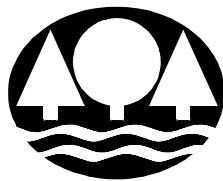


Citizen Stream-Monitoring Program

2001 Report on the Water Quality Of Minnesota Streams



**Minnesota
Pollution
Control
Agency**

**Environmental Outcomes Division
December 2002**

Laurie Sovell prepared this report with a contributed article by Dave Christopherson.

The Minnesota Pollution Control Agency thanks the 2001 Citizen Stream-Monitoring Program volunteers for their efforts in collecting water-quality data. Their commitment and dedication to stream monitoring and protection are greatly appreciated.

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TABLE OF CONTENTS

LIST OF FIGURES	2
LIST OF TABLES	2
INTRODUCTION.....	3
ECOREGIONS AND STREAM WATER QUALITY	4
SECTION 1. HOW CSMP VOLUNTEERS COLLECT AND USE DATA	5
WHAT CSMP VOLUNTEERS MEASURE.....	5
PUTTING CSMP DATA TO WORK	9
SECTION 2. SUMMARY OF 2001 CSMP DATA	10
RESULTS FROM 100-CM TRANSPARENCY TUBE.....	14
REGULAR MEAN VS. “STAGE-WEIGHTED” MEAN TRANSPARENCY	15
RAINFALL RESULTS	17
SECTION 3. CASE STUDY: WATER TRANSPARENCY AND USER PERCEPTIONS OF RECREATIONAL SUITABILITY	20
BIBLIOGRAPHY	23
SOME USEFUL DEFINITIONS.....	24
APPENDIX 1. MINNESOTA DRAINAGE BASINS & MAJOR WATERSHEDS MAP AND KEY	25
APPENDIX 2. SUMMARY OF 2001 CSMP DATA SORTED BY DRAINAGE BASIN AND MAJOR WATERSHED.....	28
APPENDIX 3. SUMMARY OF 2001 CSMP DATA COLLECTED WITH 100-CM TRANSPARENCY TUBE.....	67
CSMP VOLUNTEER SURVEY	69

LIST OF FIGURES

FIGURE 1. INCREASE IN CSMP VOLUNTEERS AND SITES, 1998 – 2001.....	4
FIGURE 2. MINNESOTA’S SEVEN ECOREGIONS. MAPPED BY USEPA.....	4
FIGURE 3. LOW WATER TRANSPARENCY INFLUENCES FISH HEALTH	6
FIGURE 4. NUMBER OF 2001 CSMP SITES IN EACH MAJOR DRAINAGE BASIN.....	11
FIGURE 5. MAP OF 2001 CSMP SITES AND AVERAGE TRANSPARENCY	12
FIGURE 6. RAINFALL AND TRANSPARENCY AT NORMAN PENNER’S SITE, CSMP 327	13
FIGURE 7. PERCENTAGE OF CSMP SITES ACROSS 4 CATEGORIES OF AVERAGE TRANSPARENCY	13
FIGURE 8. CSMP SITES WHERE “STAGE-WEIGHTED” MEAN DIFFERED FROM “NORMAL” MEAN	16
FIGURE 9A. 2001 WATER YEAR PRECIPITATION MAP	18
FIGURE 9B. 2001 DEPARTURE FROM NORMAL PRECIPITATION MAP.....	19
FIGURE 10. MEDIAN TRANSPARENCY BY ECOREGION	20
FIGURE 11. PERCENTAGE OF RECREATIONAL SUITABILITY RANKINGS IN 4 MINNESOTA ECOREGIONS.....	20
FIGURE 12. RECREATIONAL SUITABILITY VS. MEAN STREAM TRANSPARENCY BY ECOREGION	21
FIGURE 13. DISTRIBUTION OF TRANSPARENCY READINGS TAKEN IN MINNESOTA	22
(1999-2000).....	22

LIST OF TABLES

TABLE 1. INTERQUARTILE RANGE OF CONCENTRATIONS FOR REFERENCE STREAMS.....	5
TABLE 2. SUMMARY OF TRANSPARENCY READINGS > 60 CM.....	14

Introduction

The Minnesota Pollution Control Agency's (MPCA) Citizen Stream-Monitoring Program (CSMP) began in 1998. The CSMP was designed to give individuals across Minnesota an opportunity for involvement in a simple, yet meaningful stream-monitoring program that provides data management and interpretation. 2001 marks the CSMP's third full monitoring season. The level of participation in the program continues to increase, from 17 volunteers and 22 sites during the 1998 pilot season, to 294 volunteers and 413 sites during 2001 (Figure 1).

The CSMP uses a collaborative approach to stream monitoring by partnering with citizen volunteers who live on or near a stream, and who are interested in water quality. Any person or group willing to devote a small amount of time and energy to conduct simple stream visits on a regular basis can participate in the CSMP. Volunteers receive a transparency tube, rain gauge, data sheets, and instructions for taking measurements. Once enrolled, participants visit an established spot once per week from April to September on a nearby stream to measure stream transparency, water level (stage), appearance, and recreational suitability. In addition to weekly stream measurements, rainfall is recorded daily. Volunteers are also encouraged to monitor immediately after large rainfall events whenever possible to track the effects of rainfall runoff on their streams. At the end of each monitoring season, volunteers submit data to the MPCA.

An annual report summarizes data collected by volunteers statewide, and is sent to volunteers and other interested parties.

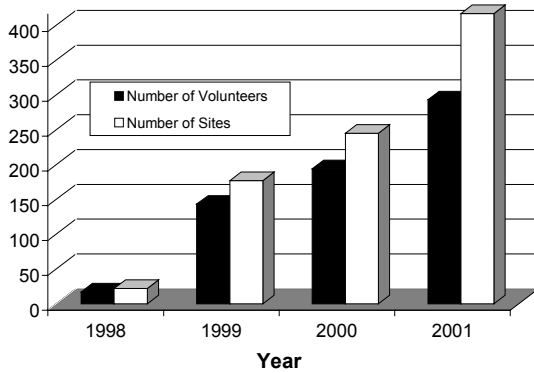
This report summarizes data collected by volunteers during 2001. The first section describes what CSMP volunteers do and gives examples of how participants are using CSMP data. Section two presents a summary of volunteer data from the 2001 monitoring season. Section three describes a study done by the MPCA that shows how recreational suitability rankings and transparency readings together can be used to tell us about stream water quality. At the very end of the report, you will find a survey form. We ask that each CSMP volunteer complete the form, remove it and send it to the address printed on the form. This survey gives you the opportunity to provide feedback on the content and format of the report.



CSMP Goals:

- Collect valuable water-quality data by expanding statewide stream monitoring
- Provide a basic program for anyone interested in stream monitoring
- Complement existing citizen efforts
- Facilitate awareness of water-quality issues and promote *shared goals*

Figure 1. Increase in CSMP Volunteers and Sites, 1998 – 2001



Ecoregions and Stream Water Quality

The U.S. Environmental Protection Agency has divided the continental United States into ecoregions based on soils, geomorphology, land use, and potential natural vegetation. In Minnesota, this results in seven fairly distinct ecoregions (Figure 2). For example, the Northern Lakes and Forests ecoregion (NLF) is predominately forested with numerous lakes and is located in the northeastern part of Minnesota. The Western Corn Belt Plains ecoregion (WCBP), located in the southern third of Minnesota, has rolling terrain and is extensively cultivated for row-crop farming. The ecoregion framework provides a good basis for evaluating differences and similarities in Minnesota's streams. Reference streams, which are felt to be

representative and reflect expected water quality for a region, were sampled by the MPCA to characterize stream conditions for each ecoregion (McCollor and Heiskary 1993). The results provide a baseline with which to compare streams. In other words, the reference streams are the yardsticks by which we measure other streams. Table 1 lists the typical total phosphorus, total suspended solids, and turbidity values for reference streams in six ecoregions.

Figure 2. Minnesota's Seven Ecoregions (Mapped by USEPA)

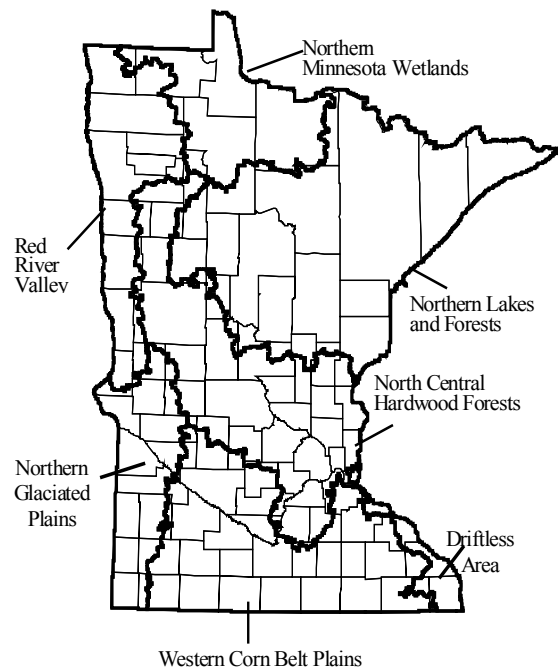


Table 1. **Interquartile Range of Concentrations for Reference Streams in Minnesota by Ecoregion.**¹ Distributions of annual data from 1970-1992 (McCollor and Heiskary, 1993; note 1 mg/L = 1 ppm = 1,000 ppb)

Region/ Percentile	Total Phosphorus (mg/L)			Total Suspended Solids (mg/L)			Turbidity (NTU)		
	25%	50%	75%	25%	50%	75%	25%	50%	75%
NLF	0.02	0.04	0.05	1.8	3.3	6.0	1.7	2.5	4.3
NMW	0.04	0.06	0.09	4.8	8.6	16.0	4.1	6.0	10.0
NCHF	0.06	0.09	0.15	4.8	8.8	16.0	3.0	5.1	8.5
NGP	0.09	0.16	0.25	11.0	34.0	63.0	5.6	15.0	23.5
RRV	0.11	0.19	0.30	11.0	28.0	59.0	6.0	12.0	23.0
WCBP	0.16	0.24	0.33	10.0	27.0	61.0	5.2	12.0	22.0

Section 1. How CSMP Volunteers Collect and Use Data

What CSMP Volunteers Measure

Stream Water Transparency

Stream transparency is an indirect measure of the amount of *dissolved* and *suspended* materials present in water. For most bodies of water, the amount of solids suspended in the water is the most important factor in transparency: the more suspended materials, the lower the water transparency. In lakes, the majority of suspended solids are algae. In streams and rivers, soil particles (predominantly silts and clays) have a stronger influence on transparency as water flows downstream, carrying and depositing this sediment. A good example of dissolved material affecting transparency is the tea color caused by organic material of some northern, bog-influenced lakes and streams.

Tracking water transparency is like monitoring your blood pressure on a regular basis because it tells us about the health of a stream. First, changes in transparency tell us when key water pollutants are present. In

general, a low transparency reading reflects a large amount of sediment (excessive soil material) or other suspended material like algae in the water. Too much sediment in the water is a significant pollutant itself, whether it is suspended in the water column or deposited on stream bottoms. Suspended sediment reduces light penetration needed for the growth of beneficial aquatic plants. It also interferes with the ability of fish to see and capture their prey (Figure 3).

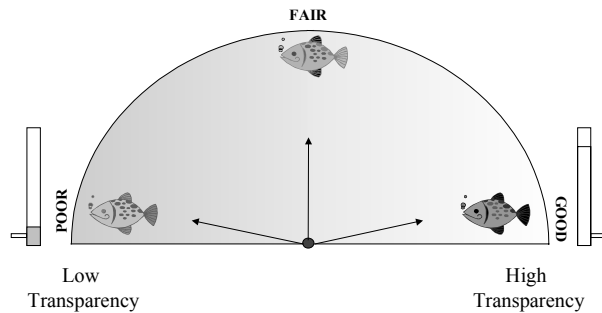
A stream bottom is described as ‘embedded’ when smaller rocks such as gravel and cobble are surrounded or buried in clay, fine silt or sand. The more embedded the stream, usually the fewer and less diverse an assemblage of aquatic insects and fish will be found living there. When a stream bottom is embedded from deposited sediment that has washed downstream, fish eggs become smothered, keeping them from getting the oxygen they need to survive. Deposited sediment also clogs spaces between rocks where insects like to live (Waters 1995).

¹ Interquartile range is determined by sorting measures from lowest to highest and represents those measures between the 25th and 75th percentiles.

This in turn can lead to fewer fish that depend on insects for food.

Finally, sediment may have pollutants attached to it such as phosphorus and petroleum products. These pollutants further degrade the quality of flowing water, as well as downstream lakes or reservoirs.

Figure 3. Low Water Transparency Influences Fish Health



Because of these effects of excessive sediment on streams, the MPCA sets limits on the discharge of suspended solids to waters, and has “standards” for turbidity, which should not be exceeded in flowing waters. Turbidity is defined as “an optical property of water resulting in a loss of light transmission from absorption or scattering” (Dieter 1990). Highly turbid water has low transparency.

High algae concentrations, which also reduce transparency, occur at lower flows in larger rivers with high nutrient concentrations. Algae contribute dissolved oxygen to the river through the process of photosynthesis while they are living, but deplete oxygen when they die and decompose on the bottom of the river. Excessive nutrients and algae in rivers have

been linked to dissolved oxygen levels too low to support healthy fish communities.

The Transparency Tube

The transparency tube was developed in Australia for measuring stream water clarity. The clear plastic tube is 2 feet long x 1½-inches wide, with a release valve at the bottom. A stopper inserted at the bottom is painted black and white, so that when you look down into the tube a distinct symbol is visible. To measure



water clarity, the tube is filled with water collected from a stream or river. Looking down into the tube, water is released through the valve until the black and white symbol is visible. The depth of the water when the symbol becomes visible is recorded in centimeters, marked on the side of the tube. If the symbol is visible when the tube is full, the transparency reading is “>60 centimeters.” A greater transparency reading reflects higher water clarity.

Transparency is a meaningful measure of water quality because people can see it change, and can easily understand how it reflects stream condition. A citizen once described his long-term goal for a river in these terms: “I want to be able to see my toes when I’m standing knee-deep in the water.” By using transparency as its central measure, the CSMP provides a tool that will allow citizens to track progress toward identified water-quality goals for their streams.

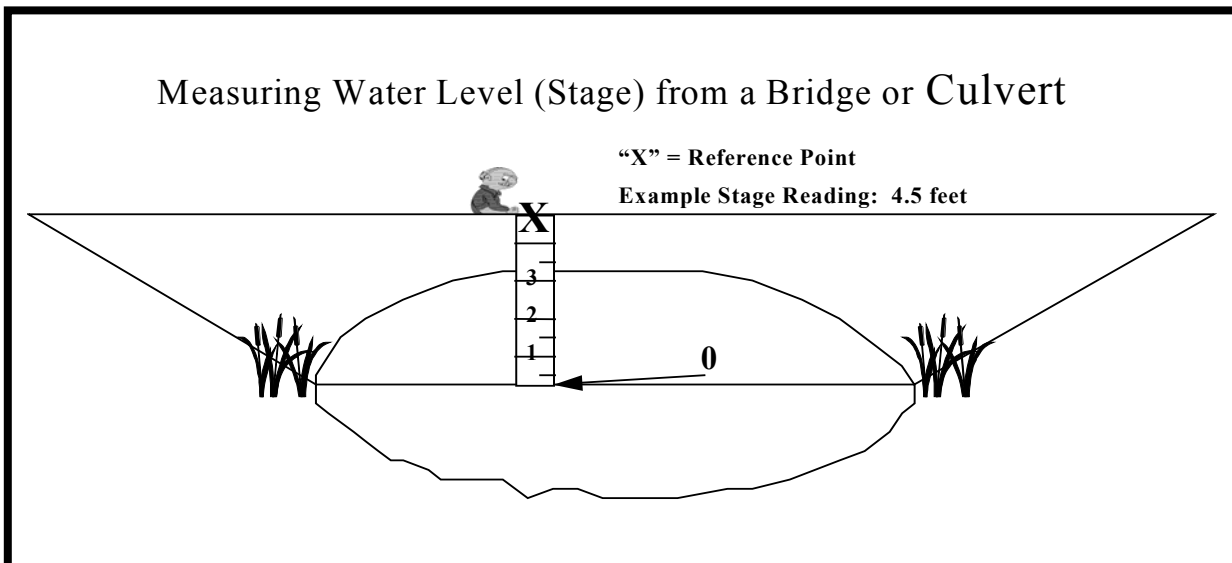
Precipitation and Stream Stage



Some rainfall eventually makes its way back to streams. Rainfall can affect a stream's water level or "stage" by increasing the amount and rate at which water flows through stream channels. Water

quality changes in response to precipitation

as a result of management practices used on the surrounding land. For example, in an area with too little vegetation to keep the soil in place, rainfall can influence stream-water transparency. It does this by carrying sediment and other materials to streams over land in runoff or underground through urban and rural subsurface drainage systems. By recording rainfall on a daily basis and simultaneously measuring transparency and stream water level, volunteers and the MPCA can determine the connections among these factors.



Appearance and Recreational Suitability

CSMP volunteers rank water appearance on a color scale that ranges from “crystal clear” to “green or muddy with floating scum or odor.” Appearance information provides insight on the possible causes of low transparency readings. A low transparency reading in conjunction with a cloudy appearance may reflect high levels of suspended sediment in the water, whereas a green tint suggests that algae growth may be reducing water clarity.

