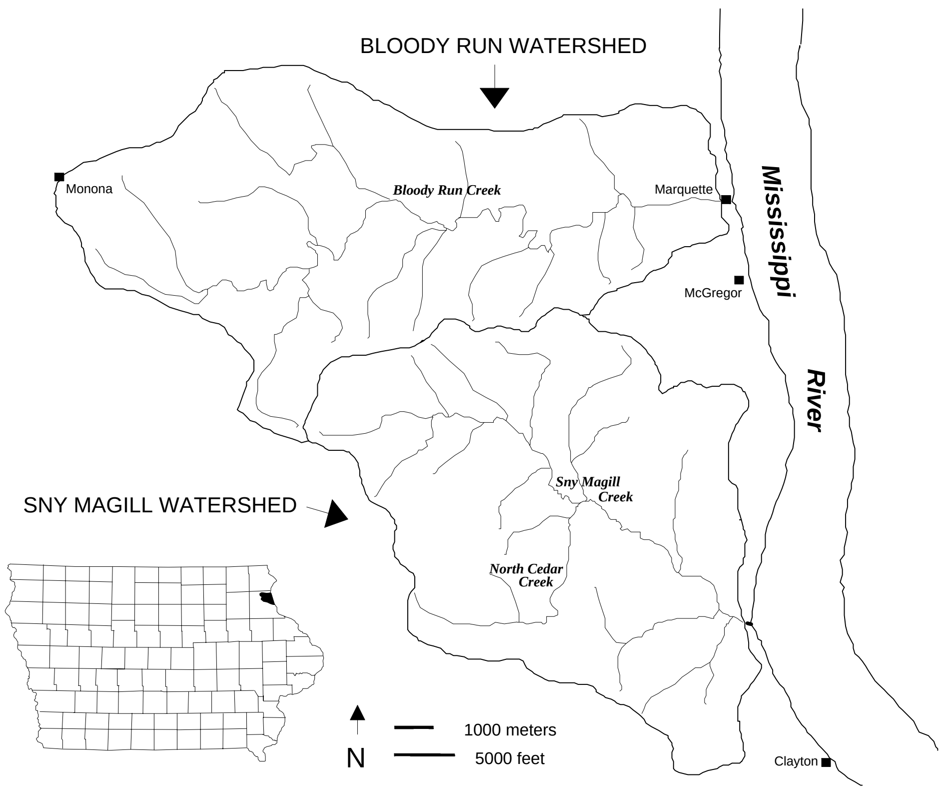
SNY MAGILL NONPOINT SOURCE POLLUTION MONITORING PROJECT, CLAYTON COUNTY, IOWA: WATER YEARS 1995 - 1998

Geological Survey Bureau
Technical Information Series 45



Iowa Department of Natural Resources
Jeffrey R. Vonk, Director
May 2001

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Prepared by

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Supported, in part, through grants from the
U.S. Environmental Protection Agency, Region VII, Nonpoint Source Program

May 2001

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ABSTRACT

Since October 1991, a consortium of state and federal agencies has been monitoring the water quality of Sny Magill and Bloody Run creeks as part of the Sny Magill Watershed Nonpoint Source Pollution Monitoring Project. The objective of this project is to monitor improvements in the quality of water in Sny Magill Creek resulting from the implementation of two land treatment programs in the Sny Magill watershed. This report summarizes the water-quality data collected during water years 1995 through 1998 from both Sny Magill and Bloody Run watersheds.

The annual precipitation during the monitoring period ranged from 98% of normal (Water Year 1996) to 135% of normal (Water Year 1998).

The fish species sampled were similar to those sampled during previous years and are typical of Iowa coldwater streams. Based on survey results, each watershed was dominated by a single species: the fantail darter in Sny Magill and the slimy sculpin in Bloody Run. Extremely low fish numbers were reported during water years 1995 through 1997 from sites in Sny Magill and North Cedar Creek.

The habitat assessments indicate monitoring sites with similar drainage areas have similar habitat characteristics for most years. In general, sites located in smaller drainage areas tend to have lower values for the following habitat variables: average depth, distance between riffles, fine-size substrate, instream cover, pool habitat, flow, and silt deposition. The relationship between drainage area and habitat similarity failed only in Water Year 1997.

The benthic macroinvertebrate communities in Sny Magill and Bloody Run watersheds have remained relatively constant. Regression analyses produced strong evidence of significant trends toward improving water quality in the Sny Magill watershed. Multiple regressions comparing means of two treatment and control sites through time showed significant trends in the direction of improving water quality for the following bioassessment metrics: taxa richness, EPT, and percent dominant taxa. Simple regressions of the combined Sny Magill tributary sites versus time appear to corroborate the results of the multiple regressions.

For both watersheds, the majority of a water year's discharge occurs during intermittent high flow events. From 1995 to 1998, discharge varied in the Bloody Run watershed from 7.3 to 242 cfs, and from 6.3 to 260 cfs in the Sny Magill watershed. Discharge traditionally was higher during the spring and summer months and declined during the fall and summer months for most years.

The majority of a water year's total sediment load is delivered during two periods: a spring snowmelt period and a summer storm period. From 1995 to 1998, sediment loads varied in the Bloody Run watershed from 0.08 to 2930 tons/day, and from 0.02 to 3310 tons/day in the Sny Magill watershed. Some intense rainfall events have occurred in one watershed while not in the other. These storms significantly increased the discharge in the affected watershed and account for a large percentage of the total annual sediment load for that year.

Nitrate+nitrite-N, chloride, fecal bacteria, and triazine concentrations, were consistently higher in Bloody Run than Sny Magill. Mean annual triazine herbicide concentrations and the percent detection of triazine herbicides have steadily declined since 1993 at BR1, while varying at SN1.

Multiple regression alnalyses show that nitrate+nitrite-N and total suspended sediment load have increased through time in the Sny Magill watershed relative to Bloody Run. Several factors may account for these increases, but further investigation is needed.

INTRODUCTION

The Sny Magill Watershed Nonpoint Source Pollution Monitoring Project, initiated in October 1991, is designed to monitor and assess improvements in water quality associated with the implementation of best management practices in the Sny Magill watershed. Best Management Practices, or BMPs, are practices or structures designed to reduce the movement of pollutants, such as sediment, nutrients, pesticides, and animal waste, from the land surface into surface water or groundwater. BMPs have been implemented as part of two land treatment projects in the watershed. The goal of the land treatment projects is to reduce sediment delivery to Sny Magill Creek by 50% and fertilizer and pesticide inputs by at least 25%.

Sny Magill Creek is a coldwater stream in northeastern Iowa managed for "put and take" trout fishing by the Iowa Department of Natural Resources. The creek drains a 35.6 mi^2 agricultural watershed in Clayton County. Landuse in the watershed is primarily forest, forested pasture, rowcrop, cover crop, and pasture. Identified water-quality impairments of Sny Magill Creek include sediment, nutrients, and pesticides. The project area includes Sny Magill Creek and North Cedar Creek (henceforth referred to as the Sny Magill watershed; Figure 1), both Class "B" coldwater streams. North Cedar Creek is a tributary of Sny Magill Creek. The creeks, both managed for trout fishing, are two heavily used recreational fishing streams.

A paired-watershed approach is being used to monitor improvements in water quality in Sny Magill watershed. The paired watershed approach is the most appropriate monitoring design when trying to evaluate the impact or benefit of a BMP or system of BMPs at the watershed scale (Spooner and others, 1985). Bloody Run Creek, the adjacent watershed to the north, serves as the control watershed (Figure 1) and was selected because the size of the Sny Magill and Bloody Run watersheds are similar (Sny Magill Creek drains 35.6 mi^2; Bloody Run Creek drains 37.6 mi^2), their groundwater hydrogeology and known surface water characteristics are similar, and their proximity to each other minimizes rainfall variation.

The objectives of the Sny Magill Watershed Nonpoint Source Pollution Monitoring Project are: (1) quantify reductions in sediment, nitrate, and pesticide concentrations in Sny Magill Creek relative to Bloody Run Creek, and (2) document improvements in the biological habitat through monitoring of the benthic macroinvertebrate and fish populations and through habitat assessments of the stream corridor. Five monitoring components are present in this project: (1) primary sites near the mouth of both Sny Magill and Bloody Run creeks are equipped with stream gages to measure daily discharge and suspended sediment, (2) an annual habitat assessment is conducted along stretches of both stream corridors, (3) biomonitoring of benthic macroinvertebrates occurs on a bi-monthly basis (April-October), (4) an annual fisheries survey is conducted, and (5) primary sites and several other sites on both creeks are sampled for chemical and physical parameters on a weekly to monthly basis.

The Sny Magill Watershed Project is an interagency effort supported, in part, by a grant from the U.S. Environmental Protection Agency, Region VII (U.S. EPA Nonpoint Source Program, Section 319, Clean Water Act), administered by the Iowa Department of Natural Resources.

This report summarizes the water-quality data collected during water years 1995 through 1998 from both Sny Magill and Bloody Run watersheds.

SECTION 319 NATIONAL MONITORING PROGRAM

The Sny Magill Nonpoint Source Pollution Monitoring Project is part of the U.S. EPA's Section 319 National Monitoring Program. This program, developed in 1991 under Section 319 of the Clean Water Act, evaluates the effectiveness of watershed technologies designed to control nonpoint source pollution and to improve our understanding of nonpoint source pollution. An overview of the program is provided in Osmond and others (1997). The National Monitoring Program is designed to monitor watersheds across

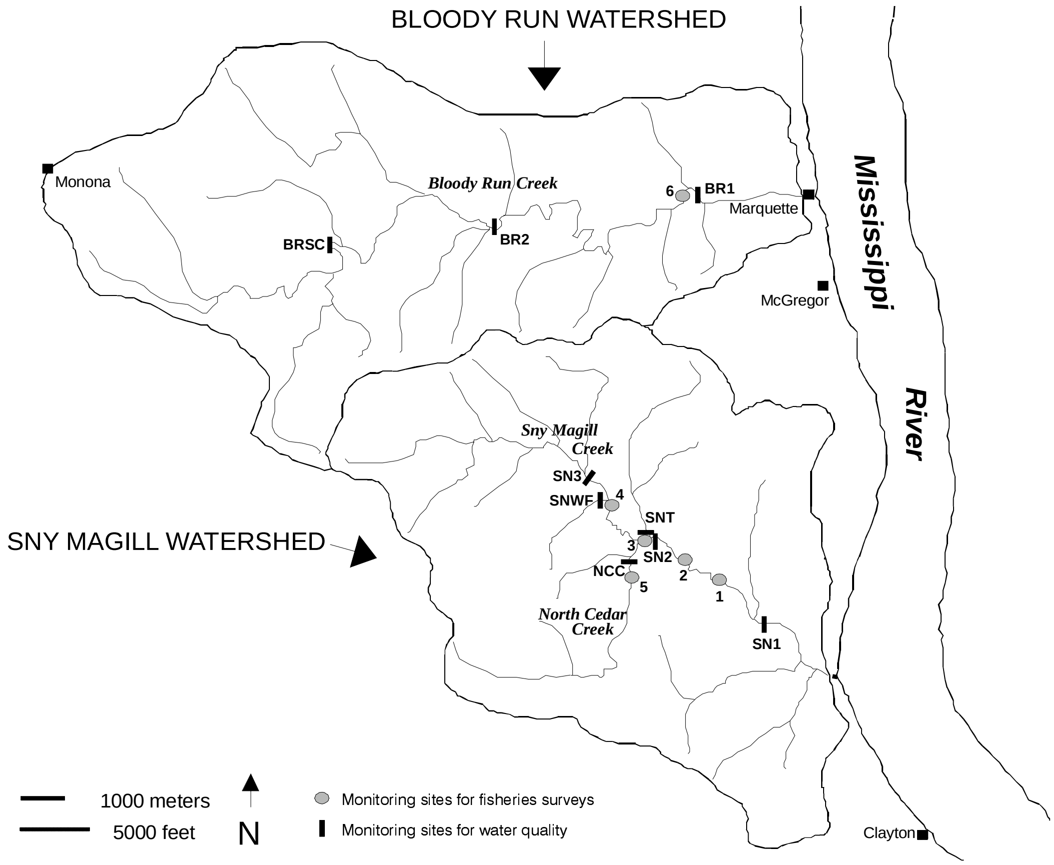


Figure 1. Location of the Sny Magill and Bloody Run watersheds, and the monitoring sites for the fisheries surveys and for water quality.

the country for a period of six to ten years to evaluate how BMPs, or improved land management practices, reduce nonpoint pollution on a watershed scale. Currently, 23 watersheds are in the National Monitoring Program (Figure 2). The primary pollutants of concern for most of these watersheds are sediment, nutrients, and fecal coliform bacteria. For details about each of the projects, see Lombardo and others (2000).

Projects in the National Monitoring Program utilize one of three study designs: a paired watershed, an upstream/downstream, or a single downstream sample location. The Sny Magill project uses a paired watershed approach, comparing Sny Magill watershed (treated), the site of a program for accelerated adoption of BMPs, to the adjacent Bloody Run watershed (control). Details of the paired watershed study design are provided in Clausen and Spooner (1993).

Collection of water-quality data for the National Monitoring Program occurs during three periods: during the pre-BMP implementation period (calibration period); during BMP implementation; and after BMP implementation (post-treatment). Due to the timing of the land treatment projects in the Sny Magill watershed, only one year (Water Year 1992; a water year is a 12-month period from October 1 through September 30, designated by the calendar year in which it ends) of water-quality data was collected during the calibration period. Water-quality data from water years 1995 through 1998 represents monitoring during the BMP implementation period.

IMPLEMENTATION PROGRAMS

The Sny Magill watershed has been the site of two U.S. Department of Agriculture land treatment programs: the Sny Magill Creek Cold Water Stream Water Quality Improvement Project (Sny Magill Hydrologic Unit Area) and the North Cedar Creek Water-Quality Special Project. The projects are intended to provide producers in the watershed with technical assistance and incentives that prompt voluntary changes in farm management practices. These changes are intended to improve water quality in Sny Magill and North Cedar creeks. The North Cedar Creek Project began in 1988 and was completed in 1994. The Sny Magill Hydrologic Unit Area (HUA) project began in 1991 and was completed in 1999.

