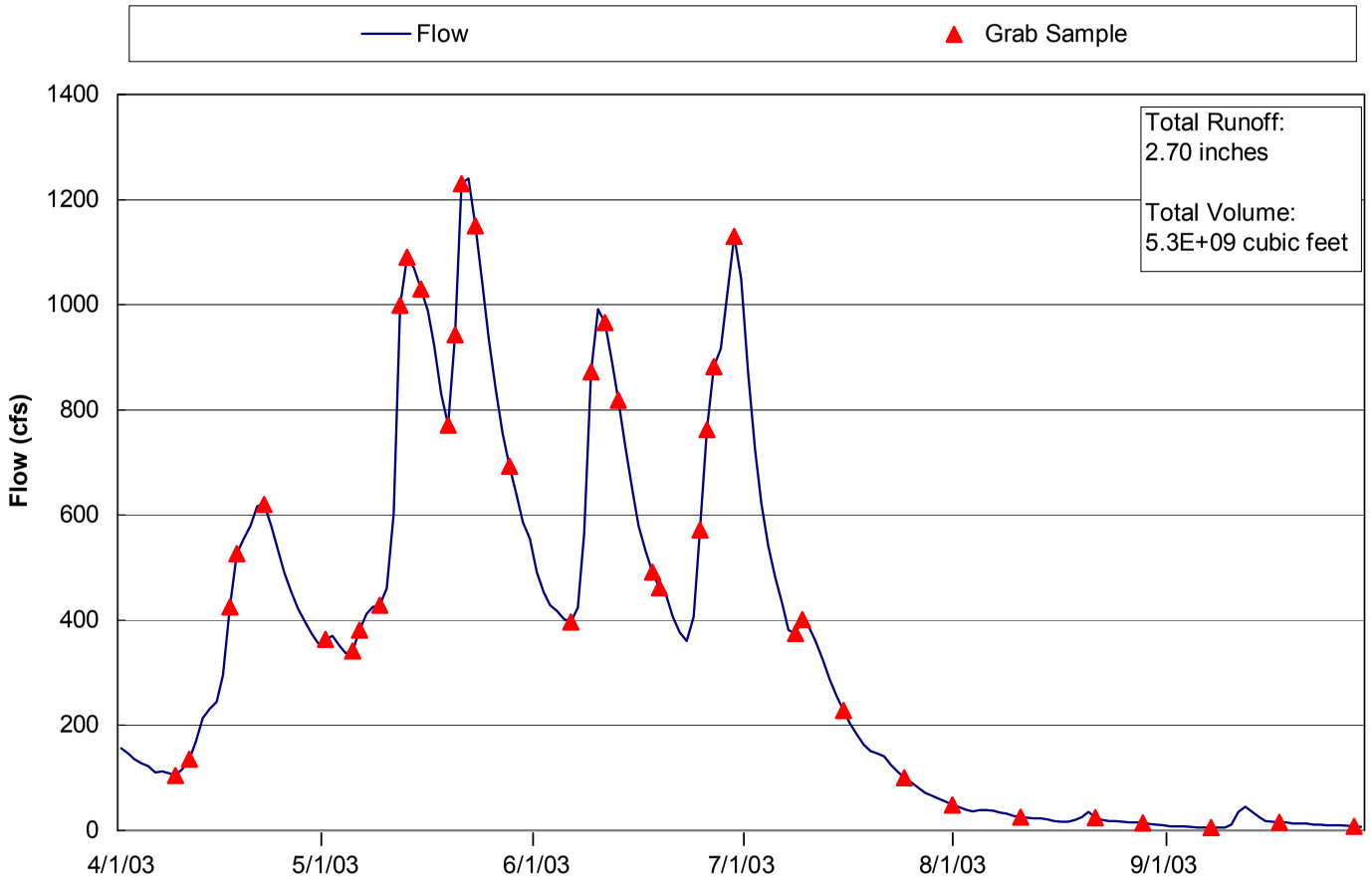
2003 Monitoring Season Results

The sampling regime was fairly complete. The falling limb of a major flow event, which occurred in late June and early July, was missed. Snowpack for the 2003 monitoring season was well below average. As a result snowmelt runoff was minimal.

Sampling Results for Watonwan River

There were thirty-eight grab samples collected at the Watonwan outlet site WO in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.10 presents the Watonwan River hydrograph for 2003.

Figure D.10 Watonwan River 2003 Hydrograph with Sampling Information



Dutch Creek

Martin County Environmental Services Department
Martin County Courthouse
201 Lake Avenue
Room 100
Fairmont, MN 56031
Phone: 507-238-3227
Fax: 507-238-3136

Contact: Darren Newville

Monitoring Began: 1999

Project Summary

Purpose:
To evaluate and make targeted improvements to water quality within the watershed.

Goals:
- To determine the nutrient and sediment loads coming from the Dutch Creek Watershed into the Fairmont Chain of Lakes. (The City of Fairmont obtains their drinking water from Budd Lake located in the Chain of Lakes and experiences taste and odor problems associated with algal blooms.)
- To determine the possible sources of the loading and implement practices to reduce the loads.
- To continue monitoring efforts and evaluate the success of implementation measures.

Project monitoring began in 1999 with grab sampling. In 2000, the sampling location changed, and an automatic sampling station was used.

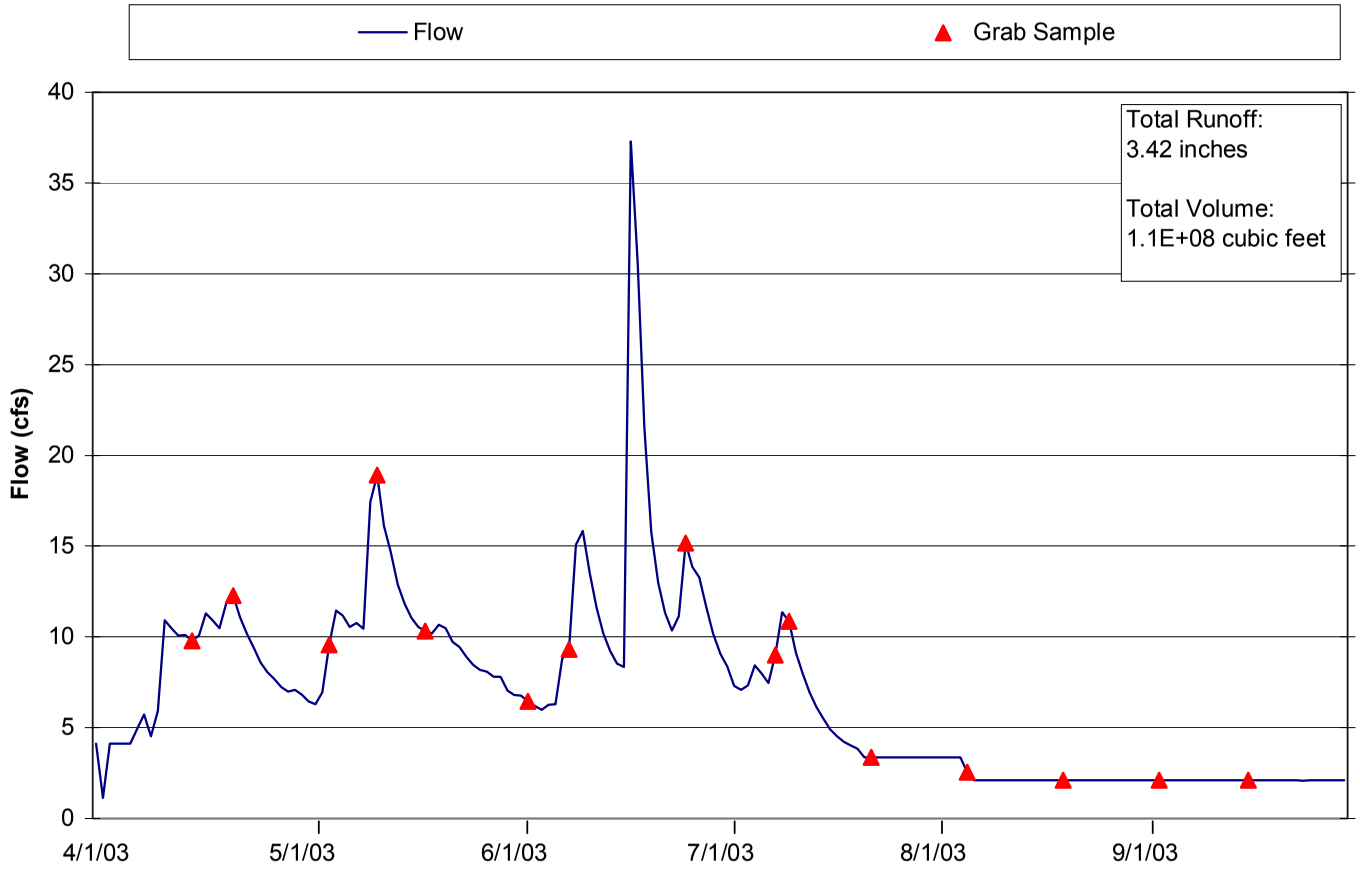
Site Location

The Dutch Creek site is located in NW¼ Sec. 24, 102N R31W, Martin County. The Dutch Creek Watershed (30072) is located in the Blue Earth River Watershed. It is located west of Fairmont and is part of the watershed that feeds the Fairmont Chain of Lakes, and eventually Center Creek. Drainage area for the entire watershed is approximately 13.52 square miles or 8,653 acres.

Sampling and Loading Results for Dutch Creek

There were fifteen grab samples collected at the Dutch Creek site in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.11 presents the Dutch Creek hydrograph for 2003.

Figure D.11 Dutch Creek 2003 Hydrograph with Rainfall and Sampling Information



Blue Earth, Le Sueur, and MN River at Judson and St. Peter

Water Resources Center at Minnesota State University, Mankato
Minnesota Department of Agriculture, Monitoring and Assessment
Mankato Field Office
184 Trafton Science Center South
Mankato, MN 56001
Contact: Zachary Pagel
zachary.pagel@mnsu.edu
Bill Van Ryswyk, MDA, Hydrologist
Phone: 507-389-5772
Fax: 507-389-5712
Bill.Vanryswyk@state.mn.us

Monitoring Began: 1999

Project Summary

In February 1999, the Minnesota Department of Agriculture (MDA) and the Metropolitan Council Environmental Services (MCES) established a surface water quality monitoring field office in Mankato. The office serves as a central location for the operation and maintenance of long-term monitoring stations located on the main stem of the Minnesota River, and near the Blue Earth and Le Sueur River Watershed outlets as well as on several other smaller tributaries. This effort is part of the "Interagency Water Monitoring Initiative" funded by the Minnesota legislature in 1997.

The MCES monitoring initiative is known as the "Minnesota River Watershed Monitoring Program" with the Mankato office focusing on the collection of hydraulic, sediment and nutrient data. The objective of this program is to focus on conventional water quality pollutants contributing to exceedances of water quality standards/criteria and impairment of designated uses in the Minnesota River Basin.

The primary goal of MDA Surface Water Monitoring Program is to quantify the long-term trends associated with normal pesticide use on surface water quality in the Minnesota, Blue Earth and Le Sueur Rivers. In 2003 the MDA monitored for 26 different pesticides (including herbicides, insecticides and breakdown products) commonly used in agriculture and on lawns and gardens as well as selected nutrients. Understanding how the routine use of pesticides impacts water quality is critical in determining how to best manage pesticides and pesticide application to minimize surface water impact. An MDA standard analyte list is presented under the Water Sample Analysis Section.

Effective January 1, 2005, the Minnesota River Watershed Monitoring Program was transferred from MCES to the Water Resources Center at Minnesota State University, Mankato. The WRC will be taking over the responsibility for running the program. MCES will continue to provide laboratory support for the project.

Water Sample Analysis
Metropolitan Council Environmental Services (MCES) samples were transported by project personal to the MCES Laboratory Services Section in St. Paul, MN. Each sample was analyzed for water transparency, total and volatile suspended solids, turbidity, alkalinity, hardness, metals, chlorides, nitrogen, phosphorus, chlorophyll-a, total organic carbon (TOC), chemical oxygen demand (COD), and biochemical oxygen demand (BOD). For a complete list, see Table D.01.

Table D.01. MCES Analyte list

Alkalinity
Chloride
Total Chlorophyll a
Total Chromium
Total Copper
Hardness
Total Lead
Total Nickel
Nitrate + Nitrite
Dissolved Othro-phosphorus
Sulfide
Total Suspended Solids
Biological Oxygen Demand
Total Kjehldahl Nitrogen
Total Organic Carbon
Dissolved Phosphorus
Total Phosphorus
Volatile Suspended Solids
Total Zinc

MDA samples were typically hand delivered or next day shipped to the MDA laboratory in St. Paul. Analysis at the MDA laboratory includes pesticides, nitrate-N, ammonia, total phosphorus and ortho-phosphorus. Pesticide analysis consists of base neutral pesticide analysis for all samples collected throughout the year and acid herbicides are run from early May through October. Acid herbicide analysis is discontinued during the winter and early spring months because the concentration of these compounds typically drops below detection levels. For a complete list of analytes, see Table D.02.

Table D.02. MDA's analyte list

PESTICIDE	METHOD	REPORTING LIMIT (ug/l)
ACETOCHLOR	BASE NEUTRAL	0.05
ALACHLOR	BASE NEUTRAL	0.05
ATRAZINE	BASE NEUTRAL	0.05
CHLOROTHALONIL	BASE NEUTRAL	0.12
CHLORPYRIFOS	BASE NEUTRAL	0.10
CYANAZINE	BASE NEUTRAL	0.20
DEETHYLATRAZINE	BASE NEUTRAL	0.05
DEISOPROPYLATRAZINE	BASE NEUTRAL	0.20
DIAZINON	BASE NEUTRAL	0.12
DIMETHENAMID	BASE NEUTRAL	0.05
DIMETHOATE	BASE NEUTRAL	0.22
EPTC	BASE NEUTRAL	0.23
FONOFOS	BASE NEUTRAL	0.10
MALATHION	BASE NEUTRAL	0.09
METHYL PARATHION	BASE NEUTRAL	0.12
METOLACHLOR	BASE NEUTRAL	0.07
METRIBUZIN	BASE NEUTRAL	0.10
PENDIMETHALIN	BASE NEUTRAL	0.08
PHORATE	BASE NEUTRAL	0.12
TERBUFOS	BASE NEUTRAL	0.19
TRIFLURALIN	BASE NEUTRAL	0.17

Le Sueur River

Site Location

The Le Sueur River monitoring site (LE 1.3) is located in T108, R27, S34, within the Red Jacket Trail County Park, 20 feet downstream from the MN Hwy 66 bridge, South Bend Township, Blue Earth County. This station is 1 mile downstream from the USGS stream gaging station 05320500. The drainage area is 1,100 square miles or 710,400 acres. Both MDA and MCES maintain this station.

2003 Monitoring Year Results

Snowmelt began during the second week of March 2003. Like 2002, spring runoff was again minimal in 2003. The peak daily average flow during the 2003 snowmelt period was 920 cfs. Only 1.91 inches of rainfall were recorded at the monitoring station in April 2003, but 3.85 inches were recorded in May. The peak daily average flow of 3,829 cfs occurred on May 15, 2003. After the last runoff event in early August, the river receded slowly and remained at baseflow for the remainder of the year. Runoff event-based composite sampling began in late March 2003 and continued into mid-July. A composite sample collected on May 15, at the peak of the hydrograph for the largest runoff event of the year, had the highest total suspended solids (TSS) concentration (958 mg/L) of all 2003 samples. After the last runoff event in early August, grab samples were obtained for the remainder of the year.

Sampling and Loading Results for Le Sueur River

MCES colleted 18 grab samples and 13 composite samples collected at the Le Sueur River station in 2003. MDA collected 29 samples of which 14 were composites.

Although some of the analysis (nitrate-N and phosphorus) completed by these two agencies seems redundant, the resulting data has allowed for evaluation of variability between laboratories, sampling methods and data analysis protocols that would not have been possible without the duplicate sampling. These efforts have resulted in better basin-wide communication, coordination and evaluation on field and laboratory methodologies and an overall improvement in data consistency across the Basin.

Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.12 presents the Le Sueur River hydrograph for 2003.

Blue Earth River

Site Location

The Blue Earth River (BU 12.0) monitoring site is located in T107, R 27, Sec 6, Rapidan Township, on the left bank 0.2 miles downstream from Rapidan Dam, 2 miles west of Rapidan, MN, Blue Earth County. This is also a USGS stream gaging station 05320000. The drainage area is approximately 2,430 square miles or 1,555,270 acres. Both MDA and MCES maintain this station.

2003 Monitoring Year Results

Snowmelt began during the second week of March 2003. The peak daily average flow of 4,700 cfs, with a stage of 6.14 feet, occurred on May 15, 2003. After the last runoff event in early August, the river receded slowly and remained at baseflow for the remainder of the year.

Event-based composite sampling began at the end of March 2003 and continued until mid-July. A composite sample collected on the rising hydrograph of an extended May runoff event had the highest total suspended solids (TSS) concentration (488 mg/L) of all 2003 samples. After the last runoff event in early August, grab samples were obtained for the remainder of the year.

Sampling and Loading Results for Blue Earth River

There were 14 grab samples and 13 composite samples were collected at the Blue Earth station in 2003 by MCES. MDA collected 26 samples of which 16 were composites. Although some of the analysis (nitrate-N and phosphorus) completed by these two agencies seems redundant, the resulting data has allowed for evaluation of variability between laboratories, sampling methods and data analysis protocols that would not have been possible without the duplicate sampling. These efforts have resulted in better basin-wide communication, coordination and evaluation on field and laboratory methodologies and an overall improvement in data consistency across the Basin.

Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Figure D.13 presents the Blue Earth River hydrograph for 2003.

Minnesota River at Judson

Site Location

The Minnesota River monitoring site near Judson, MN (MI 120.0), is located at T109, R28, S33, at the Minnesota Department of Natural Resources boat landing near Nicollet County Road 23, Nicollet Township, Nicollet County. The drainage area is approximately 11,230 square miles or 7,186,921 acres. Both MDA and MCES maintain this station.

2003 Monitoring Year Results

Snowmelt began during the second week of March 2003. The peak daily average flow of 6,600 cfs occurred on May 21, 2003. After the last runoff event in late July, the river receded slowly and remained at baseflow for the remainder of the year.

Due to a sampler pump problem, there were only grab samples collected at this location. A grab sample collected on the rising hydrograph of an April runoff event had the highest total suspended solids (TSS) concentration (191 mg/L) of all 2003 samples. After the last runoff event in early August, grab samples were obtained for the remainder of the year.

Sampling and Loading Results for the Minnesota River at Judson

MCES collected 23 grab samples at the Minnesota River at Judson in 2003. MDA collected 20 grab samples. Although some of the analysis (nitrate-N and phosphorus) completed by these two agencies seems redundant, the resulting data has allowed for evaluation of variability between laboratories, sampling methods and data analysis protocols that would not have been possible without the duplicate sampling. These efforts have resulted in better basin-wide communication, coordination and evaluation on field and laboratory methodologies and an overall improvement in data consistency across the Basin.

Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.14 presents the Minnesota River at Judson hydrograph for 2003.

Minnesota River at St. Peter

Site Location

The Minnesota River monitoring site in St. Peter, MN (MI 89.7) is located at T110, R26, Sec21, Oshawa Township, Nicollet County. This site in St. Peter is located behind the Chamber of Commerce building near the MN Highway 99 bridge. The drainage area represented by this site is approximately 15,054 square miles or 9,634,760 acres. It encompasses 11 of the 12 major watersheds in the Minnesota River Basin. MCES maintains this station.

2003 Monitoring Year Results

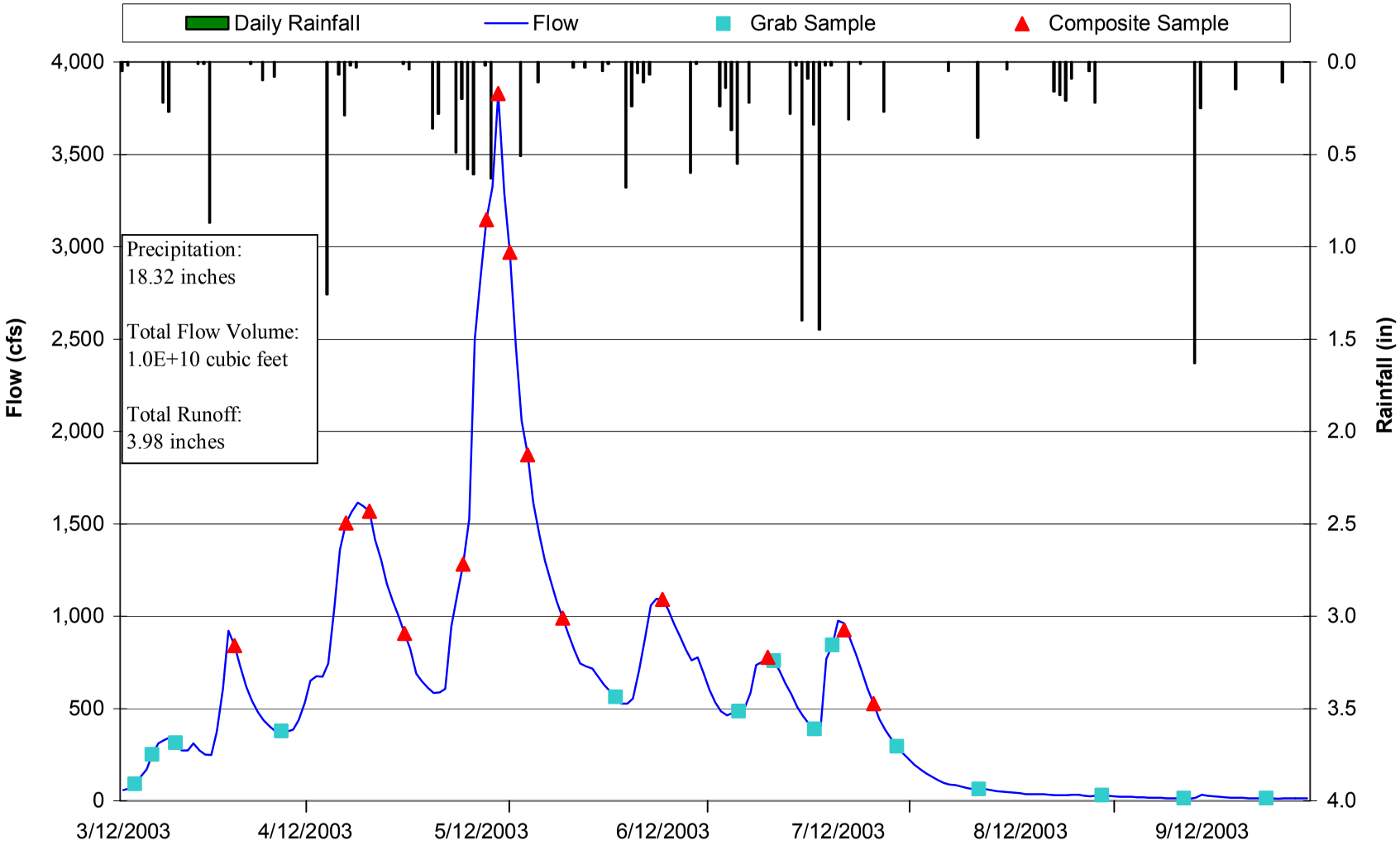
Snowmelt began during the second week of March 2003. The peak daily average flow of 14,100 cfs occurred on May 15, 2003. After the last runoff event in late July, the river receded slowly and remained at baseflow for the remainder of the year.

There were five different composite events collected in 2003. A composite sample collected on the rising hydrograph of a May runoff event had the highest total suspended solids (TSS) concentration (498 mg/L) of all 2003 samples. This sample also had the highest nitrate-N concentration for the season (13.28 mg/L) and the second highest total phosphorus concentration (.54 mg/L). After the last runoff event in early August, grab samples were obtained for the remainder of the year.

Sampling and Loading Results for the Minnesota River at St. Peter

There were 15 grab samples and 12 composite samples collected at the Minnesota River at St. Peter station in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.15 presents the Minnesota River at St. Peter hydrograph for 2003.