Volunteers have reported experiencing some confusion when deciding which appearance ranking to assign their streams. We are considering readjusting the ranking scale so that it is more continuous. For example, there is no logical progression from an appearance ranking of 1 (clear) to 3 (foamy) to 4 (tea colored). The “foamy” ranking may be eliminated from the ranking scale, since it is very rarely used. “Milky” may be changed to “cloudy”, which may be more meaningful. If you have other suggestions, please contact the CSMP coordinator at (800) 657-3864.

Stream recreational suitability rankings range from 1 to 5, where 1 is “beautiful; couldn’t be better” and 5 is “swimming and aesthetic enjoyment of the stream nearly impossible.” Recreational suitability rankings help us decipher connections between people’s perception of stream water quality and what they measure (e.g. precipitation and transparency measurements). For more information on the connections between recreational suitability rankings and transparency, see the case study on page 19 of this report.

Appearance

- 1 = Clear** - crystal clear, transparent water
- 2 = Milky** - not quite crystal clear; cloudy white or gray
- 3 = Foamy** - natural or from pollution
- 4 = Tea-colored** - clear, but colored due to wetland or bog influences
- 5 = Muddy** - cloudy brown due to high sediment levels
- 6 = Green** - might indicate excess nutrients in the stream
- 7 = Green OR Muddy plus one or more of the following:**
 - extensive floating scum on the stream or on the shore
 - strong foul odor

Recreational Suitability

- 1 = Very Good:** Beautiful, could not be better
- 2 = Good:** Very minor aesthetic problems; excellent for body-contact recreation (swimming, wading, etc.)
- 3 = Fair:** Body-contact recreation and aesthetic enjoyment slightly impaired
- 4 = Poor:** Recreation potential and level of enjoyment of the stream substantially reduced (would not swim but boating/canoeing okay)
- 5 = Very Poor:** Swimming and aesthetic enjoyment of stream nearly impossible

Putting CSMP Data to Work



Data submitted by CSMP volunteers are entered into the U.S. Environmental Protection Agency's water-quality

STORage and RETrieval database (STORET). The MPCA does not have any water-quality information for many miles of streams in Minnesota. Therefore, data from the CSMP greatly augment current stream water-quality information, and enhance our general understanding of Minnesota stream conditions. Data collected by volunteers can help identify water-quality problems, prioritize areas for additional research, and track progress toward improvement. A few examples of how CSMP data is already being used follow.

In Chisago County, volunteer data is being used for the land-use portion of a study done on the north branch of the Sunrise River. The study is trying to determine sources of excess fecal coliform bacteria in the river. Volunteer rain and stream data help paint the picture of where pollutants are entering the river and when. Two CSMP volunteers are also supporting and participating in the study by serving on the steering committee for the project. One volunteer has given the county permission to run a more intensive monitoring station on his property.

In Todd County, a lake association used CSMP data to identify a ditch that was contributing large loads of sediment to a downstream creek and lake. Streamside "buffers", or strips of vegetation set aside from farming and other land use, were established along the ditch to protect downstream waterways from runoff. Continued monitoring should reveal if the buffers are improving water quality.

The Chippewa River Watershed Project in the Minnesota River basin is using data collected through a volunteer stream-monitoring network to identify problem areas in the watershed.

Transparency readings taken from upstream to downstream in many smaller sub-watersheds pointed to key problem areas across the larger watershed. This information is being used to focus further monitoring efforts and begin implementing management practices on the land.

The High Island Creek Clean Water Partnership, located in Sibley, Renville, and McLeod counties, has experimented with using CSMP data to estimate the load of total suspended solids (TSS) at two sites in the watershed. A "load" is an estimate of the total amount of material coming out of a watershed, or passing a specific point on a river, over a specific time interval. Measuring TSS gives you a direct measurement of the amount of sediment in stream water, but it is very expensive and more time-consuming to obtain than transparency readings. Preliminary results suggest that transparency readings are useful for estimating TSS if certain requirements are met. Namely, TSS concentrations should not exceed 1500 mg/L, and transparency readings should be taken at all water levels – the more taken at higher flow, the better.

These examples represent a few ways in which people are currently using CSMP data on the ground. We are excited to see the CSMP become a useful and integrated part of water resource protection efforts throughout Minnesota.

Section 2. Summary of 2001 CSMP Data

From April to September 2001, 294 volunteers monitored 413 sites on streams and rivers across Minnesota. Volunteers monitored streams in every major river basin except the Rainy and Missouri River basins (Figure 4). Of the 84 major watersheds in the state, CSMP volunteers monitored 45.² The largest increase in CSMP participation was seen in the Minnesota River basin, where 85 sites were added during 2001. This increase in the Minnesota basin is credited to county and watershed efforts that have recruited and worked with volunteers on the local level. Active groups include the Chippewa River, Yellowbank and Lac qui Parle Rivers, High Island Creek, Pomme de Terre River, Redwood and Cottonwood Rivers, and Watonwan Watershed.

A summary of stream transparency and rain monitoring data for each site is found in Appendix 2. Mean, minimum and maximum transparencies, and the number of “>60 cm” transparency readings were calculated for each site. Figure 5 shows average transparency readings at each site throughout the state. There is a general trend of increasing average stream transparency from southwestern to northeastern Minnesota. Finer soils and more intensive land use, such as agriculture, are generally more common in the southern portion of the state, where average transparency is lower. Higher average transparencies are found in the generally forested northeastern part of the state.

A total of 7,592 transparency readings were taken during 2001, a substantial increase from 2000, when 4,328 readings were taken. Mr. Norman Penner took the largest number of transparency readings, totaling 95, at his site designated as CSMP 327 on the Watonwan River in Watonwan County. Eleven of his readings were greater than 60 centimeters, and 13 of them were taken in response to a significant rain event. Figure 6 shows how transparency dipped below 30 cm after about a 1-1.5 inch rainfall event. It then took about 3-4 weeks before transparency on the Watonwan River at Mr. Penner’s site rebounded back to a water clarity near 60 cm.

² A watershed is the area of land drained by a given stream; a basin is made up of many watersheds. For example, the Zumbro River and Cannon River watersheds are part of the Lower Mississippi River Basin.

Figure 4. Number of 2001 CSMP Sites in each Major Drainage Basin

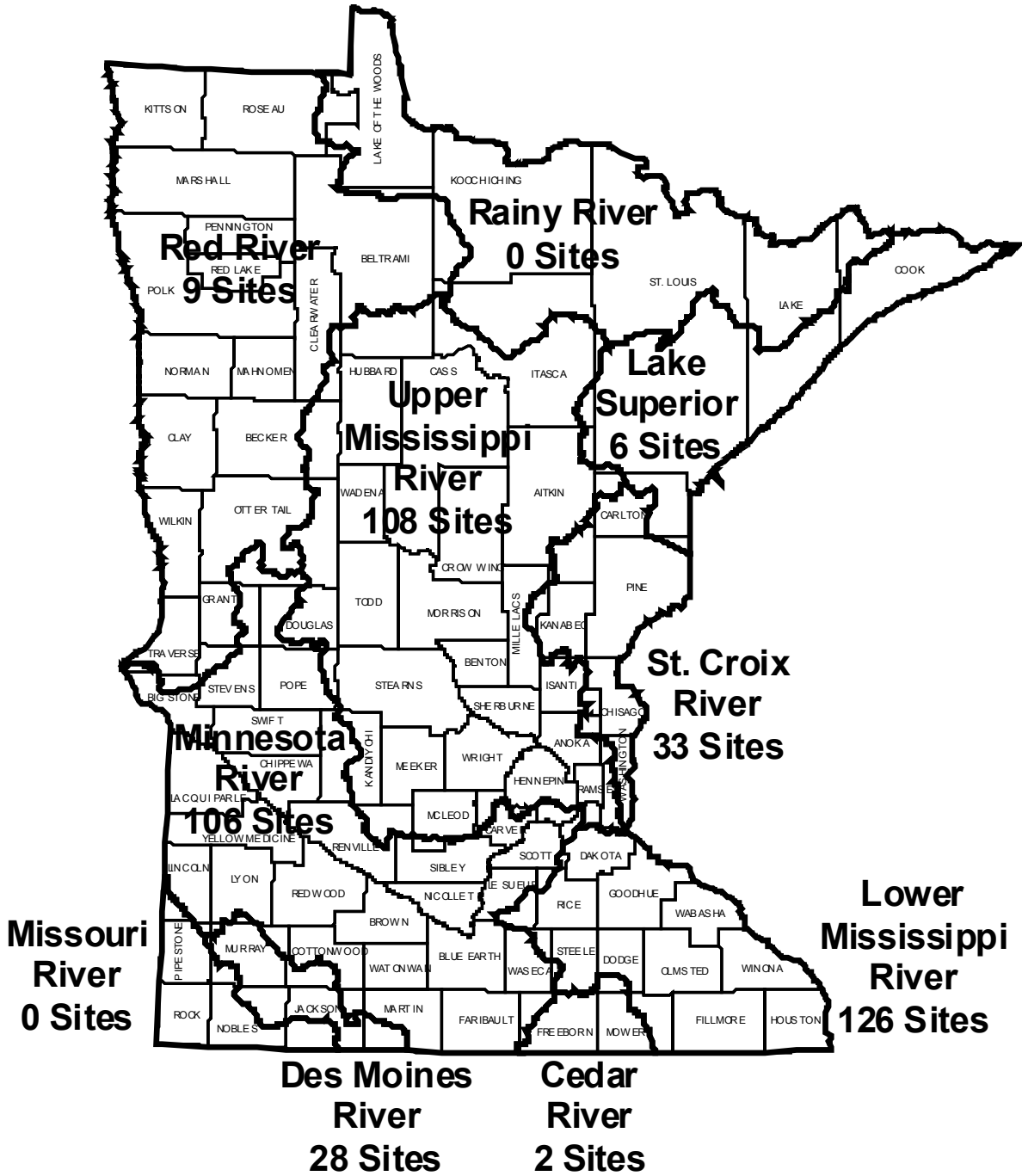


Figure 5. 2001 Average Transparency Reading

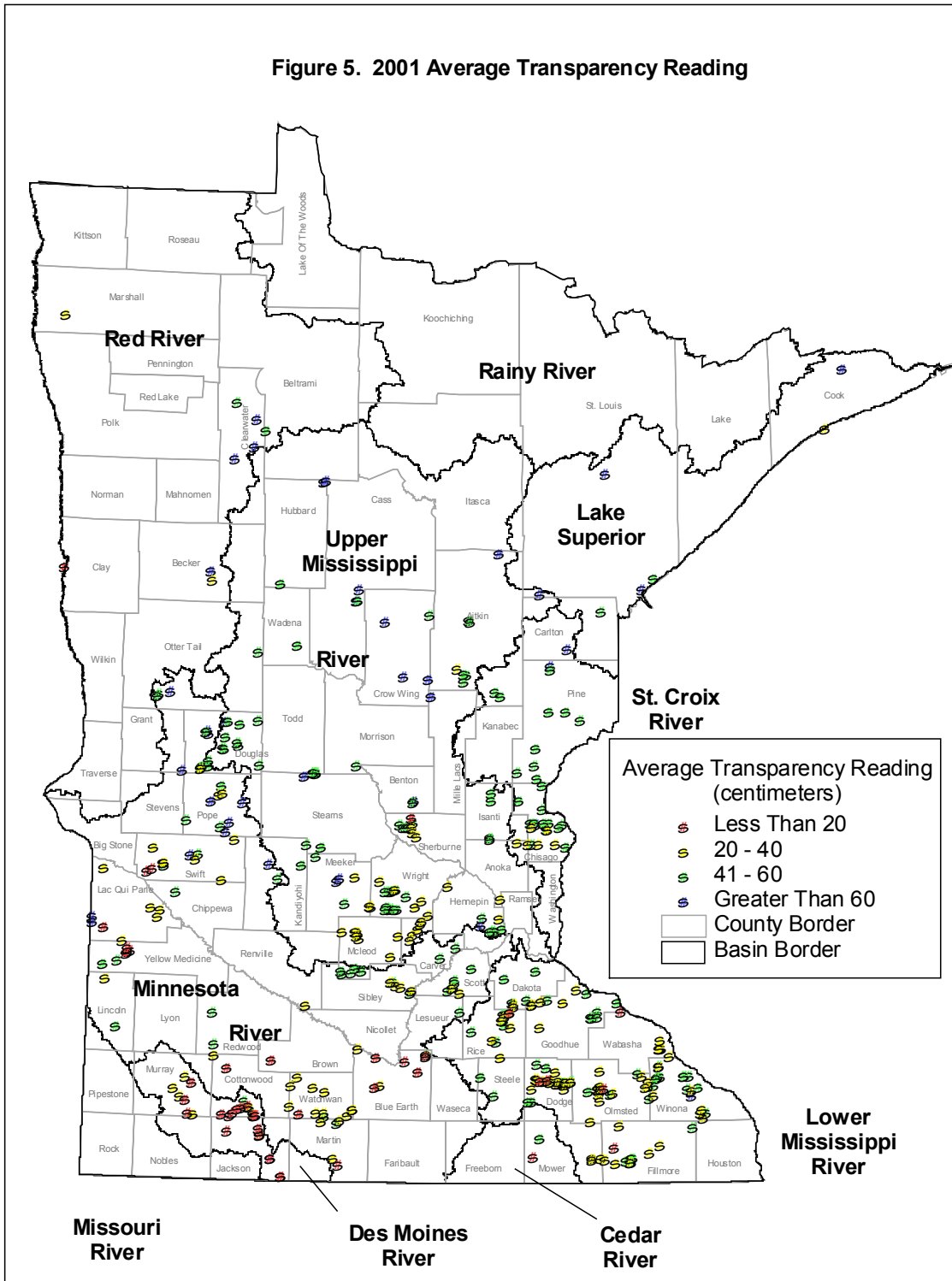
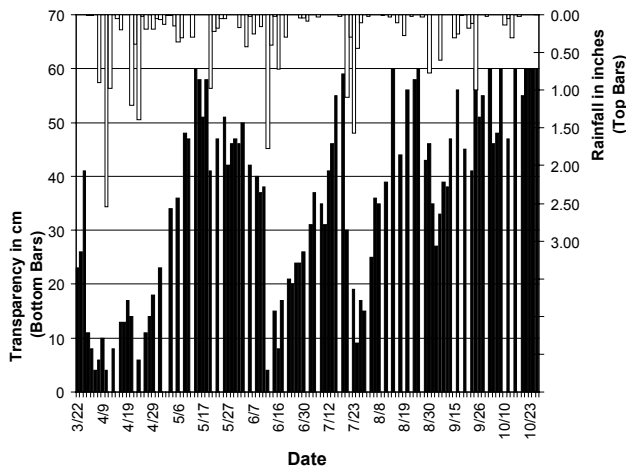


Figure 6. Rainfall and Transparency at Norman Penner’s Site, CSMP 327

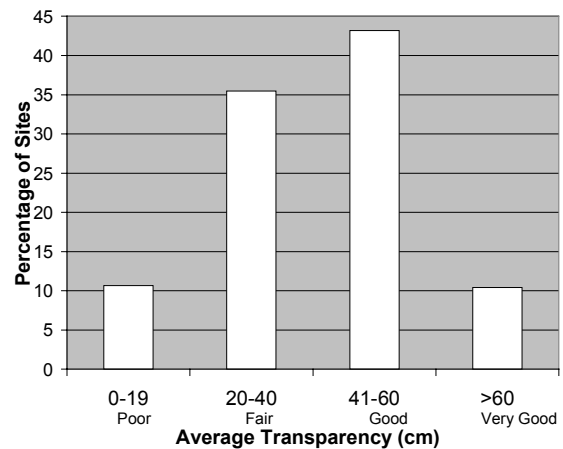


Water clarity is quite good at a majority of the river locations that were monitored in the state. Figure 7 shows the percentage of sites in each of four categories of average transparency. Fifty-three percent of CSMP sites had an average transparency of 41 centimeters or greater. These results are very similar to the past two years (1999-2000), which suggests the overall water clarity of streams and rivers in Minnesota has not changed substantially during this time. However, detection of any significant trend or change in average transparency for specific sites will require 8-10 years of data. We now have a number of sites for which we have 3-4 years of data. We encourage CSMP volunteers to keep monitoring the same sites from year to year so that we eventually have enough data to detect changes over time.

A transparency reading of zero (virtually no transparency) was recorded at 11 sites. Seven of these sites also had readings greater than 60 at some point during the monitoring season. This suggests that transparency fluctuates greatly at these sites, most likely in response to rainfall. The lowest average transparency reading of 6 cm was at site CSMP 156 on Thompson Ravine

Creek in Mankato, monitored by Carol Raymond. The MPCA’s CSMP coordinator lived a few blocks away from Thompson Ravine Creek for two years and is very familiar with the surrounding area. The ravine itself is very steep, with highly eroded slopes. The upland areas, upstream of the creek, have also experienced intense retail and residential development pressure in the last few years. There is no doubt that these activities contributed to runoff and sediment during intense rainfalls, leading to the low transparency observed.

Figure 7. Percentage of CSMP Sites across Four Categories of Average Transparency



For sites with lower average transparency, it will be important to determine if transparency is consistently low throughout the monitoring season, or if declines are in response to rainfall events with quick recovery of transparency. Sites with consistently low transparency may require more in-depth monitoring to determine what may be causing low readings.