In 1994, the Sny Magill Creek Watershed Project was created at the request of the Clayton County Soil and Water Conservation District. Incentive funding was lost in fiscal year 1994 for BMP installation. The Sny Magill Creek Watershed Project formed to assist the HUA carry on with its programs. Funding for the Sny Magill Creek Watershed Project included Resource Enhancement and Protection-Water Protection Funds from the Iowa Department of Agriculture and Land Stewardship-Division of Soil Conservation and U.S. EPA Section 319 funds through the Iowa Department of Natural Resources. The additional funding allowed BMP implementation to continue as part of the HUA.

Sny Magill Creek Hydrologic Unit Area

The Sny Magill Creek Hydrologic Unit Area (HUA) Project, administered by the Natural Resources Conservation Service (NRCS), Iowa State University Extension (ISUE), and the Farm Service Agency (FSA), provided technical assistance, information and education programs, and cost-share assistance to producers that prompt voluntary changes in farm management practices resulting in improved water quality in Sny Magill Creek. The Sny Magill HUA includes the entire Sny Magill watershed. (From 1991 through 1994, the North Cedar Creek subwatershed was part of the North Cedar Creek Water-Quality Special Project and was not included as part of the Sny Magill HUA.)

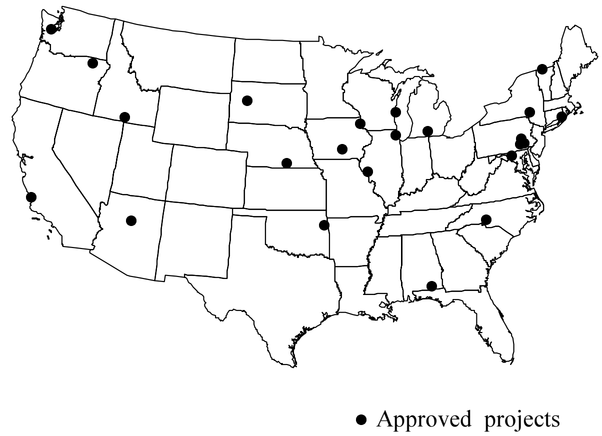


Figure 2. Location of projects in the U.S. EPA's Section 319 National Monitoring Program.

Since the inception of the Sny Magill HUA, the Farm Service Agency has contributed financial assistance as incentives in the application of BMPs. In fiscal year 1994, these funds were no longer available due to a change in funding priorities at the national level. In response, the Clayton County Soil and Water Conservation District applied for alternative financial assistance funding through the U.S. EPA Section 319 (administered by IDNR) and Iowa's Water Protection Fund (administered by the Iowa Department of Agriculture and Land Stewardship - Division of Soil Conservation). Funding was secured from these sources for fiscal years 1995 and 1996. The funding request was for financial assistance to implement traditional as well as nontraditional (i.e., streambank stabilization) BMPs.

Table 1 summarizes the practices that have been applied as part of the Sny Magill HUA project. Reduction of nutrient and pesticide delivery to Sny Magill Creek was identified as an objective of the HUA. As a result of the Integrated Crop Management (ICM) program, in 1995 producers in the Sny Magill watershed applied 26,220 pounds less nitrogen, 11,435 pounds less phosphate, 11,210 pounds less potash, 515 pounds less atrazine, and 145 pounds less cyanazine (Sny Magill Creek

Table 1. Summary, for 1991 through 1998, of practices applied as part of the Sny Magill Hydrologic Unit Area Project.

		Practices Installed per Year								
Practice Number and Activity	Unit	1991	1992	1993	1994	1995	1996	1997	1998	***SUMMARY***
327 Conservation Cover	acres		38	201					638	877
328 Rotation	acres	310	514	1,169	352	183		579	186	3,293
329 Conservation Tillage	acres	34	451	155	132	508		1,180	657	3,117
330 Contouring	acres	3	214	15	609	161	34	842	29	1,907
342 Critical Area	acres				20	2		1	25	48
380 Farmstead Windbreak	acres								1	1
386 Field Border	feet		4,200	5,200	15,800	1,100		400		26,700
392 Field Windbreak	feet					900				900
410 Grade Stabilization Structure	count		83			1	2	2	2	90
412 Grassed Waterway	acres				1			1	1	3
510 Pasture & Hayland Management	acres		382				173		155	710
556 Plan Grazing	acres			114				160	177	451
580 Streambank Protection	feet					250	405		485	1,140
585 Buffer Strips	acres		95	224	132	4				455
585 Stripcropping	acres	48	10				45			103
590 Nutrient Management - Nitrogen	acres		1,259	3,428	2,750	2,500	2,190	1,615	1,393	*
590 Nutrient Management - Phosphorus	acres		1,259	3,428	2,750	2,500	2,190	1,615	1,393	*
595 Pesticide Management	acres		1,259	3,428	2,750	2,500	2,190	1,615	1,393	*
600 Terrace	feet	8,000	64,070	42,720	52,910	17,960	29,665	33,885	20,375	269,585
606 Subsurface Drain	feet			355						335
612 Tree Planting	acres	5					5		15	25
620 Outlet	feet	4,476	30,827	26,038	28,902	13,531	17,893	18,128	10,734	150,529
638 Water & Sediment Control Basin	count		17	4	11	16	6	4	2	60
650 Windbreak Renovation	acres	1								1
692 Timber Management Plans	acres	64	327	50				93	171	705

Source: Sny Magill Creek cold water stream water quality improvement reports (1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998).

* Practices were not summed because the numbers reported are the acres maintained in that practice for that year only.

Cold Water Stream report, 1995). With the ICM program, a minimal fee for the service was charged to encourage long-term adoption of ICM. At the end of three years, it was anticipated that cooperators would continue the ICM program by using private sector ICM services. The transfer of ICM to the private sector, however, had limited success for a number of reasons, such as crop advisors are not readily available in the area, nor are they always willing to provide services to farmers with diversified operations and small acreages.

In order to have better long-term changes in producer practices related to ICM, ISUE developed the Nutrient and Pest Management Incentive Education Program (NPM) as a method to promote refined nutrient and pest management through participant education and implementation. The NPM is conducted as a series of workshops, targeting young, early-career farmers. One of the goals is to ensure that publicly funded management incentives associated with the HUA result in sustainable pollution prevention practices that participants will maintain throughout their farming careers.

The reduction of sediment delivery to Sny Magill Creek was also identified as an objective of the HUA. Prior to implementation of the HUA, it was estimated (based on the Universal Soil Loss Equation) that 69,550 tons of sediment/year were being delivered to Sny Magill Creek. Since implementation of the HUA, the amount of sediment being delivered to Sny Magill Creek has been reduced to 35,031 tons of sediment/year (Sny Magill Creek Cold Water Stream report, 1998). This represents a greater than 50% reduction since inception of the Sny Magill HUA.

North Cedar Creek Water-Quality Special Project

From 1988 to 1994, land treatment practices to control sediment erosion into North Cedar Creek were implemented as part of the North Cedar Creek Water-Quality Special Project. This project, under the guidance of the Clayton County Soil

Conservation District, the Iowa Department of Natural Resources Fish and Wildlife Division, the Upper Explorerland Resource Conservation and Development Area, and the U.S. Department of Agriculture Natural Resources Conservation Service, provided cost-share to producers to install terraces, grade stabilization structures, and agricultural waste structures. A summary of practices installed as part of this project is found in Seigley and others (1996).

Although this project did not have an associated water-quality monitoring component, a survey of several trout streams in 1994 by the IDNR indicated that natural brook trout reproduction was occurring in North Cedar Creek. A similar survey in 1995, however, did not show natural reproduction in North Cedar Creek. Previous attempts by the IDNR to establish a naturally reproducing brook trout population in North Cedar Creek in the late 1970s were unsuccessful (North Cedar Creek, 1986). The Conservation Reserve Program and terracing have reduced the amount of sediment entering streams and are cited as possible reasons for the improved reproduction in some of the trout streams in northeast Iowa.

Since 1994, additional BMP implementation in North Cedar Creek watershed occurred as part of the funding of the Sny Magill HUA.

PRECIPITATION

Rainfall was measured at sites SN1 (Sny Magill) and BR1 (Bloody Run; Figure 1) using standard tipping-bucket rain gages attached to the U.S. Geological Survey (USGS) stream gages. Rainfall was recorded at each gage site by the data-collection platforms and transmitted via satellite to the USGS office in Iowa City for storage in their database. Rainfall data is from May and others (1996, 1997, 1998, and 1999).

To provide a complete year of rainfall data, rainfall data from a climatic station in nearby Prairie du Chien, Wisconsin, was used. The long-term average rainfall for this site, based on data collected from 1961-1990, is 30.60 inches (777.2 mm) (Wisconsin State Climatology Office, personal communication).

Water Year 1995

Table 2 lists the rainfall for sites SN1 and BR1. The rainfall record for site BR1 is 95% complete and 79% complete for site SN1. The maximum recorded daily rainfall (based on available record) at site BR1 was 2.61 inches (66.3 mm) on July 27, 1995, and was 2.03 inches (51.6 mm) at site SN1 on July 27, 1995.

Table 3 lists rainfall data for the climatic station at Prairie du Chien, Wisconsin. Total rainfall at this site was 30.54 inches (775.7 mm), or 99.8% of the long-term average. The maximum recorded daily rainfall at Prairie du Chien was 2.35 inches (59.7 mm) and occurred on July 28, 1995. The maximum monthly rainfall, 5.55 inches (141.0 mm), occurred during April 1995, and was 183% of the long-term monthly normal. The minimum monthly rainfall, 0.04 inches (1.0 mm), occurred during February 1995, and was 4% of the long-term monthly normal. Rainfall was above normal for November, March, April, May, July, and August, and below normal for October, December, January, February, June, and September.

Water Year 1996

Table 4 lists the rainfall data for sites SN1 and BR1. The rainfall record for site BR1 is 97% complete and 99% complete for site SN1. The maximum recorded daily rainfall (based on available record) at site BR1 was 1.53 inches (38.7 mm) on June 6, 1996, and 2.20 inches (55.9 mm) at site SN1 on June 16, 1996.

Table 5 lists rainfall data for the climatic station at Prairie du Chien, Wisconsin. Total rainfall at this site was 30.06 inches (763.5 mm), or 98% of the long-term average. The maximum recorded daily rainfall was 1.79 inches (45.5 mm) on June 16, 1996. The maximum monthly rainfall, 8.31 inches (211.1 mm), occurred during June 1996, and was 239% of the long-term monthly normal. The minimum monthly rainfall, 0.35 inches (8.9 mm), occurred during December 1995, and was 25% of the long-term monthly normal. Rainfall was above normal for October, November, January, and June, and below normal for December,

Table 2. Daily precipitation (in inches) at sites SN1 (Sny Magill) and BR1 (Bloody Run); Water Year 1995.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Site BR1						
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01
2	0.27	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.01
3	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.13	0.00
4	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.06	0.04	0.01
5	0.00	0.02	0.20	0.00	0.00	0.19	0.08	0.00	0.00	0.01	0.01	0.00
6	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	1.03	0.20
7	0.10	0.00	0.14	0.00	0.00	0.02	0.95	0.00	0.01	0.00	0.01	0.00
8	0.01	0.03	0.00	---	0.00	---	0.31	1.74	0.00	0.00	0.03	0.01
9	0.00	0.03	0.00	---	0.00	---	0.13	1.40	0.00	0.03	0.00	0.01
10	0.01	0.00	0.00	---	0.00	0.25	0.90	0.09	0.00	0.00	0.04	0.00
11	0.00	0.01	0.00	---	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.01
12	0.01	0.00	0.00	---	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
13	0.00	0.62	0.00	---	0.00	0.02	0.00	0.11	0.00	0.00	0.00	0.00
14	0.01	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
15	0.00	0.00	0.01	---	0.00	0.04	0.00	0.00	0.00	0.94	0.03	0.01
16	0.03	0.01	0.25	---	0.01	0.00	0.37	0.06	0.00	0.00	0.49	0.06
17	0.31	0.01	0.20	---	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
18	0.01	0.16	0.00	---	0.00	0.12	0.93	0.00	0.00	0.00	0.14	0.00
19	0.00	0.00	0.04	---	0.00	0.49	0.00	0.00	0.00	0.36	0.01	1.11
20	0.00	0.01	0.00	---	0.01	0.97	0.17	0.00	0.00	0.00	0.01	0.13
21	0.00	1.01	0.00	---	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00
22	0.04	0.30	0.00	---	0.00	0.21	0.01	0.04	0.00	0.15	0.01	0.00
23	0.00	0.00	0.01	---	0.00	0.07	0.00	0.25	0.00	0.01	0.00	0.01
24	0.00	0.00	0.00	---	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.09
25	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.07	0.64	0.00	0.00
26	0.00	0.00	0.01	0.00	0.00	0.43	0.38	0.00	0.50	0.01	0.00	0.00
27	0.01	0.84	0.00	0.00	0.00	0.67	0.08	2.24	0.09	2.61	0.00	0.00
28	0.00	0.00	0.00	0.05	0.00	0.12	0.00	0.17	0.04	0.01	1.33	0.00
29	0.00	0.00	0.00	0.00	---	0.03	0.18	0.00	0.28	0.00	0.25	0.22
30	0.00	0.00	0.00	0.00	---	0.00	0.09	0.00	0.00	0.00	0.00	0.08
31	0.00	---	0.00	0.01	---	0.00	---	0.00	---	0.22	0.00	---
Total	0.84	3.06	0.88	---	0.02	---	5.93	6.13	1.23	5.07	3.58	1.97
						Site SN1						
1	0.00	---	0.00	0.00	---	0.00	0.00	0.00	0.01	0.00	0.00	0.01
2	0.00	---	0.00	0.00	---	0.00	0.00	0.00	0.14	0.00	0.00	0.00
3	0.00	---	0.00	---	---	0.01	0.00	0.00	0.00	0.00	0.09	0.00
4	0.00	---	0.00	---	---	---	0.00	0.03	0.00	0.37	0.19	0.01
5	0.00	0.00	0.15	---	---	---	0.04	0.00	0.00	0.33	0.01	0.00
6	0.03	0.00	0.00	0.00	---	---	0.00	0.00	0.09	0.00	0.79	0.44
7	0.00	0.00	0.22	---	---	---	0.70	0.00	0.00	0.00	0.01	0.00
8	0.00	0.00	0.00	---	---	---	0.16	1.33	0.00	0.00	0.00	0.01
9	0.01	0.00	0.03	---	---	---	0.11	0.73	0.00	0.02	0.00	0.01
10	0.00	0.00	0.00	---	---	0.12	0.11	0.01	0.00	0.00	0.04	0.00
11	0.00	0.00	---	---	---	0.00	0.84	0.00	0.00	0.00	0.00	0.01
12	0.00	0.00	---	---	---	---	0.01	0.00	0.00	0.00	0.00	0.01
13	0.00	0.00	0.00	---	---	---	0.01	0.41	0.00	0.00	0.03	0.00
14	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
15	0.01	0.00	0.11	---	0.00	0.00	0.00	0.00	0.00	0.39	0.02	0.00
16	0.00	---	0.13	---	0.00	0.13	0.25	0.05	0.00	0.01	0.30	0.12
17	0.00	---	0.00	---	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
18	0.00	---	0.00	---	0.00	0.08	0.80	0.00	0.00	0.00	0.00	0.01
19	0.00	0.00	0.00	---	0.00	0.18	0.00	0.00	0.00	0.36	0.00	0.80
20	0.00	0.00	0.00	---	0.00	0.55	0.24	0.00	0.00	0.00	0.01	0.13
21	0.01	0.00	---	---	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.01
22	0.00	0.00	0.00	---	0.00	0.13	0.00	0.00	0.00	0.05	0.01	0.00
23	0.00	0.00	0.00	---	0.00	0.03	0.00	0.24	0.00	0.01	---	0.00
24	---	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	---	0.15
25	---	0.01	0.01	---	---	---	0.00	0.00	0.51	0.62	0.00	0.00
26	---	---	0.01	---	---	---	0.32	0.00	0.39	0.00	0.00	0.00
27	---	---	0.00	---	---	---	0.06	1.34	0.09	2.03	0.00	0.00
28	0.00	0.00	0.00	---	---	---	0.00	0.08	0.13	0.00	0.94	0.00
29	0.00	0.00	0.00	---	---	0.01	0.23	0.00	0.01	0.00	0.25	0.13
30	0.00	0.17	0.00	---	---	0.00	0.07	0.00	0.00	0.00	0.00	0.03
31	0.00	---	0.48	---	---	0.00	---	0.00	---	0.34	0.00	---
Total	---	---	---	---	---	---	4.13	4.22	1.37	4.53	---	1.88