Figure D.12 Le Sueur River 2003 Hydrograph with Sampling Information



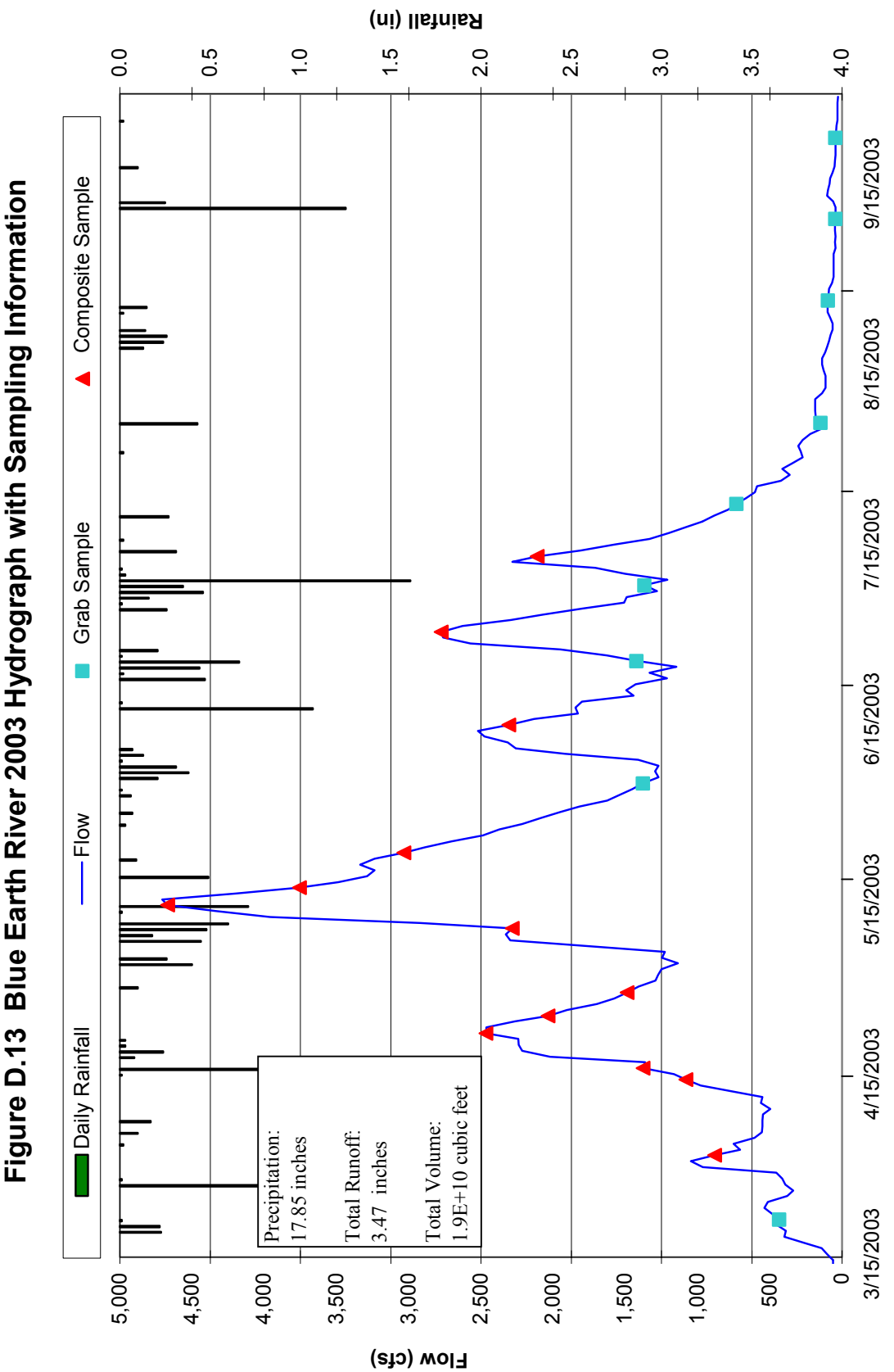


Figure D.13 Blue Earth River 2003 Hydrograph with Sampling Information
Daily Rainfall
Flow
Grab Sample
Composite Sample
Precipitation:
17.85 inches
Total Runoff:
3.47 inches
Total Volume:
1.9E+10 cubic feet
Flow (cfs)
Rainfall (in)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
3/15/2003
4/15/2003
5/15/2003
6/15/2003
7/15/2003
8/15/2003
9/15/2003

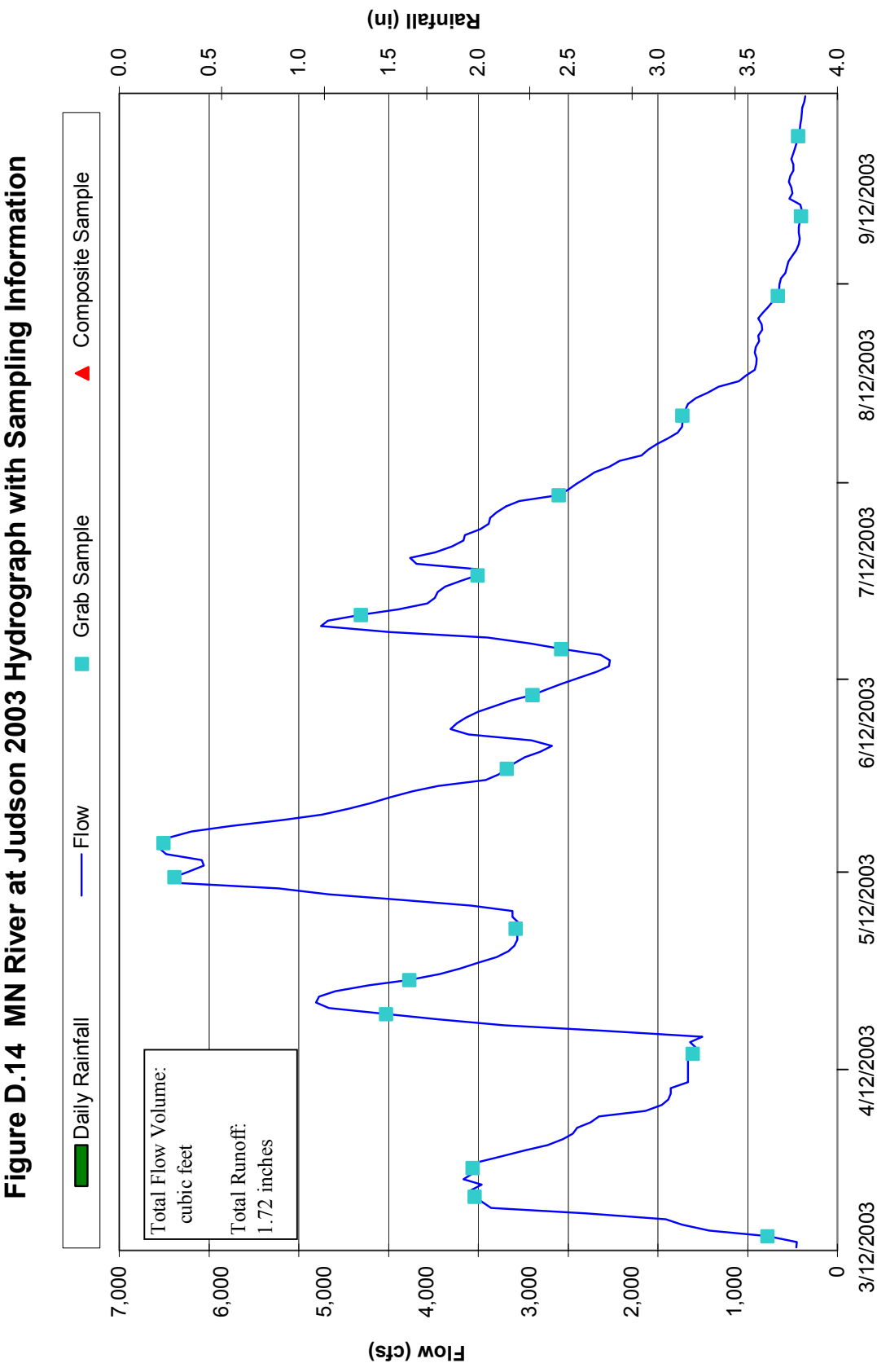
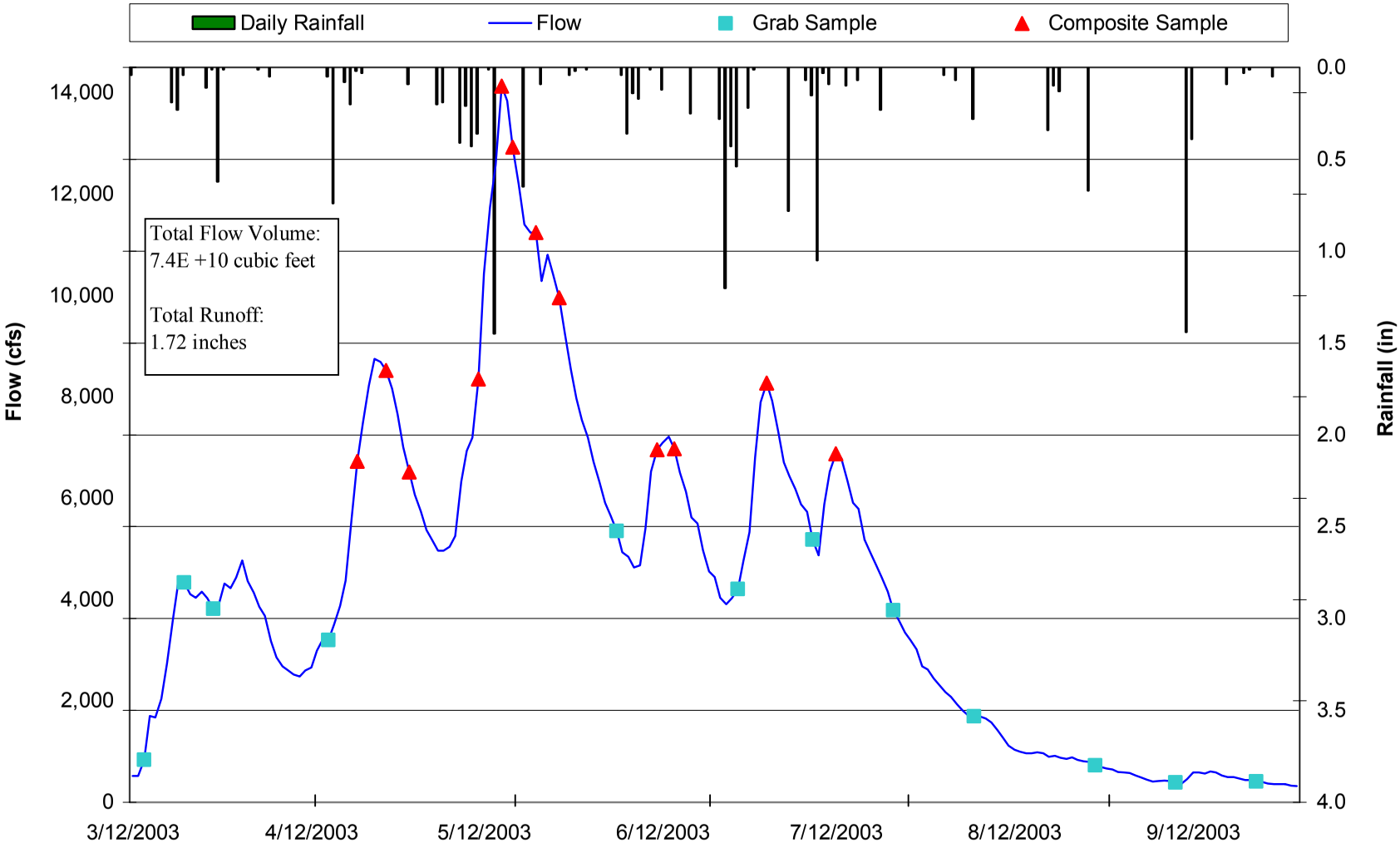


Figure D.14 MN River at Judson 2003 Hydrograph with Sampling Information
Daily Rainfall
Flow
Grab Sample
Composite Sample
Total Flow Volume:
cubic feet
Total Runoff:
1.72 inches
Flow (cfs)
Rainfall (in)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
3/12/2003
4/12/2003
5/12/2003
6/12/2003
7/12/2003
8/12/2003
9/12/2003

Figure D.15 MN River at St. Peter 2003 Hydrograph with Sampling Information



Seven Mile Creek

Seven Mile Creek Assessment Project
Brown Nicollet Cottonwood Water Board
322 So. Minnesota Ave.
St Peter, MN 56082
Phone: 507-934-4140
Fax: 507-934-8958
bnccwp@mnic.net
Contact: Kevin Kuehner, Program Director
kuehnbnc@mnic.net
To take a virtual tour of the watershed visit:
http://mrbdc.mankato.msus.edu/major/midminn/subshed/sevenmi/vtour/smvt_1.html

Monitoring Began: 1999

Project Summary

The Seven Mile Creek Watershed was chosen for a Water Quality Resource Investigation Grant following the 1990 Middle Lower Assessment Project funded through the Minnesota Pollution Control Agency. Monitoring was postponed in 1998 because of the tornado that struck St. Peter but resumed in earnest in 1999. The Seven Mile Creek project received Phase II CWP funding from the MPCA in 2002 which will allow for water quality monitoring for several more seasons.

The watershed is 23,551 acres in size and comprises about 3% of the Middle Minnesota Major watershed and covers 8% of Nicollet County. Monitoring in this watershed has taken place since the early 1990's. Since 1985, the ecological classification of the stream has been Class 1-D or a marginal trout fishery. With the start of the Middle Minnesota project in 2000, monitoring sites were established at the mouth of the watershed and the tow upper reaches to estimate loads within the Seven Mile Creek Watershed and its effect on the Minnesota River.

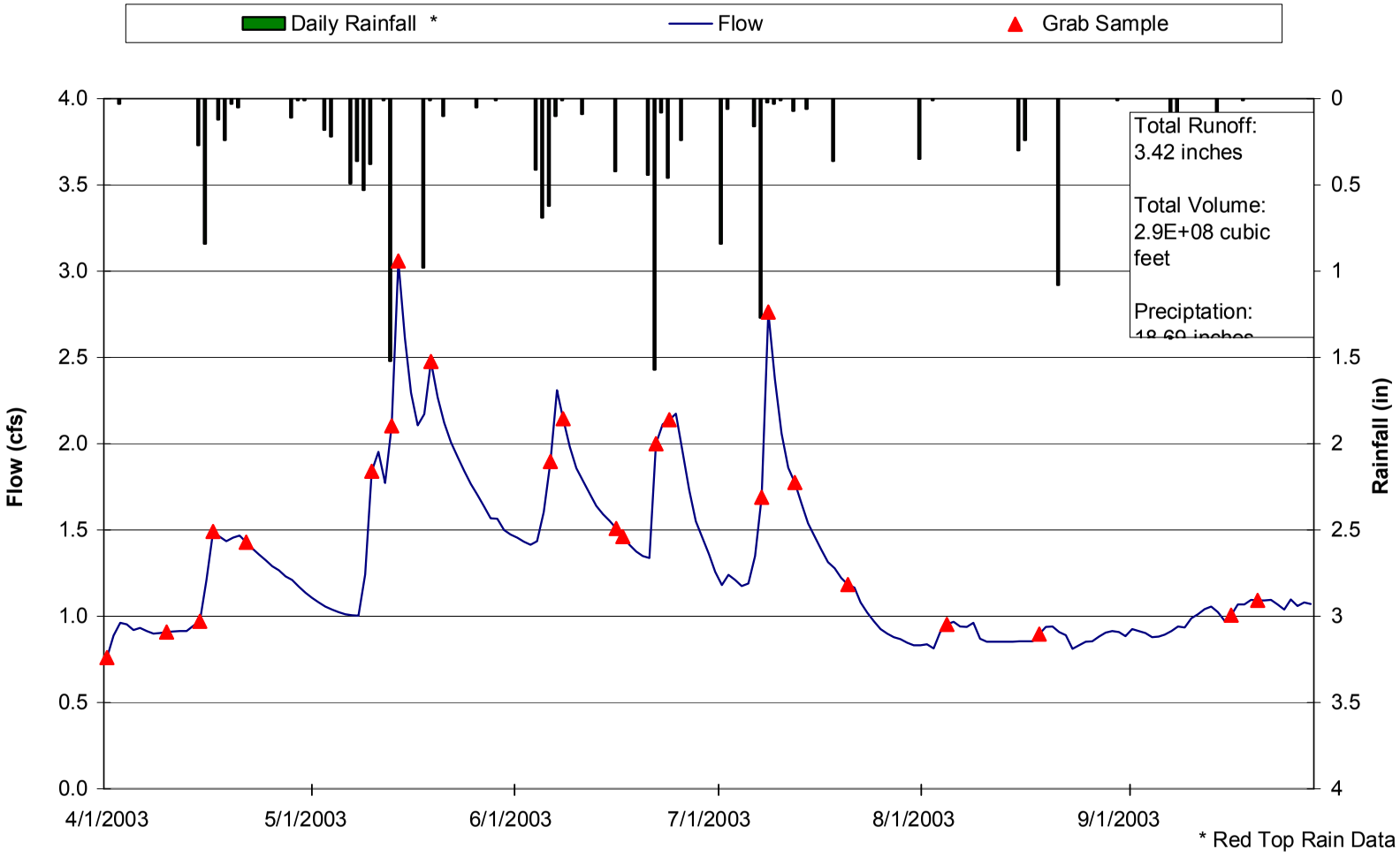
Site Location

The Seven Mile Creek monitoring site (Site 3) is located in T109, R27 Sec 12, NW1/4, SW1/4, Belgrade Township, Nicollet County, which is within the Seven Mile Creek County Park near the first footbridge. This is a mouth site, upstream of the first footbridge in the County Park. Stream flows are taken upstream of bridge about 50 yards. The drainage area is 37 square miles or 23, 551 acres.

Sampling Results for Seven Mile Creek

There were twenty-three samples collected at the Seven Mile Creek Site 3 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 to 2003 can be found at Appendix E. Figure D.16 presents the Seven Mile Creek hydrograph for 2003.

D.16 Seven Mile Creek 2003 Hydrograph with Rainfall and Sampling Information



Rush River

Rush River Assessment Project
111 6th Street, Gaylord, MN 55334
Phone 507-237-5435 ext. 105
Fax 507-237-5249
Contact: Scott Kudelka, Project Coordinator
scott.kudelka@mn.nacd.net
To take a virtual tour of the watershed, visit:
http://mrbdc.mnsu.edu/major/lowminn/subshed/rush/rr_index.html

Monitoring Began: 2003

Project Summary

The goal of the Rush River Assessment Project (RRAP) is to monitor the river to determine the amounts of sediments, nutrients and fecal coliform bacteria entering the river. It will also explore where these sediments and nutrients are coming from and how to reduce the amounts in the river to reach water quality standards by changing land use practices. A total of eight sites will be monitored for water quality three years, beginning in 2003. Five of the sites will also be monitored for flow for the duration of the project.

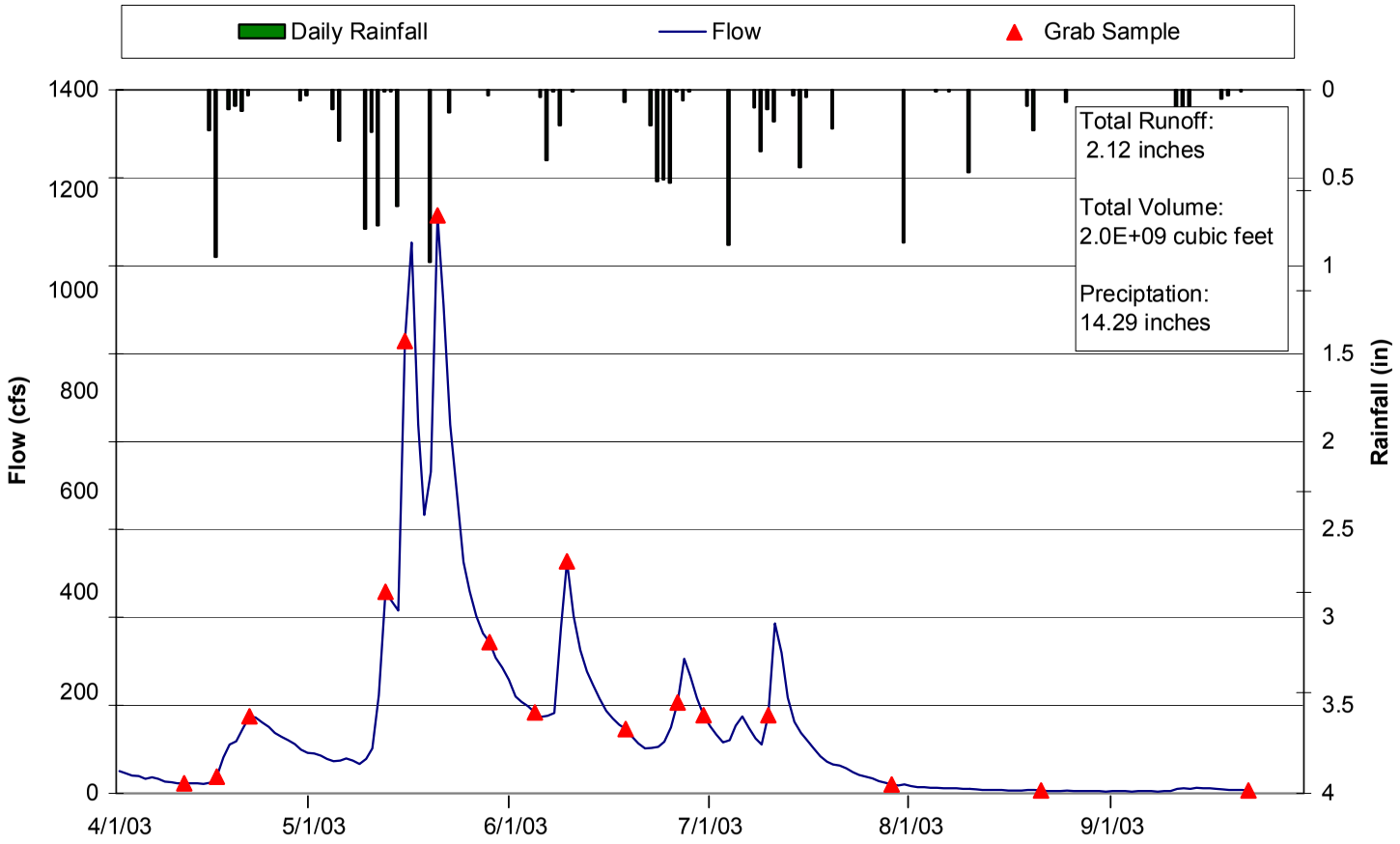
Site Location

The Rush River monitoring site (Site 1RP) is located in Sec. 24, T.112 N., R.26 W, two miles south of Henderson, on Hwy 93. It is also a USGS gaging station; site number 05326400. The equipment is placed on the downstream side of bridge.The drainage area is 403 square miles or 257,775 acres.

Sampling Results for the Rush River Watershed

There were sixteen grab samples collected at the Rush River Site 1RP in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2001 to 2003 can be found at Appendix E. Figure D.17 presents the Rush River hydrograph for 2003.

Figure D.17 Rush River 2003 Hydrograph with Rainfall and Sampling Information



High Island Creek

High Island Creek Watershed Assessment Project
PO Box 161
111 6th Street
Gaylord, MN 55334
Phone: (507) 237-5435 ext. 103
Fax: (507) 237-5249
http://cgee.hamline.edu/rivers/MRN/HIWAP/
Contact: Scott Matteson, Project Coordinator
scott.matteson@mn.usda.gov

Monitoring Began: 1999

Project Summary

The overall purpose of the diagnostic phase of the project is to obtain water quality data that will be used to implement land use changes to improve water quality. Flow data will be used in correlation with water quality data to determine loading at the five primary sampling sites. Quantity and quality data will also be used for future management of water quantity issues. The collected data will be used to determine priority areas to implement best management practices that will reduce sediment and nutrient loading to the High Island Creek. The data will also be used to create a plan that will work toward a reduction of fecal coliform bacteria in High Island Creek and its tributary, Buffalo Creek.

The goal of the Phase I Diagnostic Study is to assess the quality and quantity of water in the High Island Creek Watershed through a cooperative effort between local governments, state agencies, local residents/landowners and operators while promoting a viable economy for agriculture, industry and recreation.

Water Quality Characterization Goals

- Characterize sediment, phosphorus, nitrogen and bacteria concentrations and loading for the High Island Creek and its tributary, Buffalo Creek, during periods of baseflow and storm events.
- Identify land use and land use practices of the watershed, and correlate their relationship to observed water quality results.
- Identify the pathways of fecal coliform and nutrient loading into High Island Creek and Buffalo Creek.
- Develop load/concentration reduction goals for each parameter in the watershed.

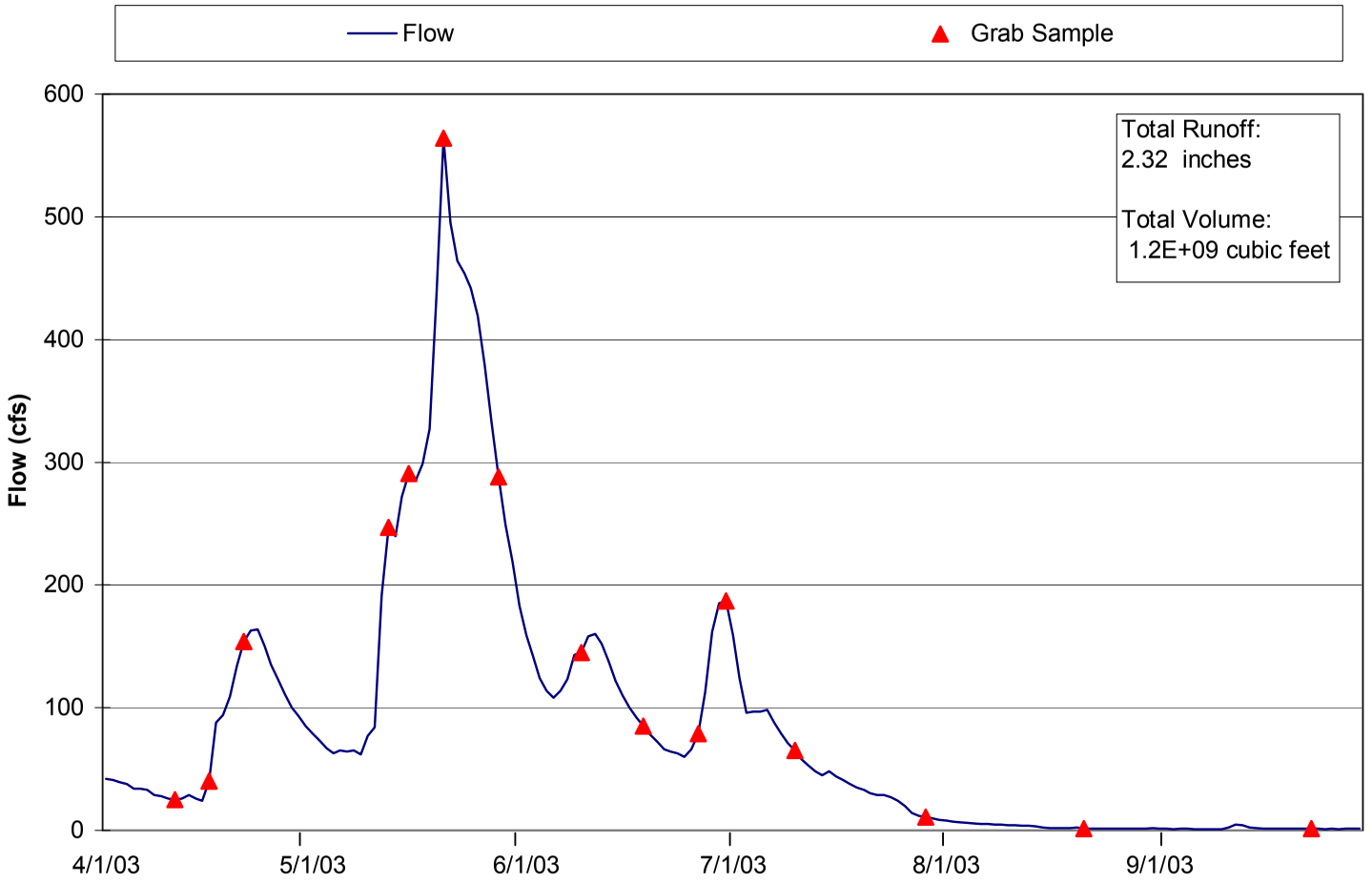
Site Location

The High Island Creek monitoring site (Site 10P) is located in T.113 N., R.26 W., Sec. 26, NE1/4, NW1/4, Sibley County, on left bank 20 ft downstream from bridge on County Road 6, 1.6 miles upstream from mouth, and 3.1 miles north of Henderson. The drainage area is 237 square miles or 152,150 acres.

Sampling Results for High Island Creek Watershed

There were twenty-one grab samples collected at the High Island Creek Site 10P in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2001 to 2003 can be found at Appendix E. Figure D.18 presents High Island Creek hydrograph for 2003.

Figure D.18 High Island Creek 2003 Hydrograph with Rainfall and Sampling Information



Lower Minnesota River Watershed monitored by MCES

Metropolitan Council Environmental Services
2400 Childs Road
St. Paul, MN 55106
http://www.metrocouncil.org/environment/RiversLakes/
Contact: Timothy Pattock
Phone: 651-602-8084
timothy.pattock@metc.state.mn.us or
Mike Ahlf
Phone: 651-602-8082
mike.ahlf@metc.state.mn.us

Monitoring Began: See Table 2.02

Project Summary

The MCES Stream Monitoring Program was initiated in the late 1980's. It was recognized at that time that point source pollution controls alone would be insufficient to attain the water quality goals of the Federal Clean Water Act, as amended through 1987, in the lower Minnesota River. To monitor the volume and water quality of major tributaries flowing to the lower Minnesota River in the TCMA, the first automonitoring sites were established in 1988 and 1989 on six tributaries (Bevens, Bluff, Carver, Credit, Nine Mile, and Sand) and at one mainstem location (Minnesota River at Jordan).

Site Locations

The Lower Bevens Creek monitoring site (BE 2.0) is located at the County Highway 40 Bridge, San Francisco Township, Carver County. The drainage area is approximately 131 square miles or 83,776 acres.

The Upper Bevens Creek monitoring site (BE 5.0) is located by Maplewood Road, Cologne, MN, Carver County. The drainage area is approximately 90.2 square miles or 57,727 acres.

The Sand Creek monitoring site (SA 8.2) is located at the Hwy 282 Bridge, Scott County, Jordan, MN. The drainage area is approximately 255 square miles or 163,071 acres.

The Carver Creek monitoring site (CA 1.7) is located ¾ of a mile west of Carver, MN, 50 ft. south of Carver County Highway 40. The drainage area is approximately 85 square miles or 54,440 acres.

The Bluff Creek monitoring site (BL 3.5) is located at 781 Flying Cloud Drive, Chanhassen, MN. The drainage area is approximately 8.9 square miles, or 5,724 acres.

The Credit Creek monitoring site (CR 0.9) is located at the 123rd St. Bridge in Savage, MN, Scott County. The drainage area is approximately 52 square miles or 32,896 acres.

The Nine Mile Creek monitoring site (NM 1.8) is located 1400 ft S of 106th St. at Central Park, Bloomington, MN, Hennepin County. The drainage area is approximately 38.3 square miles or 24,512 acres.

The Minnesota River at Jordan monitoring site (MI 39.4) is located at the bridge which intersects Hwy 9 in Scott County and Hwy 45 in Carver County, near Jordan, MN. This is a USGS station with hydrologic code 05330000. The drainage area is approximately 16,200 square miles or 10,389,757 acres.