Although the results discussed above are variable, more than 50% of CSMP sites had mean transparencies greater than 40 cm during 2001, suggesting good overall water quality.

Results From 100-cm Transparency Tube

Of the total transparency readings taken during 2001, 29% were greater than 60 centimeters (>60 cm), down from 37% last year. Table 2 summarizes the number of >60-cm readings observed during the 2001 monitoring season. The MPCA is currently testing a longer, 100-cm transparency tube in northern Minnesota where streams frequently run clear, with transparencies greater than the standard 60-cm-length tube. We want to find out how often transparency falls between 60 and 100 cm, which would make the longer tube a more useful tool for tracking water clarity changes in the northern reaches of the state.

Results from six CSMP volunteers who used the longer tube during the 2001 monitoring season are summarized in Appendix 3. A total of 106 transparency readings were taken. Of these, 78% were greater than 100 cm. Nearly half of the readings taken were marked as rain events, at which times you would expect transparency most likely to decline. These results suggest that transparency is so consistently high at these sites that even the longer tube is not useful for detecting changes in water clarity in these streams. We will continue to look at the longer tube as an option for CSMP volunteers in certain regions of the state. There may be regions where transparency often falls in the 60-100 cm range, and the 100-cm tube would prove a useful tool. The next question we hope to address is, do we need to consider additional monitoring options for volunteers in regions where transparency is so high that even the 100-cm tube is not a good water-quality monitoring tool?

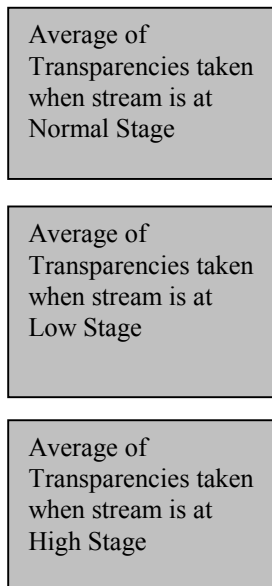
Table 2. Summary of Transparency Readings > 60 cm

	Number of Sites	Percent of Total Sites (%)
No Transparency Readings > 60 cm	179	43
At least one reading > 60 cm	234	57
Every reading > 60 cm	39	9

Regular Mean vs. “Stage-Weighted” Mean Transparency

In addition to mean transparency, a new statistic called “stage-weighted” mean transparency was calculated for each site that had stage estimate data (L-N-H) recorded. This number takes into account the number of transparency readings taken at each stage category of low, normal or high. First, an average of transparency readings measured in each stage category is calculated, followed by an average of these three averages:

Stage-weighted mean = overall average of



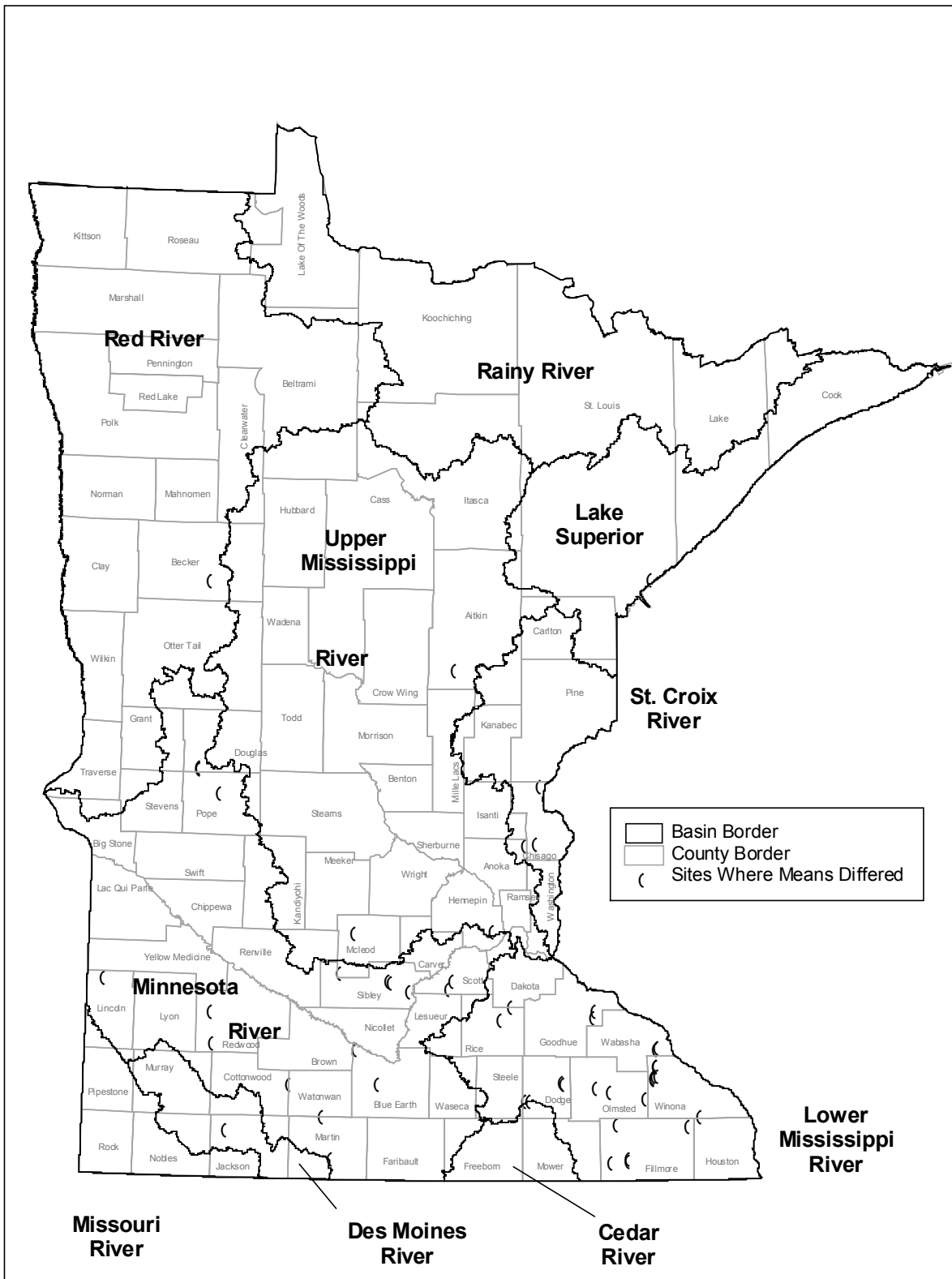
The resulting number is not a true stage-weighted mean that is evenly weighted across each category of stage. For instance, in many cases there were more readings taken during low-flow than during normal or high-flow stages. A true stage-weighted mean would have the same number of readings taken at each stage.

A statistical test (paired t-test) of the data from all sites showed there was no difference between the regular and stage-weighted mean transparencies overall.

In fact, the means were the same for 32% of the sites included in the analysis, and for another 53% of the sites, the regular and stage-weighted mean transparencies were within 5 cm of each other. However, for a small percentage of sites (15%) the difference in means was greater than 5 cm, and sometimes as large as 26 cm. These results suggest that usually, it does not matter whether a normal mean or stage-weighted mean is calculated. Perhaps this is because CSMP volunteers are doing such a good job of taking readings over a broad range of flow regimes and water levels, thus painting an accurate picture of water clarity across the state. We encourage you to continue the good work.

In some cases, however, there is a difference between the normal mean and the stage-weighted mean. Most of the sites where the difference is 5 cm or greater are located in the southern third of the state (Figure 8). Water level at these sites may be more responsive to rainfall and runoff because of the fine soils and more intensive land use in these regions. For CSMP volunteers, these results mean it is very important to measure transparency across all water levels or stages (low, normal and high), so that we can calculate a stage-weighted mean transparency and get an accurate average for the season. These results also highlight the importance of recording the stage category each time that you monitor your stream.

Figure 8. CSMP Sites where Stage-Weighted Mean Differed from Normal Mean



Rainfall Results



The amount, duration and intensity of precipitation can greatly influence stream conditions. Greater precipitation can lead to more runoff

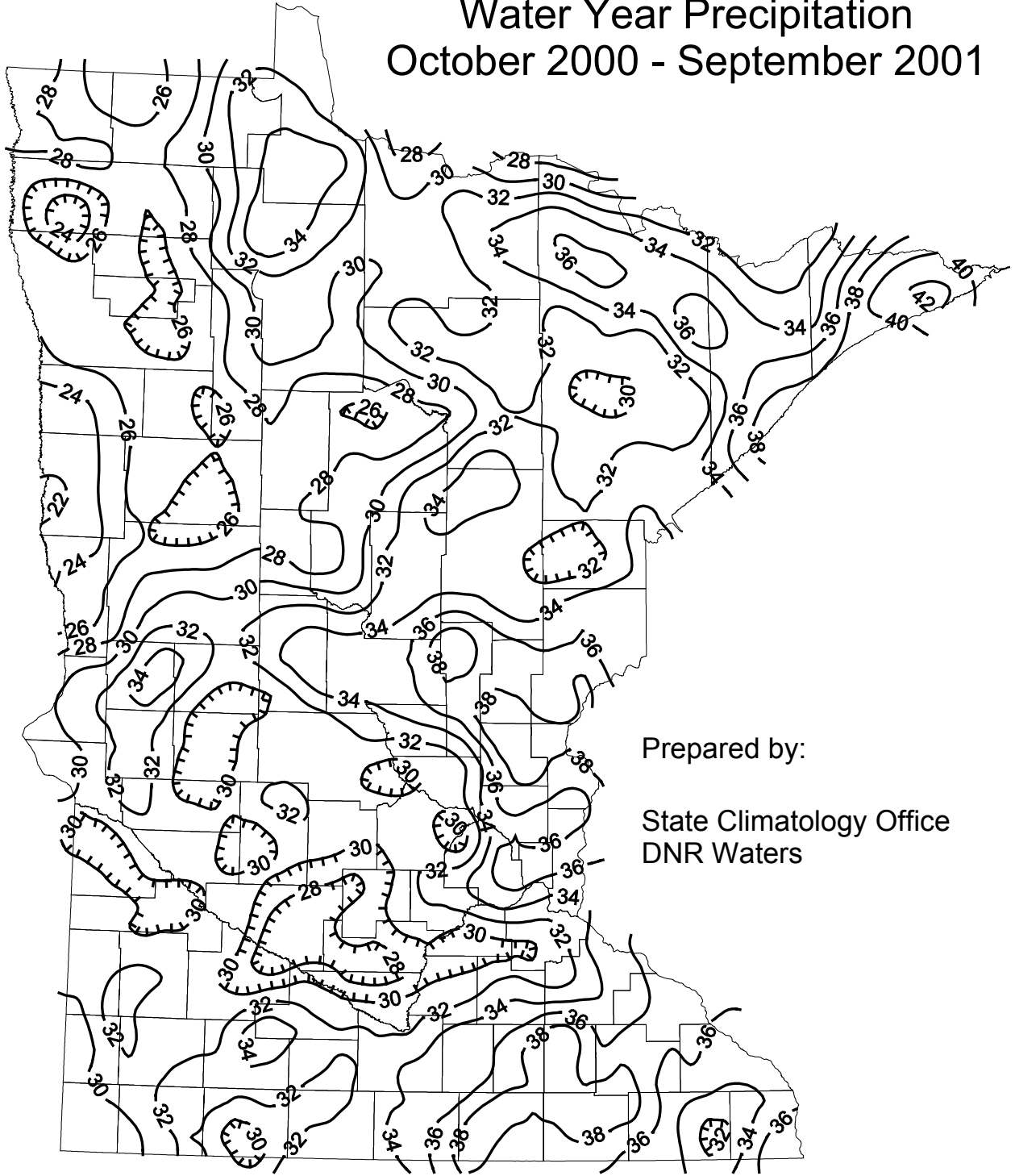
and sediment reaching streams, which causes lower stream transparency readings. Precipitation was generally at or above normal across Minnesota during 2001 (Figures 9a and 9b). Some areas experienced significantly greater amounts of precipitation than usual including far northeastern, southeastern and east central Minnesota (Figure 9b). CSMP site 94 in Cook County along the north shore received 12 inches above average precipitation, and went from an average transparency of 50 cm in 2000 to an average of 37 cm in 2001. A number of sites in Dodge County received 8 inches more than average precipitation, and were in the 41-60 cm average transparency range in 2000, but dipped to the 20-40 and 'less than 20' range in 2001. Similarly, sites in Chisago County dropped from the 41-60 cm range in 2000, to the 20-40 range in 2001.

Total rainfall amounts recorded by CSMP volunteers varied greatly, statewide and within a given watershed (See Appendix 2). Variation within watersheds may reflect the highly variable nature of rainfall across the landscape. It is also possible that some rainfall was not recorded, leading to incomplete reports. The number of rain readings reported is listed in Appendix 2 to give an idea of how often rainfall was measured for a site.

Of the CSMP sites with reported rainfall amounts, site CSMP 220 on the Fulda Lakes inlet, Murray County, reported the highest total amount of 36.59 inches, with 58 readings taken. Forty-four sites did not have any rain amounts reported. It is important to report rainfall if possible, to understand how your stream changes in response to varying amounts. We did not include a space to record rainfall on the stream data sheet in 2001, in attempt to avoid discrepancies between the stream and rain data sheets. This change may have led to fewer reports of rainfall overall.

Figure 9a. 2001 Water Year Precipitation Map

Water Year Precipitation October 2000 - September 2001



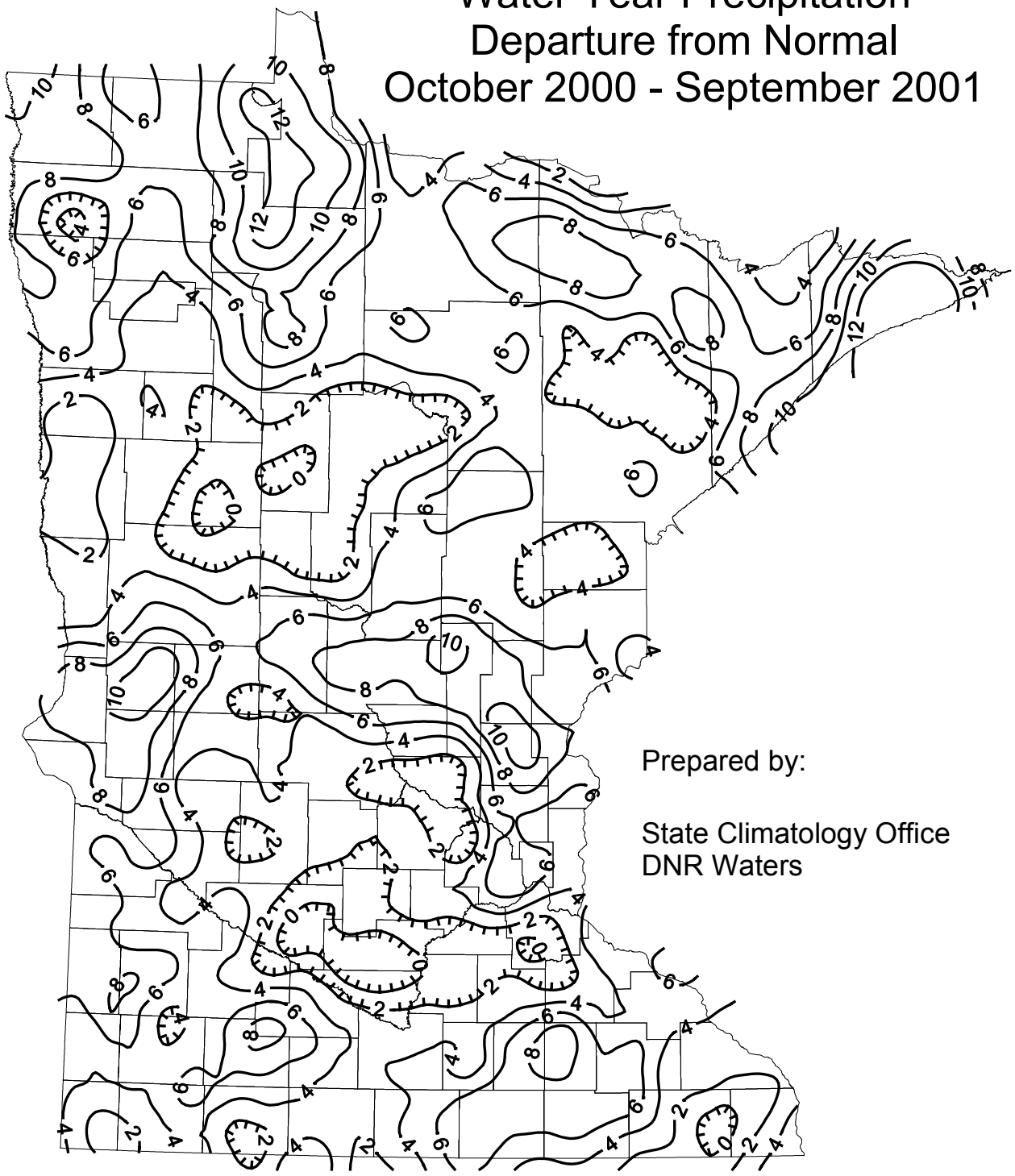
Prepared by:

State Climatology Office
DNR Waters

values are in inches

Figure 9b. 2001 Departure from Normal Precipitation Map

Water Year Precipitation Departure from Normal October 2000 - September 2001



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State Climatology Office
DNR Waters

values are in inches

Section 3. Case Study:

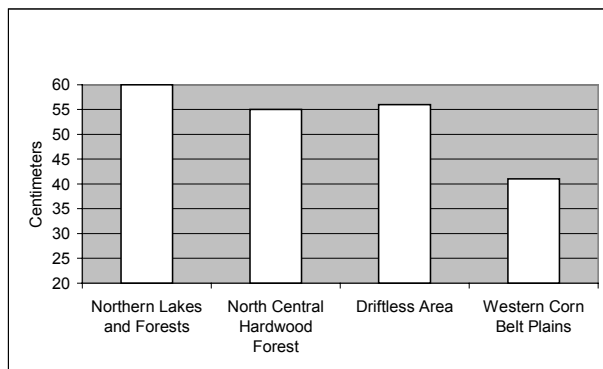
Water Transparency and User Perceptions of Recreational Suitability

By Dave Christopherson, MPCA St. Paul

Now that we have a couple of years of good CSMP data, it's time to step back and take a look at some of the results. Here we'll examine transparency and recreational suitability rankings across the state, and look at the relationship between the two. With several thousand readings taken over a two-year period from 1999-2000 at streams across Minnesota, some definite patterns are apparent.