--- no data

Table 3. Daily precipitation (in inches) for the Prairie du Chien, Wisconsin climatic station; Water Year 1995.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Prairie du Chien						
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00
2	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.15	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.20	0.00	0.00	0.09	0.00	0.00	0.00	0.34	0.00	0.00
6	0.00	0.00	0.16	0.19	0.00	0.00	0.05	0.00	0.00	0.14	0.00	0.00
7	0.11	0.00	0.59	0.05	0.00	0.53	0.00	0.00	0.13	0.00	1.51	0.08
8	0.02	0.00	0.00	0.00	0.00	0.00	1.02	0.56	0.00	0.00	0.00	0.00
9	0.00	0.03	0.00	0.00	0.00	0.00	0.37	0.91	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.06	0.00	0.00	0.05	0.43	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0.00	0.00
12	0.00	0.04	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.36	0.00	0.00	0.00	0.00
14	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.09	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.10	0.00
17	0.02	0.00	0.00	0.04	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00
18	0.59	0.15	0.00	0.02	0.00	0.02	0.24	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.09	0.29
20	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.43	0.02	0.72
21	0.00	1.13	0.00	0.00	0.00	0.38	0.41	0.00	0.00	0.00	0.00	0.10
22	0.00	0.05	0.00	0.18	0.00	0.00	0.05	0.00	0.00	0.11	0.00	0.00
23	0.07	0.00	0.00	0.08	0.00	0.23	0.00	0.07	0.00	0.08	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
26	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.22	0.60	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.33	0.28	0.00	0.58	0.00	0.00	0.00
28	0.00	0.75	0.00	0.04	0.00	0.16	0.00	1.67	0.30	2.35	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.02	0.43	0.02	0.00	1.09	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.25	0.00	0.19	0.00	0.00	0.14
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
Total	1.04	2.67	1.04	0.66	0.04	2.70	5.55	4.69	1.74	4.77	4.23	1.41
							Water year total = 30.54 inches (99.8% of normal)					

Source: Wisconsin State Climatology Office (personal communication)

February, March, April, May, July, August, and September.

Water Year 1997

Table 6 lists the rainfall data for sites SN1 and BR1. The rainfall record for both sites is 100% complete. The maximum recorded daily rainfall was 1.96 inches (49.8 mm) at site BR1 on June 15, 1997, and 2.37 inches (60.2 mm) at site SN1 on July 27, 1997. For site BR1, the maximum monthly rainfall (5.92 inches; 150.4 mm) occurred in June 1997, and the minimum monthly rainfall (0.07 inches; 1.8 mm) occurred in February 1997. For site SN1, the maximum monthly rainfall (5.91 inches; 150.1 mm) occurred in July 1997, and the minimum monthly rainfall (0.91 inches; 23.1 mm) occurred in December 1996.

Table 7 lists rainfall data for the climatic station at Prairie du Chien, Wisconsin. Total rainfall at this site was 33.56 inches (852.4 mm), or 110% of the long-term average. The maximum recorded daily rainfall was 1.90 inches (48.3 mm) on June 16, 1997. The maximum monthly rainfall, 6.12 inches (155.4 mm), occurred during July 1997, and was 175% of the long-term monthly normal. The minimum monthly rainfall, 1.27 inches (32.3 mm), occurred during January 1997, and was 137% of

Table 4. Daily precipitation (in inches) at sites SN1 (Sny Magill) and BR1 (Bloody Run); Water Year 1996.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Site BR1						
1	0.00	1.42	0.00	0.02	---	0.00	0.00	0.00	0.86	0.00	0.00	0.00
2	0.24	0.01	---	0.01	0.00	0.00	0.00	0.05	0.33	0.00	0.01	0.00
3	0.04	0.00	---	0.00	0.00	0.00	0.16	0.01	0.00	0.00	0.00	0.00
4	0.01	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
5	0.95	0.02	---	0.00	0.00	0.00	0.00	0.01	0.85	0.00	0.14	0.00
6	0.53	0.00	---	0.00	0.00	0.00	0.00	0.01	1.53	0.00	0.23	0.01
7	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.19	0.00	0.29	0.00
8	0.10	0.00	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.02	0.00	0.04
9	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.06	0.02	0.00	0.00
10	0.01	0.04	0.00	0.00	0.01	0.00	0.00	0.43	0.17	0.00	0.01	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.01	0.00	0.00
12	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
14	0.01	0.00	0.25	0.00	0.00	0.03	0.08	0.39	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.02	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.86	0.00	0.00	0.01
17	0.00	0.00	0.00	0.54	0.00	0.28	0.00	0.00	0.22	0.22	0.01	0.00
18	0.00	0.00	0.00	0.27	0.00	0.01	0.65	0.00	0.03	0.00	0.10	0.01
19	0.18	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.02	0.00	0.06	0.01
20	0.05	0.00	0.00	0.00	0.00	0.00	0.44	0.42	0.02	0.00	0.02	0.17
21	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00
23	0.43	0.00	0.00	0.00	0.04	0.11	0.00	0.24	0.02	0.16	0.00	0.01
24	0.01	0.00	0.00	---	0.00	0.48	0.00	0.05	0.01	0.01	0.00	0.01
25	0.01	0.00	0.00	---	0.00	0.11	0.12	0.43	0.01	0.00	0.00	0.12
26	0.00	0.00	0.00	---	0.01	0.00	0.01	0.04	0.02	0.00	0.00	0.44
27	0.05	0.05	0.00	---	0.28	0.00	0.00	0.37	0.02	0.26	0.00	0.08
28	0.27	0.00	0.00	---	0.00	0.00	0.00	0.67	0.01	0.17	0.00	0.05
29	0.02	0.00	0.00	---	0.00	0.00	0.69	0.00	0.19	0.04	0.00	0.04
30	0.00	0.31	0.00	0.00	---	0.25	0.01	0.00	0.67	0.02	0.00	0.05
31	0.77	---	0.02	0.00	---	0.01	---	0.00	---	0.00	0.00	---
Total	3.71	1.85	---	---	---	1.28	2.46	3.85	7.19	1.24	0.89	1.07
						Site SN1						
1	0.01	1.21	0.00	0.02	---	0.00	0.00	0.00	0.74	0.00	0.00	0.00
2	0.22	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.09	0.00	0.00	0.00
3	0.02	0.57	0.01	0.00	0.00	0.00	0.12	0.01	0.00	0.00	0.00	0.00
4	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5	0.68	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.58	0.00	0.05	0.00
6	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.32	0.01
7	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	---	0.00	0.19	0.00
8	0.06	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.02	0.07	0.01	0.49
9	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.08	0.00	0.00	0.00
10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.41	0.06	0.00	0.00	0.03
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
12	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.01
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.00
14	0.04	0.00	0.14	0.00	0.00	0.00	0.04	0.21	0.00	0.00	0.00	0.10
15	0.00	0.00	0.00	0.00	0.00	0.01	0.18	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	2.20	0.00	0.00	0.00
17	0.00	0.00	0.00	0.36	0.00	0.19	0.00	0.00	0.46	0.19	0.00	0.00
18	0.00	0.00	0.00	0.24	0.00	0.01	0.63	0.02	0.44	0.00	0.23	0.00
19	0.13	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.74	0.01
20	0.07	0.00	0.00	0.00	0.00	0.00	0.56	0.26	0.00	0.00	0.00	0.16
21	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
22	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.02
23	0.34	0.00	0.00	0.00	0.01	0.06	0.00	0.18	0.58	---	0.01	0.11
24	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.06	0.00	0.01	0.00	0.01
25	0.01	0.00	0.00	0.00	0.00	0.15	0.05	0.24	0.00	0.00	0.01	0.13
26	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.01	0.00	0.00	0.00	0.99
27	0.01	0.05	0.00	0.00	0.12	0.00	0.00	0.34	0.00	0.18	0.00	0.00
28	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.15	0.00	0.00
29	0.03	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.87	0.35	0.00	0.00
30	0.00	0.77	0.00	0.00	---	0.15	0.01	0.00	0.01	0.00	0.01	0.00
31	0.52	---	0.01	---	---	0.02	---	0.00	---	0.00	0.00	---
Total	2.80	2.64	0.16	---	---	0.78	2.36	3.55	---	---	1.99	2.07

--- no data

Table 5. Daily precipitation (in inches) for the Prairie du Chien, Wisconsin climatic station; Water Year 1996.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Prairie du Chien						
1	0.04	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00
3	0.31	0.03	0.00	0.00	0.00	0.00	0.00	0.10	0.25	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.00	0.13	0.00
7	0.27	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.68	0.00	0.29	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00
9	0.10	0.00	0.11	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.40
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.09	0.00	0.00	0.00
11	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00
12	0.00	0.00	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00
13	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.06	0.00	0.00	0.00	0.03	0.00	0.18	0.35	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00
19	0.00	0.00	0.00	0.73	0.00	0.00	0.67	0.00	0.00	0.00	1.48	0.00
20	0.15	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.39	0.15
21	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.08	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.18	0.00	0.49	0.00
24	0.38	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.15	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.08	0.00	0.00	0.08	0.30	0.00	0.00	0.00	0.64
27	0.00	0.14	0.00	0.86	0.38	0.00	0.00	0.10	0.00	0.00	0.00	0.75
28	0.20	0.55	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.75	0.00	0.02
29	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.34	0.00	0.20	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.65	0.00	2.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.18		0.00		0.00	0.00	
Total	2.44	2.76	0.35	2.95	0.41	0.98	2.36	3.42	8.31	1.34	2.78	1.96
								Water year total = 30.06 inches (98% of normal)				

Source: Wisconsin State Climatology Office (personal communication)

the long-term monthly normal for January. Rainfall was above normal for October through February, and for May through July, and below normal for March, April, August, and September.

Water Year 1998

Table 8 lists the rainfall data for sites SN1 and BR1. The rainfall record for both sites is 100% complete. Rainfall was 40.17 inches (1,020.3 mm) at site BR1, and 29.33 inches (745.0 mm) at site SN1. The maximum recorded daily rainfall was 2.51 inches (63.8 mm) at site BR1 on March 30, 1998, and 2.42 inches (61.5 mm) at site SN1 on March 30, 1998. For site BR1, the maximum monthly rainfall (8.56 inches; 217.4 mm) occurred in June 1998, and the minimum monthly rainfall (0.40 inches; 10.2 mm) occurred in November 1997. For site SN1, the maximum monthly rainfall (5.84 inches; 148.3 mm) occurred in August 1998, and the minimum monthly rainfall (0.19 inches; 4.8 mm) occurred in January 1998.