2003 Monitoring Year for Lower Bevens Creek

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued into July; then baseflow conditions persisted until the end of the year. The peak daily average flow of 452 cfs occurred on May 20, 2003.

Thirty-four samples were collected for water quality analysis during 2003, including 14 composite samples and 18 grab samples. Samples were obtained throughout the year during varying stream flow conditions, to most accurately characterize Lower Bevens Creek water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2003 sampling scheme met the goals of the MCES monitoring work plan.

2003 Monitoring Year for Upper Bevens Creek

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued into July. From mid-August until the end of the year, no flow existed in the stream at this monitoring station. The remaining water pooled and eventually dried up completely.

The peak daily average flow of 249 cfs occurred on May 20, 2003. This runoff event also produced the highest total suspended solids (TSS) concentration (720 mg/l) measured at this station in 2003.

Twenty samples were collected for water quality analysis during 2003, including 13 composite samples and 7 grab samples. Until mid-August, when stream flow ceased, samples were obtained during varying flow conditions, to most accurately characterize Upper Bevens Creek water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). During the portion of year when stream flow existed, the 2003 sampling scheme met the goals of the MCES monitoring work plan. Baseflow grab samples could not be obtained from September through December, due to the lack of flow at the Upper Bevens Creek monitoring station.

2003 Monitoring Year for Carver Creek

Spring snowmelt began in mid-March, and the stream was ice free on March 17, 2003. Runoff event-based composite sampling began in mid-March and continued into late May, when the monitoring station was removed. A runoff event on May 23 produced a peak daily average flow of 171 cfs.

Despite the shortened monitoring season, twenty-two samples were collected for water quality analysis during 2003, including 11 composite samples and 11 grab samples. To the extent that road and bridge construction allowed access to the monitoring site, samples were obtained throughout most of the year during varying stream flow conditions, to most accurately characterize Carver Creek water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). Due to road and bridge construction, the 2003 sampling scheme did not meet the goals of the MCES monitoring work plan.

2003 Monitoring Year for Bluff Creek

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued through mid-July; then baseflow conditions persisted until the end of the year. A runoff event on May 11 produced a peak daily average flow of 36 cfs. This event generated the highest total suspended solids (TSS) concentration (2,430 mg/l) and the highest total phosphorus (TP) concentration (0.87 mg/l) measured at this station in 2003.

Sixteen samples were collected for water quality analysis during 2003, including 1 composite sample and 15 grab samples. Samples were obtained throughout the year during varying stream flow conditions, to most accurately characterize Bluff Creek water quality. Due to equipment problems caused by shifting gravel in the streambed, which occurred during periods of increased stream flow, only one composite sample was successfully collected. While composite sampling was not successful, grab samples were collected during runoff events whenever possible. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2003 sampling scheme did not fully meet the goals of the MCES monitoring work plan, based on the very limited number of composite samples obtained.

2003 Monitoring Year for Credit River

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued through mid-September. A runoff event on May 11 produced a peak daily average flow of 169 cfs. This event generated the highest total suspended solids (TSS) concentration (634 mg/l) measured at this station in 2003.

Twenty-three samples were collected for water quality analysis during 2003, including 3 composite samples and 20 grab samples. Due to continuing problems with flow monitoring equipment at the Credit River station during the first half of 2003, flow weighted composite samples were not collected during all runoff events, as stipulated by the MCES monitoring work plan. However, when composite sampling was not possible, grab samples were collected instead. Samples were obtained throughout the year during varying stream flow conditions, to most accurately characterize Credit River water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2003 sampling scheme did not fully meet the goals of the MCES monitoring work plan, based on the very limited number of composite samples obtained.

2003 Monitoring Year for Sand Creek

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued through mid-July; then baseflow conditions persisted until the end of the year. The peak daily average flow of 992 cfs occurred on May 12, 2003. This runoff event also produced the highest total suspended solids (TSS) concentration (4,380 mg/l) and the highest total phosphorus (TP) concentration (1.14 mg/l) measured at this station in 2003.

Thirty-three samples were collected for water quality analysis during 2003, including 12 composite samples and 21 grab samples. Samples were obtained throughout the year during varying stream flow conditions, to most accurately characterize Sand Creek water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2003 sampling scheme met the goals of the MCES monitoring work plan.

2003 Monitoring Year for Nine Mile Creek

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. Runoff event-based sampling began in mid-March and continued through mid-September. The peak daily average flow of 171 cfs occurred on June 28, 2003. Due to the large amount of impervious surface in the Nine Mile Creek Watershed, including storm drainage from the Interstate Highway 35W corridor, the stream hydrograph responds rapidly to rain events and is characterized by numerous sharp peaks.

Thirty-one samples were collected for water quality analysis during 2003, including 12 composite samples and 19 grab samples. Samples were obtained throughout the year during varying stream flow conditions, to most accurately characterize Nine Mile Creek water quality. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2003 sampling scheme met the goals of the MCES monitoring work plan.

2003 Monitoring Year for Minnesota River at Jordan

Spring snowmelt and ice-free stream conditions occurred in mid-March 2003. The peak daily average flow of 15,800 cfs occurred on May 17, 2003.

Fourteen grab samples were collected for water quality analysis during the monitoring season of 2003. There were no composite samples collected at this location, as bridge construction was being completed and the station was being constructed. The peak total suspended solids concentration came (278 mg/l) during a minor rainfall event in July. Samples were collected roughly every two weeks throughout the season.

Sampling and Loading Results for Bevens 2.0 and 5.0

There were 14 grab samples and 18 composite samples collected at Bevens 2.0 in 2003. There were seven grab samples and 13 composite samples collected at Bevens 5.0 in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2000 -2003 can be found at Appendix E. Figure D.19 and Figure D.20 presents the Bevens Creeks hydrograph for 2003.

Sampling and Loading Results for Sand Creek

There were 21 grab samples and 12 composite samples collected at Sand Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.21 presents the Sand Creek hydrograph for 2003.

Sampling and Loading Results for Carver Creek

Loading results for 2000 - 2002 can be found at Appendix E. .

Sampling and Loading Results for Bluff Creek

There were 15 grab samples and one composite samples collected at Bluff Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2000 – 2003 can be found at Appendix E. Figure D.22 presents the Bluff Creek hydrograph for 2003.

Sampling and Loading Results for Credit Creek

There were 20 grab samples and three composite samples collected at Credit Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2000, 2001 and 2003 can be found at Appendix E. Figure D.23 presents the Credit Creek hydrograph for 2003.

Sampling and Loading Results for Nine Mile Creek

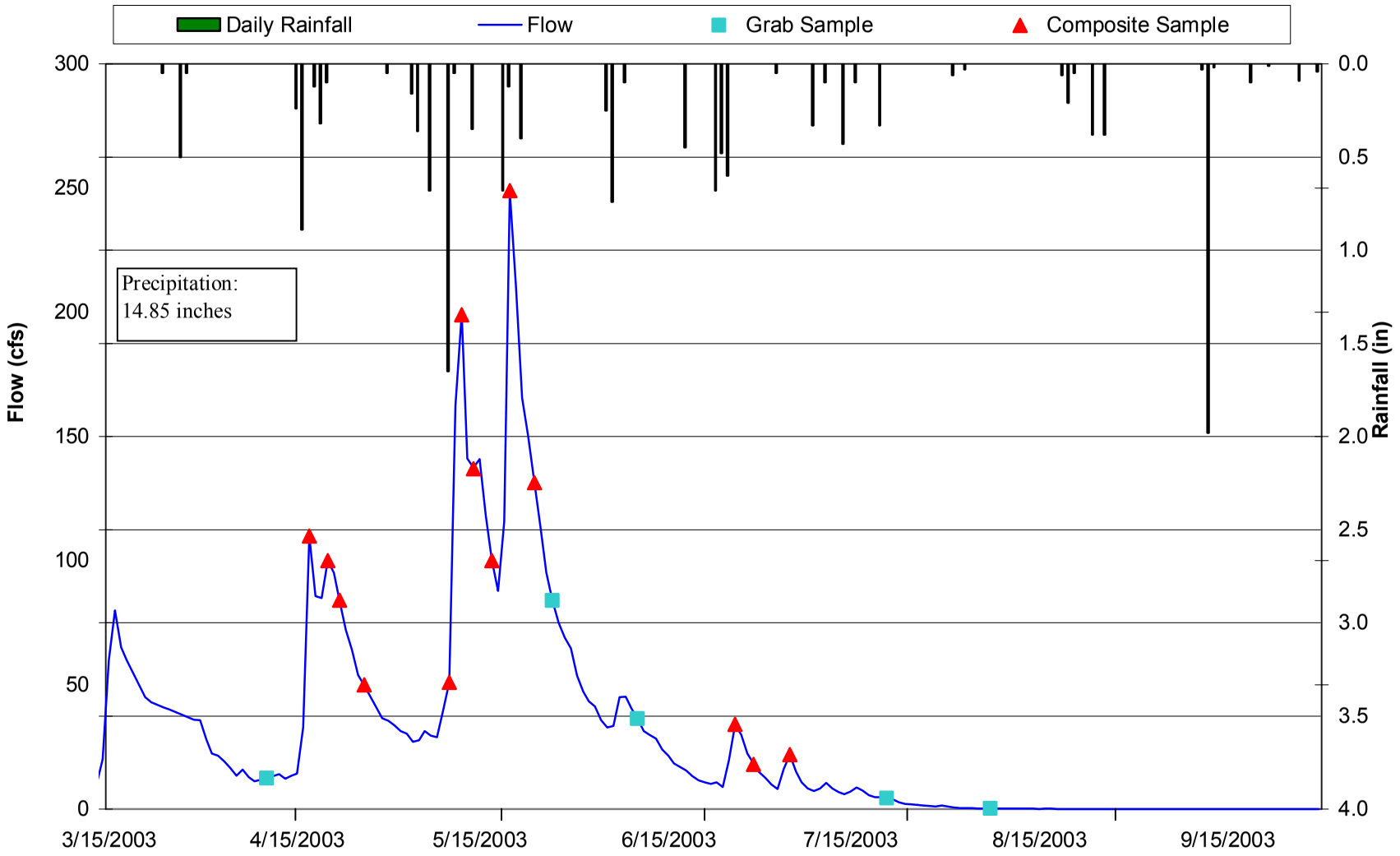
There were 19 grab samples and 12 composite samples collected at Nine Mile Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were

used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.24 presents the Nine Mile Creek hydrograph for 2003.

Sampling and Loading Results for the Minnesota River at Jordan

There were fourteen grab samples collected at the Minnesota River at Jordan. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 to 2003 can be found at Appendix E. Figure D.25 presents the Minnesota River at Jordan hydrograph for 2003.

Figure D.19 Upper Bevens Creek 2003 Hydrograph with Sampling Information



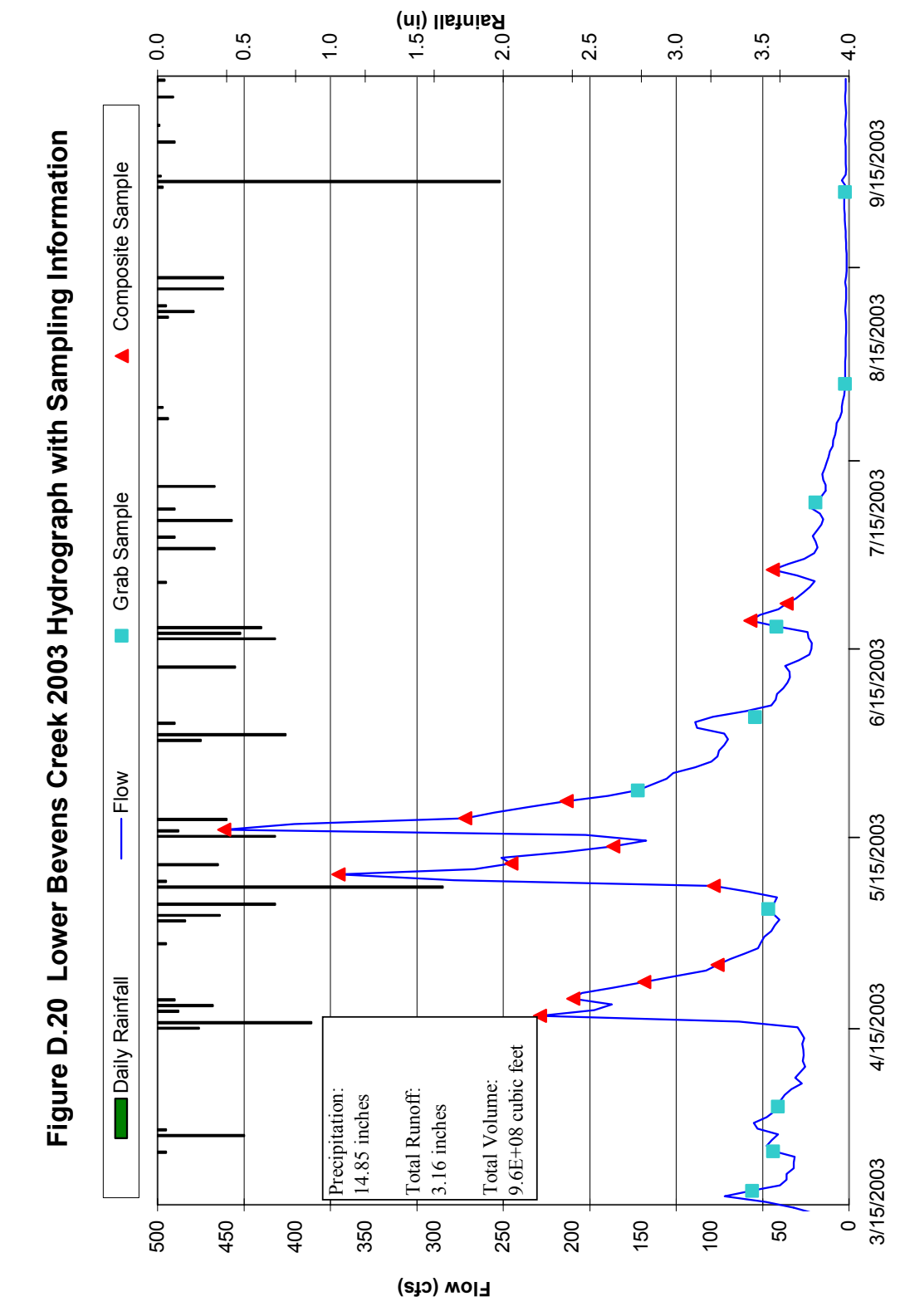


Figure D.20 Lower Bevens Creek 2003 Hydrograph with Sampling Information
Daily Rainfall
Flow
Grab Sample
Composite Sample
Precipitation:
14.85 inches
Total Runoff:
3.16 inches
Total Volume:
9.6E+08 cubic feet
Flow (cfs)
Rainfall (in)
0
50
100
150
200
250
300
350
400
450
500
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
3/15/2003
4/15/2003
5/15/2003
6/15/2003
7/15/2003
8/15/2003
9/15/2003

Figure D.21 Sand Creek 2003 Hydrograph with Sampling Information

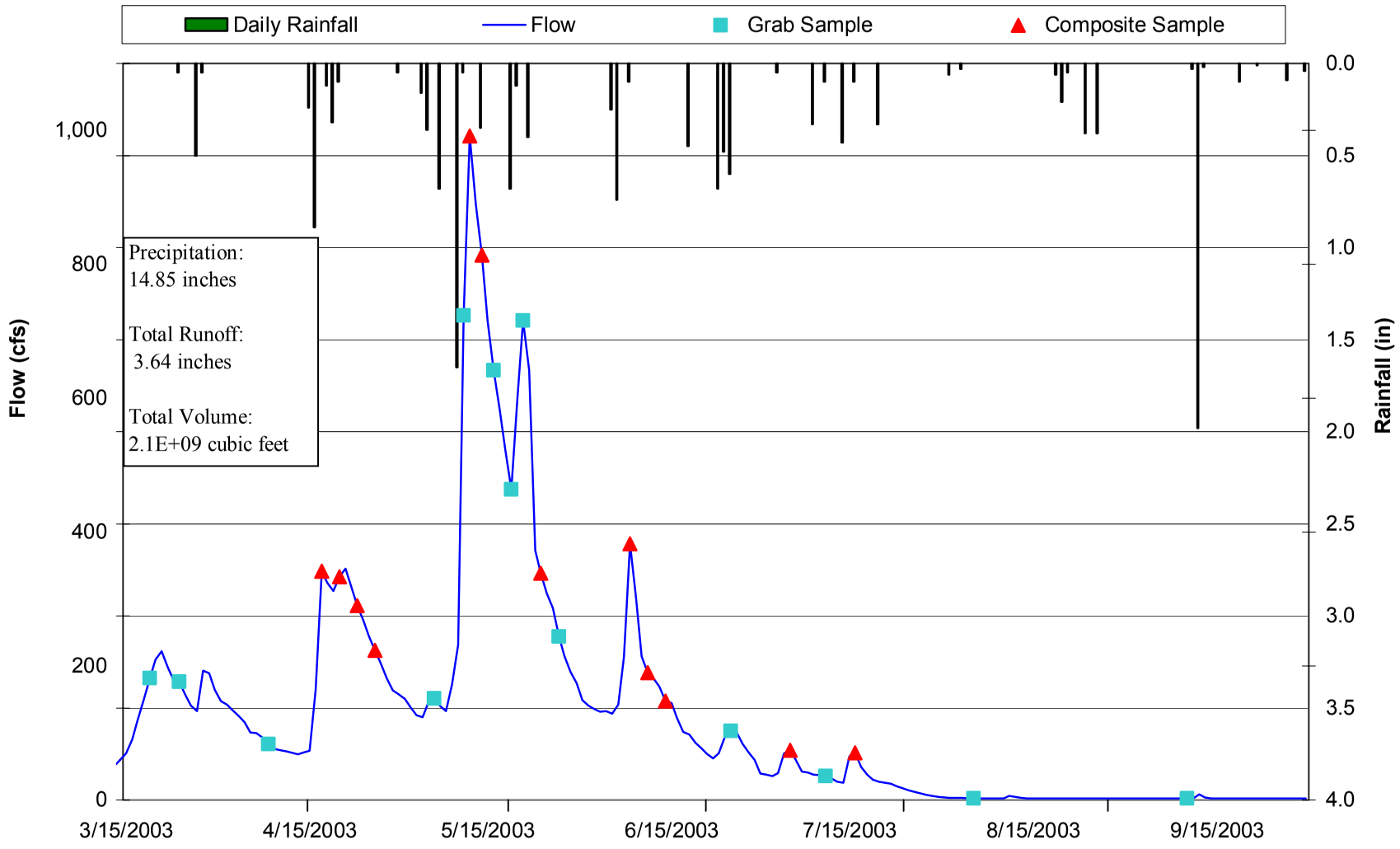


Figure D.22 Bluff Creek 2003 Hydrograph with Sampling Information

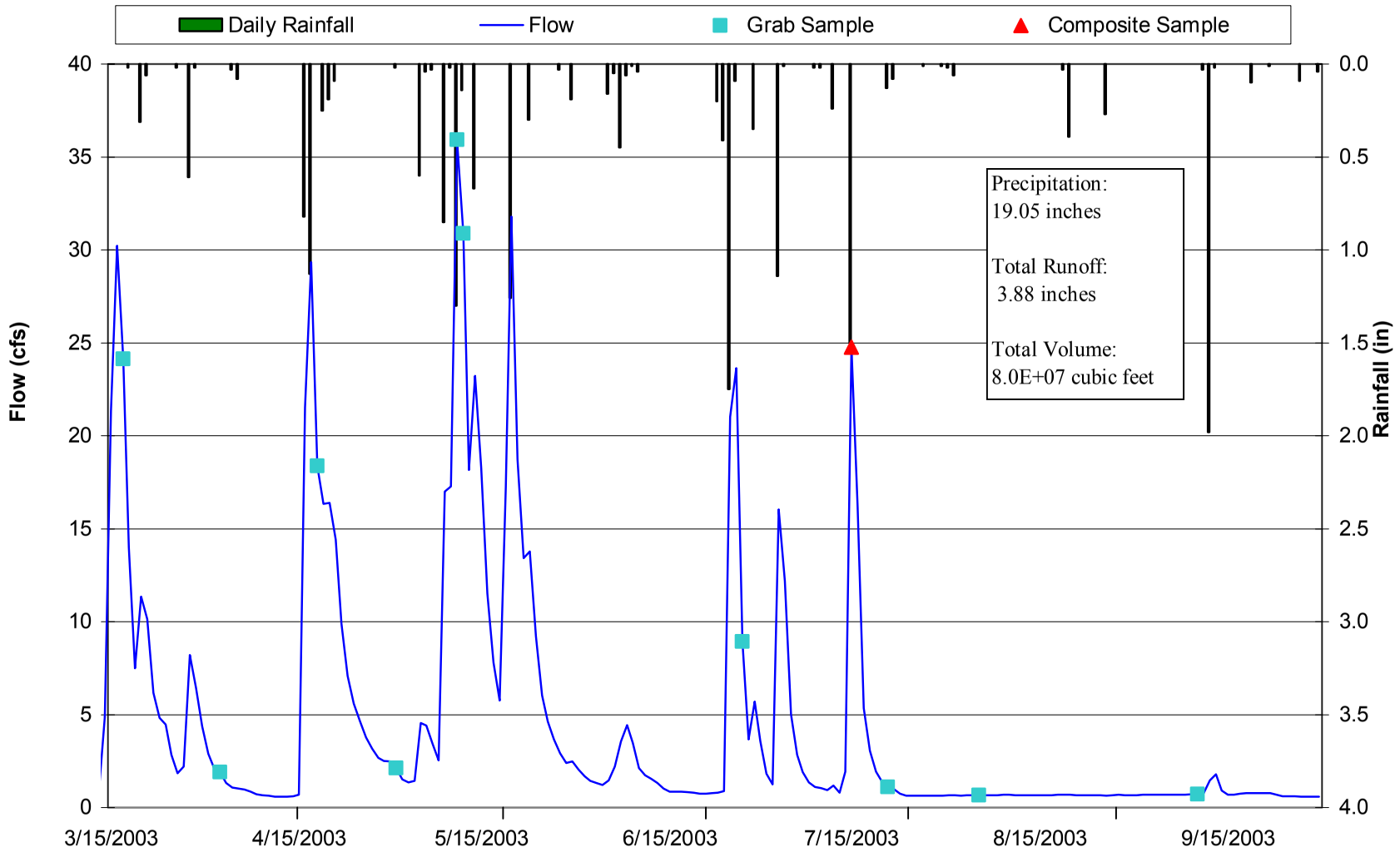
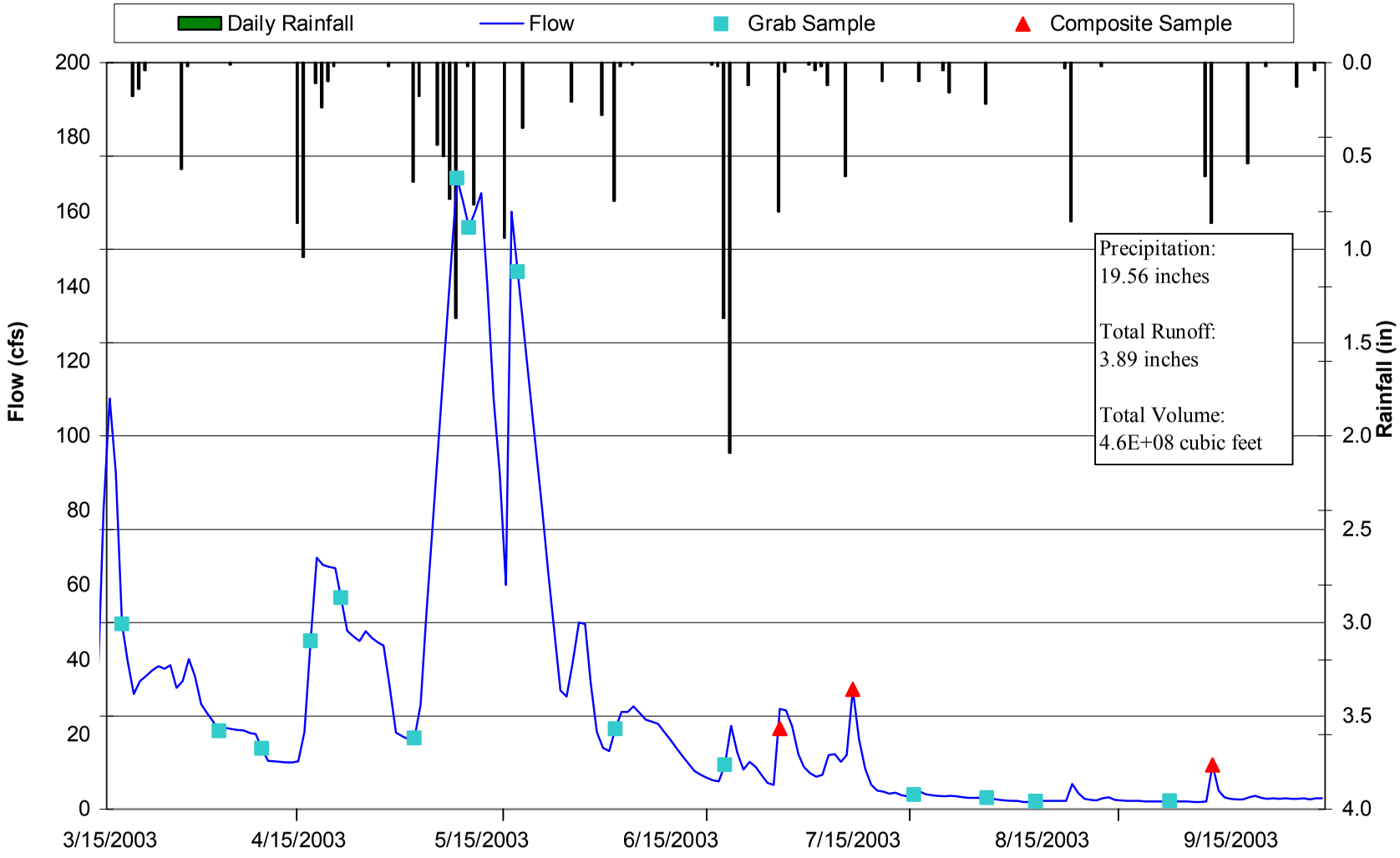