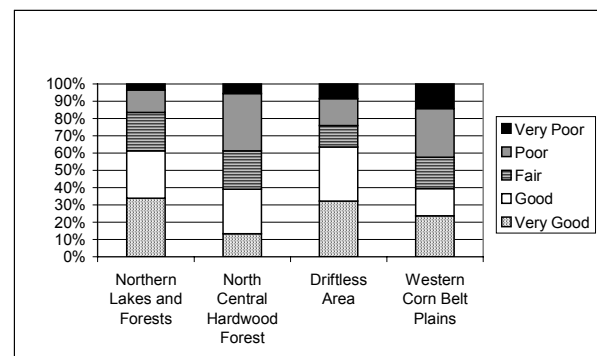
Four Minnesota ecoregions have enough data at this point to provide statistically meaningful results (see Figure 2, page 5 for a map of Minnesota ecoregions). As might be expected, transparency measurements do vary across the state, depending on the ecoregion where they are taken (Figure 10). Starting out at a median or "middle" reading of 41 cm in the Western Corn Belt Plains ecoregion, stream transparency generally increases as you move north and east, topping out at a median reading of 60 cm in the Northern Lakes and Forests ecoregion.

Figure 10. Median Transparency by Ecoregion



As might also be expected, the recreational suitability of stream water quality, as perceived by CSMP volunteers, is closely related to transparency. CSMP recreational suitability rankings show the same statewide pattern as transparency readings. The pattern is not perfect, but, as Figure 11 shows, perceived recreational suitability likewise generally increases as you move north and east, with fewer "very good" ratings and more "very poor" ratings in the Western Corn Belt Plains than in the Northern Lakes and Forests ecoregion.

Figure 11. Percentage of Recreational Suitability Rankings in 4 Minnesota Ecoregions

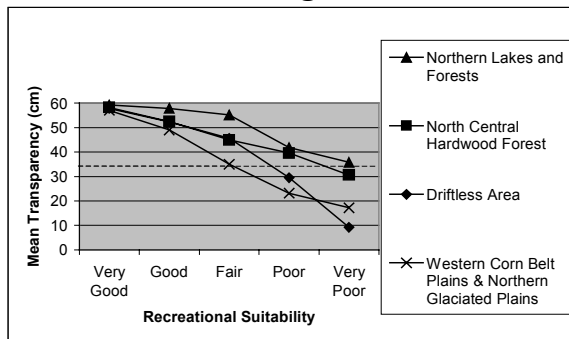


Perhaps the more interesting finding is that expectations and what people perceive as "poor" or "good" also vary across the state. As Figure 12 shows, people's idea of how clear a stream has to be before they'll consider swimming in it is definitely different in northern Minnesota than in the southern part of the state.

The easiest way to read Figure 12 is to look at the 35 cm line. CSMP volunteers in the Western Corn Belt Plains ecoregion consider the recreational suitability to be "fair" at 35 cm transparency, whereas in the Northern Lakes and Forests ecoregion the same stream would rate as "very poor."

These results are similar to what has been previously found for lakes in Minnesota. Not only does water clarity increase as you go north and east in the state, but user expectations and the relationship between clarity and recreational suitability also change. One difference between the lake and stream findings is that, for lakes, ecoregion differences are greatest at the "very good" end of the scale, while, for streams, they seem to converge at that same left end of the graph. This, however, is because the transparency tube is only 60 cm long; high-end transparency measurements are limited by the length of the tube (and the length of people's arms).

Figure 12. Recreational Suitability vs. Mean Stream Transparency by Ecoregion



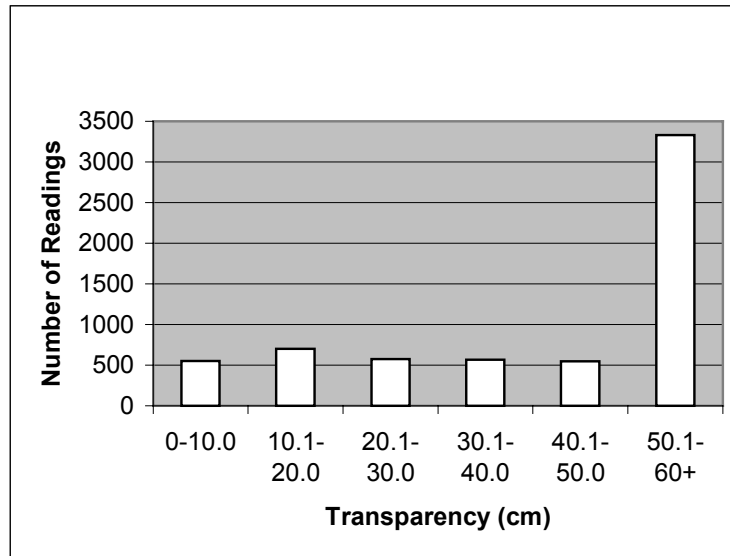
In fact, a majority (53%) of the transparency tube measurements taken in Minnesota have been 50 cm or above (Figure 13). This number of course varies across the state, but even in the Western Corn Belt Plains where transparency is generally lower, 44% of the readings were at 50 cm or above.

In spite of this limitation, the transparency tube and transparency readings are an extremely valuable tool for looking at stream water quality in Minnesota. Transparency can show differences across the state and point out problem areas that need to be addressed.

The MPCA's traditional measure of stream "swimmability" has been fecal coliform bacteria monitoring, which provides an important health-related indicator of pathogen levels -- when fecal coliform bacteria is present in water in large numbers, other bacteria that cause human diseases are likely present as well. However, fecal coliform is an incomplete indicator of overall recreational suitability. There's more to deciding if our streams and rivers are clean enough for swimming than just pathogen levels, and the CSMP provides an essential look at the clarity of our Minnesota streams and its relationship to their suitability for recreation.

In addition to the potential for using transparency as an indicator of swimmability, the MPCA plans on incorporating CSMP data into the statewide stream assessment methodology. It is hoped that CSMP data will be included in Minnesota's next report to Congress on the state's water quality. The work done by CSMP volunteers and reported here is one of the first steps in doing so.

Figure 13. Distribution of Transparency Readings Taken in Minnesota (1999-2000)



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Water flows humbly to the lowest level.

Nothing is weaker than water,

Yet for overcoming what is hard and strong,

Nothing surpasses it.

--Lao Tzu, Tao Te Ching



Some Useful Definitions

Chlorophyll – the molecule found in algae that provides pigmentation (color).

Drainage Basin – the area of land drained by a number of rivers or streams.

Ecoregion – geographic areas that are distinguished from others by ecological characteristics such as climate, soils, geology, and vegetation.

Eutrophication – the natural and artificial addition of nutrients to a water body, which may lead to depleted oxygen concentrations. Eutrophication is a natural process that is frequently accelerated and intensified by human activities.

Geomorphology – the study of the evolution and configuration of landforms.

Hypolimnion – the cool, dense layer of water found at greater lake depths.

Macrophyte – rooted or free-floating large aquatic plants found in wetlands, lakes, and streams.

Oligotrophy – term used to describe the condition of a lake that is characterized by clear blue water, low nutrient levels, and Secchi-disk transparencies of over 8 meters. Oligotrophic lakes are generally deep with relatively small drainage areas.

Photosynthesis – the process by which green plants synthesize carbohydrates from carbon dioxide and water using light as an energy source and releasing oxygen as a byproduct.

Stream Discharge – quantity of stream flow per unit of time. Stream discharge is calculated by multiplying stream velocity (V) by stream cross-sectional area (A) so that $Q=VA$, where Q = discharge ($m^3/second$); V = velocity (m/s); and A = cross section (m^2).

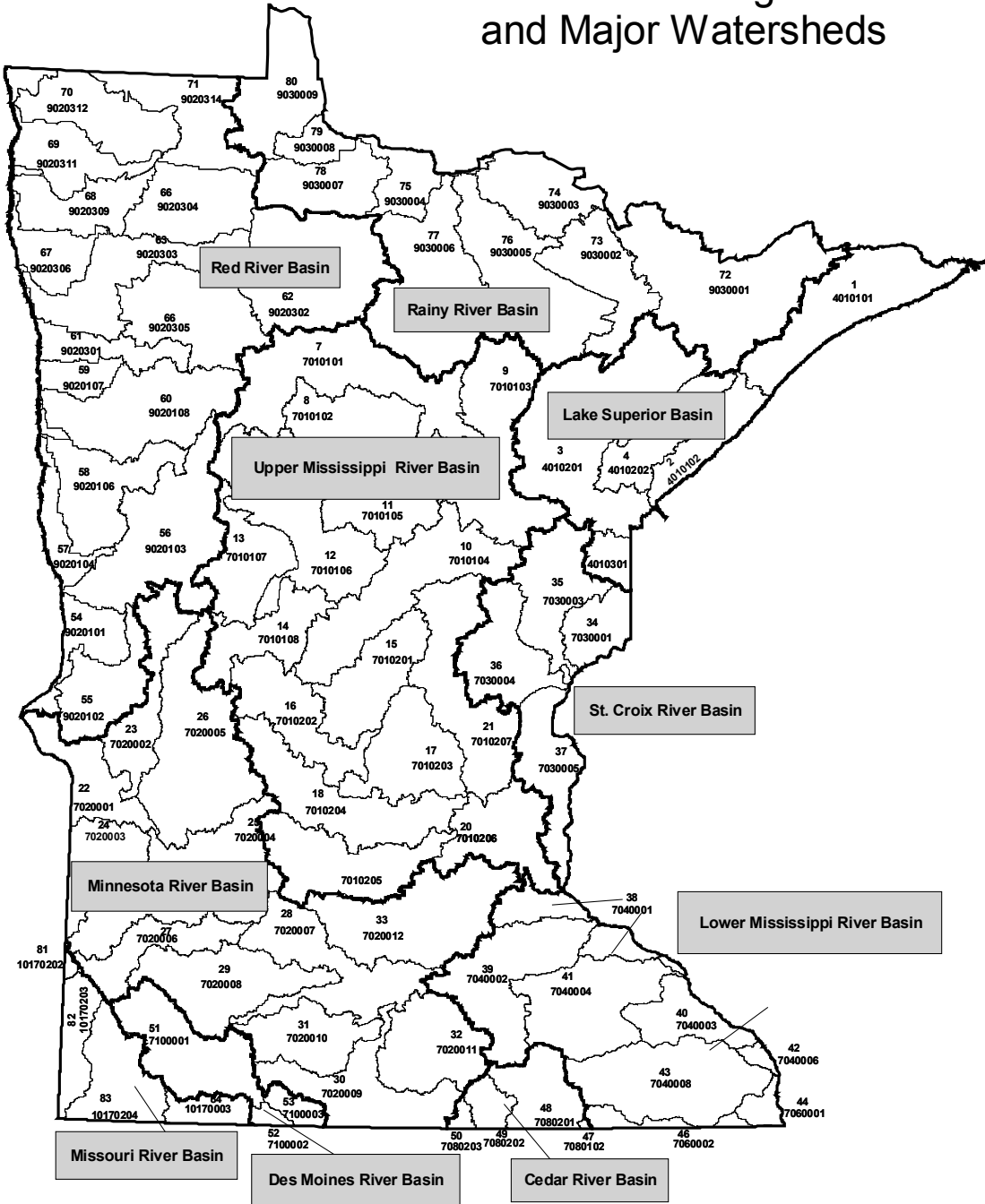
Trophic – refers to the nutrient production level of a water body.

Turbidity – murkiness or cloudiness of water, indicating the presence of suspended sediments, dissolved solids, natural or man-made chemicals, algae, etc.

Watershed – the area of land drained by a particular river or stream system, which when added together make up a drainage basin.

Appendix 1. Minnesota Drainage Basins & Major Watersheds Map and Key

Minnesota Drainage Basins and Major Watersheds



Key to Minnesota Drainage Basins and Major Watersheds

Lake Superior Basin = Drainage Basin Name
04010101 = Hydrologic Unit Code
(1) = DNR Major Watershed number
- Lake Superior (North) = Watershed Name

Lake Superior Basin

04010101 (1) – Lake Superior (North)
04010102 (2) – Lake Superior (South)
04010201 (3) – St. Louis River
04010202 (4) – Cloquet River
04010301 (5) – Nemadji River

Upper Mississippi River Basin

07010101 (7) – Mississippi (Headwaters – Lake Winnibigoshish)
07010102 (8) – Leech Lake River
07010103 (9) – Mississippi (Grand Rapids)
07010104 (10) – Mississippi River (Brainerd)
07010105 (11) – Pine River
07010106 (12) – Crow Wing River
07010107 (13) – Redeye River (Leaf River)
07010108 (14) – Long Prairie River
07010201 (15) – Mississippi River (Sartell)
07010202 (16) – Sauk River
07010203 (17) – Mississippi River (St. Cloud)
07010204 (18) – North Fork Crow River
07010205 (19) – South Fork Crow River
07010206 (20) – Mississippi River
07010207 (21) – Rum River

Minnesota River Basin

07020001 (22) – Minnesota River (Headwaters)
07020002 (23) – Pomme de Terre River
07020003 (24) – Lac Qui Parle River
07020004 (25) – Minnesota River (Granite Falls)
07020005 (26) – Chippewa River
07020006 (27) – Redwood River
07020007 (28) – Minnesota River (Mankato)
07020008 (29) – Cottonwood River
07020009 (30) – Blue Earth River
07020010 (31) – Watonwan River
07020011 (32) – Le Sueur River
07020012 (33) – Minnesota River (Shakopee)

St. Croix River Basin

07030001 (34) – St. Croix River (Upper)
07030003 (35) – Kettle River
07030004 (36) – Snake River
07030005 (37) – St. Croix River (Stillwater)

Lower Mississippi River Basin

07040001 (38) – Mississippi River and Lake Pepin (Red Wing)
07040002 (39) – Cannon River
07040003 (40) – Mississippi River (Winona)
07040004 (41) – Zumbro River
07040006 (42) – Mississippi River (La Crescent)
07040008 (43) – Root River
07060001 (44) – Mississippi River (Reno)
07060002 (46) – Upper Iowa River

Cedar River Basin

07080201 (48) – Cedar River
07080202 (49) – Shell Rock River
07080203 (50) – Winnebago River (Lime Creek)

Des Moines River Basin

07100001 (51) – West Fork Des Moines River (Headwaters)
07100002 (52) – West Fork Des Moines River (Lower)
07100003 (53) – East Fork Des Moines River

Missouri River Basin

10170202 (81) – Big Sioux River (Medary Creek)
10170203 (82) – Big Sioux River (Pipestone)
10170204 (83) – Rock River
10230003 (84) – Little Sioux River

Red River Basin

09020101 (54) – Bois De Sioux River
09020102 (55) – Mustinka River
09020103 (56) – Otter Tail River
09020104 (57) – Red River of the North (Headwaters)
09020106 (58) – Buffalo River
09020107 (59) – Marsh River
09020108 (60) – Wild Rice River
09020301 (61) – Sandhill River
09020302 (62) – Upper and Lower Red Lake
09020303 (63) – Red Lake River
09020304 (65) – Thief River
09020305 (66) – Clearwater River
09020306 (67) – Grand Marais Creek (Red River of the North)
09020309 (68) – Snake River

Key to Minnesota Drainage Basins and Major Watersheds (Continued)

<p>Lake Superior Basin = Drainage Basin Name 04010101 = Hydrologic Unit Code (1) = DNR Major Watershed number - Lake Superior (North) = Watershed Name</p>

Red River Basin (Continued)

09020311 (69) – Tamarac River (Red River of the North)
09020312 (70) Two Rivers
09020314 (71) Roseau River

Rainy River Basin

09030001 (72) – Rainy River
09030002 (73) – Vermillion River
09030003 (74) – Rainy River (Rainy Lake)
09030004 (75) – Rainy River (Manitou)
09030005 (76) – Little Fork River
09030006 (77) – Big Fork River
09030007 (78) – Rapid River
09030008 (79) – Rainy River (Baudette)
09030009 (80) – Lake of the Woods

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LAKE SUPERIOR DRAINAGE BASIN