Table 9 lists rainfall data for the climatic station at Prairie du Chien, Wisconsin. Total rainfall at this site was 41.32 inches (1,049.5 mm), or 135% of the long-term average. The maximum recorded daily rainfall was 3.88 inches (98.6 mm) on August 5, 1998. The maximum monthly rainfall, 9.4 inches

Table 6. Daily precipitation (in inches) at sites SN1 (Sny Magill) and BR1 (Bloody Run); Water Year 1997.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Site BR1						
1	0.03	0.00	0.00	0.22	0.00	0.00	0.00	0.01	0.00	0.43	0.00	0.04
2	0.02	0.00	0.00	0.11	0.00	0.00	0.03	0.61	0.00	0.00	0.00	0.06
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.10	0.01
4	0.00	0.26	0.00	0.50	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01
5	0.00	0.00	0.07	0.00	0.01	0.00	0.33	0.02	0.61	0.01	0.00	0.06
6	0.03	0.19	0.24	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00
7	0.01	0.01	0.00	0.00	0.03	0.00	0.00	0.87	0.82	0.00	0.01	0.17
8	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.66	0.00	0.62
9	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
10	0.00	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.03	0.01
11	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.02	0.00	0.04	0.01
12	0.00	0.00	0.01	0.00	0.00	0.00	0.33	0.00	0.01	0.07	1.85	0.01
13	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.07	0.00	0.08
14	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.05	0.00	0.31	0.01	0.02
15	0.12	0.24	0.02	0.00	0.00	0.00	0.00	0.00	1.96	0.01	0.02	0.00
16	0.16	0.52	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.46
17	0.13	0.24	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.40	0.00	0.01
18	0.00	0.00	0.00	0.00	0.00	0.01	0.50	0.12	0.00	0.26	0.00	0.01
19	0.00	0.00	0.00	0.06	0.00	0.00	0.01	0.00	0.20	1.35	0.01	0.05
20	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.03	0.12	0.26	0.00
21	0.22	0.13	0.00	0.06	0.00	0.00	0.01	0.00	1.61	0.04	0.01	0.01
22	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.24	0.01	0.67
23	0.50	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.76	0.08
24	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.12	0.20	0.00	0.00	0.01
25	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.62	0.00	0.01
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.01	0.02
28	0.00	0.01	0.18	0.00	0.00	0.22	0.00	0.42	0.00	0.01	0.01	0.36
29	1.32	0.14	0.00	0.00		0.00	0.00	0.07	0.00	0.00	0.00	0.00
30	0.01	0.21	0.00	0.00		0.05	1.62	0.00	0.35	0.02	0.54	0.00
31	0.00		0.00	0.25		0.00		0.00		0.01	0.00	
Total	3.13	2.09	1.10	1.34	0.07	0.51	3.05	2.33	5.92	5.49	3.70	2.81
						Site SN1						
1	0.00	0.00	0.00	0.15	0.00	0.01	0.00	0.01	0.00	0.22	0.00	0.02
2	0.00	0.00	0.00	0.05	0.00	0.00	0.01	0.50	0.00	0.00	0.00	0.05
3	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
4	0.01	0.21	0.00	0.50	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
5	0.00	0.00	0.12	0.00	0.00	0.00	0.26	0.00	0.25	0.00	0.00	0.03
6	0.03	0.20	0.08	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.38	0.00	0.00	0.18
8	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.59	0.00	0.24
9	0.01	0.00	0.00	0.05	0.03	0.39	0.00	0.00	0.00	0.00	0.00	0.03
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.01	0.00	0.04	0.01
12	0.00	0.00	0.00	0.00	0.00	0.01	0.24	0.01	0.00	0.02	1.30	0.00
13	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.28	0.00	0.06
14	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00
15	0.39	0.10	0.02	0.00	0.00	0.00	0.00	0.00	1.64	0.00	0.15	0.00
16	0.42	0.38	0.00	0.00	0.03	0.05	0.00	0.00	0.01	0.00	0.00	0.56
17	0.09	0.09	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.23	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.02	0.37	0.11	0.00	0.11	0.00	0.00
19	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.08	1.02	0.01	0.00
20	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.01	0.21	0.18	0.01
21	0.38	0.10	0.00	0.02	0.27	0.00	0.00	0.00	1.13	0.04	0.00	0.00
22	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.00	0.53
23	0.02	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.18	0.09
24	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.08	0.30	0.00	0.01	0.00
25	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.02	0.37	0.00	0.01
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	2.37	0.00	0.05
28	0.00	0.10	0.20	0.00	0.02	0.15	0.00	0.38	0.00	0.01	0.01	0.18
29	0.98	0.39	0.00	0.00		0.00	0.00	0.04	0.00	0.00	0.00	0.00
30	0.00	0.03	0.00	0.00		0.04	1.01	0.00	0.17	0.00	0.50	0.00
31	0.00		0.00	0.19		0.00		0.00		0.00	0.00	
Total	3.21	1.75	0.91	1.00	1.02	1.12	2.06	1.86	4.06	5.91	2.39	2.06

Table 7. Daily precipitation (in inches) for the Prairie du Chien, Wisconsin climatic station; Water Year 1997.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Prairie du Chien						
1	0.00	0.00	0.00	0.00	0.00	0.02	0.00	1.28	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.50	0.00	0.13
3	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.38	0.23	0.00	0.00	0.00	0.00	0.10	0.03	0.00
5	0.00	0.24	0.09	0.09	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.06	0.00	0.00	0.00	0.28	0.00	0.55	0.00	0.00	0.00
7	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.14	0.73	0.00	0.60
9	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.05	0.00
10	0.00	0.00	0.00	0.19	0.00	0.34	0.00	0.00	0.00	0.00	0.02	0.11
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.11	0.00	0.39	0.00	0.00	0.00	1.42	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.20	0.00
14	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.02	0.00	0.22	0.00	0.07
15	0.00	0.00	0.42	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
16	0.13	0.48	0.00	0.03	0.19	0.00	0.00	0.00	1.90	0.00	0.00	0.00
17	0.24	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.11	0.00	0.08	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.23	0.05
21	0.00	0.32	0.00	0.00	0.35	0.00	0.00	0.00	1.67	0.15	0.00	0.00
22	0.34	0.00	0.00	0.04	0.19	0.00	0.00	0.00	0.00	0.35	0.00	0.00
23	0.97	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.48	0.00	0.73
24	0.03	0.16	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00
25	0.00	0.00	0.00	0.28	0.00	0.35	0.00	0.14	0.27	0.00	0.00	0.00
26	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.79	0.00	0.00
27	0.00	0.00	0.00	0.11	0.23	0.00	0.00	0.00	0.00	0.51	0.00	0.00
28	0.00	0.04	0.00	0.02	0.00	0.15	0.00	0.00	0.00	0.57	0.00	0.26
29	0.00	0.00	0.00	0.00		0.00	0.00	0.37	0.00	0.00	0.00	0.00
30	1.11	0.34	0.00	0.00		0.00	0.00	0.02	0.00	0.00	0.50	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	2.82	2.39	1.42	1.27	1.64	1.65	2.21	3.86	4.58	6.12	3.23	2.37
							Water year total = 33.56 inches (110% of normal)					

Source: Wisconsin State Climatology Office (personal communication)

(238.8 mm), occurred during August 1998, and was 238% of the long-term monthly normal. The minimum monthly rainfall, 0.25 inches (6.4 mm), occurred during November 1997, and represented 13% of the long-term monthly normal for November. Rainfall was above normal for October, January through June, and for August, and below normal for November, December, July, and September.

FISH ASSESSMENT RESULTS

The Iowa Department of Natural Resources-Fisheries Bureau inventoried the forage fish population at five sites in the Sny Magill watershed (four sites on the main stem of Sny Magill and one site on a tributary to Sny Magill Creek) and one site on Bloody Run Creek (Figure 1). These six sites have been sampled annually since 1992. A baseline assessment conducted in 1991 included only the four sites on Sny Magill Creek.

Collection dates were chosen to minimize stocked trout numbers, to minimize angler interference with fish sampling personnel, and to sample the streams under baseflow conditions. Sampling gear consisted of two backpack-mounted stream electrofishing units operated at 100 volts DC and 100 pulses per second. Small seines (1/4-

Table 8. Daily precipitation (in inches) at sites SN1 (Sny Magill) and BR1 (Bloody Run); Water Year 1998.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
						Site BR1						
1	0.00	0.00	0.00	0.00	0.22	0.08	0.20	0.00	0.04	0.00	0.00	0.01
2	0.01	0.04	0.00	0.01	0.09	0.03	0.00	0.03	0.01	0.00	0.00	0.00
3	0.01	0.06	0.43	0.00	0.00	0.06	0.00	0.02	0.00	0.32	0.19	0.06
4	0.00	0.00	0.01	0.09	0.00	0.01	0.01	0.02	0.00	0.00	1.77	0.01
5	0.00	0.04	0.00	0.41	0.00	0.00	0.00	0.00	0.10	0.01	0.85	0.01
6	0.00	0.08	0.00	0.02	0.00	0.07	0.01	0.00	0.07	0.17	0.02	0.01
7	0.00	0.00	0.04	0.00	0.00	0.00	0.10	0.00	0.01	0.64	0.14	0.00
8	0.31	0.00	0.00	0.00	0.00	0.01	0.60	0.01	0.14	0.01	0.01	0.01
9	0.14	0.08	0.03	0.00	0.00	0.00	0.02	0.00	1.25	0.00	0.93	0.00
10	0.01	0.00	0.02	0.00	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.01
11	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	2.15	0.00	0.01	0.00
12	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
13	0.42	0.00	0.00	0.00	0.02	0.15	0.37	0.00	0.00	0.00	0.00	0.00
14	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.90	1.46
15	0.00	0.04	0.01	0.00	0.00	0.03	0.33	0.00	0.00	0.00	0.01	0.01
16	0.01	0.00	0.00	0.00	0.10	0.03	0.67	0.00	0.02	0.00	0.00	0.01
17	0.00	0.00	0.01	0.00	0.05	0.35	0.01	0.00	0.01	0.01	1.61	0.01
18	0.01	0.01	0.00	0.00	0.00	0.39	0.00	0.00	1.64	0.00	0.00	0.01
19	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.43	0.00	0.00
20	0.01	0.01	0.00	0.00	0.00	0.00	0.27	0.00	0.62	0.65	0.41	0.03
21	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.01	0.00	0.00
22	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.09	0.00	0.21	0.01	0.00
23	0.02	0.00	0.01	0.00	0.14	0.00	0.00	0.08	0.01	0.01	0.00	0.54
24	0.00	0.00	0.01	0.09	0.00	0.00	0.00	0.71	0.92	0.01	0.15	0.12
25	0.00	0.00	0.00	0.09	0.04	0.00	0.53	0.00	0.00	0.00	0.01	0.01
26	0.15	0.00	0.01	0.04	1.21	0.00	0.16	0.00	0.00	0.01	0.01	0.02
27	0.17	0.00	0.00	0.06	0.62	0.00	0.00	0.00	0.84	0.00	0.83	0.01
28	0.01	0.00	0.01	0.00	0.05	0.00	0.00	0.60	0.64	0.00	0.24	0.01
29	0.01	0.03	0.00	0.00		0.12	0.03	0.07	0.02	0.02	0.01	0.22
30	0.02	0.00	0.00	0.00		2.51	0.00	0.05	0.01	0.00	0.01	0.43
31	0.01		0.00	0.00		0.88		0.20		0.01	0.01	
Total	3.47	0.40	0.62	0.82	2.64	4.75	3.33	1.88	8.56	2.54	8.14	3.02
						Site SN1						
1	0.00	0.00	0.00	0.00	0.19	0.04	0.13	0.00	0.03	0.00	0.00	0.00
2	0.00	0.04	0.00	0.00	0.07	0.04	0.00	0.19	0.01	0.00	0.00	0.01
3	0.00	0.06	0.27	0.00	0.00	0.05	0.00	0.24	0.00	0.35	0.23	0.03
4	0.00	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00
5	0.00	0.03	0.00	0.15	0.00	0.00	0.00	0.00	0.07	0.06	1.00	0.01
6	0.00	0.04	0.00	0.01	0.00	0.06	0.00	0.07	0.02	0.23	0.01	0.00
7	0.00	0.00	0.03	0.00	0.00	0.00	0.09	0.61	0.00	0.52	0.35	0.00
8	0.10	0.00	0.00	0.00	0.00	0.03	0.42	0.00	0.13	0.00	0.00	0.00
9	0.11	0.04	0.08	0.00	0.00	0.00	0.05	0.00	0.56	0.00	0.94	0.01
10	0.00	0.00	0.04	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	1.68	0.00	0.00	0.00
12	1.44	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
13	0.21	0.00	0.00	0.00	0.00	0.03	0.30	0.00	0.00	0.00	0.00	0.00
14	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.91	1.13
15	0.00	0.00	0.01	0.00	0.00	0.01	0.24	0.04	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.11	0.01	0.51	0.00	0.00	0.00	0.00	0.01
17	0.01	0.00	0.00	0.00	0.04	0.11	0.00	0.00	0.01	0.01	0.55	0.00
18	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.55	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.35	0.00	0.01
20	0.01	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.51	0.07	0.29	0.00
21	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.04	0.04	0.01	0.00
22	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.07	0.00	0.03	0.02	0.00
23	0.02	0.00	0.01	0.00	0.12	0.00	0.00	0.50	0.00	0.01	0.01	0.34
24	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.65	0.49	0.00	0.21	0.14
25	0.00	0.00	0.00	0.00	0.14	0.00	0.27	0.00	0.03	0.00	0.01	0.02
26	0.05	0.00	0.02	0.00	0.80	0.00	0.13	0.00	0.00	0.00	0.00	0.01
27	0.15	0.00	0.00	0.01	0.44	0.00	0.00	0.00	0.14	0.00	0.41	0.00
28	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.34	0.71	0.00	0.14	0.00
29	0.00	0.01	0.00	0.00		0.02	0.01	0.05	0.02	0.00	0.00	0.15
30	0.01	0.00	0.01	0.00		2.42	0.03	0.05	0.00	0.00	0.01	0.20
31	0.01		0.00	0.00		0.75		0.21		0.00	0.00	
Total	2.12	0.23	0.57	0.19	2.09	3.97	2.51	3.02	5.05	1.67	5.84	2.07

Table 9. Daily precipitation (in inches) for the Prairie du Chien, Wisconsin climatic station; Water Year 1998.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
					Prairie du Chien							
1	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.27	0.15	0.08	0.00	0.15	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.65	0.00	0.00	0.08	0.15
4	0.00	0.09	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.28	0.00
5	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.10	0.00	3.88	0.00
6	0.00	0.08	0.00	0.18	0.00	0.09	0.00	0.00	0.00	0.02	0.05	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.20	0.23	0.98	0.00	0.20	0.20	0.00
9	0.33	0.00	0.09	0.00	0.00	0.63	0.38	0.00	0.43	0.00	0.00	0.00
10	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.46	0.00
11	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00
12	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00	2.35	0.00	0.00	0.00
13	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
15	0.00	0.08	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	1.40	1.33
16	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.05	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.10	0.11	0.00	0.00	0.00	0.58	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.37	0.14	0.00	0.00	0.00	1.65	0.00
19	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.95	0.45	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
21	0.00	0.00	0.00	0.10	0.00	0.00	0.33	0.00	0.74	0.74	0.49	0.00
22	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.09	0.05	0.00	0.00	0.06	0.00	0.31	0.00	0.00
24	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.90	0.68	0.00	0.00	0.56
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
26	0.00	0.00	0.00	0.00	0.23	0.00	0.37	0.00	0.10	0.00	0.00	0.02
27	0.35	0.00	0.00	0.00	1.13	0.00	0.00	0.00	1.73	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.76	0.00
29	0.00	0.00	0.00	0.00		0.00	0.00	0.57	0.00	0.00	0.00	0.28
30	0.00	0.00	0.00	0.00		0.05	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		2.80		0.18		0.00	0.00	
Total	2.96	0.25	0.65	0.98	2.21	4.61	3.45	3.61	8.82	2.01	9.40	2.37

Water year total = 41.32 inches (135% of normal)

Source: Wisconsin State Climatology Office (personal communication)

inch bar measure) were used to block the upper and lower sample site boundaries and limit inter-site fish movement. All fish captured were identified to species, enumerated, and immediately released downstream. All sample runs were made upstream through approximately 300 feet (91 m) of mixed pool-riffle habitat. Since both streams are managed for trout fishing, the number of any trout captured was not included, only noted as being present.