Figure D.23 Credit River 2003 Hydrograph with Sampling Information



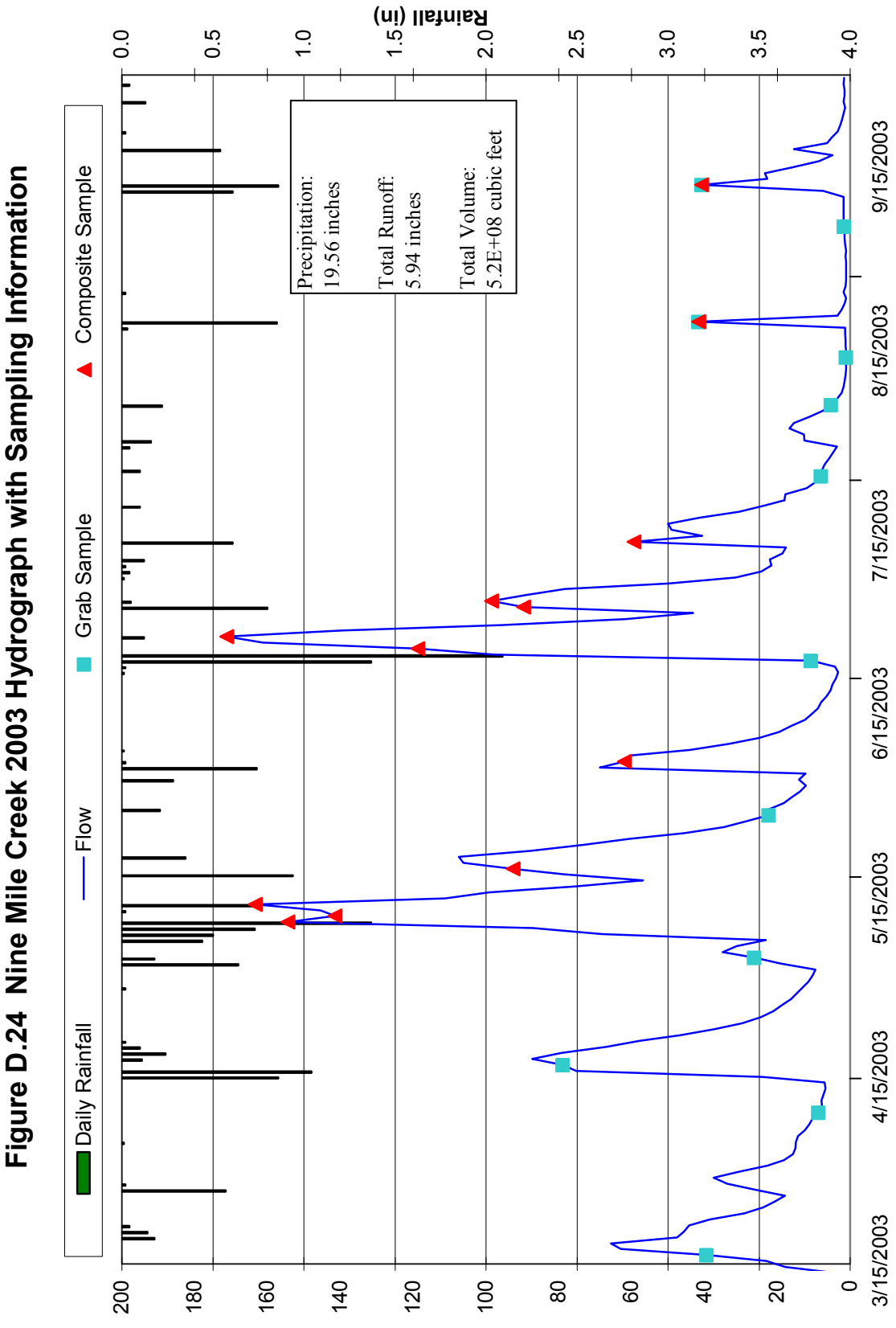
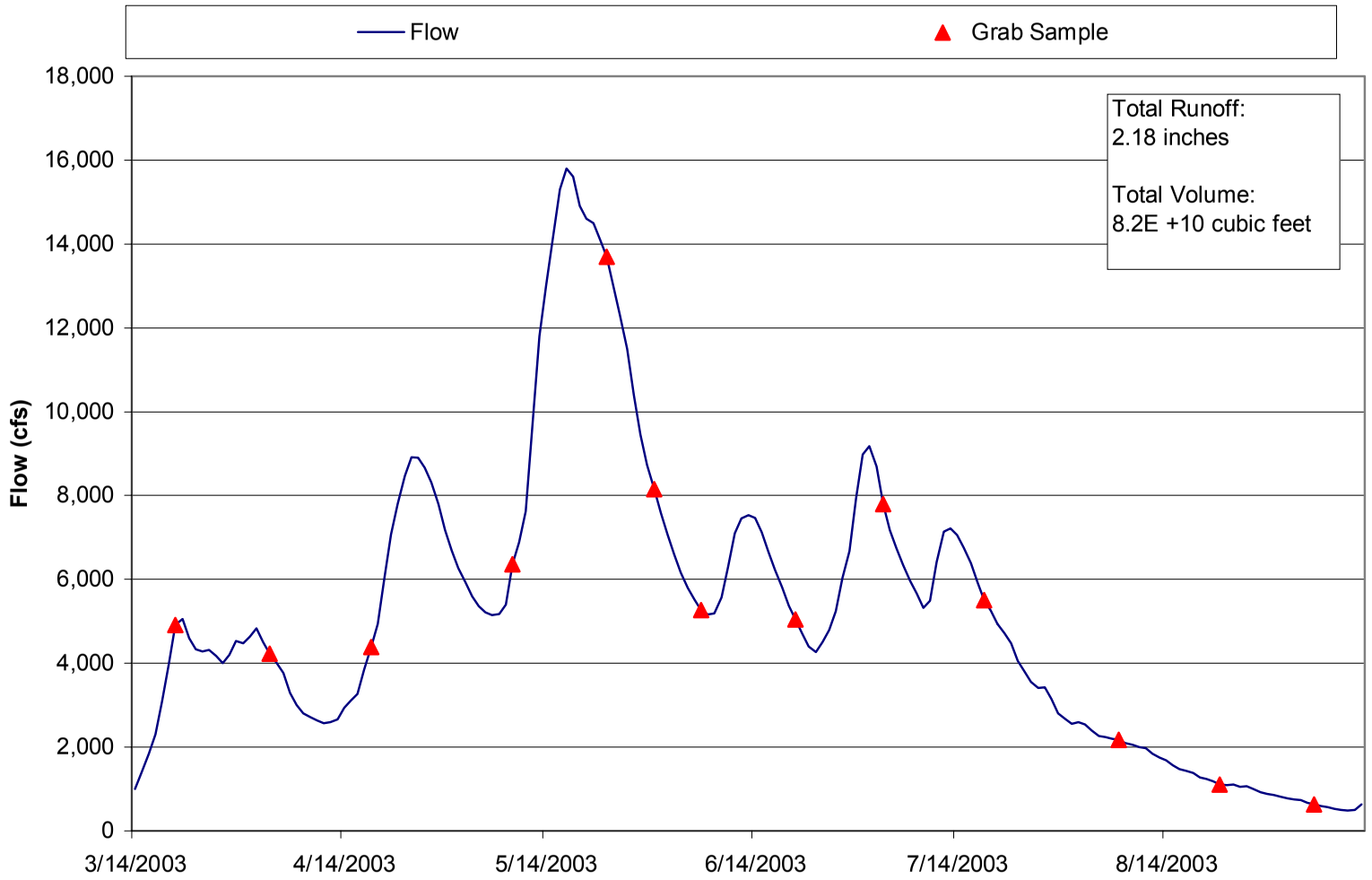


Figure D.24 Nine Mile Creek 2003 Hydrograph with Sampling Information
Daily Rainfall
Flow
Grab Sample
Composite Sample
Precipitation:
19.56 inches
Total Runoff:
5.94 inches
Total Volume:
5.2E+08 cubic feet
Rainfall (in)
Flow (cfs)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0
20
40
60
80
100
120
140
160
180
200
3/15/2003
4/15/2003
5/15/2003
6/15/2003
7/15/2003
8/15/2003
9/15/2003

Figure D.25 Minnesota River at Jordan 2003 Hydrograph with Sampling Information



Chaska Creek

Minnesota Department of Agriculture
90 West Plato Blvd.
St. Paul, MN 55107
Contact: Marie Juenemann
Phone: 952-707-6413
Mjuenema@mda.state.mn.us

Monitoring Began: 1999 Chaska Creek

Project Summary for Chaska Creek

In 1997, the Minnesota Department of Agriculture (MDA) in cooperation with Carver County Environmental Services began long-term non-point surface water monitoring efforts in the Lower Minnesota River Watershed, focusing on agriculture and urban development patterns. The surface water monitoring stations are located in two minor watersheds of the Lower Minnesota River watershed. Both watersheds have a mix of agriculture and older and newer urban land use.

The Chaska Creek monitoring station, established in 1999, is situated at Chaska Creek and located in the Chaska Creek watershed which covers an area of 3520 acres and drains into the Minnesota River. The Chaska Creek watershed also takes the outlet from an adjacent unnamed watershed covering an area of 5,800 acres. Delineated from the point of sample location, this monitoring station covers 9000 acres of watershed area.
The goals and objectives of MDA are to define long-term trends associated with the non-point concentrations of pesticides and nutrients in surface waters of the state. This information aids in assessing the impacts of pesticide and nutrient use in agricultural and urban environments and is needed in determining how to best manage pesticides and nutrients to minimize their impact on surface water. The MDA monitors for 21 Base Neutral pesticides (including breakdown products), 6 Acid Herbicides, and selected nutrients.

Site Location

The Chaska Creek (Site CHA) in T115N, R23W, Sec. 8 in Carver County off old County Road 10 in Chaska. This station is located up stream from open Ogee Spillway and Inlet on levee at the VFW parking lot. The drainage area is 9,640 acres.

Riley Creek

Barr Engineering Co.
4700 West 77th St.
Edina, MN 55435
Contact: Chris Bonick
Phone: 952-832-2760
cbonick@barr.com
Station Operator: Riley-Purgatory-Bluff Creek Watershed District / Barr Engineering, Inc.
Monitoring Began: 1999

Project Summary

The "Metropolitan Area Watershed Outlet Monitoring Program," implemented in early 1998, significantly expanded the existing stream monitoring network in the Metropolitan Area. Eight new monitoring sites (Bassett Creek, Cannon River, Crow River, Eagle Creek, Minnehaha Creek, Riley Creek, Valley Creek, and Willow Creek) were established in eight Metro Area watersheds. Three of these watersheds are in the Minnesota River Basin, Riley being one of them. The physical and chemical data from these eight monitoring sites will be used by MCES to develop target pollutant loads for these watersheds, and to measure water quality improvements as best management practices are implemented.

Site Location

The Riley Creek monitoring site (RI 1.3) is located in T116N, R22W, Sec. 33, in Hennepin County. The drainage area is approximately 13 square miles or 8,366 acres.

2003 Monitoring Year

Riley Creek flow was perennial in 2003 due to groundwater discharge from Quaternary terrace deposits. Spring snowmelt began in mid-March. Numerous rainfall events occurred throughout the spring and early summer of 2003. The peak daily average flow of 19.7 cfs, with a stage of 0.43 feet, occurred on May 11, 2003, when 0.85 inch of rain was recorded by the station's rain gauge. The largest rain event (1.53 inches) occurred on June 25. This wet pattern tapered off dramatically after mid- July, when drought conditions became prevalent. Daily average flows were estimated during the August-September period, since the ultrasonic sensor at this site cannot accurately measure stage during prolonged drought conditions.

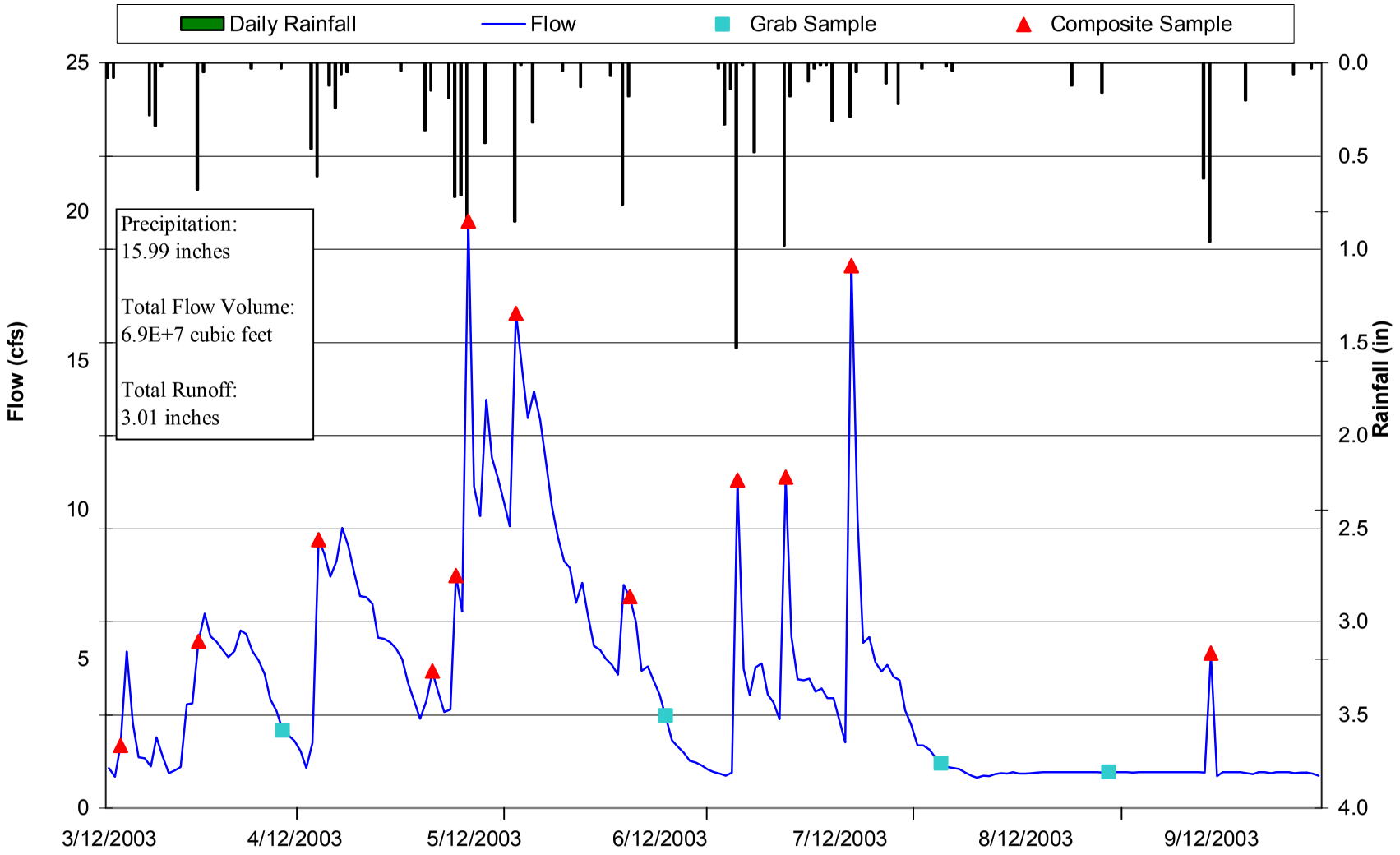
Despite extremely cold air temperatures, baseflow grab samples were successfully collected during the winter months of 2003. Runoff event-based composite sampling began in mid-March 2003 and continued through mid-October. The highest total suspended solids (TSS) concentration (2,970 mg/l) observed in 2003 was measured in a composite sample collected during the July 14, 2003 storm event, after a series of rain events during the preceding 3 weeks had created saturated soil conditions in the watershed.

Twenty-two samples were collected for water quality analysis during 2003, including 13 composite samples and nine grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open-water season (March-November). The 2003 sampling scheme did not quite meet the goals of the MCES monitoring work plan, as monthly baseflow grab samples were not obtained in February, May, and September. However, all runoff events in 2003 were well characterized by flow-weighted composite samples. A limited number of composite samples were obtained during the last half of 2003 due to drought conditions.

Sampling and Loading Results for Riley Creek

There were nine grab samples and 22 composite samples collected at Riley Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2001 - 2003 can be found at Appendix E. Figure D.26 presents the Riley Creek hydrograph for 2003.

Figure D.26 Riley Creek 2003 Hydrograph with Sampling Information



Eagle Creek

Metropolitan Council Environmental Services
2400 Childs Road
St. Paul, MN 55106
http://www.metrocouncil.org/environment/RiversLakes/
Contact: Leigh Harrod
651-602-8085
leigh.harrod@metc.state.mn.us
Station Operator: City of Savage, MN
Monitoring Began: 1999

Project Summary

The "Metropolitan Area Watershed Outlet Monitoring Program," implemented in early 1998, significantly expanded the existing stream monitoring network in the Metropolitan Area. Eight new monitoring sites (Bassett Creek, Cannon River, Crow River, Eagle Creek, Minnehaha Creek, Riley Creek, Valley Creek, and Willow Creek) were established in eight Metro Area watersheds. Three of these watersheds are in the Minnesota River Basin, Eagle being one of them. The physical and chemical data from these eight monitoring sites will be used by MCES to develop target pollutant loads for these watersheds, and to measure water quality improvements as best management practices are implemented.

Site Location

The Eagle Creek monitoring site (Ea 0.8) is located at the 126th St. Bridge in Savage MN, at T118N, R21W, Sec. 7, Scott County. The drainage area is 3.4 square miles or 2,176 acres.

2003 Monitoring Year

Spring snowmelt occurred in late March 2003. The peak daily average flow of 16.2 cfs, with a stage of 1.43 feet, occurred on March 31. The 2003 monitoring year was marked by normal to heavy precipitation during the first half of the year, followed by intermittent drought conditions during the second half of the year. Rain was recorded on 71 days at this location in 2003. The largest rain event (1.67 inches) occurred on June 25. Runoff event-based composite sampling began in mid- March 2003 and continued through early September.

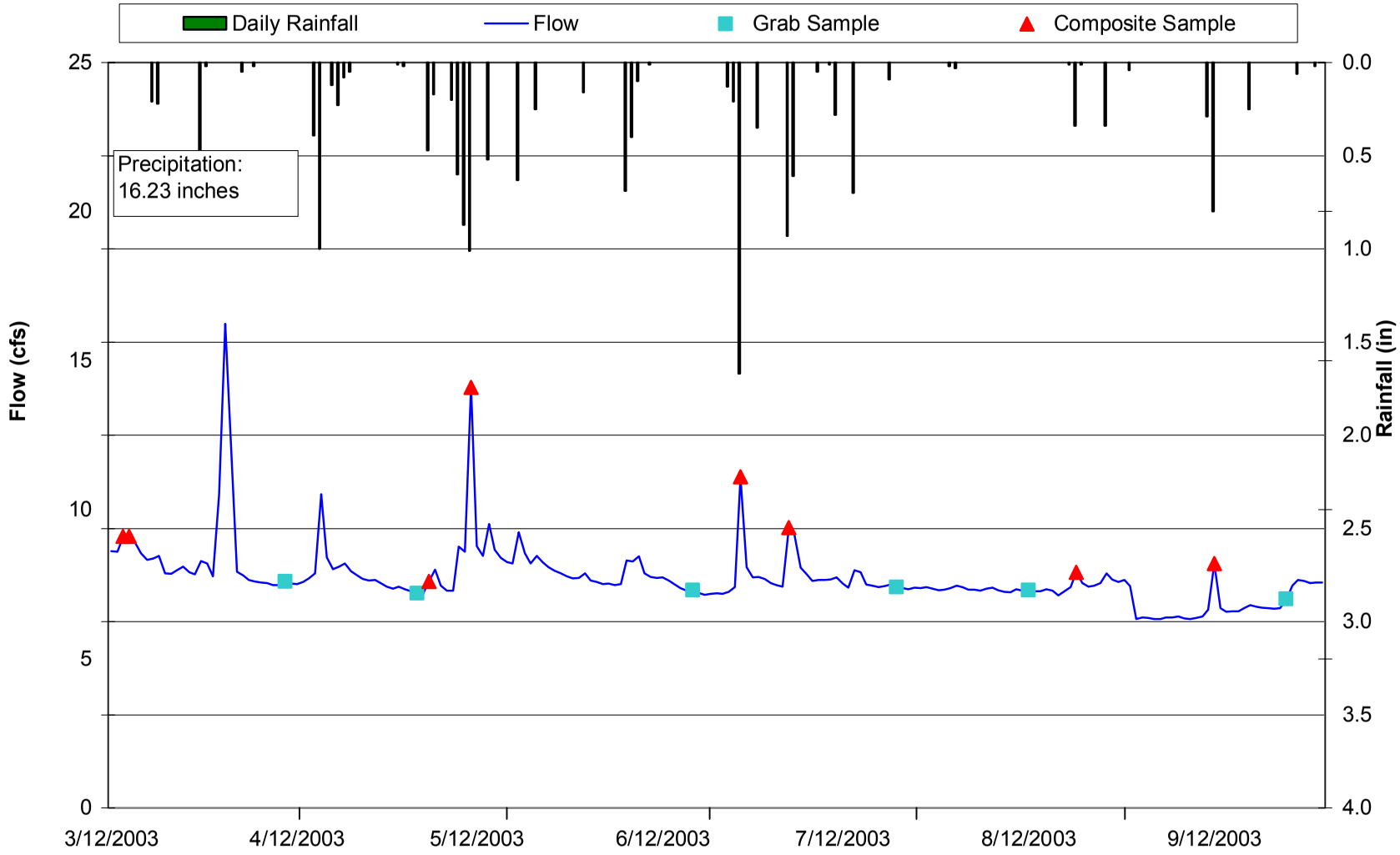
Field observations indicate that a large population of waterfowl congregates in this small watershed during the winter months, because of the warmer water and ice-free conditions. Thousands of birds have been observed churning the waters of Eagle Creek on random days between December and March. When the birds are present in large numbers, field notes typically report the appearance of the creek as cloudy. Winter field measurements taken under these conditions register some of the highest turbidity and lowest transparency levels of the year. When the birds are present in large numbers, total suspended solids (TSS) concentrations and fecal coliform bacteria levels in winter baseflow grab samples register as high as the concentrations in composite samples generated by intense summer thunderstorm events.

Twenty-one samples were collected for water chemistry analysis during 2003, including eight composite samples and thirteen grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). In 2003, baseflow conditions were well characterized by monthly grab samples. However, several runoff events during the late March to mid- April period were not characterized by composite samples. A limited number of composite samples were obtained during the last half of 2003 due to drought conditions.

Sampling and Loading Results for Eagle Creek

There were thirteen grab samples and eight composite samples collected at Eagle Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2002 to 2003 can be found at Appendix E. Figure D.27 presents the Eagle Creek hydrograph for 2003.

Figure D.27 Eagle Creek 2003 Hydrograph with Sampling Information



Willow Creek

Barr Engineering Co.
4700 West 77th St.
Edina, MN 55435
Contact: Chris Bonick
Phone: 952-832-2760
cbonick@barr.com
Station Operator: Riley-Purgatory-Bluff Creek Watershed District / Barr Engineering, Inc.
Monitoring Began: 1999

Project Summary

The "Metropolitan Area Watershed Outlet Monitoring Program," implemented in early 1998, significantly expanded the existing stream monitoring network in the Metropolitan Area. Eight new monitoring sites (Bassett Creek, Cannon River, Crow River, Eagle Creek, Minnehaha Creek, Riley Creek, Valley Creek, and Willow Creek) were established in eight Metro Area watersheds. Three of these watersheds are in the Minnesota River Basin, Willow Creek being one of them. The physical and chemical data from these eight monitoring sites will be used by MCES to develop target pollutant loads for these watersheds, and to measure water quality improvements as best management practices are implemented.

Site Location

The Willow Creek monitoring site (WI 1.0) is located at Hwy 13, in Burnsville, MN, T115N, R21W, Sec. 14, Dakota County. The drainage area is approximately 10.25 square miles or 6,558 acres.

2003 Monitoring Year:

Because the underground box culvert prevents Willow Creek from freezing, direct measurements of stage and flow were possible throughout the 2003 monitoring year. Spring snowmelt occurred throughout March 2003. The highest conductivity measurements of the year occurred during this period. During a rain event, Willow Creek flow typically exhibits a rapid increase followed by a rapid subsidence after the storm. At all other times, the creek is usually characterized by low-flow conditions. In 2003, the peak daily average flow for Willow Creek was 36.6 cfs, with a daily average stage of 0.87 feet. This occurred on May 11 in response to a 1.38-inch rainfall in the watershed, when soil conditions were already saturated after a series of precipitation events. The peak instantaneous flow of 97 cfs, with a stage of 1.71 feet, occurred three days later during a storm event on May 14. A total of 5.6 inches of rain fell in the watershed during the month of May.

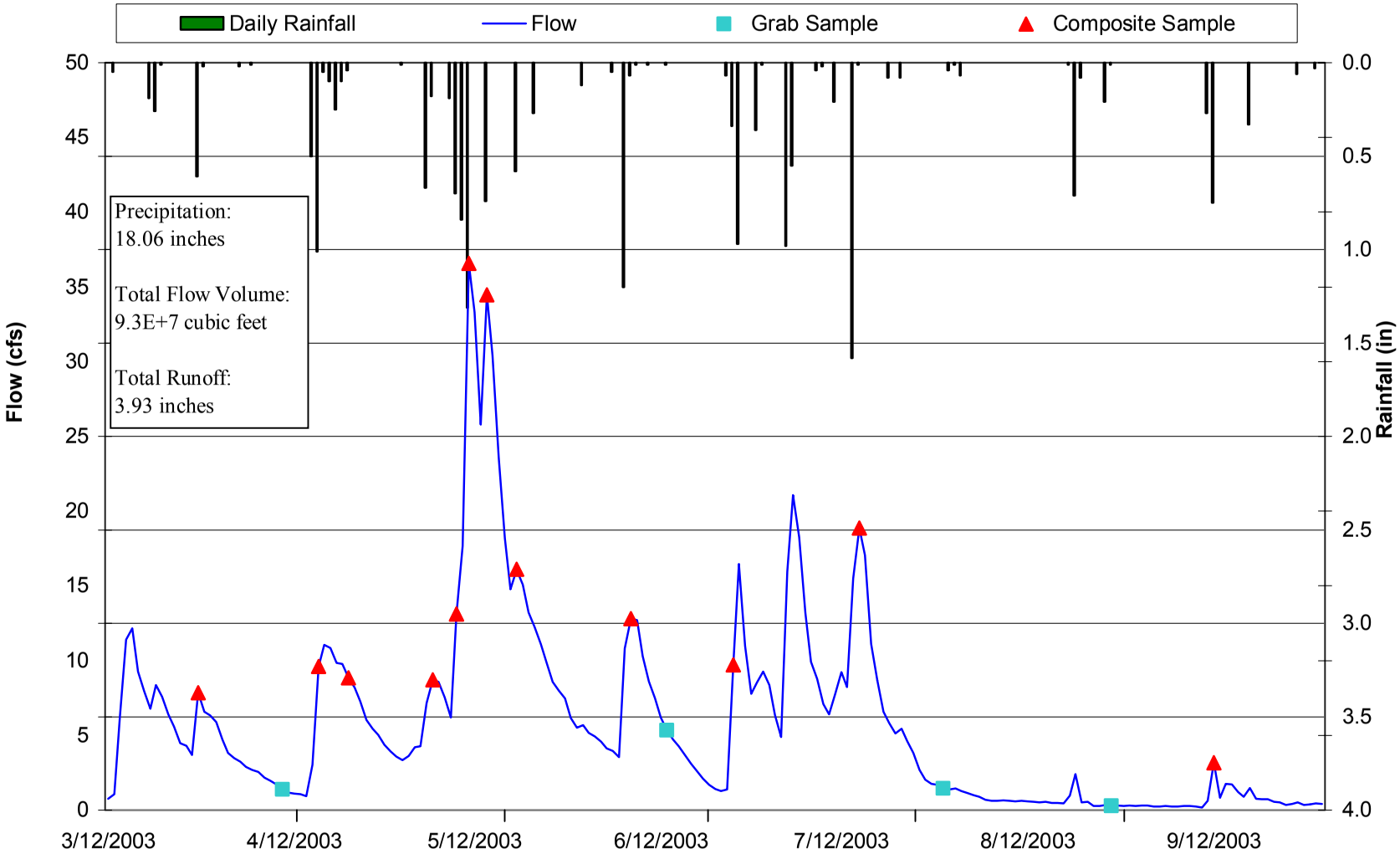
Runoff event-based composite sampling began in late March 2003 and continued through mid-September. The highest total suspended solids (TSS) concentration (216 mg/l) observed in 2003 was measured in a composite sample obtained during a mid-April rainfall event.

Twenty samples were collected for water quality analysis during 2003, including 12 composite samples and 8 grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open-water season (March-November). The 2003 sampling scheme did not quite meet the goals of the MCES monitoring work plan. Due to low-flow conditions, monthly baseflow samples could not be obtained in January and February. When higher flow conditions precluded baseflow sampling in May and July, additional composite samples were obtained. Overall, the 2003 sampling scheme adequately characterized Willow Creek water quality for the monitoring year.

Sampling and Loading Results for Willow Creek

There were eight grab samples and twelve composite samples collected at Willow Creek in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. For yearly results, please refer to MCES Annual Stream Monitoring Report 2003. Loading results for 2001 - 2003 can be found at Appendix E. Figure D.28 presents the Willow Creek hydrograph for 2003.