Lake Superior (North) Watershed (Hydrologic Unit Code – HUC – 04010101)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Eleanor & Donald Lease	79	Cook	No. Brule River	4/30 - 10/19	60	60	60	60	14	14	20.99	0	59
Matt Farley	94	Cook	Spruce Creek	4/7 - 7/4	37	38	10	60	9	1	32.1	2	74

Lake Superior (South) Watershed (HUC 04010102)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Timothy Musick	24	St. Louis	Lester River	5/6 - 8/18	34	26	10	60	6	1	15.13	10	39
Tom Estabrooks	268	St. Louis	Chester Creek	6/11 - 9/7	35	35	29	41	2	0	11.69	16	44

St. Louis River Watershed (HUC 04010201)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
John Nyhus	249	St. Louis	Embarass River	6/5 - 10/23	60	60	60	60	18	18	14.21	8	58
Kay Rezanka	2	Carlton	St. Louis River	4/13 - 11/16	49	49	14	60	18	10	2.17	4	42

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN

Mississippi (Headwaters-Lake Winnibigoshish) Watershed (HUC 07010101)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Terry Larson	75	Hubbard	Midge Lake outlet	4/30 - 11/16	60	60	60	60	8	8	1.16	1	1
Terry Larson	76	Hubbard	Little Wolf Lake outlet	4/30 - 11/16	60	60	60	60	8	5		1	0

Mississippi (Grand Rapids) Watershed (HUC 07010103)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Pamalla Boyce	93	Aitkin	Swan River	6/2 - 6/15	50		39	60	2	1	13.2	0	15
Janet Smude	312	St. Louis	Prairie River	7/16 - 10/22	60	60	60	60	7	7		0	0

Mississippi (Brainerd) Watershed (HUC 07010104)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Herb Nelson	244	Crow Wing	Nokasippi River	4/21 - 7/1	60	60	60	60	6	6	4	1	1
Dennis Troye	382	Aitkin	Fleming Lake inlet, "CR 5" (NE end)	4/25 - 7/11	58		47	60	9	7		5	0
Dennis Troye	381	Aitkin	Fleming Lake inlet, "Twp Rd-32" (north end)	4/23 - 8/13	59	60	45	60	12	11		6	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Pine River Watershed (HUC 07010105)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Marvin W. Miller	31	Crow Wing	Johnson Creek	5/24 - 9/4	41	41	40	44	6	0	22.27	2	51
Don Van Vorst	253	Cass	Unnamed tributary to Norway Lake	4/27 - 10/27	50	54	45	60	27	9	21.35	11	47
Greg & Mary Johnson	25	Cass	Pine River	4/6 - 10/13	60	60	60	60	32	32	21.63	9	66
Joe & Catherine O'Donnell	251	Crow Wing	Pelican Brook	4/24 - 10/10	60	60	60	60	19	19	16.8	2	59
Don Van Vorst	252	Cass	Pine River	4/27 - 10/27	60	60	60	60	27	27	21.35	11	47

Crow Wing River Watershed (HUC 07010106)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Chuck Tritz	348	Hubbard	Shell River	5/10 - 9/30	57	57	52	60	12	3	12.29	3	46

Redeye River (Leaf River) Watershed (HUC 07010107)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Mike Smith	88	Otter Tail	Oak Creek	4/2 - 10/29	55	55	15	60	47	34	22.79	20	72
David J. Kleis	248	Wadena	Leaf River	5/8 - 10/31	60	60	59	60	22	21	17.36	4	63

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Redeye River (Leaf River) Watershed (Continued, HUC 07010107)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Collen Olson	258	Wadena	Leaf River	NA					0	0	22.09		59

Long Prairie River Watershed (HUC 07010108)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Ken Tuedt	462	Douglas	Inlet to Lake Brophy, "Flooding Resort (1)"	4/24 - 9/13	60	60	58	60	21	0	19.78		49
Jack Anderson	511	Douglas	Inlet to Lake Miltona from Lake Irene	4/28 - 10/15	59	60	45	60	20	19	20.3	2	77
Billie Jo Jones	458	Douglas	Spirits Creek	4/10 - 8/11	57	56	26	60	33	28	21.31	14	75
Joseph R. Gondek	459	Douglas	Kruegers Slough inlet to Lake Le Homme Dieu	4/10 - 9/30	53	54	15	60	27	21	17.14	4	67
Jerald Fulton	460	Douglas	Srping Lake inlet to Lake Miltona	4/10 - 9/18	60	60	60	60	12	12	22.14	1	52
Dennis E. Cin	395	Douglas	Douglas Co. Ditch 6	5/24 - 10/15	58	56	35	60	15	14	15.25	5	41
Jerald Fulton	461	Douglas	Unnamed trib. To Lake Miltona, "Dittberner Cr"	4/14 - 9/18	58	57	50	60	12	7	22.14	1	52
Ken Tuedt	463	Douglas	Inlet to Lake Brophy, "2"	4/24 - 9/13	58	59	55	60	21	0	19.78		49
Veronica Stans	109	Douglas	Stormy Creek	4/7 - 12/17	54	49	38	60	4	0		1	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Long Prairie River Watershed (Continued, HUC 07010108)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Dean Jahnke & Harold Dellwo	101	Douglas	Ditch 23	5/29 - 9/2	60		59	60	8	0	21.3	3	41
Gerry E. Goblirsch	397	Douglas	Lake Rachel inlet, west side	5/9 - 6/20	59	56	52	60	6	5		1	0

Mississippi River (Sartell) Watershed (HUC 07010201)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Connie Jendro	26	Morrison	Two Rivers	4/8 - 10/11	56	57	21	60	37	29	23.53	17	51

Sauk River Watershed (HUC 07010202)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Gene Waldorf	90	Todd	Fish Creek, "a"	4/5 - 7/24	55	56	10	60	12	5	13.82	5	14
Gene Waldorf	91	Todd	Fish Creek, "b"	4/5 - 9/8	50	53	9	60	16	8	13.82	6	14
Gene Waldorf	184	Todd	Unnamed tributary to Fish Creek, "c"	4/5 - 9/8	46	47	8	60	16	2	13.82	6	14
Gene Waldorf	185	Todd	Fish Creek, "d"	4/5 - 9/7	47	50	8	60	16	5	13.82	6	14
Dick & Nita Anderson	95	Stearns	Little Birch Lake Outlet (Zinniel Creek)	4/6 - 10/4	60	60	60	60	21	0	22.51	0	33

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Sauk River Watershed (Continued, HUC 07010202)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Harold Podolske	457	Douglas	Gulden Lake inlet	4/11 - 9/24	52	52	14	60	18	0	20.13	5	49
Jeanine Renard	92	Todd	Fish Creek	4/21 - 9/6	42	45	8	60	16	5	15.5	10	22

Mississippi (St. Cloud) Watershed (HUC 07010203)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
George Kydd	222	Sherburne	Briggs Creek, "1B"	4/25 - 10/20	57	57	40	60	33	17	19.94	12	66
George Kydd	224	Sherburne	Rice Creek at CSAH 6	4/25 - 10/20	15	15	8	41	33	0	19.85	12	66
George Kydd	225	Sherburne	Elk River at Co. Rd. 61	4/25 - 10/20	50	50	7	60	33	23	19.85	12	66
George Kydd	226	Sherburne	Elk River at CSAH 20	4/25 - 10/20	52	51	13	60	33	23	19.85	12	66
George Kydd	227	Sherburne	Rice Creek at CSAH 16	4/25 - 10/20	43	43	14	60	32	7	19.85	11	66
George Kydd	228	Sherburne	Elk River at CSAH 6	4/25 - 10/20	51	50	17	60	32	10	19.85	11	66
George Kydd	229	Sherburne	Rush Lake outlet	4/25 - 10/20	28	27	8	60	33	1	19.85	12	66
George Kydd	230	Sherburne	Elk River at Co. Rd. 53	4/25 - 10/20	26	27	8	55	32	0	19.85	11	66
George Kydd	231	Sherburne	Elk River at State Hwy. 25	4/25 - 10/20	25	27	2	51	31	0	19.94	10	66

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Mississippi (St. Cloud) Watershed (Continued, HUC 07010203)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Gene & Betty Pundsack	116	Benton	Stony Brook, "site 1"	5/3 - 10/14	60	60	60	60	21	21	22.63	2	37
Gene & Betty Pundsack	117	Benton	Stony Brook, "site 2"	5/3 - 10/14	55	57	38	60	17	12	22.63	2	37

North Fork Crow River Watershed (HUC 07010204)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Anthony Kaster	145	Wright	Twelve Mile Creek	4/6 - 10/21	58	55	30	60	13	12	22.28	3	22
Thomas G. Burr	188	Meeker	No. Fork Crow River, "site 1"	5/20 - 9/23	45	43	14	60	17	5	16.47	2	58
Thomas G. Burr	189	Stearns	No. Fork Crow River, "site 2"	5/20 - 9/23	55	56	43	60	17	6	16.47	2	58
Thomas G. Burr	190	Stearns	No. Fork Crow River, "site 3"	5/20 - 9/23	59	59	50	60	17	12	12.77	2	55
Litchfield WWTP Plant Operator	191	Meeker	Jewitts Creek	5/17 - 10/25	60	60	60	60	20	20	13.33	5	46
Litchfield WWTP Plant Operator	192	Meeker	No. Fork Crow River	5/17 - 10/25	60	60	60	60	14	14	13.33	3	46

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

North Fork Crow River Watershed (Continued, HUC 07010204)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Walt Barlow	193	Wright	No. Fork Crow River	5/28 - 10/28	45	44	26	60	20	5	14.18	6	55
Mark D. Miller	194	Wright	No. Fork Crow River, 5 mi N Howard Lake	5/23 - 10/27	36	40	19	58	42	0	22.14	9	51
Wallace W. McCurdy	195	Wright	No. Fork Crow River	4/10 - 9/23	42	41	18	60	18	2	21.47	8	44
Torney Marshall	196	Wright	Crow River	5/29 - 9/24	21	22	13	47	19	0	22.83	0	45
Gabe Davidson	201	Wright	No. Fork Crow River	5/16 - 10/12	41	43	28	60	21	2	16.45	5	6
John Hiebert	203	Wright	Unnamed Tributary To No. Fork Crow River	4/4 - 10/31	31	33	2	60	44	3	22.55	15	71
John Hiebert	203	Wright	Unnamed Tributary To No. Fork Crow River	4/4 - 10/31	31	33	2	60	44	3	22.55	15	71
Sheryl & Erikson O. Wuollet	204	Wright	No. Fork Crow River	4/12 - 9/24	43	40	16	60	23	7	16.06	11	23
Bob Schwingler	254	Meeker	Unnamed tributary to Manuella Lake	1/27 - 9/15	55	56	14	60	30	19	16.18	11	50
Tom Hammer	304	Wright	Wright Co. Ditch 10, "site 1 near boat landing"	4/13 - 8/18	52	52	7	60	9	6	22.19	3	75
Tom Hammer	305	Wright	Wright Co. Ditch 10, "site 2/Co. 5"	4/13 - 8/18	59	59	50	60	8	7	22.09	3	74
Tom Hammer	306	Wright	Wright Co. Ditch 10, "site 3 Keats Ave"	4/13 - 9/15	55	54	10	60	10	9	22.09	3	74

Monitoring Period: Period over which transparency readings were taken
Mean: Average stream transparency in centimeters
"Stage Weighted" Mean: Average stream transparency that takes stream water level into account
Min: Minimum transparency reading in centimeters
Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken
N>60: Number of transparency readings greater than 60 centimeters
Total Rain: Amount of rain reported over entire season in inches
Rain Event Readings: Number of transparency readings taken immediately after major rainfall
N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

North Fork Crow River Watershed (Continued, HUC 07010204)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Tom Hammer	307	Wright	unnamed trib. to Wright Co. Ditch 10, "site 4"	4/13 - 6/25	53	54	9	60	7	6	22.09	3	74
Tom Hammer	308	Wright	unnamed trib. to Wright Co. Ditch 10, "site 5"	4/13 - 9/15	52	52	4	60	10	8	22.09	3	74
Tom Hammer	309	Wright	Wright Co. Ditch 10, "site 6 near townhall"	4/13 - 9/15	53	52	8	60	10	7	22.09	3	74
Ruth Schaefer	320	Kandiyohi	Middle Fork Crow River, CR-2	5/12 - 9/27	59	56	45	60	24	22	7.34	3	19
Howard L. Turck	421	Meeker	No. Fork Crow River	4/10 - 11/24	37	38	7	56	29	0	25.55	19	32
Lee G. Miska	422	Meeker	Collinwood Lake So. Inlet (from Maple Lake)	8/20 - 10/22	21		0	60	11	3	3.22		15
Carol R. Marjapori	423	Wright	Crow River, "intersection of CR 3 and 37"	4/8 - 8/11	29	29	9	50	9	0	7.39	2	25
Mary Reynolds	425	Wright	No. Fork Crow River	5/6 - 10/20	34	37	14	60	14	2	13.79	7	46
Richard P. Gehlen	428	Meeker	Silver Creek	9/4 - 10/11	23	23	20	28	4	0	2.66	0	11

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

South Fork Crow River Watershed (HUC 07010205)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Jim Hansen	200	McLeod	So. Fork Crow River	5/21 - 10/19	28	28	18	47	8	0	23.55	4	68
Anne Mills	426	Carver	So. Fork Crow River, "Hwy. 25"	5/12 - 9/27	39	34	15	54	7	0	15.09	1	27
Anne Mills	427	Carver	So. Fork Crow River, "old mill park"	5/12 - 11/6	36	36	13	58	10	0	14.49	1	28
Marion Graham	198	McLeod	So. Fork Crow River, "airport bridge"	5/24 - 8/9	33	30	21	60	13	2	12.01	6	30
Marion Graham	448	McLeod	So. Fork Crow River, "Girl Scout Park"	6/4 - 8/9	23	23	15	33	10	0	12.01	3	30
Marion Graham	449	McLeod	So. Fork Crow River, "3M Bridge"	5/24 - 8/9	32	31	19	60	13	1	12.01	4	30
Roger Berggren	396	McLeod	So. Fork Crow River, "Bluff St. Bridge"	5/9 - 8/31	30	21	14	60	34	6	24.74	4	42
Roger Berggren	97	McLeod	So. Fork Crow River, "Co. Rd. 14"	5/9 - 9/6	33	33	16	60	18	3	12.37	3	21
Roger Berggren	96	McLeod	So. Fork Crow River, "Co. Rd. 9"	5/9 - 9/6	27	27	12	60	18	3	12.37	3	21
Gary Schreifels	187	McLeod	Buffalo Creek	4/3 - 10/17	34	34	11	60	33	2	21.5	11	58
Jim & Emma Petersen	377	Carver	So. Fork Crow River, "Site #2"	4/29 - 10/6	37	40	18	60	9	2	16.27	2	78
Alex A. Kregel	424	Carver	So. Fork Crow River	1/10 - 10/16	25	24	8	45	21	0	17.45	6	51
Jim & Emma Petersen	376	Carver	So. Fork Crow River, "Site #1"	4/29 - 10/6	38	40	19	60	9	2	16.27	2	78
Jack Russek	199	Wright	So. Fork Crow River	5/15 - 7/18	33	28	16	41	3	0		0	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Mississippi River Watershed (HUC 07010206)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Todd Biewen	35	Hennepin	Bassett Creek	5/18 - 10/12	57	58	35	60	12	9	23.01	2	57
Celine Lyman	57	Hennepin	Minnehaha Creek @ Nicollet Ave.	4/1 - 8/24	47	47	17	60	19	0	29.38	11	69
Warren Westphal	29	Hennepin	Minnehaha Creek	4/27 - 10/1	60	60	60	60	7	7	16.75	0	33
Louise Hotka	1	Hennepin	Mississippi River	4/1 - 9/15	34	34	12	60	25	1	24.71	5	49
Celine Lyman	58	Hennepin	Minnehaha Creek @ "Flats"	4/1 - 9/24	41	53	15	60	13	0	29.38	9	69
Sharon Wheeler	71	Hennepin	Minnehaha Creek	5/10 - 9/24	58	58	47	60	18	5	18.44	4	37
Steve Goodell	64	Hennepin	Minnehaha Creek	4/12 - 7/30	48	51	22	60	12	0	25.87	4	77
Donald Sovell	30	Hennepin	Minnehaha Creek	4/27 - 11/9	50	49	13	60	24	1	25.41	15	83
Terry Brennan	89	Anoka	Rice Creek	4/14 - 10/27	35	39	17	60	9	2	23.37	0	62

38

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

UPPER MISSISSIPPI RIVER DRAINAGE BASIN (Continued)