The baseline fish assessment conducted on Bloody Run and Sny Magill watersheds in 1991 was summarized by Wunder and Stahl (1994). Annual assessments from 1992 through 1995 were summarized by Wunder and Gritters (1995), Seigley and others (1994), and Seigley and others (1996). Below are a summary of the 1995 through 1998 fish assessments from Wunder and Jansen (1997) and Wunder and Polton (1998).

Water Year 1995

The fish sampling occurred in November 1995. Table 10 summarizes the relative abundance of the forage fish species sampled in 1995. For 1995, similar fish numbers were reported from Bloody Run Creek as had been reported for previous years; extremely low numbers, however, were

Table 10. Relative abundance of forage fish species sampled from six sites in Sny Magill and Bloody Run creeks; November 1995.

	Number (%)							
Species	Site 1(a) Sny Magill 1995	Site 2 (b) Sny Magill 1995	Site 3 (c) Sny Magill 1995	Site 4 (d) Sny Magill 1995	Site 5 (e) North Cedar (Sny Magill) 1995	Site 6 (a) Bloody Run 1995	Sny Magill sites 1,2,3,4 (d) 1995	All sites 1995
Catostomus commersoni White sucker	1 (17%)	2 (10%)	1 (4%)	1 (25%)		11 (2%)	5 (9%)	16 (3%)
Cottus cognatus Slimy sculpin						476 (97%)		476 (84%)
Culaea inconstans Brook stickleback			4 (17%)				4 (7%)	4 (<1%)
Etheostoma flabellare Fantail darter	3 (50%)	14 (67%)	3 (13%)	3 (75%)	18 (75%)		23 (43%)	41 (7%)
Etheostoma nigrum Johnny darter					1 (4%)			1 (<1%)
Rhinicthys atratulus Blacknose dace	2 (33%)	5 (24%)	14 (61%)		4 (17%)	3 (<1%)	21 (39%)	28 (5%)
Semotilus atromaculatus Creek chub			1 (4%)		1 (4%)		1 (2%)	2 (<1%)
Total	6	21	23	4	24	490	54	568

(a) brown trout also sampled
(b) rainbow trout also sampled
(c) brown, rainbow, and brook trout also sampled
(d) rainbow and brown trout also sampled
(e) brown and brook trout also sampled

Table 11. Relative abundance of forage fish species sampled from six sites in Sny Magill and Bloody Run creeks; November 1996.

	Number (%)							
Species	Site 1(a) Sny Magill 1996	Site 2 (b) Sny Magill 1996	Site 3 (c) Sny Magill 1996	Site 4 (d) Sny Magill 1996	Site 5 (e) North Cedar (Sny Magill) 1996	Site 6 (a) Bloody Run 1996	Sny Magill sites 1,2,3,4 (d) 1996	All sites 1996
Campastoma anomalum Central stoneroller	3 (5%)						3 (1%)	3 (<1%)
Catostomus commersoni White sucker	7 (11%)	3 (1%)		1 (2%)		5 (2%)	11 (3%)	16 (2%)
Cottus cognatus Slimy sculpin						283 (98%)		283 (40%)
Culaea inconstans Brook stickleback			17 (22%)	4 (6%)			21 (5%)	21 (3%)
Etheostoma flabellare Fantail darter	43 (65%)	180 (93%)	36 (47%)	36 (56%)	12 (50%)		295 (74%)	307 (43%)
Etheostoma nigrum Johnny darter					3 (13%)			3 (<1%)
Rhinicthys atratulus Blacknose dace	9 (14%)	11 (6%)	23 (30%)	23 (36%)	6 (25%)	1 (<1%)	66 (17%)	73 (10%)
Semotilus atromaculatus Creek chub	4 (6%)				3 (13%)		4 (1%)	7 (1%)
Total	66	194	76	64	24	289	400	713

(a) brown trout also sampled
(b) rainbow trout also sampled
(c) brown, rainbow, and brook trout also sampled
(d) rainbow and brown trout also sampled
(e) brown and brook trout also sampled

reported for the four sites on Sny Magill Creek and the one site on North Cedar Creek relative to past years.

A total of 490 fish were sampled from Bloody Run Creek. The Bloody Run Creek sample was dominated by slimy sculpin (97%), with some white sucker (2%) and blacknose dace (<1%) also present.

The North Cedar Creek site reported 24 fish, with the fantail darter (75%) being the most common followed by blacknose dace (17%), johnny darter, and creek chub (each 4%).

A total of 54 fish were sampled from the four sites on Sny Magill Creek. The number of fish at each site ranged from 4 to 23. The two dominant fish species at these four sites were the fantail darter (43%) and blacknose dace (39%). Other fish sampled include brook stickleback (7%), white sucker (9%), and creek chub (2%).

Water Year 1996

The fish sampling occurred in November 1996. Table 11 summarizes the forage fish species sampled in 1996. From 1995 to 1996, the number of fish sampled from Bloody Run Creek declined while the number increased for the four main stem Sny Magill sites and remained unchanged for North Cedar Creek.

A total of 289 fish were sampled from Bloody Run Creek. The fish population was again dominated by slimy sculpin (98%), with white sucker (2%) and blacknose dace (<1%) also present.

The North Cedar Creek site reported 24 fish for a second consecutive year. The fantail darter continued to dominate the population (50%), followed by blacknose dace (25%), johnny darter (13%), and creek chub (13%).

A total of 400 fish were sampled from the four sites on Sny Magill Creek, an increase from 54 in 1995. The fantail darter (74%) and blacknose dace (17%) dominated the fish population. Other fish present included brook stickleback (5%), white sucker (3%), central stoneroller (1%), and creek chub (1%).

Water Year 1997

The fish sampling occurred in November 1997. Table 12 summarizes the forage fish species sampled in 1997.

A total of 312 fish were sampled from Bloody Run Creek. The Bloody Run Creek sample was dominated by slimy sculpin (96%), with white sucker (3%), blacknose dace (<1%), and longnose dace (<1%) also present. This is the fourth consecutive year that slimy sculpin comprised more than 95% of the fish population at Bloody Run Creek.

A total of 18 fish were sampled from North Cedar Creek, the fewest reported from this site to date. Blacknose dace was the most common (82%), followed by fantail darter (6%), fathead minnow (6%), and white sucker (6%). For the first time, blacknose dace, rather than fantail darter, dominated the population. Additionally, the first occurrence of the fathead minnow was reported from any of the six sites.

A total of 315 fish were sampled from the four sites on Sny Magill Creek. The number of fish at each site ranged from 15 to 146. Low numbers were again reported for sites 1 and 2 on Sny Magill Creek (15 and 25 fish, respectively). Fantail darter was the most dominant species (41%), followed by white sucker (24%), blacknose dace (12%), brook stickleback (9%), and longnose dace (8%). Also present were johnny darter, southern southern redbelly dace, bluntnose minnow, creek chub, and burbot.

Water Year 1998

The fish sampling occurred in September 1998. Table 13 summarizes the forage fish species sampled in 1998. For each site, the number of species and the total number of fish sampled varied from previous years. Only one electrofishing unit operated during the survey, which may explain the low numbers of fish.

A total of 96 fish were sampled from Bloody Run Creek, the fewest to date. The population was once again dominated by slimy sculpin (71%), followed by longnose dace (14%) and central stoneroller (6%).

Table 12. Relative abundance of forage fish species sampled from six sites in Sny Magill and Bloody Run creeks; November 1997.

Species	Site 1(a) Sny Magill 1997	Site 2 (b) Sny Magill 1997	Site 3 (c) Sny Magill 1997	Site 4 (d) Sny Magill 1997	Site 5 (e) North Cedar (Sny Magill) 1997	Site 6 (a) Bloody Run 1997	Sny Magill sites 1,2,3,4 (d) 1997	All sites 1997
	Number (%)							
Catostomus commersoni White sucker		1 (4%)	51 (40%)	24 (16%)	1 (6%)	10 (3%)	76 (24%)	87 (13%)
Cottus cognatus Slimy sculpin						300 (96%)		300 (47%)
Culaea inconstans Brook stickleback	1 (7%)		25 (19%)	1 (<1%)			27 (9%)	27 (4%)
Etheostoma flabellare Fantail darter	13 (86%)	10 (40%)	16 (12%)	90 (62%)	1 (6%)		129 (41%)	130 (20%)
Etheostoma nigrum Johnny darter		1 (4%)	7 (5%)	1 (<1%)			9 (3%)	9 (1%)
Lota lota Burbot				2 (1%)			2 (<1%)	2 (<1%)
Phoxinus erythrogaster Southern redbelly dace			4 (3%)				4 (1%)	4 (1%)
Pimephales notatus Bluntnose minnow			4 (3%)				4 (1%)	4 (1%)
Pimephales promelas Fathead minnow					1 (6%)			1 (<1%)
Rhinicthys atratulus Blacknose dace		3 (12%)	21 (16%)	13 (9%)	15 (82%)	1 (<1%)	37 (12%)	53 (8%)
Rhinichthys cataractae Longnose dace		10 (40%)		15 (10%)		1 (<1%)	25 (8%)	26 (4%)
Semotilus atromaculatus Creek chub	1 (7%)		1 (<1%)				2 (<1%)	2 (<1%)
Total	15	25	129	146	18	312	315	645

(a) brown trout also sampled
(b) rainbow trout also sampled
(c) brown, rainbow, and brook trout also sampled
(d) rainbow and brown trout also sampled
(e) brown and brook trout also sampled

A total of 73 fish were sampled from North Cedar Creek, a significant increase from the previous three years. Fantail darter (49%) and blacknose dace (47%) dominated the population. Longnose dace (4% of the population) were sampled from North Cedar Creek for only the second year since sampling began.

A total of 154 fish were sampled from the four Sny Magill sites. The majority of the population was comprised of fantail darter (42%), followed by blacknose dace (15%), white sucker (11%), and johnny darter (10%). At Sny Magill Site #4, the first occurrence of green sunfish in the Sny Magill watershed was reported.

Comparison of Water Years 1992 through 1998

Appendix A lists the relative abundance of the forage fish species sampled from 1992 through 1998. Every year a single species dominated the majority of the stream forage fish population; the fantail darter in Sny Magill Creek and North Cedar Creek, and the slimy sculpin in Bloody Run Creek. All species collected are indicative of typical Iowa coldwater streams.

The fish population at the Bloody Run Creek site has shown a steady increase in the percent of the population composed of slimy sculpin. In 1992

Table 13. Relative abundance of forage fish species sampled from six sites in Sny Magill and Bloody Run creeks; September 1998.

Species	Site 1 Sny Magill 1998	Site 2 Sny Magill 1998	Site 3 Sny Magill 1998	Site 4 Sny Magill 1998	Site 5 North Cedar (Sny Magill) 1998	Site 6 Bloody Run 1998	Sny Magill sites 1,2,3,4 1998	All sites 1998
	Number (%)							
Campastoma anomalum Central stoneroller						6 (6%)		6 (2%)
Catostomus commersoni White sucker	2 (10%)		10 (13%)	5 (10%)		3 (3%)	17 (11%)	20 (6%)
Cottus cognatus Slimy sculpin						68 (71%)		68 (21%)
Culaea inconstans Brook stickleback	2 (10%)		2 (3%)				4 (3%)	4 (1%)
Etheostoma flabellare Fantail darter	6 (29%)	5 (83%)	26 (34%)	27 (53%)	36 (49%)	3 (3%)	64 (42%)	103 (32%)
Etheostoma nigrum Johnny darter			15 (20%)				15 (10%)	15 (5%)
Lepomis cyanellus Green Sunfish				3 (6%)			3 (2%)	3 (1%)
Lota lota Burbot				8 (16%)			8 (5%)	8 (2%)
Rhinicthys atratulus Blacknose dace	11 (52%)	1 (17%)	7 (9%)	4 (8%)	34 (47%)	3 (3%)	23 (15%)	60 (19%)
Rhinichthys cataractae Longnose dace			6 (8%)	3 (6%)	3 (4%)	13 (14%)	9 (6%)	25 (8%)
Semotilus atromaculatus Creek chub			10 (13%)	1 (2%)			11 (7%)	11 (3%)
Total	21	6	76	51	73	96	154	323

and 1993, only half of the population was composed of slimy sculpin. In more recent years, more than 95% of the population is slimy sculpin. Fantail darter and longnose dace, both sampled during the early surveys, have rarely been found in more recent years in Bloody Run Creek.