Figure D.28 Willow River 2003 Hydrograph with Sampling Information



Minnesota River at Fort Snelling

Metropolitan Council Environmental Services
2400 Childs Road
St. Paul, MN 55106
http://www.metrocouncil.org/environment/RiversLakes/Rivers/index.htm
Contact: Scott Schellhaass
Phone: 651-602-3841
Scott.schellhaass@metc.state.mn.us

Monitoring Began: 1976

Project Summary

MCES operates an automatic monitoring network that was initiated in 1973 as a cooperative program with the United States Geological Survey (USGS). The network consists of six monitors which continuously measure dissolved oxygen, temperature, pH and specific conductance of the river water. I n addition to the previously listed variables, turbidity is continuously measured at the Fort Snelling site. These variables are good indicators of river water quality and the effectiveness of MCES wastewater treatment plant operations. The data are reported to the Minnesota Pollution Control Agency via monthly monitoring reports, as required by NPDES permits.

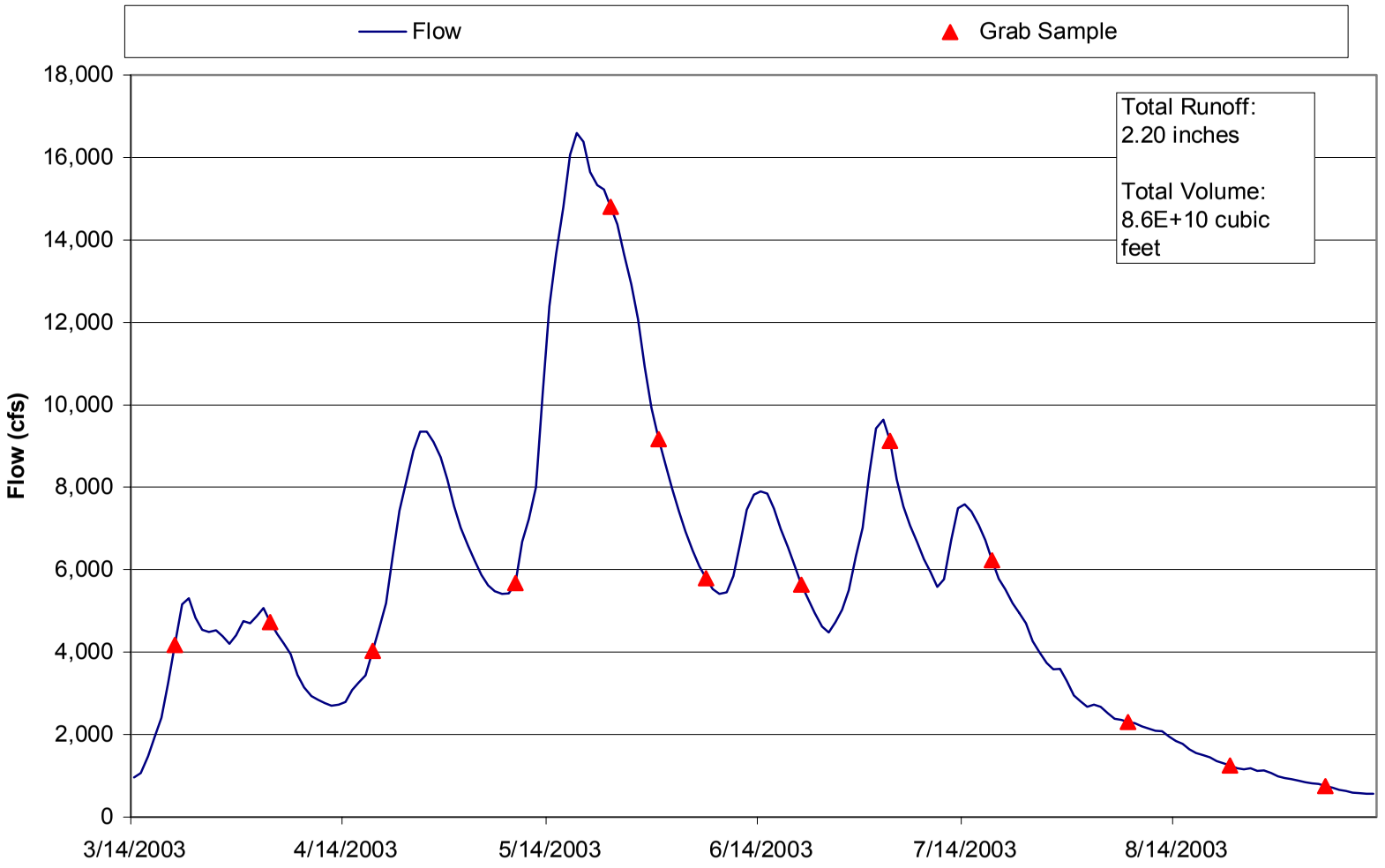
Extensive conventional pollutant monitoring is also conducted to complement automatic monitoring. Samples are manually collected at numerous sites in addition to the automatic monitoring stations, and are analyzed for a wide variety of variables not measurable by the automatic monitors. Sample collection takes place on a weekly (March-October) or semi-monthly (November-February) basis at most sites. This sampling schedule may be reduced depending on the variable being monitored. Sample analyses are conducted in the field as well as in the MCES laboratory in St. Paul, MN. The river monitoring results are used to more fully characterize water quality and to help determine specific sources of pollution, as well as the extent and nature of problems that may exist.

Site Location

The Minnesota River at Fort Snelling monitoring site (MI 3.5) is a sampling point located southeast of the Postroad and Highway 5 overpass. Samples are collected in the main channel from the pier extending off the North bank of the Minnesota River. The drainage area is approximately 16,988 square miles or 10,849,467 acres.

There were fifteen samples collected at the Minnesota River at Fort Snelling in 2003. Only samples collected during the defined monitoring season (ice out – 9/30) were used to calculate the monitoring load estimates for this report. Loading results for 2000 - 2003 can be found at Appendix E. Figure D.29 presents the Minnesota River at Fort Snelling hydrograph for 2003.

Figure D.29 Minnesota River at Fort Snelling 2003 Hydrograph with Sampling Information



Appendix E

Water Quality Concentrations for Monitoring Sites

The concentrations provided on the following pages are the lab results from samples submitted by each project or program. This is the data which was used to calculated the loads for 2003. Grab or composite samples are not identified. For further information on a specific sample, please contact the data owner.

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Yellow Bank River	01/08/03		1			0.03	0.03	0.00	
Yellow Bank River	03/17/03		14			0.9	0.91	0.51	
Yellow Bank River	04/09/03		1			<0.01	0.04	0.00	
Yellow Bank River	04/21/03		3			0.17	0.07	0.02	
Yellow Bank River	04/28/03		2			<0.01	0.05	0.01	
Yellow Bank River	05/12/03		2			<0.01	0.06	0.02	
Yellow Bank River	05/14/03		2			<0.01	0.07	0.02	
Yellow Bank River	05/19/03		2			<0.01	0.06	0.02	
Yellow Bank River	05/22/03		1			<0.01	0.06	0.02	
Yellow Bank River	06/19/03		3			0.05	0.13	0.07	
Yellow Bank River	06/25/03		3			0.11	0.10	0.06	
Yellow Bank River	06/25/03		3			0.13	0.10	0.06	
Yellow Bank River	06/26/03		3			0.13	0.11	0.06	
Yellow Bank River	07/17/03		3			0.09	0.10	0.04	
Yellow Bank River	07/21/03		2			0.13	0.12	0.05	
Yellow Bank River	08/19/03		3			0.03	0.09	0.02	
Yellow Bank River	09/11/03		3			0.01	0.07		
Yellow Bank River	09/15/03		4			<0.01	0.07	0.01	
Yellow Bank River	09/29/03		3			<0.01	0.05	0.01	
Lac qui Parle River	01/08/03		9			1.1	0.05	0.05	
Lac qui Parle River	03/17/03		142			1.4	0.84	0.84	
Lac qui Parle River	04/09/03		9			0.01	0.07	0.07	
Lac qui Parle River	04/21/03		29			1.9	0.12	0.12	
Lac qui Parle River	04/28/03		14			0.6	0.06	0.06	
Lac qui Parle River	05/12/03		11			1.6	0.23	0.23	
Lac qui Parle River	05/14/03		23			1.5	0.21	0.21	
Lac qui Parle River	05/15/03		16			2.8	0.21	0.21	
Lac qui Parle River	05/19/03		27			1.8	0.14	0.14	
Lac qui Parle River	05/22/03		20			1.7	0.10	0.10	
Lac qui Parle River	06/09/03		37			1.6	0.10	0.10	
Lac qui Parle River	06/10/03		43			1.7	0.13	0.13	
Lac qui Parle River	06/19/03		23			0.63	0.13	0.13	
Lac qui Parle River	06/25/03		63			1.1	0.15	0.15	
Lac qui Parle River	06/25/03		84			1.4	0.21	0.21	
Lac qui Parle River	06/26/03		57			1.3	0.22	0.22	
Lac qui Parle River	07/17/03		17			0.1	0.13	0.13	
Lac qui Parle River	07/21/03		30			< 0.01	0.16	0.16	
Lac qui Parle River	08/19/03		8			0.07	0.10	0.10	
Lac qui Parle River	09/11/03		9			0.09	0.09	0.09	
Lac qui Parle River	09/15/03		10			0.05	0.08	0.08	
Lac qui Parle River	09/29/03		6			0.05	0.06	0.06	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Chippewa River	03/27/03	546	35			0.4	0.14	0.05	
Chippewa River	04/08/03	273	9			0.4	0.07	0.00	
Chippewa River	04/17/03	342	22			0.11	0.11	0.01	
Chippewa River	04/22/03	629	64			2.7	0.18	0.02	
Chippewa River	05/01/03	496	56			0.8	0.12	0.00	
Chippewa River	05/08/03	515	66			0.7	0.13	0.01	
Chippewa River	05/13/03	782	68			1.9	0.13	0.00	
Chippewa River	05/20/03	942	75			2.2	0.14	0.00	
Chippewa River	05/28/03	754	69			1.5	0.13	0.00	
Chippewa River	06/04/03	539	97			1.2	0.17	0.01	
Chippewa River	06/11/03	583	107			1.5	0.17	0.02	
Chippewa River	06/19/03	365							
Chippewa River	06/24/03	410	92			0.8	0.19	0.03	
Chippewa River	06/26/03	986	190			5.3	0.29	0.07	
Chippewa River	07/01/03	1110	83			2.1	0.19	0.05	
Chippewa River	07/09/03	1040	64			0.4	0.24	0.13	
Chippewa River	07/16/03	1110	75			0.67	0.20	0.11	
Chippewa River	07/22/03	930	68			0.4	0.23	0.13	
Chippewa River	07/29/03	740	68			0.28	0.23	0.12	
Chippewa River	08/06/03	527							
Chippewa River	08/12/03	407	86			0.17	0.22	0.07	
Chippewa River	08/27/03	187	80			0.01	0.21	0.03	
Chippewa River	09/04/03	133							
Chippewa River	09/11/03	185	120			0.01	0.26	0.06	
Chippewa River	09/30/03	93	13			0.01	0.08	0.00	
Dry Weather	03/17/03	76	9			2	0.66	0.49	
Dry Weather	03/27/03	18	6			0.8	0.12	0.04	
Dry Weather	04/08/03	3	5			0.5	0.05	0.00	
Dry Weather	04/17/03	7	3			0.03	0.06	0.01	
Dry Weather	04/22/03	31	4			11	0.06	0.02	
Dry Weather	05/01/03	14	4			6	0.03	0.00	
Dry Weather	05/08/03	15	4			5	0.03	0.00	
Dry Weather	05/09/03	20	5			5.2	0.04	0.00	
Dry Weather	05/13/03	49	9			9.7	0.04	0.00	
Dry Weather	05/14/03	112	62			10	0.20	0.04	
Dry Weather	05/19/03	78	11						
Dry Weather	05/20/03	122	17			11	0.11	0.04	
Dry Weather	05/28/03	34	8			8.8	0.05	0.00	
Dry Weather	06/04/03	20	6			6.8	0.04	0.01	
Dry Weather	06/09/03	17	4						
Dry Weather	06/11/03	16	6			5	0.06	0.02	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Dry Weather	06/19/03	9	4						
Dry Weather	06/25/03	10	142						
Dry Weather	06/26/03	174	65			11	0.21	0.12	
Dry Weather	07/01/03	238	21			10	0.11	0.05	
Dry Weather	07/09/03	33	11			3	0.07	0.03	
Dry Weather	07/16/03	12	9			1	0.07	0.04	
Dry Weather	07/22/03	8	7			0.29	0.09	0.05	
Dry Weather	07/29/03	6	8			0.27	0.13	0.09	
Dry Weather	08/06/03	3	24						
Dry Weather	08/12/03	3	22			0.01	0.19	0.07	
Dry Weather	08/27/03	2	13			0.17	0.22	0.05	
Dry Weather	09/04/03	1							
Dry Weather	09/11/03	8	21			0.08	0.17	0.08	
Dry Weather	09/30/03	2	5			0.02	0.04	0.03	
Yellow Medicine River	03/15/03								
Yellow Medicine River	04/10/03	48	9			0.23	0.07	0.01	
Yellow Medicine River	04/17/03	63	11			0.01	0.09	0.00	
Yellow Medicine River	04/24/03	384	60			7	0.14	0.05	
Yellow Medicine River	05/08/03	192	11			3	0.05	0.00	
Yellow Medicine River	05/20/03	261	11			4.9	0.05	0.00	
Yellow Medicine River	06/05/03	121	17			3	0.05	0.01	
Yellow Medicine River	07/01/03	104	39			5.3	0.19	0.02	
Yellow Medicine River	07/16/03	31	64			0.005	0.23	0.00	
Yellow Medicine River	09/11/03	11	25			0.06	0.10	0.01	
Hawk Creek	04/02/03	98	5			1.9	0.61	0.52	2.01
Hawk Creek	04/15/03	56	19			2.2	0.66	0.45	<0.02
Hawk Creek	04/21/03	744	48			16	0.33	0.21	0.15
Hawk Creek	04/29/03	235	19			10	0.21	0.11	
Hawk Creek	05/05/03	206	17			7.7	0.27	0.16	
Hawk Creek	05/13/03	493	31			12	0.17	0.07	
Hawk Creek	05/19/03	351	26			10	0.18	0.08	0.02
Hawk Creek	05/27/03	294	19			11	0.15	0.08	
Hawk Creek	06/02/03	180	27			10	0.28	0.17	<0.02
Hawk Creek	06/18/03	162	46			8.1	0.30	0.22	0.04
Hawk Creek	06/26/03	1407	410			9.8	0.61	0.22	0.13
Hawk Creek	07/01/03	519	78			8.8	0.40	0.20	<0.02
Hawk Creek	07/15/03	215	65			5.9	0.45	0.24	
Hawk Creek	07/22/03	177	71			3.8	0.49	0.27	<0.02
Hawk Creek	08/05/03	63	43			0.6	0.63	0.33	<0.02
Hawk Creek	08/26/03	8	54			<0.1	0.55	0.30	<0.02
Hawk Creek	09/09/03	9	64			<0.1	0.74	0.30	<0.02

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Hawk Creek	09/23/03	17	63			<0.1	0.46	0.10	0.07
West Fork Beaver Creek	04/02/03	13	8			1.2	0.14	0.06	0.38
West Fork Beaver Creek	04/15/03	2	22			0.01	0.11	0.02	<0.02
West Fork Beaver Creek	04/21/03	121	14			15	0.24	0.18	0.09
West Fork Beaver Creek	04/29/03	31	13			8	0.06	0.01	
West Fork Beaver Creek	05/05/03	29	6			5.4	0.05	0.00	
West Fork Beaver Creek	05/13/03	95	5			12	0.05	0.01	
West Fork Beaver Creek	05/19/03	58	9			8	0.07	0.01	0.07
West Fork Beaver Creek	05/27/03	61	13			11	0.07	0.01	
West Fork Beaver Creek	06/02/03	39	14			8	0.08	0.02	0.1
West Fork Beaver Creek	06/18/03	34	49			7.2	0.17	0.11	0.25
West Fork Beaver Creek	06/26/03	79	51			5	0.19	0.11	0.19
West Fork Beaver Creek	07/01/03	62	42			7	0.25	0.14	0.09
West Fork Beaver Creek	07/15/03	2	93			0.9	0.25	0.20	
West Fork Beaver Creek	07/22/03	2	72			0.57	0.37	0.29	0.2
West Fork Beaver Creek	08/05/03	0							
Redwood River	05/14/03		100			11.2	0.20	0.12	
Redwood River	05/19/03		90			9.05	0.22	0.12	
Redwood River	05/27/03								
Redwood River	06/26/03		192			5.79	0.32	0.05	
Redwood River	07/31/03		35			<0.2	0.23	0.03	
Redwood River	08/13/03		64			<0.2	0.33	0.02	
Redwood River	09/29/03		74			<0.2	0.53	0.20	
Redwood River	10/22/03		49			<0.2	0.64	0.52	
Redwood River	11/13/03		5			3.18	1.01	0.93	
Redwood River	12/22/03		28			3.08	1.32	1.30	
Cottonwood River	01/07/03		7			5.3	0.10	0.02	
Cottonwood River	02/20/03		6			3	0.32	0.03	
Cottonwood River	03/19/03		113			1.78	0.53	0.41	
Cottonwood River	04/08/03	145	14			1.79	0.08	0.02	
Cottonwood River	04/22/03	1270	348			11.00	0.28	0.08	
Cottonwood River	04/29/03	636	88			9.14	0.16	0.04	
Cottonwood River	05/05/03	477	66			7.41	0.09	0.02	
Cottonwood River	05/12/03	1150	260			8.71	0.21	0.02	
Cottonwood River	05/14/03	1409	178			11.8	0.18	0.05	
Cottonwood River	05/19/03	981	100			11.00	0.15	0.04	
Cottonwood River	05/27/03	1120							
Cottonwood River	06/26/03	875	460			11.90	0.64	0.18	
Cottonwood River	06/30/03	72	263			15.10	0.27	0.06	
Cottonwood River	07/31/03	48	40			<0.2	0.10	0.02	
Cottonwood River	08/13/03	32	43			<0.2	0.11	0.01	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Cottonwood River	09/25/03	32	13			<0.2	0.12	0.01	
Cottonwood River	10/22/03	41	12			<0.2	0.04	0.02	
Cottonwood River	11/13/03		9			0.64	0.04	0.02	
Cottonwood River	12/22/03		21			1.55	0.02		
Little Cottonwood River	03/20/03	80	82			1.8	0.38	0.19	
Little Cottonwood River	04/10/03	30	5			1.5	0.09	0.02	
Little Cottonwood River	04/16/03	40	17			0.5	0.10	0.00	
Little Cottonwood River	05/12/03	147	334			13	0.42	0.01	
Little Cottonwood River	05/15/03	144	213			12	0.16	0.07	
Little Cottonwood River	05/20/03	175	341			9.4	0.17	0.06	
Little Cottonwood River	06/09/03	82	156			8.1	0.22	0.14	
Little Cottonwood River	06/24/03	129	250			8.7	0.49	0.09	
Little Cottonwood River	07/10/03	115	532			6.9	0.65	0.13	
Little Cottonwood River	08/06/03	10	27			1.04	0.11	0.05	
Little Cottonwood River	09/22/03	3	6			0.5	0.09	0.03	
Watonwan River	04/09/03	105	6			4.09	0.21	0.15	
Watonwan River	04/11/03	136	12			3.82	0.21	0.14	
Watonwan River	04/17/03	425	98			9.23	0.25	0.08	
Watonwan River	04/18/03	526	130			11.1	0.22	0.10	
Watonwan River	04/22/03	620	78			13.4	0.20	0.08	
Watonwan River	5/1/2003-1	364							
Watonwan River	5/1/2003-2	364							
Watonwan River	05/05/03	342	34			7.88	0.13	0.04	
Watonwan River	05/06/03	381	42			8.21	0.14	0.05	
Watonwan River	05/09/03	429	48			10.1	0.12	0.12	
Watonwan River	05/12/03	999	304			12.4	0.32	0.08	
Watonwan River	05/13/03	1090							
Watonwan River	05/15/03	1030							
Watonwan River	05/19/03	771							
Watonwan River	05/20/03	943							
Watonwan River	05/21/03	1230							
Watonwan River	05/23/03	1150							
Watonwan River	05/28/03	693							
Watonwan River	06/06/03	397	104			11.6	0.19	0.10	
Watonwan River	06/09/03	872							
Watonwan River	06/11/03	966							
Watonwan River	06/13/03	818							
Watonwan River	06/18/03	491							
Watonwan River	06/19/03	462							
Watonwan River	06/25/03	572	228			12.8	0.34	0.21	
Watonwan River	06/26/03	762	91			16.0	0.32	0.21	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Watonwan River	06/27/03	882	168			16.5	0.27	0.17	
Watonwan River	06/30/03	1130	142			17.9	0.29	0.12	
Watonwan River	07/09/03	375	136			11.4	0.27	0.17	
Watonwan River	07/10/03	401	128			11.1	0.27	0.15	
Watonwan River	07/16/03	228	86			10.8	0.16	0.16	
Watonwan River	07/25/03	100	28			5.78	0.18	0.21	
Watonwan River	08/01/03	49	20			2.18	0.17	0.14	
Watonwan River	08/11/03	25	54			1.04	0.26	0.21	
Watonwan River	08/22/03	24	53			0.86	0.25	0.10	
Watonwan River	08/29/03	14	42			<0.2	0.20	0.09	
Watonwan River	09/08/03	6	48			<0.2	0.22	0.02	
Watonwan River	09/18/03	15	41			1.51	0.53	0.43	
Watonwan River	09/29/03	8	6			0.24	0.27	0.20	
Dutch Creek	04/15/03	10	13			17.8	0.04	0.02	
Dutch Creek	04/21/03	12	10			19.0	0.05	0.04	
Dutch Creek	05/05/03	10	5			16.4	0.02	0.01	
Dutch Creek	05/12/03	19	26			19.0	0.06	0.04	
Dutch Creek	05/19/03	10	9			16.3	0.03	0.01	
Dutch Creek	06/03/03	6	6			16.3	0.04	0.03	
Dutch Creek	06/09/03	9	7			17.5	0.03	0.03	
Dutch Creek	06/26/03	15	15			21.1	0.10	0.09	
Dutch Creek	07/09/03	9	13			15.6	0.01	0.01	
Dutch Creek	07/11/03	11	9			20.4	0.09	0.07	
Dutch Creek	07/23/03	3	12			9.3	0.13	0.10	
Dutch Creek	08/06/03	3	17			2.6	0.19	0.20	
Dutch Creek	08/20/03	2	12			0.9	0.27	0.26	
Dutch Creek	09/03/03	2	11			0.5	0.15	0.12	
Dutch Creek	09/16/03	2	189			1.1	0.28	0.29	
Le Sueur River	01/30/03	41	1	8.16	0.05	8.21	0.04	0.02	0.2
Le Sueur River	03/14/03	90	3	2.88	0.06	2.94	0.41	0.30	0.38
Le Sueur River	03/17/03	250	52	3.7	0.03	3.73	0.11	0.09	0.2
Le Sueur River	03/21/03	338	33	2.34	0.06	2.4	0.27	0.15	0.44
Le Sueur River	03/31/03	812	205	12.2	0.15	12.35	0.66	0.13	0.27
Le Sueur River	04/08/03	377	21	9.23	0.05	9.28	0.11	0.03	0.02
Le Sueur River	04/19/03	1344	308	10.9	0.05	10.95	0.12	0.01	0.06
Le Sueur River	04/23/03	1540	158	14.6	0.03	14.63	0.18	0.03	0.1
Le Sueur River	04/28/03	1003	137	12.5	0.03	12.53	0.15	0.01	0.02
Le Sueur River	05/10/03	1648	324	15	0.06	15.06	0.59	0.05	0.03
Le Sueur River	05/13/03	3161	514	18.5	0.09	18.59	0.71	0.10	0.02
Le Sueur River	05/15/03	3739	958	16.3	0.12	16.42	1.07	0.13	0.09
Le Sueur River	05/17/03	3049	340	16.7	0.09	16.79	0.55	0.11	0.03

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Le Sueur River	05/20/03	1854	216	15	0.05	15.05	0.25	0.07	0.02
Le Sueur River	05/25/03	1098	125	12.7	0.03	12.73	0.23	0.06	0.02
Le Sueur River	06/04/03	571	56	10.9	0.04	10.94	0.15	0.01	0.02
Le Sueur River	06/12/03	1063	284	15.9	0.04	15.94	0.31	0.07	0.02
Le Sueur River	06/25/03	495	143	12.2	0.03	12.23	0.21	0.06	0.02
Le Sueur River	06/30/03	762	143	14.1	0.03	14.13	0.33	0.08	0.02
Le Sueur River	07/01/03	744	172	14.9	0.03	14.93	0.23	0.09	0.02
Le Sueur River	07/08/03	395	107	10.3	0.03	10.33	0.18	0.09	0.02
Le Sueur River	07/13/03	899	390	13.7	0.03	13.73	0.46	0.11	0.02
Le Sueur River	07/11/03	839	316	13.2	0.04	13.24	0.45	0.13	0.02
Le Sueur River	07/17/03	545	224	12.1	0.05	12.15	0.27	0.07	0.02
Le Sueur River	07/22/03	296	98	10.5	0.13	10.63	0.05	0.03	0.02
Le Sueur River	08/05/03	65	10	2.84	0.04	2.88	0.05	0.01	0.02
Le Sueur River	08/26/03	31	26	0.19	0.03	0.22	0.07	0.01	0.02
Le Sueur River	09/09/03	13	12	0.1	0.03	0.13	0.04	0.01	0.02
Le Sueur River	09/23/03	13	3	0.33	0.03	0.36	0.21	0.05	0.02
Le Sueur River	10/14/03	16	3	0.55	0.03	0.58	0.04	0.01	0.02
Le Sueur River	10/28/03	18	3	0.83	0.03	0.86	0.72	0.01	0.02
Le Sueur River	11/19/03	20	3	0.5	0.03	0.53	0.01	0.01	0.02
Blue Earth River	01/30/03	75	2	7.38	0.06	7.44	0.11	0.08	0.17
Blue Earth River	03/13/03	62	2	4.1	0.04	4.14	0.16	0.13	0.17
Blue Earth River	03/21/03	627	7	1.49	0.04	1.53	0.14	0.11	0.39
Blue Earth River	04/01/03	995	25	8.13	0.15	8.28	0.19	0.10	0.18
Blue Earth River	04/14/03	1106	54	8.18	0.04	8.22	0.14	0.01	0.12
Blue Earth River	04/16/03	1632	50	13.5	0.04	13.54	0.31	0.04	0.03
Blue Earth River	04/22/03	2362	59	13.1	0.04	13.14	0.18	0.04	0.04
Blue Earth River	04/25/03	2087	66	13.5	0.03	13.53	0.12	0.02	0.02
Blue Earth River	04/26/03	1507	54	11.4	0.03	11.43	0.14	0.01	0.02
Blue Earth River	05/10/03	2436	101	12.6	0.04	12.64	0.16	0.02	0.02
Blue Earth River	05/14/03	4567	488	15.7	0.07	15.77	0.55	0.06	0.09
Blue Earth River	05/17/03	3805	234	15.2	0.05	15.25	0.27	0.06	0.02
Blue Earth River	05/23/03	3055	133	14.1	0.03	14.13	0.23	0.04	0.02
Blue Earth River	06/04/03	1408	51	11.6	0.03	11.63	0.13	0.01	0.02
Blue Earth River	06/14/03	2299	94	13.9	0.04	13.94	0.14	0.05	0.02
Blue Earth River	06/25/03	1446	80	12.1	0.03	12.13	0.17	0.05	0.02
Blue Earth River	06/30/03	2726	185	15.5	0.04	15.54	0.26	0.09	0.02
Blue Earth River	07/01/03	2484	137	14.9	0.04	14.94	0.21	0.08	0.02
Blue Earth River	07/08/03	1484	85	10.7	0.03	10.73	0.19	0.07	0.02
Blue Earth River	07/13/03	2068	103	14.4	0.03	14.43	0.31	0.09	0.02
Blue Earth River	07/22/03	765	65	10.3	0.04	10.34	0.17	0.07	0.02
Blue Earth River	08/05/03	169	63	1.74	0.05	1.79	0.11	0.01	0.13