Rum River Watershed (HUC 07010207)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Michael Macioch	314	Aitkin	Mormon Creek	7/23 - 10/9	59	59	56	60	5	4	26.39	0	89
Michael Macioch	162	Aitken	Borden Creek	4/10 - 10/9	56	57	35	60	15	7	26.89	2	89
Michael Macioch	163	Aitken	Seventeen Creek	4/10 - 7/23	46	42	18	60	11	4	26.89	2	89
Michael Macioch	272	Aitken	Reddy Creek	4/10 - 10/9	28	36	10	53	15	0	26.89	2	89
Eric North	164	Mille Laes	Little Whitefish Lake outlet	4/4 - 10/22	60	60	60	60	18	18	24.33	11	32
Bruce Odenbach	158	Crow Wing	Garrison Creek	4/25 - 10/22	60	60	60	60	24	24	22.47	0	58
Caron Gibson	263	Isanti	Rum River	4/3 - 12/8	54	55	40	60	27	9	26.51	5	47
Caron Gibson	264	Isanti	Owl Creek (Co. Ditch 15)	4/3 - 12/8	49	49	18	60	28	9	26.51	7	47
Jim & Sherry Kaiserlik	378	Isanti	Stanchfield Creek, "Site 1"	6/4 - 10/10	60	59	52	60	18	17	17.31	8	35
Jim & Sherry Kaiserlik	379	Isanti	Stanchfield Creek, "Site 2"	6/4 - 10/10	60	59	52	60	18	17	17.31	8	35
Don Quaintance	9	Isanti	Isanti Co. Ditch 10	NA					0	0	21.95		56
John Pap	161	Mille Laes	Anderson Lake outlet	NA					0	0	19.39		44

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN

Minnesota River (Headwaters) Watershed (HUC 07020001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Tom Graham	477	Laq qui Parle	Yellowbank River	9/8 - 9/18	32	32	31	32	2	0			0

Pomme de Terre River Watershed (HUC 07020002)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Gerald & Mary Erickson	369	Ottertail	Pomme de Terre River	9/24 - 11/5	57	57	55	60	8	1	2	1	15
Berthold Koosmann	370	Swift	Pomme de Terre River	4/12 - 11/26	24	23	6	45	21	0	21.45	7	58
Art Johnson	384	Ottertail	Pomme de Terre River	4/10 - 11/21	58	58	49	60	81	0	23.75	38	56
Norma Wojtalewicz	361	Swift	Pomme de Terre River "Hering St. RR BR"	5/6 - 9/16	17	18	4	35	17	0	12.45	7	43
Floyd Mark	385	Ottertail	Pomme de Terre River	7/1 - 8/27	60	60	60	60	5	5			0
Norma Wojtalewicz	362	Swift	Pomme de Terre River "US-59"	5/6 - 9/16	18	22	3	40	18	0	12.95	9	44

Lac Qui Parle River Watershed (HUC 07020003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Allen J. Krueger	98	Yellow Medicine	Lac Qui Parle River	4/4 - 9/28	16	14	4	60	31	1	21.76	11	36
Allen J. Krueger	372	Yellow Medicine	Lac Qui Parle River, CR-D8	4/4 - 9/28	11	12	4	29	32	0	17.55		31

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Lac Qui Parle River Watershed (Continued, HUC 07020003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Lynn Lokken	466	Laq qui Parle	Lac qui Parle River	7/24 - 8/6	22	25	15	33	3	0	0.6		4
Dustin & Jeff Johnson	467	Laq qui Parle	County Ditch 34	7/20 - 11/4	33	36	8	58	8	0	4.67		13
Norris Peterson	468	Yellow Medicine	Lac qui Parle River	7/22 - 9/23	17	14	2	27	10	0	6.31		17
Norris Peterson	469	Yellow Medicine	Lac qui Parle River	7/22 - 9/23	13	9	2	25	9	0	6.31		17
Burton Hendrickson	470	Laq qui Parle	Cobb Creek	7/16 - 10/23	17		5	54	9	0	5.89		20
Deb & George Peterson	471	Laq qui Parle	Lazarus Creek	7/23 - 10/30	22	22	10	28	11	0	4.29		10
Harold Solem	472	Laq qui Parle	County Ditch 4	7/20 - 10/6	32	32	11	60	5	0			0
Windfred Schmidt	473	Laq qui Parle	Lost Creek, sec. 16 Mehurin Twp	7/19 - 10/8	60		60	60	11	0	4.77		23
Windfred Schmidt	474	Laq qui Parle	Unnamed trib. To Crow Creek, sec. 28 Mehurin Twp	7/19 - 7/29	60		60	60	3	0	1.49		8
Dennis Schentzel	476	Lincoln	Laq qui Parle River	7/21 - 10/5	30	20	8	52	9	0	12.06		22

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Minnesota River (Granite Falls) Watershed (HUC 0702004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Glenn Simons	401	Kandiyohi	Halvorson Slough inlet	4/8 - 7/25	54	51	34	60	4	3	20.4	1	80
Joseph Rolling	291	Lincoln	Lake Benton outlet	4/21 - 8/3	48	46	10	60	18	0	28.84	10	86
Lewis Miller	465	Yellow Medicine	Canby Creek	7/28 - 10/28	42	42	20	56	15	0	8.43		15
Lewis Miller	464	Yellow Medicine	Lac qui Parle River, sec 1 Norman Twp	7/22 - 10/28	43		5	60	16	0	8.43		15

Chippewa River Watershed (HUC 07020005)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bruce & Barb Mulvaney	491	Pope	Chippewa River @	4/27 - 5/21	60	60	60	60	3	4	0.5		1
Paul Wymar	502	Chippewa	County Ditch 21	4/24 - 10/11	46		3	60	20	10		6	0
Leon Sawyer	501	Pope	Lake Pelican outlet	4/15 - 9/25	40	14	14	60	23	8	18.55		15
Leon Sawyer	500	Pope	Trapper's Run Creek @ 260th Ave. Culvert	6/19 - 9/25	29		10	60	15	3	9.05		8
Leon Sawyer	499	Pope	Lake Ann outlet	5/1 - 9/25	43	42	0	60	22	13	12.42		13
Bob Reynolds	486	Douglas	Chippewa River @ Little Chippewa Lk outlet	5/6 - 12/24	58	60	50	60	75	53	35.3	42	73

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Chippewa River Watershed (Continued, HUC 07020005)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bob Reynolds	497	Douglas	Devils Lk outlet	5/6 - 9/22	60	60	60	60	42	42	19.54	42	42
Bob Reynolds	496	Douglas	Chippewa Lk outlet @ CR-7	5/6 - 9/22	60	60	60	60	42	42	19.54	42	42
Edgar Persons	495	Grant	Chippewa River @ sec. 36, Land Twp	4/6 - 11/22	60	60	60	60	8	8	2.95	0	3
James Offerdahl	494	Swift	County Ditch 3 @ US-12	6/18 - 9/27	60		60	60	2	2			0
Glen Matejka	486	Douglas	Chippewa River @ Little Chippewa Lk outlet	5/6 - 12/24	58	60	50	60	75	53	35.3	42	73
Deb Nelson	492	Kandiyohi	Shakopee Creek @ CR-29	4/12 - 11/5	60	60	60	60	11	7	11.8		19
Jon Boese	478	Swift	Cottonwood Creek @ CR-38, "A"	6/16 - 6/16	34		34	34	1	0	2.6	1	1
Bruce & Barb Mulvaney	490	Pope	Chippewa River @ CR-19	5/7 - 8/30	60	60	60	60	6	6	0.5	0	1
John & Judy Morton	489	Pope	East Branch Chippewa River	5/28 - 9/30	60	60	60	60	11	11	2.91	3	3
Nancy Messner	488	Pope	Chippewa River @ CR-2	4/12 - 11/13	42		14	60	25	11	5.88		12
Vernon Hanson	484	Pope	Lake Minnewaska outlet	4/13 - 9/28	60		60	60	20	20			0
Dave McRoberts	487	Pope	County Ditch 15	4/24 - 10/10	58	57	44	60	8	7	2.5	4	3
John Hutchinson	485		Chippewa River	5/17 - 11/10	31	29	12	60	18	2	2.85		4

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Chippewa River Watershed (Continued, HUC 07020005)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Tim Kennedy	483	Swift	Unnamed trib. To Shakopee Creek	4/7 - 10/20	29	24	12	42	29	0	22.19		29
Rick Gronseth	482	Swift	Mud Creek	4/2 - 8/13	40		17	60	19	0	9.63		14
Jon Boese	480	Swift	Cottonwood Creek @ US-12, "1"	NA					0	0	2.6	1	1
Jon Boese	481	Swift	Cottonwood Creek, "J"	6/14 - 6/16	56		55	58	2	0	2.6	1	1
Jon Boese	479	Swift	Unnamed trib. to Cottonwood Creek, "B"	6/16 - 6/16	29		29	29	1	0	2.6	1	1
James Offerdahl	493	Swift	Chippewa River @ US-12, Benson	6/18 - 9/27	48		35	60	2	1			0
Allan Olk	456	Douglas	Freeborn Lake inlet "site 3"	4/26 - 8/18	37	27	12	55	15	0	2.77	4	4
Allan Olk	455	Douglas	Freeborn Lake inlet "site 2"	4/26 - 9/8	42	34	8	60	17	0	2.77	4	4
Allan Olk	454	Douglas	Freeborn Lake inlet "site 1"	4/26 - 9/8	59	60	55	60	17	0	2.77	4	4

44

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Redwood River Watershed (HUC 07020006)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Daniel Swedzinski	357	Redwood	Clear Creek	4/27 - 9/29	54	46	23	60	22	17	19.76	10	44

Minnesota River (Mankato) Watershed (HUC 07020007)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
John Erb	73	Blue Earth	Little Cottonwood River	4/29 - 9/11	25	31	9	60	9	2	21.23	3	41
Robert Kaukola	148	Renville	Fort Ridgely Creek	4/4 - 10/30	39	37	5	60	42	9	26.61	5	102
Mary Hollingsworth	321	Blue Earth	Minnesota River, Judson Bridge	4/1 - 10/18	16	15	5	38	42	0	26.06	3	72
Carol Raymond	156	Blue Earth	Thompson Ravine Creek	4/1 - 5/6	6	6	0	13	6	0	21.47	6	63

Cottonwood River Watershed (HUC 07020008)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Robert Schultz	356	Redwood	Plum Creek	4/23 - 9/20	45	28	2	60	6	0	23.27	3	50
Linda Lang	358	Brown	Mound Creek	5/7 - 9/26	17		14	38	19	0	14.37	4	35
Richard Van Hecke	359	Cottonwood	Pell Creek	4/25 - 10/1	38	37	11	59	25	0	12.63	2	41
Steve Iverson	360	Cottonwood	Dutch Charley	5/6 - 9/24	18	20	5	38	16	0	15	3	39

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Blue Earth River Watershed (HUC 07020009)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Becky Schlorf-Von Holdt	28	Martin	Mud Creek	6/19 - 10/10	17	16	9	31	14	0		1	0
Becky Schlorf-Von Holdt	290	Martin	Dutch Creek, Y2000	5/18 - 10/10	33	26	3	60	25	1		4	0

Watonwan River Watershed (HUC 07020010)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Tom Peterson	420	Watonwan	So. Fork Watonwan River	3/31 - 11/30	16	16	3	55	24	0	28.35	8	61
Harold D Eichman	331	Blue Earth	Perch Creek, 121st St.	4/1 - 11/1	26	25	7	42	23	0	21.45	9	49
Harold D Eichman	332	Blue Earth	Perch Creek "CSAH 24"	4/1 - 11/1	26	27	7	37	21	0	21.45	8	49
Richard Enger	326	Watonwan	St. James Creek	4/4 - 10/19	29	28	10	58	21	0	25.83	8	61
Ken & Carol Bratland	375	Watonwan	So. Fork Watonwan River	4/1 - 12/9	25	22	10	60	21	0	27.59	5	69
Steve Dieteman	267	Blue Earth	Watonwan River	3/29 - 11/24	16	19	2	34	10	0	23.56	3	40
Bob Decker	323	Martin	Perch Creek	4/5 - 9/19	38	36	9	60	17	0	20.42	0	15
Bob Decker	324	Martin	Mink Creek	4/5 - 9/19	46	45	9	60	17	5	20.42	0	15
Bob Decker	325	Martin	Willow Creek	4/5 - 9/19	33	29	11	60	15	2	21.87	0	15

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Watowan River Watershed (Continued, HUC 07020010)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bernhardt & Sharon Schwardt	330	Watowan	Willow Creek	4/1 - 10/31	47	39	11	60	21	13	24.93	2	58
Wilbert Oberdieck	287	Watowan	Perch Creek	4/15 - 9/30	25		4	48	26	0		6	0
Norman H. Penner	327	Watowan	Watowan River	3/22 - 10/28	36	29	4	60	95	11	23.22	13	67
Dustin Menssen	322	Watowan	Butterfield Creek	4/2 - 10/29	30	31	6	56	11	0	23.51	7	49
Erik & Adam Munsterman	328	Watowan	So. Fork Watowan River	4/30 - 9/24	28	26	8	60	22	0	12.58	6	43
Paula Janzen	329	Watowan	Unnamed Tributary to Irish Lake "WMS3"	4/15 - 9/16	24	24	4	55	27	0	16.82	13	40
Michael Scullin	402	Blue Earth	Watowan River	4/1 - 12/2	30	24	7	60	36	5	26.16	18	47
David Raney	243	Watowan	No. Fork Watowan River	4/8 - 9/27	29	32	4	60	14	3	13.7	9	7

47

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Le Sueur River Watershed (HUC 07020011)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Duane Mettler	150	Blue Earth	unnamed tributary to Duck Lake (5 foot culvert)	4/30 - 7/5	59	58	50	60	13	0	6.98	9	9
Duane Mettler	151	Blue Earth	tile outlet to Duck Lake	4/30 - 7/5	58	58	40	60	13	0	6.98	8	9
Joe Dwyer	383	Blue Earth	unnamed tributary to Duck Lake "#3"	4/23 - 6/16	17		2	54	7	0	19.11		27
Tom Hausenbauer	149	Blue Earth	LeSueur River	5/18 - 8/30	19	17	3	40	12	0	15.66	4	12

Minnesota River (Shakopee) Watershed (HUC 07020012)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Kim Borman	107	Scott	unnamed tributary from Spring to Prior Lake	4/4 - 6/26	58	58	40	60	14	12	22.76	7	51
Shirley Schoenbauer	338	Scott	Raven Stream "MN-21"	6/13 - 10/12	43	46	12	60	17	6	8.24	7	27
Shirley Schoenbauer	337	Scott	Raven Stream "CR-64"	6/13 - 10/12	49	47	5	60	17	5	8.24	7	27
Shirley Schoenbauer	336	Scott	Sand Creek "CSAH 8"	6/11 - 10/12	51	42	10	60	18	8	8.24	5	27
Alice Nytes	335	Scott	Raven Stream	6/9 - 7/12	41	37	8	60	8	1	8.46	2	30
Mark Hiles	284	McCleod	High Is. Cr @ CSAH 7	5/4 - 8/10	41	35	7	60	15	5		0	0
Mark Hiles	285	McCleod	Judicial Ditch 24	5/4 - 8/3	54	50	34	60	14	9		0	0
Mark Hiles	286	McCleod	High Island Creek @ Co. Rd. 54	5/4 - 8/10	42	37	8	60	15	6		0	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

MINNESOTA RIVER BASIN (Continued)

Minnesota River (Shakopee) Watershed (Continued, HUC 07020012)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Georgiann & Ted Keyport	334	Carver	Chaska Creek	5/27 - 9/30	44	45	35	55	12	0	9.65	4	26
Albert Karels	430	Sibley	High Island Creek	4/26 - 9/26	26	8	5	56	18	0	13.4		29
Alvin Rostberg	429	Sibley	Buffalo Creek	4/13 - 10/16	45	40	2	60	30	0	18.88	9	61
Don Nuessmeier	432	Sibley	High Island Creek, "Trocke bridge"	4/5 - 9/17	25	24	6	45	20	0	19.59	2	60
Bernard Sobczak	380	Scott	Raven Stream "St. Benedict"	6/10 - 11/5	31	37	7	60	77	24	8.53	17	48
Lyle Winterfeldt	281	McCleod	High Island Creek	4/6 - 8/1	44		18	60	31	15	18.02		41
Lyle Winterfeldt	282	McCleod	McCleod Co. Ditch 30	4/6 - 7/1	52		20	60	21	10	18.02		41
Jean Williams	345	Carver	Carver Creek	4/22 - 10/21	44	46	23	60	20	8	20.18	7	67
Pauline Haney	433	Sibley	Sibley Co. Ditch #2	4/1 - 6/18	48	33	18	60	11	0	12.23	6	32
Greg Busch	399	Le Sueur	Sand Creek	6/10 - 7/29	50	50	25	60	8	2	10.04	1	43
Don Nuessmeier	431	Sibley	High Island Creek, "sportsman bridge"	4/5 - 9/17	28	27	8	43	20	0	19.59	2	60
Glenn Gieseke	434	Sibley	High Island Creek	4/17 - 8/30	23	16	4	42	11	0	16.08	6	40
Don & Mary Javurek	333	Scott	Sand Creek	6/14 - 10/23	34	33	18	60	20	3	10.29	3	42
Genevieve Metzdorff	106	Scott	West Branch Raven Stream	NA					0	0	19		35
Dave Minar	302	Scott	Sand Creek	NA					0	0	19.1		53

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

ST. CROIX RIVER BASIN

St. Croix River (Upper) Watershed (HUC 07030001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Leland Magnuson	214	Pine	Sand Creek	4/20 - 10/26	58	58	27	60	36	32	24.78	17	59
John Berens	207	Pine	West Crooked Creek	4/22 - 10/28	59	59	55	60	16	11	23.13	2	21