The fantail darter and blacknose dace were present all seven years in North Cedar Creek.

For the Sny Magill sites, fantail darter and blacknose dace were present all seven years. For the main stem sites on Sny Magill Creek, johnny darter, longnose dace, and bluntnose minnow were present from 1992 through 1994, but were not present in 1995 and 1996. Burbot occurred in 1993, 1994, 1997, and 1998.

The cause of the low numbers in Sny Magill and North Cedar creeks during water years 1995 through 1997 is not known. The chemical water-quality data does not indicate an increase in contaminants that may have negatively impacted the fish population. An herbicide spill occurred on May 19, 1995, at site SN2, but an inspection by IDNR officials noted no immediate impact from the spill on the fish populations (Mike Wade, IDNR, personal communication). Sampling during water years 1995 through 1997 occurred in November, later than previous years. Wunder and Jansen (1997) stated that deep water habitat is more prevalent in Bloody Run. By the time sampling occurred, fish population in Sny Magill may have moved to deeper water habitats (away from the sampling area) for the winter.

Fish data collected from 1992 through 1994 was previously summarized by site based on each

Table 14. Scoring criteria for calculating the coldwater index of biotic integrity of Lyons and others (1996).

Metric	Criteria for assigning scores of: 20 (good)	10 (fair)	0 (poor)
(1) Number of intolerant species	>1	1	0
(2) Percent of all individuals that are tolerant species	0-5	6-22	23-100
(3) Percent of all individuals that are top carnivore species	46-100	15-45	0-14
(4) Percent of all individuals that are stenothermal coolwater and coldwater species (native and exotic)	86-100	43-85	0-42
(5) Percent of salmonid individuals that are brook trout	96-100	5-95	0-4

fish species' environmental tolerance to contaminants (see Seigley and others, 1996). The environmental tolerance rating used was from Plafkin and others (1989) and classified fish species as being tolerant, intermediate, or intolerant to environmental pollution. This tolerance rating, although limited, allowed for an initial analysis of fish data. There was, however, still a need for further analysis of the fish data from these sites.

Index of Biotic Integrity

The index of biotic integrity (IBI) is a widely used tool for evaluating the environmental health of a stream or river based on its fish population. The IBI uses a number of metrics or parameters to assess the integrity of a stream or river based on the types of fish species present and the abundance of each. The IBI, originally developed by Karr and others (1986), has been modified for use in different types of streams and rivers.

Previous research has shown that many of the metrics used in warmwater versions of the IBI are not suitable for use in coldwater streams (Steedman, 1988; Lyons, 1992; Lyons and others, 1996). Coldwater and warmwater streams respond differently to environmental degradation; many of the taxonomic groups that are important in high-quality, warmwater streams are rare or absent in high-quality, coldwater streams. In general, a high-quality, coldwater stream has lower species richness than a comparable high-quality, warmwater stream (Moyle and Herbold, 1987; Lyons, 1992; Lyons and others, 1996), and in response to increased human disturbance, a coldwater stream may show an increase in species richness (Fisher, 1989; Lyons, 1992; Lyons and others, 1996; Mundahl and Simon, 1999).

Currently, Iowa has not developed an IBI specific to coldwater streams, therefore, other IBIs for coldwater streams were evaluated. Lyons and others (1996) developed an IBI based on five metrics for coldwater streams in Wisconsin. Since Iowa coldwater streams have similar characteristics to and occur in the same ecoregion (Omernik and Gallant, 1988) as Wisconsin coldwater streams, fish data from Sny Magill and Bloody Run creeks were evaluated using the IBI of Lyons and others (1996). Additionally, Mundahl and Simon (1999) developed an IBI using 12 metrics for coldwater streams of the upper midwestern United States. Some research suggests that an IBI calculated using few metrics may not be as sensitive at detecting various levels of impairment as an IBI based on multiple metrics, as the range of impairment to which a metric is sensitive varies among the metrics (Angermeier and Karr, 1986; Karr and others, 1986). Fish data

Table 15. Guidelines for interpreting coldwater index of biotic integrity (IBI) scores calculated using the IBI of Lyons and others (1996).

IBI Score	Integrity rating	Interpretation and fish community attributes
100 - 90	Excellent	Comparable to the best situations with the least human disturbance: mottled or slimy sculpins are usually common; intolerant, native stenothermal coldwater species such as lampreys or redside dace may also be present; brook trout are the primary top carnivores and are present in good numbers; exotic salmonids are absent or uncommon; tolerant species may be present in low to moderate numbers.
80 - 60	Good	Evidence for some environmental degradation and reduction in biotic integrity: either brook trout or sculpins may be uncommon or absent; exotic salmonids often dominate, keeping the abundance of top carnivores high; tolerant species may be common but do not dominate.
50 - 30	Fair	The stream reach has experienced moderate environmental degradation, and biotic integrity has been significantly reduced: total species richness is often relatively high, but intolerant and native stenothermal coldwater species are uncommon or absent; native stenothermal coolwater species and exotic salmonids may be moderately common, but tolerant eurythermal species or warmwater species are usually more abundant.
20-10	Poor	Major environmental degradation has occurred, and biotic integrity has been severely reduced: total species richness may be relatively high, but intolerant species, top carnivores, and salmonids are absent; a few native stenothermal coolwater species such as brassy minnows or brook sticklebacks may persist in low numbers; tolerant eurythermal species or warmwater species or both dominate.
0 or no score	Very poor	Human disturbance and environmental degradation have decimated the natural coldwater fish assemblage of the reach: either only warmwater and tolerant species remain, or fish abundance is so low (<25 individuals captured) that the IBI cannot be calculated.

from Sny Magill and Bloody Run creeks were also evaluated using the IBI of Mundahl and Simon (1999).

Wisconsin Index of Biotic Integrity for Coldwater Streams

The IBI of Lyons and others (1996) represents the combined score from five metrics: (1) the number of intolerant species, (2) the percent of all individuals that are tolerant species, (3) the percent of all individuals that are top carnivore species, (4) the percent of all individuals that are native or exotic stenothermal (narrow preference for summer temperatures) coldwater or coolwater species, and (5) the percent of salmonid individuals that are brook trout (*Salvelinus fontinalis*). Table 14 lists the criteria for calculating the IBI and Table 15 provides an interpretation of the IBI scores. Table 16 lists the tolerance rating, feeding classification, and temperature classification for each species sampled (from Lyons and others, 1996). Lyons and others (1996) do not recommend calculating an IBI if fewer than 25 fish are sampled for a given site, so IBI values were not calculated for all sites.

Annual variation in IBI scores was low to moderate for individual sites. Table17 lists the IBI scores for the six sites by year. The site on Bloody Run Creek had the greatest change in IBI scores, increasing from 20 in 1992 to 50 from 1994 through 1997. The increase in the Bloody Run score is associated with an increase in the percentage of slimy sculpin present at this site. The IBI scores for the four main stem Sny Magill Creek sites and the North Cedar Creek site ranged from 0 to 20.

Table 16. Lyons and others (1996) classification of fish species into tolerance, feeding, and temperature preference categories for calculation of coldwater IBI metrics.

Scientific Name	Common Name	Tolerance	Feeding (a)	Temperature
Campostoma anomalum	Central Stoneroller	Other	---	native eurythermal
Catostomus commersoni	White sucker	Tolerant	---	native eurythermal
Cottus cognatus	Slimy sculpin	Intolerant	---	native stenothermal coldwater
Culaea inconstans	Brook Stickleback	Other	---	native stenothermal coolwater
Etheostoma flabellare	Fantail Darter	Other	---	native eurythermal
Etheostoma nigrum	Johnny Darter	Other	---	native eurythermal
Lepomis cyanellus	Green Sunfish	Tolerant	---	native eurythermal
Lota lota	Burbot	Other	TC	native stenothermal coolwater
Phoxinum erythrogaster	Southern redbelly dace	Other	---	native eurythermal
Pimephales notatus	Bluntnose minnow	Tolerant	---	native eurythermal
Pimephales promelas	Fathead minnow	Tolerant	---	native eurythermal
Rhinichthys atratulus	Blacknose dace	Tolerant	---	native eurythermal
Rhinichthys cataractae	Longnose dace	Other	---	native eurythermal
Semotilus atromaculatus	Creek chub	Tolerant	---	native eurythermal

(a) Feeding types: top carnivore (TC); not top carnivore (---)

Discussion

The IBI of Lyons and others (1996) is of limited value in this study because the IDNR stocks trout in Sny Magill, North Cedar Creek, and Bloody Run. Lyons and others (1996) state that stocked trout should not be included in any of the metric calculations because they do not reflect the biotic integrity of the site. Since trout are considered top carnivores, excluding stocked trout reduces the score for "percent top carnivore species" to zero for most sites (the only exception is site #4 on Sny Magill where burbots were found in 1996 and 1997). Trout are considered to have a temperature preference of stenothermal coldwater. Exclusion of stocked trout reduces scores for "percent stenothermal coolwater and coldwater species" to zero for all sites in Sny Magill. Natural reproduction of brook trout occurs in very few coldwater streams in northeast Iowa and was reported only once (1994) in North Cedar Creek. Consequently, excluding stocked brook trout reduces the scores for "percent salmonids that are brook trout" to zero for all sites.

Bloody Run has consistently had higher IBI scores relative to the other sites because of a single fish species, the slimy sculpin. Slimy sculpin only occur in Bloody Run Creek and account for the majority of the fish sampled from this site (see Appendix A). Lyons and others (1996) classify the slimy sculpin as intolerant of environmental degradation and as a stenothermal coldwater species. Consequently, the scores for "number of intolerant species" and "percent of all individuals that are stenothermal coolwater and coldwater species" are systematically higher at the Bloody Run site compared to the other sites.

Slimy sculpin may have occurred in Sny Magill and North Cedar creeks in the past, but if habitat conditions were lost, re-establishing a population in either stream would be difficult. Both Sny Magill and Bloody Run are coldwater streams separated from other coldwater streams by the Mississippi River, a warmwater body which limits inter-stream movement of coldwater fish species. Since slimy sculpin does not live in the Mississippi River, they, or any other intolerant species not currently present, are unlikely to be found in either Bloody Run or Sny Magill creeks in the future unless the species are artificially reintroduced.

The Iowa Stream Biocriteria Project, designed to assess the biological integrity of Iowa's rivers

Table 17. Index of biotic integrity (IBI) scores and ratings for Sny Magill, North Cedar, and Bloody Run creeks (water years 1992 through 1998) calculated using the IBI of Lyons and others (1996).

Sny Magill Creek #1	1992	1993	1994	1995 (a)	1996	1997 (a)	1998 (a)
				number or percent (score)			
Number of intolerant species	0 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Percent tolerant species	58% (0)	9% (10)	27% (0)	-----	31% (0)	-----	-----
Percent top carnivore species	0% (0)	0% (0)	0% (0)	-----	0% (0)	-----	-----
Percent stenothermal coolwater and coldwater species	<1% (0)	0% (0)	0% (0)	-----	0% (0)	-----	-----
Percent of salmonids that are brook trout	0% (0)	0% (0)	0% (0)	-----	0% (0)	-----	-----
IBI Score (Integrity Rating)*	**0 (VP)**	**10 (P)**	**0 (VP)**	**-----**	**0 (VP)**	**-----**	**-----**
Sny Magill Creek #2	1992	1993	1994	1995 (a)	1996	1997	1998 (a)
Number of intolerant species	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	-----
Percent tolerant species	25% (0)	31% (0)	56% (0)	-----	7% (10)	16% (10)	-----
Percent top carnivore species	0% (0)	0% (0)	0% (0)	-----	0% (0)	0% (0)	-----
Percent stenothermal coolwater and coldwater species	6% (0)	0% (0)	<1% (0)	-----	0% (0)	0% (0)	-----
Percent of salmonids that are brook trout	0% (0)	0% (0)	0% (0)	-----	0% (0)	0% (0)	-----
IBI Score (Integrity Rating)*	**0 (VP)**	**0 (VP)**	**0 (VP)**	-----	**10 (P)**	**10 (P)**	**-----**
Sny Magill Creek #3	1992	1993	1994	1995 (a)	1996	1997	1998
Number of intolerant species	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent tolerant species	16% (10)	5% (20)	40% (0)	-----	30% (0)	60% (0)	26% (0)
Percent top carnivore species	0% (0)	1% (0)	0% (0)	-----	0% (0)	0% (0)	0% (0)
Percent stenothermal coolwater and coldwater species	<1% (0)	1% (0)	0% (0)	-----	22% (0)	0% (0)	3% (0)
Percent of salmonids that are brook trout	0% (0)	0% (0)	0% (0)	-----	0% (0)	0% (0)	0% (0)
IBI Score (Integrity Rating)*	**10 (P)**	**20 (P)**	**0 (VP)**	**-----**	**0 (VP)**	**0 (VP)**	**0 (VP)**
Sny Magill Creek #4	1992	1993	1994	1995 (a)	1996	1997	1998
Number of intolerant species	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent tolerant species	40% (0)	22% (10)	19% (10)	-----	38% (0)	25% (0)	12% (10)
Percent top carnivore species	0% (0)	0% (0)	6% (0)	-----	0% (0)	1% (0)	16% (10)
Percent stenothermal coolwater and coldwater species	3% (0)	0% (0)	6% (0)	-----	6% (0)	1% (0)	16% (0)
Percent of salmonids that are brook trout	0% (0)	0% (0)	0% (0)	-----	0% (0)	0% (0)	0% (0)
IBI Score (Integrity Rating)*	**0 (VP)**	**10 (P)**	**10 (P)**	-----	**0 (VP)**	**0 (VP)**	**20 (P)**
North Cedar Creek	1992	1993	1994	1995 (a)	1996 (a)	1997(a)	1998
Number of intolerant species	0 (0)	0 (0)	0 (0)	-----	-----	-----	0 (0)
Percent tolerant species	48% (0)	49% (0)	16% (10)	-----	-----	-----	0% (20)
Percent top carnivore species	1% (0)	0% (0)	1% (0)	-----	-----	-----	0% (0)
Percent stenothermal coolwater and coldwater species	1% (0)	0% (0)	0% (0)	-----	-----	-----	0% (0)
Percent of salmonids that are brook trout	0% (0)	0% (0)	1% (0)	-----	-----	-----	0% (0)
IBI Score (Integrity Rating)*	**0 (VP)**	**0 (VP)**	**0 (VP)**	-----	-----	-----	**20 (P)**
Bloody Run Creek	1992	1993	1994	1995	1996	1997	1998
Number of intolerant species	1 (10)	1 (10)	1 (10)	1 (10)	1 (10)	1 (10)	1 (10)
Percent tolerant species	23% (0)	20% (10)	3% (20)	2% (20)	2% (20)	4% (20)	3% (20)
Percent top carnivore species	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)
Percent stenothermal coolwater and coldwater species	52% (10)	43% (10)	96% (20)	97% (20)	98% (20)	96% (20)	71% (10)
Percent of salmonids that are brook trout	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)
IBI Score (Integrity Rating)*	**20 (P)**	**30 (F)**	**50 (F)**	**50 (F)**	**50 (F)**	**50 (F)**	**40 (F)**

(a) Fish numbers were less than 25, therefore, an IBI was not calculated.