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Blue Earth River	08/26/03	95	61	0.24	0.03	0.27	0.15	0.02	0.08
Blue Earth River	09/09/03	45	40	0.35	0.03	0.38	0.13	0.01	0.02
Blue Earth River	09/23/03	42	39	0.49	0.03	0.52	0.12	0.01	0.03
Blue Earth River	10/14/03	35	42	0.56	0.03	0.59	0.10	0.01	0.13
Blue Earth River	11/19/03	53	15	0.72	0.03	0.75	0.12	0.01	0.02
Seven Mile Creek	03/18/03		11			3.6	0.46	0.26	
Seven Mile Creek	03/20/03		81			3.6	0.42	0.28	
Seven Mile Creek	04/01/03	0				6.08	0.12	0.06	
Seven Mile Creek	04/10/03	1	3			4.3	0.08	0.00	
Seven Mile Creek	04/15/03	1	7			2.6	0.08	0.01	
Seven Mile Creek	04/17/03	20				11.7	0.15	0.09	
Seven Mile Creek	04/22/03	16				14	0.04	0.01	
Seven Mile Creek	05/11/03	42	38			15	0.25	0.01	
Seven Mile Creek	05/11/03	33				18.7	0.38	0.04	
Seven Mile Creek	05/14/03	158	2849			11	0.54	0.26	
Seven Mile Creek	05/15/03	209	644			7.9	0.51	0.20	
Seven Mile Creek	05/15/03	191				29	0.53	0.10	
Seven Mile Creek	05/20/03	108	142			24	0.19	0.17	
Seven Mile Creek	05/20/03	105				24	0.19	0.04	
Seven Mile Creek	06/07/03	84				22.5	0.26	0.03	
Seven Mile Creek	06/09/03	67	49			29	0.15	0.15	
Seven Mile Creek	06/09/03	84	237			22	0.20	0.14	
Seven Mile Creek	06/17/03	15				18.4	0.03	0.01	
Seven Mile Creek	06/18/03	16	6			20	0.06	0.05	
Seven Mile Creek	06/23/03	78				18	0.43	0.15	
Seven Mile Creek	06/25/03	66				21.4			
Seven Mile Creek	06/25/03	66	84			22	0.25	0.06	
Seven Mile Creek	06/25/03	67	338			21	0.45	0.12	
Seven Mile Creek	06/25/03	68				24.6	0.13	0.02	
Seven Mile Creek	07/09/03	13				14.9	0.04	0.02	
Seven Mile Creek	07/09/03	156				14.5	1.06	0.12	
Seven Mile Creek	07/09/03	156				16.4	1.30	0.16	
Seven Mile Creek	07/10/03	158	399			20	0.49	0.06	
Seven Mile Creek	07/10/03	156	1770			15	1.64	0.19	
Seven Mile Creek	07/10/03	100	308			22.2	0.25	0.04	
Seven Mile Creek	07/14/03	100	184			25			
Seven Mile Creek	07/22/03	6	93			14	0.04	0.01	
Seven Mile Creek	08/06/03	1				6.39	0.01		
Seven Mile Creek	08/20/03	2	14			6.9	0.12	0.02	
Seven Mile Creek	09/18/03	2				5.5	0.01		
Seven Mile Creek	09/22/03	2	2			5.6	0.69	0.11	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
High Island Creek	03/25/03	59	109			2.79	0.28	0.18	
High Island Creek	04/11/03	25	12			1.59	0.11	0.02	
High Island Creek	04/16/03	35	48			0.71	0.15	0.02	
High Island Creek	04/21/03	97	308			11.30	0.24	0.08	
High Island Creek	05/12/03	148	408			13.70	0.31	0.08	
High Island Creek	05/15/03	183	456			18.20	0.28	0.08	
High Island Creek	05/20/03	450	1090			19.00	0.55	0.25	
High Island Creek	05/28/03	284	212			14.60	0.19	0.05	
High Island Creek	06/09/03	138	146			13.90	0.14	0.02	
High Island Creek	06/18/03	77	56			12.10	0.10	0.04	
High Island Creek	06/26/03	66	71			8.69	0.17	0.12	
High Island Creek	06/30/03	177	224			19.00	0.21	0.12	
High Island Creek	07/10/03	NA	62			9.32	0.18	0.13	
High Island Creek	07/29/03	13	10			1.49	0.04	0.01	
High Island Creek	08/21/03	2	6			<.2	0.10	0.03	
High Island Creek	09/23/03	2	2			<.2	0.04	0.04	
Rush River	03/25/03	45	63			4.03	0.33	0.25	
Rush River	04/11/03	22	12			3.01	0.19	0.10	
Rush River	04/16/03	29	50			1.06	0.20	0.03	
Rush River	04/21/03	147	220			12.3	0.27	0.09	
Rush River	05/12/03	388	1030			16.4	0.69	0.11	
Rush River	05/15/03	901	2350			19.7	1.66	0.25	
Rush River	05/20/03	1024	900			23.0	0.58	0.33	
Rush River	05/28/03	286	106			18.9	0.14	0.09	
Rush River	06/04/03	159	-			20.0	-	-	
Rush River	06/09/03	465	190			22.0	0.24	0.14	
Rush River	06/09/03	465	230			21.6	0.24	0.13	
Rush River	06/18/03	120	46			18.7	0.07	0.05	
Rush River	06/26/03	169	100			16.2	0.22	0.12	
Rush River	06/30/03	149	96			20.7	0.15	0.08	
Rush River	07/10/03	94	60			11.9	0.14	0.09	
Rush River	07/29/03	16	8			6.5	0.03	<.005	
Rush River	08/21/03	4	2			0.2	0.03	0.03	
Rush River	09/23/03	7	5			<.2	0.02	0.01	
Sand Creek	04/17/03	304	493	4.11	0.04	4.15	1.03	0.10	
Sand Creek	04/20/03	332	613	5.14	0.04	5.18	0.74	0.10	
Sand Creek	04/23/03	310	1190	4.08	0.02	4.10	0.80	0.08	
Sand Creek	04/26/03	228	126	2.58	0.02	2.60	0.22	0.05	
Sand Creek	05/12/03	979	2240	8.48	0.09	8.57	1.14	0.17	
Sand Creek	05/14/03	887	1250	7.60	0.06	7.66	0.90	0.12	
Sand Creek	05/24/03	344	1490	1.94	0.02	1.96	0.95		

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Sand Creek	06/08/03	299	712	4.42	0.05	4.47	0.76	0.13	
Sand Creek	06/11/03	200	524	3.78	0.02	3.80	0.62	0.12	
Sand Creek	06/14/03	151	528	2.04	0.02	2.06	0.72	0.10	
Sand Creek	07/05/03	83		1.11	0.02	1.13	0.90	0.15	
Sand Creek	07/16/03	77		0.63	0.04	0.67	0.45	0.08	
Sand Creek	01/07/03	45	2	2.60	0.04	2.64	0.17	0.11	
Sand Creek	02/13/03	37	5	3.32	0.04	3.36	0.34	0.30	
Sand Creek	03/19/03	179	36	2.06	0.10	2.16	0.56	0.31	
Sand Creek	03/24/03	184	105	2.06	0.25	2.31	0.36	0.13	
Sand Creek	04/08/03	81	19	1.56	0.02	1.58	0.19	0.01	
Sand Creek	05/06/03	149	20	2.12	0.02	2.14	0.19	0.08	
Sand Creek	05/11/03	800	4380	5.04	0.07	5.11	1.00	0.16	
Sand Creek	05/16/03	648	195	4.34	0.05	4.39	0.28	0.10	
Sand Creek	05/19/03	464	153	2.56	0.02	2.58	0.24	0.07	
Sand Creek	05/21/03	410	106	2.71	0.02	2.73	0.26	0.10	
Sand Creek	05/27/03	225	64	2.32	0.03	2.35	0.28	0.10	
Sand Creek	06/25/03	103	84	6.57	0.07	6.64	0.38	0.24	
Sand Creek	07/11/03	41	28	2.65	0.02	2.67	0.35	0.28	
Sand Creek	08/05/03	2	6	0.30	0.02	0.32	0.21	0.19	
Sand Creek	09/10/03	2	5	0.09	0.02	0.11	0.08	0.05	
Sand Creek	10/07/03	2	3	0.51	0.02	0.53	0.09	0.06	
Sand Creek	10/22/03	1	1	0.60	0.02	0.62	0.25	0.17	
Sand Creek	11/12/03	3	2	1.54	0.02	1.56	0.40	0.34	
Sand Creek	11/25/03	1	2	3.44	0.04	3.48	0.72	0.66	
Sand Creek	12/11/03	1	2	3.56	0.04	3.60	0.65	0.56	
Sand Creek	12/22/03	1	1	3.68	0.05	3.73	0.67	0.55	
Lower Bevens Creek	04/17/03	194	622	7.99	0.07	8.06	1.00	0.21	
Lower Bevens Creek	04/20/03	188	219	9.97	0.05	10.02	0.36	0.16	
Lower Bevens Creek	04/23/03	165	117	9.57	0.03	9.60	0.21	0.12	
Lower Bevens Creek	04/26/03	99	58	7.77	0.04	7.81	0.18	0.10	
Lower Bevens Creek	05/10/03	308	520	6.28	0.05	6.33	0.56	0.15	
Lower Bevens Creek	05/12/03	368	820	15.90	0.09	15.99	0.86	0.23	
Lower Bevens Creek	05/14/03	263	300	12.60	0.05	12.65	0.34		
Lower Bevens Creek	05/17/03	183	170	10.00	0.03	10.03	0.28	0.14	
Lower Bevens Creek	05/20/03	415	592	14.40	0.08	14.48	0.66	0.23	
Lower Bevens Creek	05/22/03	311	302	14.80	0.05	14.85	0.57	0.15	
Lower Bevens Creek	05/25/03	221	171	10.80	0.02	10.82	0.33		
Lower Bevens Creek	06/26/03	70	159	6.62	0.08	6.70	0.50	0.35	
Lower Bevens Creek	06/29/03	44	68				0.30		
Lower Bevens Creek	07/05/03	52	102	7.02	0.07	7.09	0.46	0.34	
Lower Bevens Creek	01/07/03	29	2	4.26	0.04	4.30	0.35	0.32	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Lower Bevens Creek	02/20/03	24	2	2.95	0.03	2.98	0.40	0.36	
Lower Bevens Creek	03/17/03	70	67	5.07	0.18	5.25	0.90	0.71	
Lower Bevens Creek	03/24/03	67	52	4.88	0.23	5.11	0.35	0.20	
Lower Bevens Creek	04/10/03	31	5	3.00	0.03	3.03	0.19	0.12	
Lower Bevens Creek	05/06/03	58	6	5.32	0.03	5.35	0.18	0.11	
Lower Bevens Creek	05/27/03	152	99	8.87	0.03	8.90	0.35	0.11	
Lower Bevens Creek	06/09/03	68	10	6.89	0.04	6.93	0.19	0.17	
Lower Bevens Creek	06/25/03	52	144	5.35	0.08	5.43	0.40	0.28	
Lower Bevens Creek	07/17/03	21	26	3.71	0.04	3.75	0.39	0.36	
Lower Bevens Creek	08/07/03	3	3	0.29	0.03	0.32	0.13	0.12	
Lower Bevens Creek	09/10/03	2	2	0.56	0.03	0.59	0.04	0.01	
Lower Bevens Creek	10/07/03	2	2	1.17	0.03	1.20	0.03	0.01	
Lower Bevens Creek	10/22/03	2	2	1.14	0.03	1.17	0.02	0.02	
Lower Bevens Creek	11/12/03	2	1	1.13	0.03	1.16	0.02	0.01	
Lower Bevens Creek	11/25/03	2	1	1.12	0.03	1.15	0.01	0.01	
Lower Bevens Creek	12/11/03	2	2	1.25	0.03	1.28	0.02	0.00	
Lower Bevens Creek	12/22/03	2	4	1.12	0.03	1.15	0.01	0.01	
Bluff Creek	07/15/03	20	337	0.12	0.015	0.135	0.46	0.18	
Bluff Creek	01/07/03	1	5	0.24	0.02	0.26	0.05	0.02	
Bluff Creek	02/13/03	0	1	0.40	0.02	0.42	0.01	0.01	
Bluff Creek	03/17/03	23	155	1.24	0.07	1.31	0.69	0.44	
Bluff Creek	04/02/03	2	3	0.73	0.02	0.75	0.10		
Bluff Creek	04/18/03	18	40	1.13	0.04	1.17	0.16	0.05	
Bluff Creek	05/01/03	2	2	0.36	0.02	0.38	0.07	0.02	
Bluff Creek	05/11/03	61	2430	1.63	0.05	1.68	0.87	0.13	
Bluff Creek	05/12/03	30	272	0.81	0.02	0.83	0.21	0.09	
Bluff Creek	06/27/03	9	24	0.41	0.02	0.43	0.16	0.10	
Bluff Creek	07/21/03	1	4	0.38	0.02	0.40	0.10	0.06	
Bluff Creek	08/05/03	1	5	0.28	0.02	0.30	0.04	0.02	
Bluff Creek	09/10/03	1	9	0.22	0.02	0.24	0.05	0.02	
Bluff Creek	10/29/03	1	1	0.85	0.02	0.87	0.02	0.02	
Bluff Creek	11/25/03	0	4	0.70	0.02	0.72	0.04	0.02	
Bluff Creek	12/17/03	1	1	0.75	0.02	0.77	0.04	0.02	
Nine Mile Creek	05/11/03	165	152	0.21	0.02	0.23	0.20	0.01	
Nine Mile Creek	05/12/03	142	54	0.19	0.02	0.21	0.12	0.01	
Nine Mile Creek	05/14/03	236	456	0.23	0.02	0.25	0.26		
Nine Mile Creek	05/20/03	94	74	0.13	0.02	0.15	0.12	0.04	
Nine Mile Creek	06/07/03	66	48	0.24	0.02	0.26	0.18		
Nine Mile Creek	06/26/03	120	114	0.24	0.02	0.26	0.15	0.05	
Nine Mile Creek	06/28/03	225					0.26		
Nine Mile Creek	07/03/03	161	372	0.38	0.02	0.40	0.24		

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Nine Mile Creek	07/04/03	96	47	0.26	0.04	0.30	0.19	0.07	
Nine Mile Creek	07/14/03	189		0.49	0.02	0.51	0.42		
Nine Mile Creek	08/20/03	85	306	0.61	0.04	0.65	0.44		
Nine Mile Creek	09/12/03	83		0.28	0.02	0.30	0.31		
Nine Mile Creek	01/02/03	5	2	0.36	0.02	0.38	0.01	0.01	
Nine Mile Creek	02/06/03	3	2	0.88	0.02	0.90	0.04	0.01	
Nine Mile Creek	03/04/03	3	1	1.11	0.02	1.13	0.02	0.01	
Nine Mile Creek	03/14/03	45	304	0.87	0.09	0.96	0.83		
Nine Mile Creek	03/16/03	49	36	0.63	0.02	0.65	0.29	0.14	
Nine Mile Creek	04/09/03	7	3	0.45	0.02	0.47	0.04	0.00	
Nine Mile Creek	04/17/03	80	30	0.17	0.02	0.19	0.15	0.00	
Nine Mile Creek	05/05/03	24	10	0.34	0.03	0.37	0.11	0.01	
Nine Mile Creek	05/29/03	21	4	0.23	0.04	0.27	0.08		
Nine Mile Creek	06/24/03	8	5	0.69	0.05	0.74	0.16	0.07	
Nine Mile Creek	07/25/03	8	5	0.29	0.02	0.31	0.08		
Nine Mile Creek	08/06/03	5	3	0.31	0.02	0.33	0.08	0.03	
Nine Mile Creek	08/14/03	1	1	0.72	0.02	0.74	0.05	0.03	
Nine Mile Creek	08/20/03	10						0.04	
Nine Mile Creek	09/05/03	2	1	0.90	0.02	0.92	0.06	0.02	
Nine Mile Creek	09/12/03	8	38					0.00	
Nine Mile Creek	10/21/03	2	1	0.87	0.02	0.89	0.03	0.01	
Nine Mile Creek	11/14/03	2	1	0.68	0.02	0.70	0.03	0.01	
Nine Mile Creek	12/03/03	2	2	0.99	0.02	1.01	0.01	0.01	
Riley Creek	01/30/03	2	2	2.03	0.04	2.07	0.03	0.03	0.07
Riley Creek	03/05/03	2	3	2.2	0.03	2.23	0.03	0.02	0.02
Riley Creek	03/15/03	8	512	1.04	0.07	1.11	1.98		0.02
Riley Creek	03/27/03	7	534	0.71	0.03	0.74	0.55	0.04	0.21
Riley Creek	04/10/03	2	59	0.76	0.03	0.79	0.12	0.02	0.09
Riley Creek	04/16/03	7	205	0.58	0.03	0.61	1.23	0.02	0.09
Riley Creek	05/05/03	4	61	0.63	0.03	0.66	0.09		0.06
Riley Creek	05/09/03	8	535	0.55	0.04	0.59	0.88		0.05
Riley Creek	05/11/03	17	1130	0.44	0.04	0.48	0.73		0.07
Riley Creek	05/19/03	19	415	0.49	0.03	0.52	0.44		0.02
Riley Creek	06/07/03	8	263	0.47	0.08	0.55	0.26		0.06
Riley Creek	06/13/03	4	89	0.66	0.05	0.71	0.04	0.03	0.02
Riley Creek	06/25/03	11	1370	0.54	0.08	0.62	1.28		0.09
Riley Creek	07/03/03	11	835	0.48	0.04	0.52	0.82		0.05
Riley Creek	07/14/03	38	2970	0.32	0.1	0.42	2.89		0.12
Riley Creek	07/29/03	2	30	0.75	0.04	0.79	0.10	0.03	0.06
Riley Creek	08/26/03	1	3	1.6	0.03	1.63	0.05	0.04	0.02
Riley Creek	09/12/03	7	800	0.37	0.05	0.42	1.00	0.06	0.04

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Riley Creek	10/03/03	1	1	1.97	0.03	2	0.04	0.04	0.02
Riley Creek	10/12/03	3	8	1.59	0.03	1.62	0.08		0.02
Riley Creek	10/31/03	1	3	2.3	0.03	2.33	0.04	0.03	0.03
Riley Creek	12/03/03	1	2	2.25	0.03	2.28	0.05	0.02	0.03
Eagle Creek	01/07/03	9	8	0.31	0.03	0.34	0.05	0.01	0.02
Eagle Creek	02/12/03	7	32	0.75	0.03	0.78	0.19	0.01	0.08
Eagle Creek	03/11/03	9	40	0.36	0.03	0.39	0.18	0.01	0.07
Eagle Creek	03/14/03	10	31	0.39	0.03	0.42	0.13		0.06
Eagle Creek	03/15/03	10	15	0.25	0.03	0.28	0.07		0.06
Eagle Creek	04/10/03	7	5	0.09	0.03	0.12	0.05	0.01	0.02
Eagle Creek	05/02/03	7	7	0.1	0.03	0.13	0.05	0.01	0.02
Eagle Creek	05/04/03	8		0.11	0.03	0.14	0.08	0.01	0.03
Eagle Creek	05/11/03	14	36	0.19	0.03	0.22	0.06	0.01	0.02
Eagle Creek	06/17/03	7	8	0.06	0.03	0.09	0.01	0.01	0.02
Eagle Creek	06/25/03	11	31	0.13	0.03	0.16	0.08	0.01	0.03
Eagle Creek	07/03/03	12	46	0.17	0.03	0.2	0.11	0.01	0.02
Eagle Creek	07/21/03	8	3	0.07	0.03	0.1	0.04	0.01	0.03
Eagle Creek	08/12/03	7	3	0.08	0.03	0.11	0.04	0.01	0.07
Eagle Creek	08/20/03	8	5	0.14	0.03	0.17	0.07	0.01	0.04
Eagle Creek	09/12/03	9	11	0.05	0.03	0.08	0.07	0.02	0.02
Eagle Creek	09/24/03	7	2	0.11	0.03	0.14	0.03	0.01	0.02
Eagle Creek	10/08/03	8	4	0.63	0.03	0.66	0.03	0.01	0.02
Eagle Creek	10/11/03	10		0.62	0.03	0.65	0.05		0.03
Eagle Creek	11/05/03	8	2	0.57	0.03	0.6	0.03	0.01	0.03
Eagle Creek	11/19/03	8	5	0.26	0.03	0.29	0.03	0.01	0.04
Eagle Creek	12/07/03	7	92	0.17	0.03	0.2	0.35	0.01	0.06
Credit Creek	01/07/03	9	1	0.88	0.02	0.90	0.02	0.01	
Credit Creek	02/06/03	8	1	1.36	0.02	1.38	0.03	0.02	
Credit Creek	03/17/03	58	66	1.60	0.04	1.64	0.75	0.43	
Credit Creek	04/02/03	23	8	1.13	0.02	1.15	0.12		
Credit Creek	04/09/03	13	4	0.70	0.02	0.72	0.06	0.01	
Credit Creek	04/17/03	66	52	1.58	0.05	1.63	0.24	0.09	
Credit Creek	04/22/03	49	15	1.54	0.02	1.56	0.16	0.04	
Credit Creek	05/05/03	32	32	0.45	0.02	0.47	0.08	0.01	
Credit Creek	05/11/03	169	634	0.62	0.02	0.64	0.32	0.07	
Credit Creek	05/13/03	156	180	1.54	0.02	1.56	0.23	0.11	
Credit Creek	05/21/03	52	26	0.70	0.02	0.72	0.17	0.08	
Credit Creek	06/06/03	26	32	0.59	0.02	0.61	0.20	0.05	
Credit Creek	06/24/03	11	8	0.77	0.02	0.79	0.11	0.08	
Credit Creek	07/03/03	25	38					0.05	
Credit Creek	07/03/03	22		0.65	0.03	0.68	0.80		

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
Credit Creek	07/15/03	37	78					0.08	
Credit Creek	07/15/03	20		0.50	0.02	0.52	0.63		
Credit Creek	07/25/03	4	2	0.55	0.02	0.57	0.07	0.05	
Credit Creek	08/06/03	3	1	0.36	0.02	0.38	0.05	0.03	
Credit Creek	08/14/03	3	2	0.56	0.02	0.58	0.05	0.04	
Credit Creek	09/05/03	2	1	0.73	0.02	0.75	0.07	0.04	
Credit Creek	09/12/03	10	19					0.06	
Credit Creek	09/12/03	17		0.70	0.02	0.72	0.52		
Credit Creek	10/21/03	3	1	0.78	0.02	0.80	0.58	0.01	
Credit Creek	11/18/03	6	2	0.73	0.02	0.75	0.04	0.03	
Credit Creek	12/15/03	3	3	1.04	0.02	1.06	0.05	0.02	
Willow Creek	03/07/03	0	28	1.12	0.07	1.19	0.11	0.02	0.57
Willow Creek	03/27/03	9	40	0.27	0.03	0.3	0.15	0.04	0.17
Willow Creek	04/10/03	1	4	0.12	0.03	0.15	0.06	0.01	0.02
Willow Creek	04/16/03	9	216	0.29	0.03	0.32	0.38	0.02	0.22
Willow Creek	04/21/03	9	8	0.41	0.03	0.44	0.07	0.01	0.05
Willow Creek	05/05/03	10	40	0.21	0.03	0.24	0.25		0.06
Willow Creek	05/09/03	13	52	0.15	0.03	0.18	0.24		0.07
Willow Creek	05/11/03	30	66	0.15	0.03	0.18	0.12		0.06
Willow Creek	05/14/03	35	31	0.19	0.03	0.22	0.06	0.01	0.07
Willow Creek	05/19/03	16	18	0.18	0.03	0.21	0.06		0.04
Willow Creek	06/07/03	12	29	0.14	0.03	0.17	0.10		0.11
Willow Creek	06/13/03	5	3	0.21	0.03	0.24	0.06	0.02	0.03
Willow Creek	06/24/03	12	49	0.22	0.03	0.25	0.14		0.09
Willow Creek	07/15/03	19	42	0.16	0.03	0.19	0.11		0.09
Willow Creek	07/29/03	1	2	0.42	0.03	0.45	0.03	0.01	0.05
Willow Creek	08/26/03	0	1	1.03	0.03	1.06	0.03	0.01	0.02
Willow Creek	09/12/03	14	56	0.14	0.03	0.17	0.17		0.03
Willow Creek	10/06/03	1	1	1.23	0.03	1.26	0.02	0.01	0.04
Willow Creek	10/31/03	0	1	0.97	0.03	1	0.01	0.01	0.02
Willow Creek	11/19/03	0	1	0.79	0.03	0.82	0.01	0.01	0.03
MN River at Judson	01/30/03	449	4	1.72	0.03	1.75	0.15	0.11	0.2
MN River at Judson	03/14/03	533	4	1.14	0.03	1.17	0.24	0.18	0.36
MN River at Judson	03/21/03	3411	168	1.89	0.12	2.01	0.65	0.44	0.86
MN River at Judson	03/26/03	3554	112	1.35	0.05	1.4	0.42	0.26	0.46
MN River at Judson	04/15/03	1456	87	0.05	0.03	0.08	0.22	0.01	0.02
MN River at Judson	04/22/03	4452	191	7.23	0.08	7.31	0.37	0.07	0.08
MN River at Judson	04/28/03	4202	138	4.57	0.03	4.6	0.22	0.03	0.06
MN River at Judson	05/07/03	3135	75	2.79	0.03	2.82	0.22	0.01	0.06
MN River at Judson	05/16/03	6454	174	9.16	0.04	9.2	0.24	0.05	0.03
MN River at Judson	05/22/03	6567	159	7.98	0.03	8.01	0.17	0.05	0.02