Kettle River Watershed (HUC 07030003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Lee A. Dybvig	100	Pine	Kettle River	4/3 - 10/13	55	57	35	60	16	0	26.6	6	62
Sandy Wentkiewicz	23	Carlton	Moose Horn River	4/12 - 9/29	60	60	60	60	24	24	20.27	4	76
Jake Young	205	Pine	Kettle River	4/8 - 10/14	58	59	35	60	18	16	24.01	5	54
Jake Young	206	Pine	Moose Horn River	4/8 - 10/14	60	60	60	60	18	18	24.51	5	55

Snake River Watershed (HUC 07030004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Lawrence Lundgren	213	Pine	Mission Creek	4/10 - 9/27	45	45	13	57	22	0	20.79		31
Larry & Judy Wagner	212	Pine	Snake River	4/5 - 10/25	55	54	26	60	20	16	30	2	94
Janet Smude	367	Aitkin	Snake River "MN-18"	4/9 - 11/9	60	60	58	60	13	12		1	0
Janet Smude	366	Aitkin	Bear Creek "4th St., McGrath"	4/9 - 11/9	59	59	51	60	11	10		1	0

Monitoring Period: Period over which transparency readings were taken
Mean: Average stream transparency in centimeters
"Stage Weighted" Mean: Average stream transparency that takes stream water level into account
Min: Minimum transparency reading in centimeters
Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken
N>60: Number of transparency readings greater than 60 centimeters
Total Rain: Amount of rain reported over entire season in inches
Rain Event Readings: Number of transparency readings taken immediately after major rainfall
N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

ST. CROIX RIVER BASIN (Continued)

Snake River Watershed (Continued, HUC 07030004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bill Anderson	208	Pine	Snake River	4/19 - 8/30	54	52	35	60	30	17	22.06	24	49

St. Croix River (Stillwater) (HUC 07030005)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bob Kessen	269	Chisago	West Branch Sunrise River	4/2 - 10/14	47	45	18	60	28	9	22.33	5	85
Gary Schmid	167	Chisago	Rock Creek	4/2 - 10/1	41	47	3	60	53	18	28.35	12	91
Barbara Nelson	176	Chisago	Unnamed tributary to Goose Creek	4/25 - 9/23	57	58	50	60	15	0	17.47	3	77
Robert Olson	165	Chisago	No. Branch Sunrise River, "site A"	4/18 - 10/4	50	48	30	60	16	0	24.32	5	43
Dayle DeClercq	346	Chisago	Teacher Creek "South Chisago Lakes Township"	4/17 - 10/25	26	28	0	58	27	0	23.88	15	52
Craig Grabinski	175	Chisago	Sunrise River	5/4 - 9/7	37	45	17	60	9	1	18.43	1	33
Robert Olson	166	Chisago	No. Branch Sunrise River, "site B"	4/18 - 10/4	48	48	35	60	16	0	24.32	4	43
Gene Walton	270	Chisago	Unnamed Tributary to Goose Lake	4/13 - 10/3	57	58	45	60	14	11	27.43	2	69
Dave Banta	216	Pine	Rock Creek	4/6 - 10/5	51	52	6	60	49	30	25.86	27	71
Gary Noren	170	Chisago	Dry Creek	4/4 - 9/8	47	47	10	60	15	7		4	0
Vickie Meehan	349	Chisago	Lawrence Creek	4/8 - 7/2	42	41	6	60	22	2	24.87	9	60

Monitoring Period: Period over which transparency readings were taken
Mean: Average stream transparency in centimeters
"Stage Weighted" Mean: Average stream transparency that takes stream water level into account
Min: Minimum transparency reading in centimeters
Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken
N>60: Number of transparency readings greater than 60 centimeters
Total Rain: Amount of rain reported over entire season in inches
Rain Event Readings: Number of transparency readings taken immediately after major rainfall
N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

ST. CROIX RIVER BASIN (Continued)

St. Croix River (Stillwater) (Continued, HUC 07030005)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Mark Olson	355	Chisago	North Branch Sunrise River "MN-95"	5/20 - 10/7	56	56	28	60	16	11	13.59	6	19
Jan Harnack	354	Chisago	Dry Creek	5/12 - 7/5	42	42	19	60	5	2	4.15	0	5
Linda Christianson	353	Chisago	Dry Creek	4/8 - 5/2	36	36	10	60	4	2	25.69		55
Mary Schmitz	173	Chisago	So. Branch Sunrise River	4/8 - 10/16	38	46	13	60	20	5	31.46	8	68
Gene Paul	172	Chisago	Sunrise River	4/4 - 10/22	52	51	24	60	37	22	25.59	8	62
Linda Christianson	352	Chisago	Sunrise River	4/8 - 10/13	58	58	35	60	17	15	25.69	7	55
Laura & Ken Corbin-Geisen	351	Chisago	North Branch Sunrise River	5/4 - 6/19	60	60	60	60	6	5	16.45	5	37
Scott Sardeson	350	Chisago	West Branch Sunrise River	4/1 - 9/5	27	27	7	60	13	1	24.51	2	51
Mike Peplinski	368	Chisago	Chisago County Ditch 7	5/28 - 6/20	40	41	33	45	8	0	4.03	3	11
Richard L. Hanson	177	Chisago	Goose Creek, "Co. 57 bridge"	NA					0	0	29.49		90
Richard L. Hanson	178	Chisago	Goose Creek, "Holman Ave. culvert"	NA					0	0	30.17		91

52

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN

Mississippi River and Lake Pepin (Red Wing) Watershed (HUC 07040001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Deb & Jerry Moynihan	265	Goodhue	Hay Creek, Y2000	4/8 - 9/24	42	37	13	60	19	3	24.07	3	80
Stanley Klair	81	Goodhue	Wells Creek	6/14 - 9/20	55	55	20	60	8	0	21.45	2	49
Harry Roberts & Chuck Juhnke	104	Goodhue	Wells Creek	5/17 - 9/27	47	45	3	60	19	8	8.5	11	6
Mark Diercks	398	Goodhue	Clear Creek	5/31 - 9/6	43	29	12	60	11	2	31.32	1	79
Judy Sloan	113	Dakota	Vermillion River	4/7 - 9/30	54	54	16	60	14	11	17.85	2	39
Beth Knudsen	186	Goodhue	Gilbert Creek @ Co. Rd. 5	3/31 - 7/23	19	16	1	52	7	0	23.36	6	36
Robert Nicholson	115	Dakota	Unnamed trib. to Vermillion River	4/10 - 10/28	52		10	60	22	0	21.77		45
Stanley Klair	82	Goodhue	unnamed tributary to Wells Creek	6/14 - 9/20	54	54	10	60	8	0	21.45	2	49
Richard Diercks	80	Goodhue	Wells Creek	4/5 - 10/25	54	28	0	60	30	0	25.74	9	60

53

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Cannon River Watershed (HUC 07040002)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Rose Ann Steenhoek	33	Rice	Prairie Creek	3/25 - 9/16	32	31	4	60	27	3	25.01	7	68
Tom & Julie Bittinger	34	Steele	Straight River	5/27 - 7/11	43		14	60	5	1	17.74	0	38
Jon Stoike	40	Rice	Cannon River	6/4 - 10/23	42	43	11	58	7	0	16.84	0	26
Roger Dack	43	Dakota	Mud Creek	5/1 - 10/31	46	46	34	60	26	3	15.3	3	48
Mrs. B-J Norman	44	Goodhue	Belle Creek	4/4 - 11/7	39	38	2	60	30	14	21.28	4	63
Alden McCutchan	99	Goodhue	Little Cannon River	4/23 - 9/8	29	30	2	60	16	2	18.08	9	37
Cathy Larson	111	Rice	Cannon River	4/8 - 9/30	25	25	2	60	43	2	23.42	24	72
Cathy Larson	112	Rice	Wolf Creek	4/8 - 9/30	35	32	6	60	43	9	23.42	24	72
Rodney R. Helgeson	182	Rice	Rice Creek, Decker Ave.	3/20 - 10/23	44	41	3	60	38	13	23.09	5	86
Justin Watkins	183	Rice	Rice Creek, Dundas Blvd.	4/5 - 9/14	42		9	60	28	9	9.93		27
Ann Lundstrom	247	Dakota	Chub Creek	4/23 - 9/10	32	30	9	56	15	0	15.57	3	46
Joyce E. Moorhouse	259	Goodhue	Prairie Creek	4/9 - 9/14	35	33	8	50	4	0	22.73	1	73
Roy Anderson	292	Rice	Straight River	4/6 - 11/20	41	39	4	60	59	14	26.99	10	81
Justin Watkins	292	Rice	Straight River	4/6 - 11/20	41	39	4	60	59	14	26.99	10	81
Alan Freeland	293	Dakota	Cannon River @ Canada Ave.	4/6 - 10/16	35	27	11	60	16	0	7.39	0	12

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Cannon River Watershed (Continued, HUC 07040002)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Justin Watkins	293	Dakota	Cannon River @ Canada Ave.	4/6 - 10/16	35	27	11	60	16	0	7.39	0	12
Richard Fetterly	296	Rice	Rush Creek	4/13 - 10/11	39		1	60	25	11	24.97	8	55
Beth Croteau-Kallestad	339	Rice	Cannon River "5th St. BR in Northfield"	4/14 - 10/13	35	33	5	60	19	0	17.74	1	63
Steven Larson	340	Goodhue	Cannon River	4/1 - 10/19	29	32	4	60	41	9	23.58	12	88
Carmen Dorr	341	Rice	Cannon River	4/25 - 9/26	59	57	44	60	23	21	19.12	2	58
David Velasquez	418	Goodhue	Cannon River	5/13 - 7/15	50	52	35	60	3	1	15.55	0	49
David Baldini	503	Steele	Judicial Ditch 1 @ CSAH 18	4/29 - 11/1	48	50	21	59	17	0	3.5	3	16
John Holden	504	Rice	Cannon River	5/16 - 10/30	43	34	8	60	19	0	6.45	12	19
Lynn Sanborn	505	Rice	Cannon River @ Hulet Ave., Faribault	4/6 - 11/20	31		12	60	62	2	7.37		27
Justin Watkins	505	Rice	Cannon River @ Hulet Ave., Faribault	4/6 - 11/20	31		12	60	62	2	7.37		27
Justin Watkins	506	Goodhue	Cannon River @ Cannon Falls Park	4/25 - 9/18	36		12	60	9	0	1.51		9
Justin Watkins	507	Goodhue	Prairie Creek @ 310th St.	4/6 - 9/18	40		6	60	10	1	3.34		10
Justin Watkins	508	Dakota	Chub Creek @ Randolph	4/6 - 9/18	46		24	60	10	0	0.2		10
Justin Watkins	509	Rice	Heath Creek @ Armstrong Ave.	4/5 - 9/14	43		9	60	27	4	2.24		28

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Cannon River Watershed (Continued, HUC 07040002)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Justin Watkins	510	Rice	Cannon River @ 5th St. in Northfield	4/3 - 6/8	19		7	48	12	0	0.36		11

Mississippi (Winona) Watershed (HUC 07040003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Toni McMillin	84	Wabasha	Snake Creek, "#1"	4/22 - 7/19	21	22	1	47	6	0	17.59	4	20
Toni McMillin	85	Wabasha	Snake Creek, "#2"	4/22 - 7/19	30	18	1	59	6	0	17.59	4	20
Toni McMillin	86	Wabasha	Snake Creek, "#3"	4/22 - 7/19	30	19	1	60	6	1	17.59	4	20
Peggy Backup	277	Winona	Garvin Brook	4/23 - 8/25	58	58	40	60	19	16	25.5	6	64
Janel Dean	279	Winona	Rollingstone Creek, "Lower"	7/17 - 11/6	48	53	17	60	8	3	10.52	2	21
Janel Dean	364	Winona	Rollingstone Creek, "Upper"	7/17 - 11/6	49	52	21	60	7	4	10.52	2	21
Janel Dean	365	Winona	Speltz Creek	7/19 - 11/6	44	42	11	60	7	4	10.52	1	21
Jim Clark	371	Winona	Gilmore Creek	6/23 - 11/26	59	59	40	60	23	22	18.56	5	22
Larry Johnson	435	Winona	Whitewater River, @ mouth	4/19 - 10/5	39	39	1	60	25	6		0	0
Larry Johnson	437	Winona	Beaver Creek, "MN-74"	4/6 - 10/5	56	35	10	60	27	22		0	0
Larry Johnson	438	Winona	Whitewater River, "CSAH-30"	4/6 - 10/5	38	21	1	60	27	9		0	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Mississippi (Winona) Watershed (Continued, HUC 07040003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Larry Johnson	439	Winona	So. Fork Whitewater River, "CSAH-26"	4/6 - 10/5	45	26	1	60	27	13		0	0
Larry Johnson	440	Winona	Whitewater River, "CSAH-26"	4/6 - 10/5	42	24	1	60	27	12		0	0
Larry Johnson	441	Winona	No. Fork Whitewater River, "MN-74"	4/6 - 10/5	43	25	1	60	27	14		0	0
Larry Johnson	442	Winona	Middle Fork Whitewater River, "MN-74"	4/6 - 10/5	41	24	1	60	27	10		0	0
Bob Wiskow	443	Winona	So. Fork Whitewater River, "Twp. Rd. 17"	8/9 - 10/9	38	33	7	60	5	2	29.66	4	88
Bob Wiskow	444	Winona	So. Fork Whitewater River	8/9 - 8/30	42	33	6	60	3	2	29.66	3	88
Gwen Ahern	445	Winona	No. Fork Whitewater River, "Carley Park"	8/19 - 10/13	56	57	49	60	6	2	7.19	0	15
Dave Palmquist	446	Winona	Middle Fork Whitewater River	4/5 - 10/17	43	39	18	60	22	0	8.05	8	12
Paul Chick, Sr.	447	Olmsted	No. Fork Whitewater River	4/7 - 10/11	34	38	1	60	23	5	17.21	12	28
Tony Korder	450	Winona	Stockton Valley Cr, T106N R8W NW Sec 14	5/23 - 11/7	60	60	60	60	16	0		9	0
Willis van Norman	451	Olmsted	Middle Fork Whitewater River	4/4 - 9/23	31		0	60	23	5	27.73		66
Bryan Todd	452	Olmsted	Unnamed trib. To Middle Fork Whitewater River	5/11 - 8/22	40	35	3	60	10	2	18.91	13	42
Nick Reisdorf	453	Olmsted	Middle Fork Whitewater River	3/17 - 10/13	34	34	1	60	56	1	22.46	16	67

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Mississippi (Winona) Watershed (Continued, HUC 07040003)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
William Johnson	453	Olmsted	Middle Fork Whitewater River	3/17 - 10/13	34	34	1	60	56	1	22.46	16	67
Tony Korder	513	Winona	Stockton Valley Cr, T106N R8W NW Sec 2	5/23 - 11/7	36	35	15	54	16	0		8	0

Zumbro River Watershed (HUC 07040004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Alan & Judy Hoffman	45	Olmsted	Zumbro River	5/28 - 9/9	30		20	45	4	0	11	0	22
Jill Leet-Otley	47	Olmsted	So. Fork Zumbro River	5/16 - 9/24	39	40	18	60	10	2		1	0
Paul & Greg Thompson	49	Olmsted	Cascade Creek	4/11 - 8/26	38	40	5	60	9	4	23.57	3	53
Kay Franks	50	Olmsted	Cascade Creek	4/30 - 11/8	51	41	14	60	20	12	35.42	1	83
Matthew Feirer	114	Olmsted	So. Branch Zumbro River	4/13 - 10/8	38	41	4	60	33	6	30.46	20	82
Ell Heusinkveld	123	Dodge	So. Branch Middle Fork Zumbro River	4/1 - 9/30	30	31	3	60	19	0	25.48	6	52
Jon Tollefson	124	Dodge	Masten Creek	6/26 - 9/13	57	51	4	60	68	49	23.52	14	69
Martin Miller	125	Dodge	Stuccy Creek	4/29 - 9/8	48	50	3	60	8	5	2.45	3	3
Martin Miller	126	Dodge	So. Branch Middle Fork Zumbro River	4/29 - 9/8	50	50	38	60	7	1	2.6	3	3

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Zumbro River Watershed (Continued, HUC 07040004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Diane Fish	127	Dodge	Unnamed trib So. Branch Middle Fork Zumbro River	4/14 - 9/2	60	60	60	60	9	9	21.28	2	30
Dave Delzer	128	Dodge	Unnamed trib So. Branch Middle Fork Zumbro River	4/4 - 9/12	28	33	4	60	5	2	24.61	2	6
Bill Thompson	129	Dodge	So. Branch Middle Fork Zumbro River	3/22 - 11/27	31		1	60	80	22	23.92	27	64
Randy Rysavy	131	Dodge	Masten Creek	4/5 - 10/7	38	33	6	60	29	12	28.57	10	68
Dean Schrandt	133	Dodge	Dodge Center Creek, "605th St."	4/6 - 10/5	36	31	2	60	21	3	26.07		59
Bruce Schmoll	135	Dodge	Dodge Center Creek	4/6 - 9/10	36	38	1	60	48	16	26.09	28	52
Dale Wacek	136	Dodge	Ripley Ditch	5/7 - 9/11	49	33	3	60	10	0		5	0
Carole Toquam	137	Dodge	Ripley Ditch	4/26 - 7/6	52	41	2	60	7	6	22.83	2	30
Dave Peterson	140	Dodge	Unnamed tributary to Middle Fork Zumbro River	3/31 - 9/30	52	40	1	60	26	13	30.78	6	63
Janet Helder	142	Dodge	Masten Creek	4/8 - 10/1	47	41	3	60	32	18	26.05	10	82
Mark Gamm	232	Dodge	So. Branch Middle Fork Zumbro River	4/11 - 9/24	32	34	2	60	16	0		7	0
Nicole Hrtanek	234	Dodge	So. Branch Middle Fork Zumbro River	5/12 - 8/26	46	48	8	60	9	5	11.06	3	18
Bob & Elle Smith	235	Dodge	Middle Fork Zumbro River	4/28 - 10/19	45	43	25	60	7	0		1	0