* VP = Very Poor; P = Poor; F = Fair; G = Good; E = Excellent.

and streams, had developed tolerance ratings for Iowa fish species. These tolerance ratings differ from the ratings of Lyons and others (1996) for five fish species. The white sucker and blacknose dace were classified as "other" by the Iowa Stream Biocriteria Project and "tolerant" by Lyons and others (1996). The brook stickleback, the Southern redbelly dace, and the longnose dace were classified as "intolerant" by the Iowa Stream Biocriteria Project and "other" by Lyons and others (1996). Figure 3 compares the distribution of fish species, by site and by year, based on the tolerance ratings of the Iowa Stream Biocriteria Project versus the rating of Lyons and others (1996).

Using the tolerance ratings from the Iowa Stream Biocriteria Project, the IBI scores were recalculated. The IBI calculated for Sny Magill and North Cedar Creek were significantly higher. For the majority of sites, the rating changed from poor to fair. Several sites went from a rating of very poor (score of zero) to fair (40). However, the IBI calculated for the Bloody Run site changed very little. The most significant change occurred in 1992, where the IBI increased by 30 points and the rating changed from poor to fair.

Index of Biotic Integrity for Coldwater Streams of the Upper Midwestern U.S.

The IBI for coldwater streams of the upper midwestern United States was developed based on data from coldwater streams in Minnesota, Wisconsin, and Michigan (Mundahl and Simon, 1999). Unlike warmwater fish assemblages, coldwater fish assemblages display more similarities over broad geographic areas (Moyle and Herbold, 1987; Lyons, 1989; Poff and Allan, 1995; Lyons and others, 1996), and the IBI of Mundahl and Simon (1999) should be applicable for coldwater streams in northeastern Iowa. The IBI is based on 12 metrics (see Table 18 for metrics and scoring). Table 19 lists the classification of each fish species into tolerance, feeding, habitat, and temperature preference categories for those fish sampled from Sny Magill and Bloody Run watersheds. Table 20 provides an integrity rating and an interpretation of the IBI

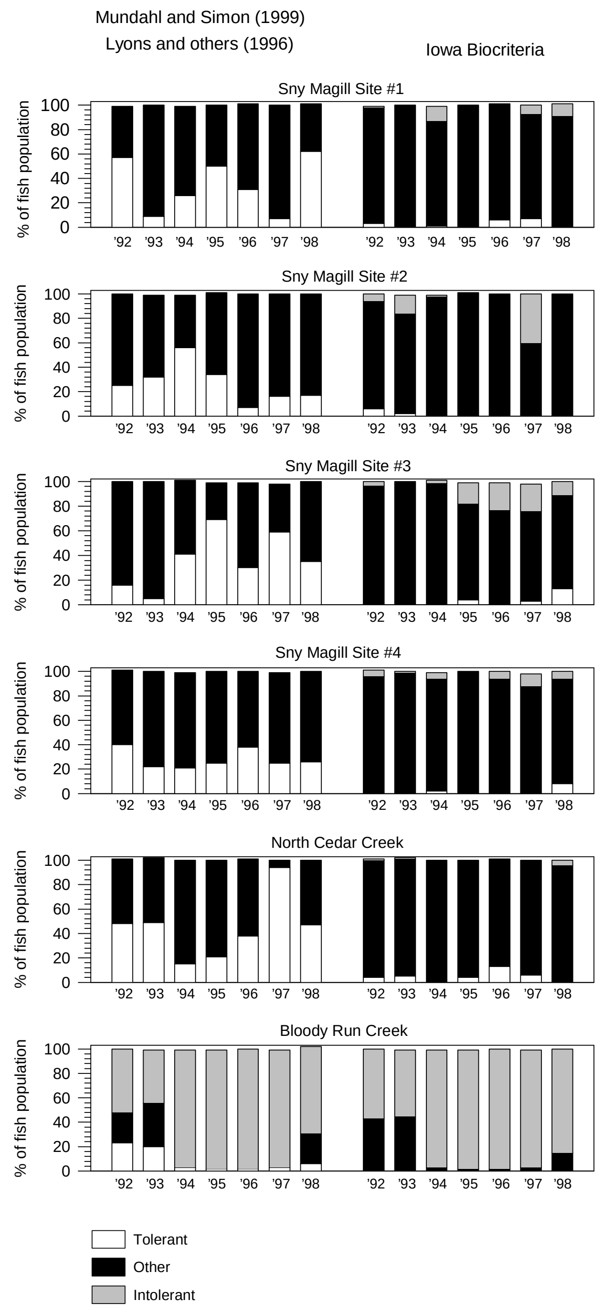


Figure 3. Comparison of the distribution of fish species, by site and by year, based on the tolerance ratings of Lyons and others (1996) and Mundahl and Simon (1999) versus the rating of the Iowa Stream Biocriteria Project.

Table 18. Scoring criteria for calculating the coldwater index of biotic integrity of Mundahl and Simon (1999).

Metrics	Scoring		
	0	5	10
Number of species	>9	5-9	<5
Number of coldwater species	0-1	2-3	>3
Number of minnow species	>3	2-3	<2
Number of benthic species	>2	2	<2
Number of tolerant species	>3	2-3	<2
Percent salmonids as brook trout	<12	12-92	>92
Percent intolerant individuals	<10	10-43	>43
Percent coldwater individuals	<42	42-88	>88
Percent white suckers	>1.5	>0-1.5	0
Percent top carnivores	<30	30-72	>72
Number of coldwater individuals	<32	32-75	>75
Number of warmwater individuals	>60	16-60	<16

scores. Like Lyons and others (1996), the IBI developed by Mundahl and Simon (1999) requires a minimum of 25 fish per site in order to calculate an IBI.

Table 21 lists the IBI scores for the six sites by year. Appendix B provides the complete listing of fish community characteristics and scores for all sites. The four sites on the main stem of Sny Magill Creek were classified as “poor” to “very poor.” The exception was in 1996 when sites 2, 3 and 4 were classified as “fair.” The IBI scores from North Cedar Creek were rated as “poor” to “fair.” Low numbers from this site prevented an IBI from being calculated for 1995 through 1997. IBI scores from the one Bloody Run site were “fair” to “good.” Again, the dominance of slimy sculpin at the Bloody Run site was responsible for the increased scores.

Discussion

Like the IBI of Lyons and others (1996), the IBI of Mundahl and Simon (1999) is of limited value in this study. Stocked trout were not included in the IBI metric calculations, which reduces the scores for the following metrics: “number of species,” “number of coldwater species,” “percent coldwater individuals,” “percent top carnivores,” “number of coldwater individuals,” and “percent salmonids as brook trout.”

Similar to the scores calculated using the IBI of Lyons and others (1996), Bloody Run consistently has higher IBI scores compared to the other sites because of a single fish species, the slimy sculpin. Consequently, the scores for “percent intolerant individuals,” “percent coldwater individuals,” and “number of coldwater individuals” are always higher in the Bloody Run site compared to the other sites. As noted earlier, slimy sculpin may have occurred in Sny Magill and North Cedar creeks in the past, but if habitat conditions were lost, re-establishing a population in either stream is difficult because the Mississippi River serves as a barrier.

The IBI of Mundahl and Simon (1999) was re-calculated using the tolerance ratings from the Iowa Stream Biocriteria Project to determine if the IBI scores varied. The tolerance rating from the Iowa Stream Biocriteria Project differs for five fish species. The white sucker and blacknose dace were classified as “other” by the Iowa Stream Biocriteria Project and “tolerant” by Mundahl and Simon (1999). The brook stickleback, the Southern redbelly dace, and the longnose dace were

Table 19. Mundahl and Simon (1999) classification of fish species into tolerance, feeding, habitat, and temperature preference categories for calculation of coldwater IBI metrics.

Scientific Name (Common Name)	Tolerance(a)	Feeding(b)	Habitat(c)	Temperature Preference(d)
Campostoma anomalum (Central stoneroller)	----	----	----	----
Catostomus commersoni (White sucker)	T	----	B	----
Cottus cognatus (Slimy sculpin)	I	----	B	C
Culaea inconstans (Brook stickleback)	----	----	----	C
Etheostoma flabellare (Fantail darter)	----	----	B	----
Etheostoma nigrum (Johnny darter)	----	----	B	----
Ictulurus melas (Black bullhead)	----	----	B	----
Lepomis cyanellus (Green sunfish)	T	----	----	----
Lepomis machrochirus (Bluegill)	----	----	----	----
Lota lota (Burbot)	----	TC	----	C
Phoxinus erythrogaster (Southern redbelly dace)	----	----	----	----
Pimephales notatus (Bluntnose minnow)	T	----	----	----
Pimephales promelas (Fathead minnow)	T	----	----	----
Rhinicthys atratulus (Blacknose dace)	T	----	----	----
Rhinicthys cataractae (Longnose dace)	----	----	B	----
Semotilus atromaculatus (Creek chub)	T	----	----	----

(a) Tolerance categories: tolerant (t), intolerant (I), other (---)

(b) Feeding categories: top carnivore (TC), other (---)

(c) Habitat categories: benthic (B), other (---)

(d) Temperature preference categories: coldwater (C), warmwater (---)

Classification of species based on Ohio EPA (1987), Karr and others (1986), Lyons (1992), and Lyons and others (1996).

classified as "intolerant" by the Iowa Stream Biocriteria Project and "other" by Mundahl and Simon (1999). Figure 3 compares the distribution of fish species, by site and by year, based on the tolerance ratings of the Iowa Stream Biocriteria Project versus the rating of Mundahl and Simon (1999). The overall IBIs and integrity ratings for the sites changed very little, improving at a few sites. The integrity rating changed from "very poor" (score of 5) to "poor" (15) for Sny Magill Creek #1 in 1994, from "poor" (30) to "fair" (35) for Sny Magill #3 in 1993, and from "very poor" (5) to "poor" (20) for Sny Magill #3 in 1997.

Table 20. Guidelines for interpreting coldwater index of biotic integrity (IBI) scores calculated using the IBI of Mundahl and Simon (1999).

Total IBI Score	Integrity Rating	Fish Community Characteristics
105-120	Excellent	Comparable to the best situations with little human disturbance; 3 or 4 coldwater species present; dominated (>75%) by brook trout; exotic salmonids absent or limited to few individuals; sculpin present; lampreys often present; white suckers absent; warmwater species absent or very uncommon.
70-100	Good	Some impairment present; coldwater intolerant species (sculpin, brook trout) reduced in abundance; white suckers present in low numbers; often dominated by brown trout or other exotic salmonids; higher species richness resulting from presence of more tolerant warmwater minnows and darters.
35-65	Fair	Moderate impairment; coldwater intolerant species rare or absent; brown trout and more tolerant coldwater species (e.g., brook stickleback) may be common; relatively high species richness; warmwater species relatively common.
10-30	Poor	High impairment; more tolerant warmwater species usually dominant; white suckers often abundant; salmonids very rare or absent; relatively high species richness.
0-5	Very poor	Severe impairment; coldwater fish absent; only warmwater species present.
No Score	No Score	Too few fish (<25 individuals) to calculate IBI score.

HABITAT ASSESSMENT

The habitat assessment was designed to characterize stream habitat conditions and to test standardized habitat evaluation methods developed for use on coldwater streams in Iowa. Aquatic habitat assessments were completed at the six water-quality sites in Sny Magill and two sites in Bloody Run (Figure 1; site BRSC was not included). The assessments were completed by personnel from the Iowa Department of Natural Resources-Water Quality Bureau (IDNR) and the University of Iowa Hygienic Laboratory (UHL) working in teams of two or more observers.

The habitat assessment was normally completed at the end of the growing season under baseflow conditions. Procedures involved measuring and observing instream and streamside habitat variables at a series of ten regularly spaced, cross-sectional transects within approximately 100 feet. The 100-foot stream reach included two or three sets of pools and riffles. The sampling procedures used are described in Habitat Evaluation Data Collection Procedures (Iowa DNR, 1991), a document prepared by the IDNR-Water Quality Bureau for standardization of coldwater stream data collection procedures in Iowa. Observational methods were patterned after those described by Hamilton and Bergersen (1984), Platts and others (1983), and others (Lyons, 1990; Ohio EPA, 1989; Pajak, 1987; Rankin, 1989; Simonson and Kaminski, 1990). Examples of the habitat evaluation field sheets can be found in Wilton (1994).

Annual habitat assessments have detected changes in habitat characteristics that resulted from activities, such as channel alterations, that directly impacted the immediate area of stream evaluated (Wilton, 1998). Several small sections of streambank in Sny Magill have been altered since 1995 to slow streambank erosion. In 1995, approximately 500 feet of streambank was graded between SN1 and SN2 to facilitate the installation of live plants and rip-rap was placed along the stream channel to prevent erosion. To stabilize an eroding streambank with warm season grasses, 225 feet of streambank were graded between SN2 and SN3 in July 1996. To create a handicapped accessible fishing area in Sept. 1996, the streambank at SN2 was graded and planted

Table 21. Index of biotic integrity scores and ratings for Sny Magill, North Cedar, and Bloody Run creeks (water years 1992 through 1998) calculated using the IBI of Mundahl and Simon (1999). Scores from Appendix B.