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
MN River at Judson	06/04/03	3214	88	4.28	0.03	4.31	0.15	0.01	0.02
MN River at Judson	06/17/03	2945	112	4.51	0.03	4.54	0.19	0.01	0.02
MN River at Judson	06/25/03	3037	117	4.65	0.03	4.68	0.21	0.01	0.02
MN River at Judson	07/01/03	4596	136	9.23	0.04	9.27	0.24	0.10	0.02
MN River at Judson	07/08/03	3503	140	3.43	0.03	3.46	0.25	0.05	0.02
MN River at Judson	07/22/03	2703	138	1.16	0.04	1.2	0.31	0.09	0.02
MN River at Judson	08/05/03	1517	114	0.05	0.03	0.08	0.29	0.09	0.03
MN River at Judson	08/26/03	569	132	0.11	0.03	0.14	0.31	0.12	0.02
MN River at Judson	09/09/03	352	60	0.05	0.03	0.08	0.25	0.07	0.02
MN River at Judson	09/23/03	378	45	0.33	0.03	0.36	0.01	0.01	0.02
MN River at Judson	10/14/03	201	60	0.54	0.03	0.57	0.25	0.08	0.02
MN River at Judson	10/28/03	226	71	0.72	0.03	0.75	0.19	0.06	0.02
MN River at Judson	11/19/03	258	30	0.42	0.03	0.45	0.19	0.01	0.03
MN River at St. Peter	01/30/03	540	2	3.3	0.04	3.34	0.13	0.10	0.15
MN River at St. Peter	03/14/03	840	13	1.78	0.07	1.85	0.22	0.18	0.28
MN River at St. Peter	03/21/03	4332	90	1.91	0.12	2.03	0.58	0.38	0.72
MN River at St. Peter	03/26/03	3811	103	1.62	0.08	1.7	0.50	0.24	0.45
MN River at St. Peter	04/15/03	3186	84	4.54	0.03	4.57	0.20	0.01	0.02
MN River at St. Peter	04/20/03	6274	151	8.38	0.04	8.42	0.25	0.04	0.02
MN River at St. Peter	04/25/03	8376	159	9.79	0.06	9.85	0.24	0.05	0.03
MN River at St. Peter	04/29/03	6369	80	7.57	0.03	7.6	0.16	0.01	0.02
MN River at St. Peter	05/11/03	8280	247	9.67	0.04	9.71	0.34	0.03	0.03
MN River at St. Peter	05/15/03	13518	498	13.2	0.08	13.28	0.54	0.07	0.08
MN River at St. Peter	05/17/03	12742	260	12.4	0.06	12.46	0.34	0.06	0.02
MN River at St. Peter	05/21/03	11103	150	10.6	0.05	10.65	0.29	0.06	0.02
MN River at St. Peter	05/25/03	9623	111	10.2	0.05	10.25	0.22	0.04	0.02
MN River at St. Peter	06/04/03	5378	126	7.44	0.03	7.47	0.21	0.01	0.02
MN River at St. Peter	06/11/03	7097	120	10.3	0.04	10.34	0.16	0.03	0.02
MN River at St. Peter	06/14/03	7129	126	11.2	0.05	11.25	0.17	0.04	0.02
MN River at St. Peter	06/25/03	4315	146	7.74	0.03	7.77	0.23	0.03	0.02
MN River at St. Peter	06/30/03	7923	190	10.7	0.05	10.75	0.25	0.09	0.02
MN River at St. Peter	07/08/03	5155	139	5.81	0.03	5.84	0.26	0.07	0.02
MN River at St. Peter	07/12/03	6703	169	7.61	0.03	7.64	0.30	0.07	0.02
MN River at St. Peter	07/22/03	3790	136	3.73	0.04	3.77	0.25	0.09	0.02
MN River at St. Peter	08/05/03	1690	104	0.26	0.03	0.29	0.23	0.06	0.02
MN River at St. Peter	08/26/03	729	75	0.13	0.03	0.16	0.23	0.07	0.02
MN River at St. Peter	09/09/03	390	46	0.08	0.03	0.11	0.20	0.03	0.02
MN River at St. Peter	09/23/03	411	36	0.25	0.03	0.28	0.42	0.06	0.02
MN River at St. Peter	10/14/03		26	0.7	0.03	0.73	0.15	0.05	0.02
MN River at St. Peter	11/19/03		42	0.5	0.03	0.53	0.21	0.01	0.02
MN River at Jordan	01/10/03	870	4	2.46	0.03	2.49	0.05	0.05	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
MN River at Jordan	02/07/03	760	5	2.72	0.03	2.75	0.15	0.08	
MN River at Jordan	02/21/03	780	3	2.27	0.03	2.3	0.12	0.10	
MN River at Jordan	03/07/03	780	3	2.41	0.03	2.44	0.13	0.08	
MN River at Jordan	03/20/03	4910	84	1.7	0.07	1.77	0.42	0.23	
MN River at Jordan	04/03/03	4230	123	5.02	0.08	5.1	0.23	0.11	
MN River at Jordan	04/18/03	4380	106	5.75	0.03	5.78	0.22	0.01	
MN River at Jordan	05/09/03	6360	112	7	0.03	7.03	0.22	0.01	
MN River at Jordan	05/23/03	13700	165	12.8	0.03	12.83	0.23	0.06	
MN River at Jordan	05/30/03	8150	106	10.3	0.03	10.33	0.20	0.02	
MN River at Jordan	06/06/03	5270	100	6.73	0.03	6.76	0.15	0.01	
MN River at Jordan	06/20/03	5040	127	8.87	0.03	8.9	0.23	0.03	
MN River at Jordan	07/03/03	7800	208	12.7	0.03	12.73	0.32	0.09	
MN River at Jordan	07/18/03	5500	278	6.76	0.03	6.79	0.25	0.08	
MN River at Jordan	08/07/03	2170	94	0.13	0.03	0.16	0.18	0.03	
MN River at Jordan	08/22/03	1110	78	0.05	0.03	0.08		0.03	
MN River at Jordan	09/05/03	636	54	0.05	0.03	0.08	0.18	0.01	
MN River at Jordan	09/19/03	651	62	0.05	0.03	0.08	0.16	0.01	
MN River at Jordan	10/03/03		35	0.08	0.03	0.11	0.15	0.01	
MN River at Jordan	10/10/03		57	0.67	0.03	0.7	0.24	0.01	
MN River at Jordan	10/17/03		35	0.45	0.03	0.48	0.11	0.01	
MN River at Jordan	10/24/03		46	0.42	0.03	0.45	0.10	0.01	
MN River at Jordan	10/30/03		22	0.97	0.03	1	0.10	0.01	
MN River at Jordan	11/07/03		11	1.18	0.03	1.21	0.10	0.06	
MN River at Jordan	11/13/03		16	0.95	0.03	0.98	0.18	0.02	
MN River at Jordan	11/21/03		46	0.12	0.03	0.15	0.13	0.01	
MN River at Jordan	11/25/03		36	0.05	0.03	0.08	0.13	0.01	
MN River at Jordan	12/05/03		18	0.9	0.03	0.93	0.21	0.03	
MN River at Jordan	12/11/03		11	1.08	0.03	1.11	0.15	0.07	
MN River at Jordan	12/23/03		4	1.5	0.04	1.54	0.12	0.07	
MN River at Jordan	12/30/03		6	1.46	0.03	1.49	0.16	0.10	
MN River at F. Snelling	01/10/03	1040	11	2.59	0.03	2.62	0.15	0.08	
MN River at F. Snelling	01/24/03	860	10	3.96	0.03	3.99	0.18	0.11	
MN River at F. Snelling	02/07/03	820	9	3.15	0.03	3.18	0.11	0.07	
MN River at F. Snelling	02/21/03	850	7	2.8	0.04	2.84	0.14	0.08	
MN River at F. Snelling	03/07/03	850	10	3.17	0.04	3.21	0.12	0.08	
MN River at F. Snelling	03/20/03	4169	28	1.75	0.06	1.81	0.39	0.25	
MN River at F. Snelling	04/03/03	4725	71	3.26	0.05	3.31	0.22	0.11	
MN River at F. Snelling	04/18/03	4032	67	3.16	0.03	3.19	0.21	0.01	
MN River at F. Snelling	05/09/03	5670	45	3.96	0.03	3.99	0.01	0.01	
MN River at F. Snelling	05/23/03	14805	164	11.6	0.04	11.64	0.27	0.06	
MN River at F. Snelling	05/30/03	9167	96	8.96	0.03	8.99	0.21	0.03	

Water Quality Concentrations for Monitoring Sites 2003

Site	Date	Flow (cfs)	TSS (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate-N (mg/L)	TP (mg/L)	PO-4 (mg/L)	NH3 (mg/L)
MN River at F. Snelling	06/06/03	5796	85	7.04	0.03	7.07	0.17	0.01	
MN River at F. Snelling	06/20/03	5639	58	8.83	0.03	8.86	0.17	0.04	
MN River at F. Snelling	07/03/03	9125	70	11.8	0.04	11.84	0.19	0.10	
MN River at F. Snelling	07/18/03	6227	76	7.33	0.04	7.37	0.22	0.11	
MN River at F. Snelling	08/07/03	2310	54	0.66	0.03	0.69	0.18	0.09	
MN River at F. Snelling	08/22/03	1250	64	0.61	0.03	0.64	0.23	0.10	
MN River at F. Snelling	09/05/03	747	36	0.63	0.03	0.66	0.36	0.06	
MN River at F. Snelling	09/19/03	771	39	0.9	0.04	0.94	0.17	0.05	
MN River at F. Snelling	10/03/03		67	1.08	0.04	1.12	0.21	0.01	
MN River at F. Snelling	10/10/03		35	1.56	0.03	1.59	0.14	0.01	
MN River at F. Snelling	10/17/03		27	1.68	0.03	1.71	0.13	0.03	
MN River at F. Snelling	10/24/03		39	1.87	0.03	1.9	0.18	0.01	
MN River at F. Snelling	10/30/03		37	0.92	0.03	0.95	0.16	0.01	
MN River at F. Snelling	11/07/03		74	2.25	0.03	2.28	0.21	0.03	
MN River at F. Snelling	11/13/03		36	1.75	0.03	1.78	0.13	0.03	
MN River at F. Snelling	11/21/03		40	1.52	0.03	1.55	0.14	0.01	
MN River at F. Snelling	11/25/03		31	1.39	0.03	1.42	0.81	0.01	
MN River at F. Snelling	12/05/03		34	0.98	0.03	1.01	0.12	0.01	
MN River at F. Snelling	12/11/03		32	0.82	0.03	0.85	0.14	0.01	
MN River at F. Snelling	12/19/03		17	1.68	0.04	1.72	0.14	0.02	
MN River at F. Snelling	12/23/03		13	2.16	0.04	2.2	0.12	0.03	
MN River at F. Snelling	12/30/03		18	2.35	0.04	2.39	0.18	0.07	

Appendix F

Loads, Yields, Runoff-Adjusted Yields, and Flow-Weighted Mean Concentrations for Monitoring Sites, 2000-2003

2000 to 2003 Loads, Yields, Runoff-Adjusted Yields and Flow-Weighted Mean Concentrations

Stream	2000 TSS (Thousands of Tons)	2001 TSS (Thousands of Tons)	2002 TSS (Thousands of Tons)	2003 TSS (Thousands of Tons)	2000 TSS Yield (lbs/acre)	2001 TSS Yield (lbs/acre)	2002 TSS Yield (lbs/acre)	2003 TSS Yield (lbs/acre)	2000 TSS Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2001 TSS Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2002 TSS Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2003 TSS Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2000 TSS FWMC (mg/l)	2001 TSS FWMC (mg/l)	2002 TSS FWMC (mg/l)	2003 TSS FWMC (mg/l)
Mainstem Sites																
MN R at Judson	131	573	341	184	36	159	95	51	43	24	43	30	188	107	187	131
Greater Blue Earth River	710	830	143	155	627	718	126	137	150	58	42	38	661	256	185	166
MN R at St. Peter	763	1,828	528	356	158	379	110	74	94	48	47	35	415	210	204	154
MN R at Jordan	481	1,226	670	366	93	236	129	70	50	28	51	32	222	124	226	142
MN R at Fort Snelling	728	1,411	537	229	134	260	99	42	72	31	39	19	320	136	172	85
Major Sites																
Yellow Bank			1				4				5				20	
Laq Que Parle			7	1			24	3			17	5			77	23
Chippewa	16	40	25	21	26	67	41	35	25	10	19	18	112	46	83	80
Yellow Medicine			10	2			46	7			19	7			92	31
Hawk	13	2	5	8	81	10	32	52	45	7	14	19	198	33	63	84
Redwood	15		31	9	76		155	45	59		42	23	261		186	100
Cottonwood	76		111	27	181		265	65	140		74	32	638		328	144
Little Cottonwood			11	6			204	106			52	50			229	219
Watonwan	14	65	18	26	52	241	66	95	35	23	33	35	155	100	144	155
Blue Earth	183	431	43	77	236	555	56	99	83	47	21	28	362	205	95	125
Le Sueur	527	382	99	78	1,483	1,076	280	221	208	81	72	55	918	355	318	245
Rush				20				155				73				322
High Island		68	29	14		897	387	182		115	92	79		508	408	347
Sand	7	25	44	38	90	305	534	471	37	39	92	129	166	174	404	571
Minor Sites																
Dry Weather			0.2	0.2			6	7			5	5			21	24
WFBC	2	1	0.4	0.3	61	24	12	10	15	3	9	5	156	39	41	25
Clear	0	0	4.3		13	13	139		16	3	25		87	19	138	
Dutch	0	2	0.0	0.1	76	529	10	12	25	32	5	4	105	140	21	16
Seven Mile	2	12	3.5	2.2	156	984	299	186	44	61	55	54	192	263	241	254
Bevens	0.3	21	33.1	6.2	7	500	789	147	16	62	97	47	57	272	429	206
Chaska																
Carver	0.4	4.1	12.1		14	153	452		24	25	66		105	111	298	
Bluff			1.6	0.4			553	140			106	36			472	160
Riley		2.7	1.5	1.0		644	468	313		120	75	104		531	327	516
Eagle			0.1	0.0			47	24							9	8
Credit		1.3	0.0	2.0		76		121		15		31		67		137
Willow		0.3	0.5	0.1		80	150	27		9	18	7		40	77	33
Nine Mile	1.0	1.4	3.0	1.5	78	114	248	121	11	14	22	20	48	62	96	90

2000 to 2003 Loads, Yields, Runoff-Adjusted Yields and Flow-Weighted Mean Concentrations

Stream	2000 Nitrate-N (tons)	2001 Nitrate-N (tons)	2002 Nitrate-N (tons)	2003 Nitrate-N (tons)	2000 NO3-N Yield (lbs/acre)	2001 NO3-N Yield (lbs/acre)	2002 NO3-N Yield (lbs/acre)	2003 NO3-N Yield (lbs/acre)	2000 NO3-N Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2001 NO3-N Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2002 NO3-N Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2003 NO3-N Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2000 NO3-N FWMC (mg/l)	2001 NO3-N FWMC (mg/l)	2002 NO3-N FWMC (mg/l)	2003 NO3-N FWMC (mg/l)
Mainstem Sites																
MN R at Judson	3,636	18,512	8,687	6,028	1.01	5.15	2.42	1.68	1.19	0.78	1.09	0.98	5.24	3.46	4.75	4.31
Greater Blue Earth River	10,697	31,389	7,532	11,603	9.44	27.71	6.65	10.24	2.25	2.24	2.22	2.82	9.95	9.88	9.78	12.44
MN R at St. Peter	15,470	46,653	16,476	17,565	3.21	9.68	3.42	3.65	1.91	1.22	1.48	1.73	8.41	5.37	6.36	7.60
MN R at Jordan	15,762	65,308	21,062	21,093	3.03	12.57	4.05	4.06	1.65	1.50	1.61	1.86	7.28	6.62	7.12	8.22
MN R at Fort Snelling	12,480		20,267	19,642	2.30		3.74	3.62	1.24		1.48	1.65	5.48		6.51	7.28
Major Sites																
Yellow Bank			17				0.12				0.15				0.64	
Lac Que Parle			140	50			0.46	0.16			0.33	0.31			1.45	1.38
Chippewa	142	1,400	341	315	0.24	2.33	0.57	0.52	0.23	0.36	0.26	0.27	1.01	1.60	1.14	1.19
Yellow Medicine			470	215			2.21	0.98			0.90	1.01			4.44	4.45
Hawk	429	302	475	969	2.65	1.87	2.94	6.00	1.47	1.43	1.33	2.19	6.50	6.31	5.87	9.67
Redwood	188		1,718	696	0.93		8.53	3.46	0.73		2.33	1.74	3.21		10.30	7.68
Cottonwood	824		3,382	1,781	1.96		8.05	4.24	1.52		2.26	2.07	6.71		9.96	9.41
Little Cottonwood			359	141			6.59	2.59			1.68	1.21			7.40	5.33
Watonwan	861	6,744	1,184	2,141	3.16	24.77	4.35	7.86	2.14	2.33	2.16	2.91	9.40	10.30	9.52	12.85
Blue Earth	5,518	20,252	3,918	7,422	7.10	26.04	5.04	9.54	2.50	2.18	1.95	2.75	10.90	9.64	8.59	12.12
Le Sueur	5,179	11,136	3,614	4,181	14.58	31.35	10.17	11.77	2.04	2.35	2.62	2.96	9.20	10.35	11.56	13.04
Rush				1,063				8.25				3.89				17.12
High Island		1,105	626	574		14.53	8.22	7.54		1.86	1.96	3.25		8.22	8.66	14.33
Sand	191	1,008	616	269	2.34	12.36	7.55	3.30	0.98	1.60	1.30	1.52	4.32	7.05	5.70	4.00
Minor Sites																
Dry Weather			42	74			1.24	2.19			0.99	1.74			4.35	8.08
WFBC	95	109	52	122	3.11	3.57	1.68	3.98	0.74	0.49	1.30	2.01	7.97	5.77	5.59	9.98
Clear	48	174	587		1.95	7.08	23.82		2.32	1.93	4.29		10.26	8.53	18.95	
Dutch	32	213	24	53	7.29	49.33	5.51	12.21	2.40	2.96	2.65	3.57	10.10	13.07	11.60	15.68
Seven Mile	161	464	194	163	13.69	39.41	16.43	13.83	3.83	2.44	3.00	4.04	16.75	10.50	13.23	18.86
Bevens	51	1,159	689	258	1.22	27.68	16.45	6.17	2.71	3.41	2.03	1.95	9.80	15.12	8.93	8.61
Chaska		61				13.65				1.21				5.32		
Carver	8	192	71		0.29	7.20	2.67		0.52	1.19	0.39		2.27	5.23	1.75	
Bluff			3	2			0.95	0.81			0.18	0.21			0.81	0.92
Riley		4	2	2		0.98	0.59	0.49		0.18	0.09	0.16		0.80	0.41	0.81
Eagle			1	1			0.96	0.69							0.18	0.21
Credit		36		15		2.19		0.88		0.43		0.23		1.91		1.00
Willow		4	2	1		1.19	0.68	0.22		0.13	0.08	0.06		0.59	0.35	0.28
Nine Mile	9	13	14	6	0.72	1.05	1.16	0.49	0.10	0.13	0.10	0.08	0.44	0.57	0.45	0.36

2000 to 2003 Loads, Yields, Runoff-Adjusted Yields and Flow-Weighted Mean Concentrations

Stream	2000 TP (tons)	2001 TP (tons)	2002 TP (tons)	2003 TP (tons)	2000 TP Yield (lbs/acre)	2001 TP Yield (lbs/acre)	2002 TP Yield (lbs/acre)	2003 TP Yield (lbs/acre)	2000 TP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2001 TP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2002 TP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2003 TP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2000 TP FWMC (mg/l)	2001 TP FWMC (mg/l)	2002 TP FWMC (mg/l)	2003 TP FWMC (mg/l)
Mainstem Sites																
MN R at Judson	239	1,979	639	373	0.07	0.55	0.18	0.10	0.08	0.08	0.08	0.06	0.34	0.37	0.35	0.27
Greater Blue Earth River	761	1,661	244	245	0.67	1.47	0.22	0.22	0.16	0.12	0.07	0.06	0.71	0.52	0.32	0.26
MN R at St. Peter	1,112	3,188	883	669	0.23	0.66	0.18	0.14	0.14	0.08	0.08	0.07	0.60	0.37	0.34	0.29
MN R at Jordan	915	2,646	1,123	605	0.18	0.51	0.22	0.12	0.10	0.06	0.09	0.05	0.42	0.27	0.38	0.24
MN R at Fort Snelling	795		1,016	610	0.15		0.19	0.11	0.08		0.07	0.05	0.35		0.33	0.23
Major Sites																
Yellow Bank			4.13				0.03				0.03				0.15	
Laq Que Parle			16.52	5.22			0.05	0.02			0.04	0.03			0.17	0.14
Chippewa	29.50	225.52	52.30	49.25	0.05	0.37	0.09	0.08	0.05	0.06	0.04	0.04	0.21	0.26	0.18	0.19
Yellow Medicine			27.05	4.43			0.13	0.02			0.05	0.02			0.25	0.09
Hawk	41.84	15.24	36.98	35.82	0.26	0.09	0.23	0.22	0.14	0.07	0.10	0.08	0.63	0.32	0.46	0.36
Redwood	36.40		59.10	21.57	0.18		0.29	0.11	0.14		0.08	0.05	0.62		0.35	0.24
Cottonwood	66.50		112.11	38.73	0.16		0.27	0.09	0.12		0.08	0.05	0.56		0.33	0.21
Little Cottonwood			8.84	7.86			0.16	0.14			0.04	0.07			0.18	0.30
Watonwan	28.70	210.02	36.63	42.39	0.11	0.77	0.13	0.16	0.07	0.07	0.06	0.06	0.31	0.32	0.29	0.25
Blue Earth	223.30	982.29	107.97	134.55	0.29	1.26	0.14	0.17	0.10	0.11	0.05	0.05	0.44	0.47	0.24	0.22
Le Sueur	537.80	679.16	136.07	110.87	1.51	1.91	0.38	0.31	0.21	0.14	0.10	0.08	0.93	0.63	0.44	0.35
Rush				21.00				0.16				0.08				0.34
High Island		75.90	46.54	11.44		1.00	0.61	0.15		0.13	0.15	0.04		0.57	0.65	0.29
Sand	23.48	55.9	65.10	40.34	0.29	0.69	0.80	0.49	0.12	0.09	0.14	0.23	0.53	0.39	0.60	0.60
Minor Sites																
Dry Weather			1.26	0.94			0.04	0.03			0.03	0.02			0.13	0.10
WFBC	4.53	6.8	2.07	1.69	0.15	0.22	0.07	0.06	0.04	0.03	0.05	0.03	0.38	0.36	0.22	0.14
Clear	1.24	4.8	9.29		0.05	0.19	0.38		0.06	0.05	0.07		0.26	0.23	0.30	
Dutch	0.62	7.13	0.60	0.24	0.14	1.65	0.14	0.06	0.05	0.10	0.07	0.02	0.20	0.44	0.29	0.07
Seven Mile	2.30	19.36	5.45	2.27	0.20	1.64	0.46	0.19	0.06	0.10	0.08	0.06	0.24	0.44	0.37	0.26
Bevens	3.0	52.31	57.25	12.43	0.07	1.25	1.37	0.30	0.16	0.15	0.17	0.09	0.57	0.68	0.74	0.41
Chaska		5.01				1.11				0.10				0.43		
Carver	1.02	19.86	31.69		0.04	0.74	1.19		0.07	0.12	0.18		0.30	0.54	0.78	
Bluff			1.85	0.85			0.65	0.30			0.12	0.08			0.55	0.34
Riley		2.47	1.72	0.81		0.59	0.54	0.25		0.11	0.09	0.08		0.49	0.38	0.42
Eagle			0.28	0.18			0.26	0.16							0.05	0.05
Credit		4.60		4.02		0.28		0.24		0.05		0.06		0.24		0.28
Willow		0.77	0.98	0.30		0.24	0.30	0.09		0.03	0.04	0.02		0.12	0.16	0.12
Nine Mile	4.12	4.16	7.89	3.39	0.34	0.34	0.64	0.28	0.05	0.04	0.06	0.05	0.21	0.19	0.25	0.21

2000 to 2003 Loads, Yields, Runoff-Adjusted Yields and Flow-Weighted Mean Concentrations

Stream	2000 OP (tons)	2001 OP (tons)	2002 OP (tons)	2003 OP (tons)	2000 OP Yield (lbs/acre)	2001 OP Yield (lbs/acre)	2002 OP Yield (lbs/acre)	2003 OP Yield (lbs/acre)	2000 OP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2001 OP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2002 OP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2003 OP Runoff-Adjusted Yield (lbs/acre/inch of runoff)	2000 OP FWMC (mg/l)	2001 OP FWMC (mg/l)	2002 OP FWMC (mg/l)	2003 OP FWMC (mg/l)
Mainstem Sites																
MN R at Judson	44	944	188	112	0.01	0.26	0.05	0.03	0.01	0.04	0.02	0.02	0.06	0.18	0.10	0.08
Greater Blue Earth River	131	595	73	56	0.12	0.53	0.06	0.05	0.03	0.04	0.02	0.01	0.12	0.19	0.09	0.06
MN R at St. Peter	187	1,562	230	165	0.04	0.324	0.05	0.03	0.02	0.04	0.02	0.02	0.10	0.18	0.09	0.07
MN R at Jordan	194	1,504	300	141	0.037	0.289	0.06	0.03	0.02	0.03	0.02	0.01	0.09	0.15	0.10	0.06
MN R at Fort Snelling	259		337	182	0.05		0.06	0.03	0.03		0.02	0.02	0.11		0.11	0.07
Major Sites																
Yellow Bank			1.86				0.01				0.02				0.07	
Laq Que Parle			6.95	1.30			0.02	0.004			0.02	0.01			0.07	0.03
Chippewa	2.80	107.99	11.88	16.02	0.00	0.18	0.02	0.03	0.004	0.03	0.01	0.01	0.02	0.12	0.04	0.06
Yellow Medicine			6.73	0.73			0.03	0.003			0.01	0.003			0.06	0.02
Hawk	21.73	9.00	25.55	19.70	0.14	0.06	0.16	0.12	0.07	0.04	0.07	0.04	0.33	0.19	0.32	0.20
Redwood	21.60		32.78	11.74	0.11		0.16	0.06	0.09		0.04	0.03	0.37		0.20	0.13
Cottonwood	16.30		48.18	9.08	0.04		0.11	0.02	0.03		0.03	0.01	0.13		0.14	0.05
Little Cottonwood			5.27	2.22			0.05	0.04			0.01	0.02			0.11	0.08
Watonwan	15.40	164.92	17.16	18.86	0.06	0.61	0.06	0.07	0.04	0.06	0.03	0.03	0.17	0.25	0.14	0.11
Blue Earth	42.30	370.61	37.52	31.82	0.05	0.48	0.05	0.04	0.02	0.04	0.02	0.01	0.08	0.18	0.08	0.05
Le Sueur	89.00	224.44	35.28	23.93	0.25	0.63	0.10	0.07	0.04	0.05	0.03	0.02	0.15	0.21	0.11	0.07
Rush				8.85				0.07				0.03				0.14
High Island		36.67	13.22	4.74		0.48	0.17	0.06		0.06	0.04	0.02		0.27	0.18	0.12
Sand	9.79	29.42	28.31	8.82	0.12	0.36	0.35	0.11	0.05	0.05	0.06	0.05	0.22	0.21	0.26	0.13
Minor Sites																
Dry Weather			0.49	0.23			0.01	0.01			0.01	0.01			0.05	0.03
WFBC	3.55	3.55	0.95	0.87	0.12	0.12	0.03	0.03	0.03	0.02	0.02	0.01	0.19	0.19	0.10	0.07
Clear	0.71	4.56	6.42		0.03	0.19	0.26		0.03	0.05	0.05		0.15	0.22	0.21	
Dutch	0.27	1.92	0.40	0.20	0.27	0.44	0.09	0.05	0.02	0.03	0.04	0.01	0.09	0.12	0.20	0.06
Seven Mile	1.70	13.02	2.47	0.82	0.15	1.11	0.21	0.07	0.04	0.07	0.04	0.02	0.18	0.30	0.17	0.10
Bevens	2.32	30.51	30.89	5.69	0.06	0.73	0.74	0.14	0.13	0.09	0.09	0.04	0.45	0.40	0.40	0.19
Chaska		2.20				0.49				0.04				0.19		
Carver	0.44	9.16	10.38		0.02	0.34	0.39		0.04	0.06	0.06		0.13	0.28	0.25	
Bluff			0.66	0.33			0.23	0.12			0.04	0.03			0.20	0.13
Riley		0.33		0.06		0.08		0.02		0.01	0.00	0.01		0.06		0.03
Eagle			0.14	0.03			0.13	0.03							0.03	0.01
Credit		1.73		1.27		0.10		0.08		0.02		0.02		0.09		0.09
Willow		0.33	0.10	0.03		0.10	0.03	0.01		0.01	0.00	0.00		0.05	0.02	0.01
Nine Mile	0.74	0.71	0.77	0.54	0.06	0.06	0.06	0.04	0.009	0.01	0.01	0.01	0.04	0.03	0.02	0.03

2000 to 2003 Loads, Yields,
Runoff-Adjusted Yields and Flow-Weighted Mean Concentrations

Stream	2000 Inches of Runoff (Water Yield)	2001 Inches of Runoff (Water Yield)	2002 Inches of Runoff (Water Yield)	2003 Inches of Runoff (Water Yield)
Mainstem Sites				
MN R at Judson	0.85	6.57	2.22	1.72
Greater Blue Earth River	4.19	12.37	3.00	3.63
MN R at St. Peter	1.69	7.96	2.31	2.12
MN R at Jordan	1.84	8.38	2.51	2.18
MN R at Fort Snelling	1.85	8.44	2.53	2.20
Major Sites				
Yellow Bank			0.85	
Laq Que Parle			1.38	0.52
Chippewa	1.04	6.44	2.20	1.94
Yellow Medicine			2.46	0.97
Hawk	1.81	1.31	2.21	2.75
Redwood	1.28		3.66	1.99
Cottonwood	1.29		3.57	2.05
Little Cottonwood			3.93	2.14
Watonwan	1.48	10.62	2.01	2.70
Blue Earth	2.84	11.92	2.59	3.47
Le Sueur	7.13	13.36	3.89	3.98
Rush				2.12
High Island	0.76	7.80	4.19	3.60
Sand	2.39	7.74	5.80	2.16
Minor Sites				
Dry Weather			1.25	1.20
WFBC	4.19	7.34	1.29	1.98
Clear	0.84	3.66	5.55	
Dutch	3.04	16.65	2.08	3.42
Seven Mile	3.57	16.15	5.48	3.42
Bevens	0.45	8.11	8.10	3.16
Chaska		11.32		
Carver	0.56	6.07	6.80	
Bluff			5.20	3.88
Riley		5.35	6.26	3.01
Eagle				0.00
Credit		5.08		3.89
Willow		8.98	8.55	3.93
Nine Mile	6.99	8.11	11.40	5.94