Monitoring Period: Period over which transparency readings were taken
Mean: Average stream transparency in centimeters
"Stage Weighted" Mean: Average stream transparency that takes stream water level into account
Min: Minimum transparency reading in centimeters
Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken
N>60: Number of transparency readings greater than 60 centimeters
Total Rain: Amount of rain reported over entire season in inches
Rain Event Readings: Number of transparency readings taken immediately after major rainfall
N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Zumbro River Watershed (Continued, HUC 07040004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Dean Schrandt	236	Dodge	So. Branch Middle Fork Zumbro River @ 142nd Ave.	4/6 - 10/9	40	37	8	60	14	0	22.24		45
Dean Schrandt	237	Dodge	So. Branch Middle Fork Zumbro River @ 150th Ave.	4/6 - 10/9	38	35	6	60	14	0	22.24		45
Dean Schrandt	238	Dodge	So. Branch Middle Fork Zumbro River @ 160th Ave.	4/6 - 10/9	17	18	7	31	14	0	22.24		45
Dean Schrandt	239	Dodge	So. Branch Middle Fork Zumbro River @ 170th Ave.	4/6 - 10/9	20	20	7	35	16	0	22.24		45
Dean Schrandt	240	Dodge	So. Branch Middle Fork Zumbro River @ 185th Ave.	4/6 - 10/9	19	19	6	29	14	0	26.07		59
Dean Schrandt	241	Dodge	So. Branch Middle Fork Zumbro River @ 195th Ave.	4/6 - 10/5	21	17	2	41	20	0	26.07		59
Bernard Nigon	266	Olmsted	Cascade Creek	4/15 - 10/28	48	46	2	60	38	25	20.28	16	27
Vera Dougher	273	Olmsted	Silver Creek	4/13 - 9/10	11	13	3	24	15	0	22.82	4	79
Norman Senjem	316	Olmsted	Zumbro River, Footbridge, Elton Hills Dr	4/29 - 9/26	27	25	12	45	30	0	22.68	11	27
Norman Senjem	317	Olmsted	So. Branch Zumbro River, Apache Mall Bridge	4/29 - 9/24	38	38	12	60	23	0	23.33	8	29

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Zumbro River Watershed (Continued, HUC 07040004)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Norman Senjem	318	Olmsted	Silver Creek, 11th St. Bridge	4/27 - 9/24	24	22	8	46	21	0	26.23	7	30
Eric Porcher	343	Olmsted	Unnamed trib to Bear Cr	5/21 - 10/31	34	28	7	60	32	1	19.62	7	70
Eric Porcher	344	Olmsted	Bear Creek	5/13 - 10/25	47	42	6	60	32	8	19.62	8	70
Paul Rohowetz	363	Wabasha	Gorman Creek	5/28 - 8/24	30	34	3	60	13	2	21.17	5	34
Dean Schrandt	373	Dodge	So. Branch Middle Fork Zumbro River @ 272 Ave	4/6 - 10/5	36	33	3	60	15	3	25.66		72
Don Heser	419	Dodge	Milliken Creek	4/1 - 9/9	38		2	60	40	9	22.87	25	54
Dean Schrandt	436	Dodge	Lower Branch Middle Fork Zumbro River @ 605th St.	4/6 - 10/5	36	31	2	60	21	3	26.07	0	59
Eric Porcher/MN PCA Roch	512	Olmsted	Willow Creek @ MN-63	4/1 - 10/29	32	25	0	60	76	2	32.23	15	112

61

Root River Watershed (HUC 07040008)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Bob & Eloda Wood	12	Fillmore	So. Branch Root River	4/6 - 10/10	48	47	9	60	15	5	25.67	12	27
Johannah Vreeman	14	Fillmore	So. Branch Root River	4/19 - 6/14	38	38	0	60	5	0	21.89	0	24
Carol Kohn	16	Mower	So. Branch Root River	4/7 - 10/15	29	32	0	56	16	0	28.12	6	41
Diane Hafner	17	Fillmore	So. Branch Root River	4/3 - 9/21	38	45	4	60	22	9	24.75	8	44

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Root River Watershed (Continued, HUC 07040008)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Tom Schmitz	19	Fillmore	So. Branch Root River, "Historic bridge"	4/6 - 10/14	46	45	4	60	32	0	28.54	12	31
Tom Schmitz	20	Fillmore	So. Branch Root River, "New bridge"	4/6 - 10/14	47	46	4	60	32	0	25.29	11	27
Tom Schmitz	21	Fillmore	Forestville Creek	4/6 - 10/14	49	43	13	60	30	0	23.74	10	26
Tom Schmitz	22	Fillmore	Canfield Creek	4/6 - 10/14	48	54	9	60	27	0	23.74	5	26
Karol Krahn	36	Mower	Mower Co. Judicial Ditch 1	4/8 - 10/21	34	34	2	60	37	5	28.72	6	68
Al Harter	51	Olmsted	No. Branch Root River	4/25 - 8/25	40	44	5	60	8	2	31.23	2	67
Ruth Lemke	74	Fillmore	Spring Valley Creek	4/6 - 4/6	8	8	8	8	1	0	27.67	1	51
Carol Kohn	179	Fillmore	So. Branch Root River @ Co. Rd. 1	4/7 - 10/15	21	26	0	55	16	0	28.12	6	41
Donna Rasmussen	256	Fillmore	So. Branch Root River	4/3 - 9/26	30	34	1	60	20	3	25.65	10	56
Karol Krahn	257	Fillmore	So. Branch Root River	4/8 - 10/21	37	37	4	60	36	6	28.72	5	68
Jerry Mueller	262	Winona	Money Creek	6/10 - 10/8	35	24	2	60	30	5	27.45	1	40
Deb Anderson	288	Fillmore	Lost Creek	5/29 - 6/16	36	53	16	60	6	2	0.01		1
Casey Sautter	289	Fillmore	So. Branch Root River	4/4 - 10/10	35	30	0	60	14	0	26.64	14	78
Larry Mierau	347	Fillmore	Rush Creek	4/7 - 11/10	45	36	2	60	34	0	23.61	5	54
Vic Ormsby	392	Winona	Unnamed trib. to Money Creek ("Wiscoy West Line")	8/6 - 10/29	50	50	31	60	13	5		0	0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

LOWER MISSISSIPPI RIVER BASIN (Continued)

Root River Watershed (Continued, HUC 07040008)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Vic Ormsby	393	Winona	Money Creek ("Zephyr Community")	8/6 - 10/29	26	26	14	50	13	0		0	0
Vic Ormsby	394	Winona	Money Creek ("County 19 culvert")	8/6 - 10/29	40	40	18	60	13	0		0	0

DES MOINES RIVER BASIN

West Fork Des Moines River (Headwaters) Watershed (HUC 07100001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Dawn Eigenberg	59	Cottonwood	West Fork Des Moines River	4/20 - 10/26	11	11	6	21	36	0	22.76	17	61
Harold Sauder	218	Jackson	Jack Creek	4/21 - 8/2	12	18	5	24	7	0	23.15		45
Marvin Mischke	220	Murray	Fulda Lakes Inlet	4/10 - 9/17	26	25	4	60	24	0	36.59	4	58
Bill Sauer	221	Murray	Jack Creek	4/1 - 9/15	14	14	12	18	9	0	26.13	3	37
Bob Goetz	246	Mower	Turtle Creek	4/12 - 9/28	14	15	2	30	31	0	24.19	18	48
Rick & Cheri Webber	342	Mower	Roberts Creek	5/19 - 10/23	46	51	19	60	13	7	5.46	10	11
Kathryn McWilliams	386	Cottonwood	West Fork Des Moines River, (above storm drain)	6/3 - 10/7	15	15	10	24	16	0	11.02	12	25
Kathryn McWilliams	387	Cottonwood	West Fork Des Moines River, (below storm drain)	6/3 - 10/7	16	15	9	25	16	0	11.02	10	25

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

DES MOINES RIVER BASIN (Continued)

West Fork Des Moines River (Headwaters) Watershed (Continued, HUC 07100001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Dominic Jones	388	Cottonwood	Harder Lake Outlet	6/8 - 8/3	20	20	11	30	8	0	12.58	0	39
Dominic Jones	389	Cottonwood	West Fork Des Moines River, "CSAH 14"	6/8 - 10/12	12	12	7	18	19	0	12.58	0	39
Dominic Jones	390	Cottonwood	Unnamed Tributary to West Fork Des Moines River	6/8 - 10/12	51	46	17	60	19	0	12.58	0	39
Dominic Jones	391	Cottonwood	String Lake Outlet	6/8 - 9/21	12	13	4	26	10	0	12.58	0	39
Perry Loegering	400	Murray	Beaver Creek	4/1 - 9/19	34	32	5	60	14	2	24.32	2	48
Dominic Jones	403	Cottonwood	Heron Lake Outlet	6/8 - 10/5	14	13	6	24	16	0	12.57	0	39
Kari & Lisa Johnson	404	Cottonwood	West Fork Des Moines River	6/9 - 10/7	13	13	9	22	13	0	11.11	2	25
Blake, Gloria & Hatty Rossow	407	Jackson	Unnamed Tributary to West Fork Des Moines River	6/4 - 9/16	37	36	7	60	7	1	11.73	3	32
Kristin Peltola	408	Murray	West Fork Des Moines River	7/15 - 10/10	16	16	11	26	5	0	6.81	1	20
Duane & Jan Voit	409	Cottonwood	West Fork Des Moines River	5/31 - 9/4	11		8	18	19	0	24.91	7	24
Roland Roesner	410	Jackson	West Fork Des Moines River	7/11 - 9/30	12	12	9	19	11	0	9.48	1	23
Joann Kaiser	411	Jackson	West Fork Des Moines River	6/17 - 10/13	14	16	11	22	9	0	6.72	3	21
Annette Bair	412	Murray	West Fork Des Moines River	5/12 - 9/29	21	23	11	44	21	0	10.77	0	44

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

DES MOINES RIVER BASIN (Continued)

West Fork Des Moines River (Headwaters) Watershed (Continued, HUC 07100001)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Lindsey & Sarah Cartwright	413	Cottonwood	Perkins Creek	5/28 - 10/4	31	32	10	51	19	0	4.97	6	12
Tom & Julia Bonneville	414	Cottonwood	West Fork Des Moines River	6/4 - 10/11	11	10	7	17	21	0	8.84	10	18
Bill Sauer	415	Murray	Lime Creek, Big Slough outlet	4/1 - 9/15	25	25	19	31	9	0	26.02	3	36
Bill Sauer	416	Murray	Lime Creek, Co. Rd. 6	4/11 - 9/15	19	18	14	24	9	0	24.83	5	35
Roger Ringkob	417	Jackson	West Fork Des Moines River	5/29 - 10/4	14	14	9	20	21	0	8.54	2	21
Roger Ringkob	475	Jackson	Unnamed trib. to W Fk Des Moines River, "spring"	6/1 - 9/21	60	60	60	60	9	0	1	2	1
Harvey & Cheryl Rients	514	Jackson	West Fork Des Moines River	NA					0	0	6.69		18

West Fork Des Moines River (Lower) (HUC 07100002)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Paul Nelson	406	Jackson	Unnamed trib. to W. Fork Des Moines River	6/24 - 9/20	15	14	5	22	13	0	24.99	3	45
Paul Nelson	405	Jackson	West Fork Des Moines River	6/24 - 9/20	14	14	10	19	13	0	24.16	3	42

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

RED RIVER BASIN

Otter Tail River Watershed (HUC 09020103)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Charles R. Wagner	271	Becker	Little Toad Lake inlet	5/1 - 9/8	35	42	9	58	22	0	14.11	6	49
Maribeth & Andy Lee	374	Becker	Unnamed trib. To Height of Land Lake	4/12 - 12/15	60	60	60	60	9	9	15.78		58

Red River of the North (Headwaters) (HUC 09020104)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Gary Brekke	7	Clay	Red River	4/6 - 11/28	13		4	43	40	0	18.28	1	84

Clearwater River Watershed (HUC 09020305)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
John O'Shea	118	Clearwater	Clearwater River, "site 10"	4/11 - 11/21	60		60	60	9	0			0
John O'Shea	119	Clearwater	Clearwater River, "site 20"	4/11 - 11/21	60		60	60	9	0			0
John O'Shea	120	Beltrami	Clearwater River, "site 30"	4/11 - 11/21	58		42	60	9	0			0
John O'Shea	121	Clearwater	Clearwater River, "site 40"	4/11 - 11/21	60		60	60	9	0			0
John O'Shea	122	Clearwater	Clearwater River, "site 50"	4/11 - 11/21	52		20	60	9	0			0

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 2. Summary of 2001 CSMP Data Sorted by Drainage Basin and Major Watershed

RED RIVER BASIN (Continued)

Snake River Watershed (HUC 09020309)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>60	Total Rain	Rain Event Readings	N Rain
Allyn Roley	242	Marshall	Swift Coulee	5/30 - 8/28	29	25	7	60	15	2	11.11	1	34

Appendix 3. Summary of 2001 CSMP Data Collected with 100-cm Transparency Tube

LAKE SUPERIOR DRAINAGE BASIN

Lake Superior (South) Watershed (HUC 04010102)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>100	Total Rain	Rain Event Readings	N Rain
Tom Estabrooks	268	St. Louis	Chester Creek	5/19 - 10/15	97	96	43	100	30	27	11.69	16	44
Timothy Musick	24	St. Louis	Lester River	6/16 - 8/19	85	85	68	100	4	1	15.13	10	39

St. Louis River Watershed (HUC 04010201)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>100	Total Rain	Rain Event Readings	N Rain
John Nyhus	249	St. Louis	Embarass River	6/12 - 10/23	100	100	98	100	17	16	14.21	8	58

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimeters

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Appendix 3. Summary of 2001 CSMP Data Collected with 100-cm Transparency Tube

UPPER MISSISSIPPI RIVER BASIN

Mississippi River (Grand Rapids) Watershed (HUC 07010103)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>100	Total Rain	Rain Event Readings	N Rain
Pamalla Boyce	93	Aitkin	Swan River	5/17 - 9/14	88	67	47	100	11	0	13.2	0	15

Pine River Watershed (HUC 07010105)

Volunteers	Site	County	Stream Name	Monitoring Period	Mean	"Stage Weighted" Mean	Min	Max	N Transparency	N>100	Total Rain	Rain Event Readings	N Rain
Sandra L. Miller-Moren	41	Cass	Pine River	5/13 - 8/28	99	99	87	100	12	10	13.67	8	39
Greg & Mary Johnson	25	Cass	Pine River	4/6 - 10/13	100	100	96	100	32	29	21.63	9	66

68

Monitoring Period: Period over which transparency readings were taken

Mean: Average stream transparency in centimeters

"Stage Weighted" Mean: Average stream transparency that takes stream water level into account

Min: Minimum transparency reading in centimeters

Max: Maximum transparency reading in centimetes

N Transparency: Number of transparency readings taken

N>60: Number of transparency readings greater than 60 centimeters

Total Rain: Amount of rain reported over entire season in inches

Rain Event Readings: Number of transparency readings taken immediately after major rainfall

N Rain: Number of rain gauge readings recorded

Does This Report Work For You?

CSMP Volunteer Survey

You, the CSMP volunteer, make this program work. We want to be sure you are getting the information you need in annual reports, and that it is easy to understand and use. Please take a moment to answer the following questions about the content and format of the CSMP annual report, so that we can address your needs. When completed, please remove this form from the report, fold on the dotted lines, tape, apply postage and drop it in the mail. Thank you for your help!

1. What sections of the report did you use? (circle all that apply)

Introduction

Ecoregions and Stream Water Quality

Section 1. How CSMP Volunteers Collect and Use Data

Section 2. Summary of CSMP Data

Section 3. Transparency and Recreational Suitability

Maps

Appendices

- | | Very | | | Not at all | |
|--|------|---|---|------------|---|
| | 1 | 2 | 3 | 4 | 5 |
| 2. Was the information provided useful? | 1 | 2 | 3 | 4 | 5 |
| 3. Could you easily understand the information? | 1 | 2 | 3 | 4 | 5 |
| 4. Were the figures and tables useful? | 1 | 2 | 3 | 4 | 5 |
| 5. Were the figure and tables easy to understand? | 1 | 2 | 3 | 4 | 5 |
| 6. If not, which ones? _____ | | | | | |
| 7. Are there any other things or topics you would like to see in future reports? | | | | | |

8. Any other comments or suggestions?

9. If you could enter your CSMP data on the World Wide Web, would you? Yes No

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**Citizen Stream-Monitoring Program
Minnesota Pollution Control Agency
Environmental Outcomes Division
520 Lafayette Rd. North
St. Paul, MN 55155-4194**

Attention: Laurie Sovell, CSMP Coordinator

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