Appendix G

Fecal Coliform Bacteria

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Yellow Bank River	5/24/2001	50
Yellow Bank River	6/13/2001	3,800
Yellow Bank River	6/21/2001	130
Yellow Bank River	7/24/2001	2,500
Yellow Bank River	8/7/2001	25
Yellow Bank River	8/15/2001	25
Yellow Bank River	8/16/2001	25
Yellow Bank River	8/30/2001	25
Yellow Bank River	9/17/2001	90
Yellow Bank River	10/4/2001	5
Yellow Bank River	5/2/2002	28
Yellow Bank River	5/13/2002	25
Yellow Bank River	5/22/2002	14
Yellow Bank River	5/30/2002	80
Yellow Bank River	6/11/2002	300
Yellow Bank River	6/24/2002	58
Yellow Bank River	6/26/2002	1,300
Yellow Bank River	6/27/2002	1,300
Yellow Bank River	7/10/2002	153
Yellow Bank River	7/22/2002	155
Yellow Bank River	8/5/2002	75
Yellow Bank River	8/7/2002	70
Yellow Bank River	8/21/2002	163
Yellow Bank River	8/22/2002	210
Yellow Bank River	8/28/2002	323
Yellow Bank River	9/25/2002	40
Yellow Bank River	5/14/2003	65
Yellow Bank River	5/19/2003	16
Yellow Bank River	5/22/2003	8
Yellow Bank River	6/19/2003	54
Yellow Bank River	6/25/2003	150
Yellow Bank River	6/26/2003	120
Yellow Bank River	7/17/2003	12
Yellow Bank River	7/21/2003	122
Yellow Bank River	8/19/2003	33
Yellow Bank River	9/11/2003	260
Yellow Bank River	9/15/2003	44
Yellow Bank River	9/29/2003	28
Lac Qui Parle River	5/24/2001	35
Lac Qui Parle River	6/13/2001	2,000
Lac Qui Parle River	6/21/2001	50

Site	Date	FC (org/100 ml)
Lac Qui Parle River	7/24/2001	3,400
Lac Qui Parle River	8/7/2001	10
Lac Qui Parle River	8/16/2001	10
Lac Qui Parle River	8/30/2001	450
Lac Qui Parle River	9/24/2001	<5
Lac Qui Parle River	10/4/2001	<5
Lac Qui Parle River	5/13/2002	14
Lac Qui Parle River	5/22/2002	54
Lac Qui Parle River	5/30/2002	9
Lac Qui Parle River	6/11/2002	160
Lac Qui Parle River	6/24/2002	380
Lac Qui Parle River	6/26/2002	65
Lac Qui Parle River	6/27/2002	900
Lac Qui Parle River	7/10/2002	225
Lac Qui Parle River	7/22/2002	105
Lac Qui Parle River	8/5/2002	55
Lac Qui Parle River	8/7/2002	50
Lac Qui Parle River	8/12/2002	258
Lac Qui Parle River	8/21/2002	785
Lac Qui Parle River	8/22/2002	1,210
Lac Qui Parle River	8/28/2002	203
Lac Qui Parle River	9/10/2002	185
Lac Qui Parle River	9/25/2002	195
Lac Qui Parle River	5/14/2003	320
Lac Qui Parle River	5/19/2003	16
Lac Qui Parle River	5/22/2003	12
Lac Qui Parle River	6/9/2003	90
Lac Qui Parle River	6/10/2003	88
Lac Qui Parle River	6/19/2003	62
Lac Qui Parle River	6/25/2003	330
Lac Qui Parle River	6/26/2003	550
Lac Qui Parle River	7/17/2003	80
Lac Qui Parle River	7/21/2003	162
Lac Qui Parle River	8/19/2003	48
Lac Qui Parle River	9/11/2003	550
Lac Qui Parle River	9/15/2003	48
Lac Qui Parle River	9/29/2003	94
Chippewa River	4/10/2001	50
Chippewa River	4/19/2001	20
Chippewa River	4/24/2001	1
Chippewa River	5/1/2001	40

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Chippewa River	5/8/2001	60
Chippewa River	5/16/2001	60
Chippewa River	5/21/2001	320
Chippewa River	5/31/2001	40
Chippewa River	6/7/2001	100
Chippewa River	6/11/2001	80
Chippewa River	6/13/2001	580
Chippewa River	6/19/2001	60
Chippewa River	7/5/2001	180
Chippewa River	7/12/2001	140
Chippewa River	7/17/2001	60
Chippewa River	7/23/2001	280
Chippewa River	7/31/2001	1
Chippewa River	8/9/2001	120
Chippewa River	8/16/2001	60
Chippewa River	8/23/2001	20
Chippewa River	8/30/2001	180
Chippewa River	9/6/2001	80
Chippewa River	9/13/2001	180
Chippewa River	9/20/2001	260
Chippewa River	9/27/2001	200
Chippewa River	10/11/2001	1
Chippewa River	4/23/2002	20
Chippewa River	4/29/2002	20
Chippewa River	5/8/2002	220
Chippewa River	5/13/2002	20
Chippewa River	5/21/2002	1
Chippewa River	5/29/2002	20
Chippewa River	6/6/2002	100
Chippewa River	6/12/2002	180
Chippewa River	6/24/2002	1,360
Chippewa River	7/2/2002	320
Chippewa River	7/17/2002	50
Chippewa River	7/23/2002	150
Chippewa River	8/1/2002	180
Chippewa River	8/6/2002	700
Chippewa River	8/21/2002	10,800
Chippewa River	8/29/2002	60
Chippewa River	9/5/2002	150
Chippewa River	9/11/2002	80
Chippewa River	9/30/2002	140

Site	Date	FC (org/100 ml)
Chippewa River	4/8/2003	1
Chippewa River	4/22/2003	54
Chippewa River	5/13/2003	52
Chippewa River	5/20/2003	174
Chippewa River	5/28/2003	120
Chippewa River	6/4/2003	64
Chippewa River	6/11/2003	170
Chippewa River	6/19/2003	192
Chippewa River	6/24/2003	220
Chippewa River	7/1/2003	2,300
Chippewa River	7/9/2003	95
Chippewa River	7/16/2003	315
Chippewa River	7/22/2003	211
Chippewa River	7/29/2003	63
Chippewa River	8/6/2003	96
Chippewa River	8/12/2003	144
Chippewa River	8/27/2003	108
Chippewa River	9/4/2003	108
Chippewa River	9/11/2003	294
Dry Weather Creek	4/10/2001	50
Dry Weather Creek	4/19/2001	1
Dry Weather Creek	4/24/2001	140
Dry Weather Creek	5/1/2001	1
Dry Weather Creek	5/8/2001	40
Dry Weather Creek	5/16/2001	1
Dry Weather Creek	5/21/2001	740
Dry Weather Creek	5/31/2001	180
Dry Weather Creek	6/7/2001	200
Dry Weather Creek	6/11/2001	540
Dry Weather Creek	6/13/2001	540
Dry Weather Creek	6/19/2001	220
Dry Weather Creek	7/5/2001	40
Dry Weather Creek	7/12/2001	80
Dry Weather Creek	7/23/2001	100
Dry Weather Creek	8/9/2001	160
Dry Weather Creek	8/16/2001	40
Dry Weather Creek	8/23/2001	40
Dry Weather Creek	8/30/2001	1,220
Dry Weather Creek	9/6/2001	220
Dry Weather Creek	9/13/2001	700
Dry Weather Creek	9/20/2001	60

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Dry Weather Creek	9/27/2001	40
Dry Weather Creek	10/11/2001	1
Dry Weather Creek	4/23/2002	1
Dry Weather Creek	4/29/2002	20
Dry Weather Creek	5/8/2002	60
Dry Weather Creek	5/13/2002	1
Dry Weather Creek	5/21/2002	1
Dry Weather Creek	5/29/2002	1
Dry Weather Creek	6/6/2002	1
Dry Weather Creek	6/12/2002	120
Dry Weather Creek	6/24/2002	300
Dry Weather Creek	7/2/2002	120
Dry Weather Creek	7/17/2002	350
Dry Weather Creek	7/23/2002	250
Dry Weather Creek	8/1/2002	100
Dry Weather Creek	8/6/2002	480
Dry Weather Creek	8/21/2002	860
Dry Weather Creek	8/22/2002	620
Dry Weather Creek	8/29/2002	280
Dry Weather Creek	9/5/2002	400
Dry Weather Creek	9/11/2002	1,400
Dry Weather Creek	9/30/2002	240
Dry Weather Creek	4/8/2003	1
Dry Weather Creek	4/22/2003	11
Dry Weather Creek	5/8/2003	42
Dry Weather Creek	5/14/2003	48
Dry Weather Creek	5/20/2003	172
Dry Weather Creek	5/28/2003	82
Dry Weather Creek	6/4/2003	5
Dry Weather Creek	6/11/2003	200
Dry Weather Creek	6/19/2003	98
Dry Weather Creek	7/1/2003	170
Dry Weather Creek	7/9/2003	184
Dry Weather Creek	7/16/2003	132
Dry Weather Creek	7/22/2003	132
Dry Weather Creek	7/29/2003	279
Dry Weather Creek	8/6/2003	140
Dry Weather Creek	8/12/2003	321
Dry Weather Creek	8/27/2003	296
Dry Weather Creek	9/4/2003	252
Dry Weather Creek	9/11/2003	10,000

Site	Date	FC (org/100 ml)
Yellow Medicine River	9/19/2001	56
Yellow Medicine River	8/28/2001	50
Yellow Medicine River	7/11/2001	83
Yellow Medicine River	6/6/2001	17
Yellow Medicine River	5/15/2001	17
Yellow Medicine River	4/25/2001	2,500
Yellow Medicine River	10/24/2000	48
Hawk Creek	5/2/2000	5
Hawk Creek	5/12/2000	240
Hawk Creek	8/28/2000	280
Hawk Creek	4/9/2001	10
Hawk Creek	4/12/2001	300
Hawk Creek	4/19/2001	90
Hawk Creek	4/25/2001	260
Hawk Creek	5/2/2001	27
Hawk Creek	5/10/2001	60
Hawk Creek	5/22/2001	50
Hawk Creek	6/4/2001	5
Hawk Creek	6/13/2001	700
Hawk Creek	6/18/2001	180
Hawk Creek	6/21/2001	64
Hawk Creek	7/9/2001	200
Hawk Creek	7/17/2001	30
Hawk Creek	7/30/2001	90
Hawk Creek	8/14/2001	120
Hawk Creek	8/30/2001	330
Hawk Creek	9/19/2001	90
Hawk Creek	9/27/2001	30
Hawk Creek	4/9/2002	5
Hawk Creek	4/16/2002	5
Hawk Creek	4/23/2002	10
Hawk Creek	4/30/2002	7
Hawk Creek	5/7/2002	25
Hawk Creek	5/13/2002	20
Hawk Creek	5/21/2002	28
Hawk Creek	5/29/2002	10
Hawk Creek	6/4/2002	66
Hawk Creek	6/12/2002	410
Hawk Creek	6/18/2002	120
Hawk Creek	6/25/2002	140
Hawk Creek	7/1/2002	300

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Hawk Creek	7/9/2002	64
Hawk Creek	7/16/2002	30
Hawk Creek	7/24/2002	27
Hawk Creek	8/7/2002	100
Hawk Creek	8/19/2002	130
Hawk Creek	9/3/2002	320
Hawk Creek	9/16/2002	70
Hawk Creek	9/30/2002	82
Hawk Creek	4/2/2003	<10
Hawk Creek	4/15/2003	<10
Hawk Creek	4/21/2003	390
Hawk Creek	4/29/2003	27
Hawk Creek	5/5/2003	30
Hawk Creek	5/13/2003	70
Hawk Creek	5/19/2003	73
Hawk Creek	5/27/2003	110
Hawk Creek	6/2/2003	40
Hawk Creek	6/18/2003	91
Hawk Creek	6/26/2003	2,400
Hawk Creek	7/1/2003	190
Hawk Creek	7/15/2003	400
Hawk Creek	7/22/2003	370
Hawk Creek	8/5/2003	280
Hawk Creek	8/26/2003	380
Hawk Creek	9/9/2003	300
Hawk Creek	9/23/2003	290
West Fork Beaver Creek	5/10/2000	180
West Fork Beaver Creek	5/12/2000	140
West Fork Beaver Creek	6/30/2000	620
West Fork Beaver Creek	8/28/2000	310
West Fork Beaver Creek	4/9/2001	50
West Fork Beaver Creek	4/12/2001	110
West Fork Beaver Creek	4/19/2001	10
West Fork Beaver Creek	4/23/2001	1,000
West Fork Beaver Creek	4/25/2001	82
West Fork Beaver Creek	5/2/2001	20
West Fork Beaver Creek	5/10/2001	36
West Fork Beaver Creek	5/22/2001	140
West Fork Beaver Creek	6/4/2001	20
West Fork Beaver Creek	6/13/2001	1,700
West Fork Beaver Creek	6/18/2001	800

Site	Date	FC (org/100 ml)
West Fork Beaver Creek	6/21/2001	500
West Fork Beaver Creek	7/9/2001	1,000
West Fork Beaver Creek	7/17/2001	440
West Fork Beaver Creek	7/30/2001	380
West Fork Beaver Creek	8/14/2001	310
West Fork Beaver Creek	8/30/2001	170
West Fork Beaver Creek	9/19/2001	40
West Fork Beaver Creek	4/9/2002	30
West Fork Beaver Creek	4/16/2002	20
West Fork Beaver Creek	4/23/2002	55
West Fork Beaver Creek	4/30/2002	8
West Fork Beaver Creek	5/7/2002	15
West Fork Beaver Creek	5/13/2002	37
West Fork Beaver Creek	5/21/2002	30
West Fork Beaver Creek	5/29/2002	35
West Fork Beaver Creek	6/4/2002	1,400
West Fork Beaver Creek	6/12/2002	700
West Fork Beaver Creek	6/18/2002	460
West Fork Beaver Creek	6/25/2002	1,100
West Fork Beaver Creek	7/1/2002	540
West Fork Beaver Creek	7/9/2002	1,400
West Fork Beaver Creek	7/16/2002	600
West Fork Beaver Creek	7/24/2002	500
West Fork Beaver Creek	8/7/2002	600
West Fork Beaver Creek	8/19/2002	60
West Fork Beaver Creek	9/3/2002	450
West Fork Beaver Creek	9/16/2002	390
West Fork Beaver Creek	9/30/2002	130
West Fork Beaver Creek	4/2/2003	<10
West Fork Beaver Creek	4/15/2003	<10
West Fork Beaver Creek	4/21/2003	210
West Fork Beaver Creek	4/29/2003	10
West Fork Beaver Creek	5/5/2003	70
West Fork Beaver Creek	5/13/2003	10
West Fork Beaver Creek	5/19/2003	160
West Fork Beaver Creek	5/27/2003	210
West Fork Beaver Creek	6/2/2003	120
West Fork Beaver Creek	6/18/2003	300
West Fork Beaver Creek	6/26/2003	350
West Fork Beaver Creek	7/1/2003	380
West Fork Beaver Creek	7/15/2003	900

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
West Fork Beaver Creek	7/22/2003	650
Watonwan River	5/18/2000	1,200
Watonwan River	5/19/2000	5,000
Watonwan River	5/22/2000	200
Watonwan River	5/26/2000	120
Watonwan River	5/30/2000	220
Watonwan River	6/1/2000	190
Watonwan River	6/5/2000	100
Watonwan River	6/13/2000	900
Watonwan River	6/16/2000	700
Watonwan River	6/21/2000	350
Watonwan River	6/26/2000	1,500
Watonwan River	7/5/2000	2,100
Watonwan River	7/10/2000	800
Watonwan River	7/14/2000	170
Watonwan River	7/21/2000	600
Watonwan River	7/31/2000	240
Watonwan River	8/9/2000	900
Watonwan River	8/18/2000	20
Watonwan River	9/26/2000	100
Watonwan River	10/29/2000	120
Watonwan River	4/6/2001	20
Watonwan River	4/13/2001	200
Watonwan River	4/17/2001	110
Watonwan River	4/22/2001	300
Watonwan River	4/25/2001	110
Watonwan River	5/4/2001	70
Watonwan River	5/15/2001	600
Watonwan River	5/23/2001	700
Watonwan River	5/29/2001	600
Watonwan River	6/3/2001	130
Watonwan River	6/7/2001	250
Watonwan River	6/14/2001	2,200
Watonwan River	6/20/2001	1,200
Watonwan River	6/26/2001	1,700
Watonwan River	7/2/2001	2,000
Watonwan River	7/16/2001	400
Watonwan River	7/24/2001	4,000
Watonwan River	7/25/2001	5,900
Watonwan River	7/30/2001	900
Watonwan River	8/6/2001	110

Site	Date	FC (org/100 ml)
Watonwan River	8/20/2001	180
Watonwan River	9/13/2001	200
Watonwan River	9/25/2001	240
Watonwan River	4/10/2002	55
Watonwan River	4/17/2002	40
Watonwan River	4/23/2002	20
Watonwan River	4/30/2002	190
Watonwan River	5/9/2002	280
Watonwan River	5/16/2002	40
Watonwan River	5/22/2002	300
Watonwan River	5/30/2002	1,500
Watonwan River	6/4/2002	1,600
Watonwan River	6/7/2002	1,200
Watonwan River	6/11/2002	2,000
Watonwan River	6/14/2002	910
Watonwan River	6/20/2002	900
Watonwan River	6/26/2002	1,100
Watonwan River	7/8/2002	460
Watonwan River	7/12/2002	600
Watonwan River	7/26/2002	200
Watonwan River	8/8/2002	4,800
Watonwan River	8/19/2002	160
Watonwan River	8/27/2002	1,000
Watonwan River	8/30/2002	900
Watonwan River	9/20/2002	320
Watonwan River	4/9/2003	10
Watonwan River	4/11/2003	36
Watonwan River	4/17/2003	520
Watonwan River	4/18/2003	330
Watonwan River	4/22/2003	140
Watonwan River	5/6/2003	300
Watonwan River	5/9/2003	150
Watonwan River	5/12/2003	900
Watonwan River	6/6/2003	510
Watonwan River	6/25/2003	3,300
Watonwan River	6/26/2003	3,000
Watonwan River	6/27/2003	6,000
Watonwan River	6/30/2003	220
Watonwan River	7/9/2003	6,000
Watonwan River	7/10/2003	10
Watonwan River	7/16/2003	1,300

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Watonwan River	7/25/2003	350
Watonwan River	8/1/2003	170
Watonwan River	8/11/2003	40
Watonwan River	8/22/2003	520
Watonwan River	8/29/2003	10
Watonwan River	9/8/2003	500
Watonwan River	9/18/2003	600
Watonwan River	9/29/2003	160
Watonwan River	10/27/2003	18
Dutch Creek	7/11/2000	870
Dutch Creek	7/17/2000	1,100
Dutch Creek	7/24/2000	250
Dutch Creek	7/27/2000	280
Dutch Creek	7/31/2000	500
Dutch Creek	8/10/2000	290
Dutch Creek	8/17/2000	1,000
Dutch Creek	8/21/2000	500
Dutch Creek	8/24/2000	1,000
Dutch Creek	8/30/2000	780
Dutch Creek	6/5/2001	210
Dutch Creek	6/13/2001	140
Dutch Creek	6/19/2001	130
Dutch Creek	6/25/2001	1,400
Dutch Creek	6/27/2001	1,500
Dutch Creek	7/2/2001	8,000
Dutch Creek	7/9/2001	2,300
Dutch Creek	7/17/2001	5,000
Dutch Creek	7/1/2401	2,000
Dutch Creek	7/30/2001	2,300
Dutch Creek	8/1/2001	8,000
Dutch Creek	8/6/2001	8,000
Dutch Creek	8/14/2001	7,000
Dutch Creek	8/20/2001	200
Dutch Creek	8/27/2001	40
Dutch Creek	6/3/2002	280
Dutch Creek	6/10/2002	480
Dutch Creek	6/17/2002	900
Dutch Creek	6/19/2002	6,000
Dutch Creek	6/24/2002	620
Dutch Creek	7/1/2002	3,000
Dutch Creek	7/8/2002	2,800

Site	Date	FC (org/100 ml)
Dutch Creek	7/15/2002	560
Dutch Creek	7/22/2002	6,000
Dutch Creek	7/31/2002	14,300
Dutch Creek	8/5/2002	60,000
Dutch Creek	8/12/2002	5,900
Dutch Creek	8/19/2002	7,500
Dutch Creek	8/21/2002	2,800
Dutch Creek	8/26/2002	3,500
Seven Mile Creek	4/26/2000	<10
Seven Mile Creek	5/8/2000	10
Seven Mile Creek	5/11/2000	40
Seven Mile Creek	5/17/2000	5,000
Seven Mile Creek	5/18/2000	3,500
Seven Mile Creek	5/21/2000	300
Seven Mile Creek	5/24/2000	90
Seven Mile Creek	5/30/2000	290
Seven Mile Creek	6/12/2000	220
Seven Mile Creek	6/20/2000	100
Seven Mile Creek	7/11/2000	3,600
Seven Mile Creek	7/25/2000	10
Seven Mile Creek	8/8/2000	5,400
Seven Mile Creek	9/6/2000	60
Seven Mile Creek	4/23/2001	500
Seven Mile Creek	5/7/2001	100
Seven Mile Creek	5/14/2001	100
Seven Mile Creek	5/22/2001	140
Seven Mile Creek	6/13/2001	600
Seven Mile Creek	6/25/2001	80
Seven Mile Creek	7/23/2001	12,400
Seven Mile Creek	8/13/2001	10
Seven Mile Creek	9/24/2001	100
Rush River	3/25/2003	10
Rush River	4/11/2003	10
Rush River	4/16/2003	330
Rush River	4/21/2003	350
Rush River	5/12/2003	5,600
Rush River	5/15/2003	4,000
Rush River	5/20/2003	7,000
Rush River	5/28/2003	140
Rush River	6/9/2003	3,550
Rush River	6/18/2003	910

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
Rush River	6/26/2003	1,700
Rush River	6/30/2003	1,300
Rush River	7/10/2003	730
Rush River	7/29/2003	1,200
Rush River	8/21/2003	1,100
High Island Creek	5/2/2000	52
High Island Creek	5/18/2000	16,600
High Island Creek	5/31/2000	400
High Island Creek	6/5/2000	8,600
High Island Creek	7/10/2000	5,000
High Island Creek	7/13/2000	2,650
High Island Creek	8/22/2000	30
High Island Creek	4/9/2001	300
High Island Creek	4/23/2001	1,000
High Island Creek	5/3/2001	10
High Island Creek	5/7/2001	80
High Island Creek	5/22/2001	400
High Island Creek	6/13/2001	1,800
High Island Creek	6/14/2001	3,300
High Island Creek	6/20/2001	100
High Island Creek	7/2/2001	100
High Island Creek	7/18/01	600
High Island Creek	4/3/02	10
High Island Creek	4/10/02	70
High Island Creek	4/24/02	20
High Island Creek	5/6/02	180
High Island Creek	5/15/02	80
High Island Creek	5/29/02	7,150
High Island Creek	6/3/02	6,000
High Island Creek	6/5/02	3,900
High Island Creek	6/12/02	1,000
High Island Creek	6/19/02	8,600
High Island Creek	6/20/02	1,400
High Island Creek	6/21/02	6,000
High Island Creek	6/25/02	3,400
High Island Creek	7/10/02	1,300
High Island Creek	9/17/02	10
High Island Creek	3/25/03	10
High Island Creek	4/11/03	10
High Island Creek	4/16/03	190
High Island Creek	4/21/03	700

Site	Date	FC (org/100 ml)
High Island Creek	5/12/2003	3,500
High Island Creek	5/15/2003	700
High Island Creek	5/20/2003	3,300
High Island Creek	5/28/2003	190
High Island Creek	6/9/2003	1,000
High Island Creek	6/18/2003	1,000
High Island Creek	6/26/2003	3,000
High Island Creek	6/30/2003	3,900
High Island Creek	7/10/2003	22,000
High Island Creek	7/29/2003	360
High Island Creek	8/21/2003	300
Lower Beven Creek	5/1/2000	290
Lower Beven Creek	5/16/2000	140
Lower Beven Creek	5/31/2000	14,050
Lower Beven Creek	6/14/2000	20
Lower Beven Creek	7/17/2000	1
Lower Beven Creek	7/28/2000	600
Lower Beven Creek	8/11/2000	100
Lower Beven Creek	8/22/2000	1
Lower Beven Creek	9/7/2000	200
Lower Beven Creek	4/9/2003	30
Lower Beven Creek	4/22/2003	250
Lower Beven Creek	5/5/2003	63
Lower Beven Creek	5/21/2003	2,900
Lower Beven Creek	6/4/2003	50
Lower Beven Creek	6/17/2003	640
Lower Beven Creek	6/30/2003	1,200
Lower Beven Creek	7/17/2003	15,000
Lower Beven Creek	7/29/2003	220
Lower Beven Creek	9/10/2003	2,000
Lower Beven Creek	9/22/2003	100
Lower Beven Creek	10/7/2003	150
Lower Beven Creek	10/22/2003	90
MN River at Dehli	10/24/2000	27
MN River at Dehli	4/25/2001	390
MN River at Dehli	5/15/2001	9
MN River at Dehli	6/6/2001	45
MN River at Dehli	6/11/2001	9
MN River at Dehli	8/28/01	66
MN River at Dehli	9/19/01	82
MN River at Dehli	10/22/03	9

Fecal Coliform Bacteria Concentrations for Monitoring Sites 2000-2003

Site	Date	FC (org/100 ml)
MN River at Morton	10/24/00	9
MN River at Morton	4/25/01	600
MN River at Morton	5/15/01	17
MN River at Morton	6/6/01	17
MN River at Morton	6/11/01	9
MN River at Morton	8/28/01	9
MN River at Morton	9/19/01	67
MN River at Morton	10/22/03	9
MN River at Courtland	10/29/00	32
MN River at Courtland	4/22/01	110
MN River at Courtland	5/23/01	120
MN River at Courtland	6/3/01	20
MN River at Courtland	8/6/01	91
MN River at Courtland	9/25/01	860
MN River at Courtland	10/26/03	24

Site	Date	FC (org/100 ml)
MN River at St. Peter	10/29/00	36
MN River at St. Peter	4/22/01	44
MN River at St. Peter	5/23/01	960
MN River at St. Peter	6/3/01	48
MN River at St. Peter	8/6/01	91
MN River at St. Peter	9/25/01	420
MN River at St. Peter	9/26/03	140
MN River at Henderson	10/29/00	9
MN River at Henderson	5/23/01	400
MN River at Henderson	6/3/01	82
MN River at Henderson	6/25/01	1,900
MN River at Henderson	8/6/01	55
MN River at Henderson	9/25/01	300
MN River at Henderson	10/26/03	20
MN River at Fort Snelling	10/18/00	320
MN River at Fort Snelling	4/3/01	78
MN River at Fort Snelling	5/29/01	85
MN River at Fort Snelling	6/12/01	9
MN River at Fort Snelling	6/24/01	180
MN River at Fort Snelling	8/7/01	120
MN River at Fort Snelling	9/4/01	55
MN River at Fort Snelling	10/1/03	12