	1992	1993	1994	1995	1996	1997	1998
Sny Magill Creek #1							
IBI Score	30	15	5	(a)	20	(a)	(a)
Integrity Rating	Poor	Poor	Very Poor	(a)	Poor	(a)	(a)
Sny Magill Creek #2							
IBI Score	30	10	15	(a)	35	15	(a)
Integrity Rating	Poor	Poor	Poor	(a)	Fair	Poor	(a)
Sny Magill Creek #3							
IBI Score	25	30	20	(a)	55	5	15
Integrity Rating	Poor	Poor	Poor	(a)	Fair	Very Poor	Poor
Sny Magill Creek #4							
IBI Score	30	15	10	(a)	35	20	15
Integrity Rating	Poor	Poor	Poor	(a)	Fair	Poor	Poor
North Cedar Creek							
IBI Score	30	25	50	(a)	(a)	(a)	40
Integrity Rating	Poor	Poor	Fair	(a)	(a)	(a)	Fair
Bloody Run Creek							
IBI Score	60	35	60	70	70	60	40
Integrity Rating	Fair	Fair	Fair	Good	Good	Fair	Fair

(a) Fish numbers were less than 25, therefore, an IBI was not calculated.

with trees and shrubs, and rip-rap, gabion baskets, and bank hides were used along the stream channel to prevent further erosion.

Results from previous habitat evaluations conducted for Sny Magill and Bloody Run watersheds are summarized in Wilton (1994), Seigley and others (1994), and Seigley and others (1996).

Water Year 1995

Aquatic habitat assessments were completed September 18-19, 1995. The aquatic habitat data for Water Year 1995 is summarized in Appendix C.

Substrate and Instream Cover

The percentages of course substrate (sediment larger than sand size) were similar to percentages reported in 1994. The average amount of coarse substrate was 82% coarse substrate at the Sny Magill tributary sites, 62% at the main stem Sny Magill sites, and 47% at the Bloody Run sites. Site SN1 had the lowest percentage of coarse substrate at 28%. Site SN3 had the highest percentage of coarse substrate at 94%.

As indicated by the average embeddedness rating, the amount of fine sediment that surrounds coarse substrate decreased from the previous year at all sites except for SN2 and SNT. (See Appendix C for an explanation of the average embeddedness rating scale). The average embeddedness rating decreased to 2.4 for the sites on the main stem of Sny Magill, remained at 1.8 for Sny Magill tributaries, and decreased to 2.7 for the sites on Bloody Run. Site SNWF had the least amount of fines surrounding coarse substrate (average embeddedness rating of 1.3). Sites SN2 and BR1 had greatest amount of fines surrounding coarse substrate (average embeddedness rating of 3.0).

Pools and overhanging vegetation were the dominant cover type in both watersheds. The average instream cover was 4% at the Sny Magill tributary sites, 17% at the main stem Sny Magill sites, and 18% at the Bloody Run sites. Site SN1 had the highest percentage of instream cover (40%), and was mostly pool habitat. Site SNT had the lowest percentage of instream cover (<5%), and was dominated by overhanging vegetation.

Channel Morphology

The percentage of scoured substrate remained low, 5% or less at all sites. Sites SN3 and SNT had the highest amount of scoured substrate at 5%. The rest of the sites had <5% scoured substrate.

Silt deposition averaged 43% for the main stem Sny Magill sites, 53% for the Bloody Run sites, and 11% for the Sny Magill tributaries. The average for the main stem Sny Magill increased from the previous year as a result of increased silt deposition at both SN1 and SN2. SN3 and NCC had a reduction of 15% in the amount of silt deposition. The sites with the largest watersheds had the greatest amount of silt deposition; silt deposition was 80% at SN1 and 70% at BR1. Site SNWF, which drains the smallest watershed, had the least amount of silt deposition at <5%.

Water Year 1996

Aquatic habitat assessments were completed October 1-2, 1996. The aquatic habitat data for Water Year 1996 is summarized in Appendix C.

Substrate and Instream Cover

The percentages of coarse substrate (sediment larger than sand size) decreased from 1995. The average amount of coarse substrate was 72% coarse substrate at the Sny Magill tributary sites, 52% at the main stem Sny Magill sites, and 32% at the Bloody Run sites. Site BR1 had the lowest percentage of coarse substrate at 16%. Site SNT had the highest percentage of coarse substrate at 77%.

As indicated by the average embeddedness rating, the amount of fine sediment that surrounds coarse substrate decreased or remained the same from the previous year for sites in the Sny Magill watershed. The average embeddedness rating decreased to 2.2 for the sites on the main stem of Sny Magill, decreased to 1.6 for Sny Magill tributaries, and increased to 2.9 for the sites on Bloody Run. The increase in the average embeddedness rating for the Bloody Run sites can be attributed to a 12% increase in the amount of fines at site BR1. Site SNWF had the least amount of fines surrounding coarse substrate (average embeddedness rating of 1.3), while site BR1 had greatest amount of fines surrounding coarse substrate (average embeddedness rating of 3.8).

Pools and overhanging vegetation were the dominant cover type for most sites in both watersheds. The average instream cover was 4% as the Sny Magill tributary sites, 15% at main stem Sny Magill sites, and 13% at the Bloody Run sites. Site SN1 had the highest percentage of instream cover (30%), and was mostly pool habitat. Site NCC had the lowest percentage of instream cover <5%, and was dominated by overhanging vegetation. Woody debris was the dominant cover type for SNWF.

Channel Morphology

The percentage of scoured substrate remained low, <5%, at all sites. Sites SN3 and SNT had a decrease from 1995 in the amount of scoured substrate. The rest of the sites remained at <5% scoured substrate.

Increased silt deposition in the Sny Magill tributaries caused the overall average percentage of silt deposition to increase. Silt deposition averaged 52% for the main stem Sny Magill sites, 23% for the Sny Magill tributaries, and 73% for the Bloody Run sites. Two of the Sny Magill tributaries and site SN3 (the uppermost site on the mainstem of Sny Magill) had significant increases from 1995 in silt deposition. Silt deposition increased 10% at NCC, 25% at SNWF, and 35% at SN3. Only at SN2 did the amount of silt deposition decrease, from 45% to 30%. The sites with the largest watersheds had the greatest amount of silt deposition; silt deposition was 80% at SN1 and 70% at BR1. Site SNT had the least amount of silt deposition at 15%.

Water Year 1997

Aquatic habitat assessments were completed September 30, 1997. The aquatic habitat data for Water Year 1997 is summarized in Appendix C.

Substrate and Instream Cover

The percentages of coarse substrate (sediment larger than sand size) increased from 1996. The average amount of coarse substrate was 76% coarse substrate at the Sny Magill tributary sites, 62% at the main stem Sny Magill sites, and 46% at the Bloody Run sites. Site BR1 had the lowest percentage of coarse substrate at 28%. Site SNT had the highest percentage of coarse substrate at 92%.

As indicated by the average embeddedness rating, the amount of fine sediment that surrounds coarse substrate only increased from 1996 on the Sny Magill tributaries. The average embeddedness rating decreased to 1.6 for the sites on the main stem of Sny Magill, increased to 2.3 for Sny Magill tributaries, and decreased to 2.6 for the sites on Bloody Run. Site SN1 had the least amount of fines surrounding coarse substrate (average embeddedness rating of 1.3). Site BR1 had greatest amount of fines surrounding coarse substrate (average embeddedness rating of 3.0).

Pools were the dominant cover type for most sites in both watersheds. The exceptions were NCC, which was dominated by overhanging vegetation, and SN3, which was dominated by an undercut bank. The average instream cover was 1% at the Sny Magill tributary sites, 14% at the main stem Sny Magill sites, and 15% at the Bloody Run sites. Site SN1 had the highest percentage of instream cover (25%), and was mostly pool habitat. Neither SNWF nor SNT had any instream cover.

Channel Morphology

The percentage of scoured substrate remained low at 5% or less for all sites. Site SNT had the highest amount of scoured substrate at 5%. All the sites on the main stem of Sny Magill and site BR1 were void of scoured substrate.

Silt deposition averaged 60% for the main stem Sny Magill sites, 42% for the Sny Magill tributaries, and 65% for the Bloody Run sites. The average amount of silt deposition decreased from 1996 in the Bloody Run watershed as a result of a 15% reduction in silt deposition at BR1. The Sny Magill tributaries had significant increases in silt deposition. Silt deposition increased from 1996 by 10% at SNWF, 20% at SNT, and 25% at NCC. Site SN1 had the greatest amount of silt deposition at 80%. Sites SNT and SN3 had the least amount of silt deposition at 35% each.

Water Year 1998

Aquatic habitat assessments were completed on Sept 28-29, 1998. The aquatic habitat data for Water Year 1998 is summarized in Appendix C.

Substrate and Instream Cover

The percentages of coarse substrate (sediment larger than sand size) increased from 1997 for sites BR1, BR2, and SNWF. The average amount of coarse substrate was 74% coarse substrate at the Sny Magill tributary sites, 61% at the main stem Sny Magill sites, and 54% at the Bloody Run sites. Site SN1 had the lowest percentage of coarse substrate at 30%. Site SNT had the highest percentage of coarse substrate at 78%.

As indicated by the average embeddedness rating, the amount of fine sediment that surrounds coarse substrate increased from the previous year at all sites except for BR1 and SNT. The average embeddedness rating increased to 2.5 for the sites on the main stem of Sny Magill, increased to 2.5 for Sny Magill tributaries, and increased to 2.7 for the sites on Bloody Run. Sites SN1 and BR1 had the least amount of fines surrounding coarse substrate (average embeddedness rating of 2.0). Site BR2 had the greatest amount of fines surrounding coarse substrate (average embeddedness rating of 3.4).

Pools were the dominant cover type for most sites in both watersheds. The average instream cover was 3% at the Sny Magill tributaries sites, 5% at the main stem Sny Magill sites, and 13% at the Bloody Run sites. Site BR2 had the highest percentage of instream cover (15%), and dominated by pool habitat. Neither SN3 nor SNT had any instream cover.

Channel Morphology

The percentage of scoured substrate remained low, 5% or less at all sites. Site SNT had the highest amount of scoured substrate at 5%, while SNWF had <5% scoured substrate. The rest of the sites were void of scoured substrate.

Silt deposition averaged 45% for the main stem Sny Magill sites, 23% for the Sny Magill tributaries, and 55% for the Bloody Run sites. All of the Sny Magill tributaries and the upstream sites on the main stems of each river had significant decreases from 1997 in the amount of silt deposition. Most notable are a 30% reduction at SN2 and a 25% reduction at SNWF. Only BR1 experienced an increase in silt deposition from 1997 to 1998. Site SN1 had the greatest amount of silt deposition at 80%. Site SNWF had the least amount of silt deposition at 15%.

Habitat Similarity Analysis

The aquatic habitat characteristics were compared using a simple ranking process and habitat similarity index. The purpose of the comparison was to look for patterns in habitat characteristics among monitoring sites.

Twelve habitat variables were chosen for the comparative analysis (Table 22). Six of the variables are related to instream habitat or channel morphology, four are substrate-related variables, and two are streambank or riparian variables. Values were listed from highest to lowest for each habitat variable (Appendix D). Average values were used for sites where replicate evaluations were completed.

The data for each of the twelve habitat variables were separated into high, medium, or low value categories using the following procedure:

(1) highest value was assigned to the high category.
(2) lowest value was assigned to the low category.
(3) the two values bracketing the median were assigned to the medium category.
(4) remaining values were assigned to the high, medium, or low category depending on whether the value was closest to the high, median, or low value.

The results of the ranking process are listed in Appendix E.

A simple index was used to quantify habitat similarity among sampling sites. The similarity index value for any given site combination is equal to the number of habitat variable data pairs that were assigned to the same category (high, medium, or low value) divided by the total number of habitat variables compared (twelve). Index values may range from 0.0 - 1.0. For example, if all twelve habitat variable data pairs were assigned to matching categories, the index value for that site comparison would be 1.0 (12/12). If half of the data pairs matched, the index value would be 0.50 (6/12). Index values $\geq$ 0.50 suggest relatively good habitat similarity, while lower values suggest poorer habitat similarity.

Tables 23, 24, 25, and 26 contain the matrix of similarity index values and a summary of the best and worst site matches for water years 1995 through 1998, respectively. Except for Water Year

Table 22. Habitat assessment variables used to calculate the habitat similarity index.

Habitat variables related to instream habitat or channel morphology	
CVR	% of stream reach area providing instream cover.
FLW	Stream flow (cubic meters per second).
POL	% of stream reach area consisting of pool habitat.
RRT	Riffle repeat frequency (expressed as a multiple of average stream width).
TWD	Thalweg depth (average maximum depth in meters).
WDP	Ratio of average stream width to average stream depth.
Habitat variables related to substrate	
CBL	% of stream bottom area consisting of cobble substrate.
EMB	Average rating of coarse substrate embeddedness in riffles and runs.
FIN	% of stream bottom area consisting of fine particle (sand, silt, clay) substrates.
SDP	% of stream bottom area affected by silt deposition.
Streambank or riparian variables	
SER	Average rating of eroding/unstable streambank area.
SHD	Average stream shading rating

1997, monitoring sites with similar drainage size showed greater habitat similarity to each other than to other sites, confirming a trend initially identified by Wilton (1994). Based on a simple comparison of index values, the two monitoring sites with the largest drainage area (BR1, SN1) share greater habitat similarity to each other than to sites of smaller drainage area. Likewise, monitoring sites with the smaller drainage basins (SNT, SNWF) have more in common with each other than with any of the other sites. The pattern also holds true for monitoring sites with intermediate-size drainage area (SN2, BR2, SN3, NCC).

The trend identified by Wilton (1994) may be partially related to stream gradient. In general, sites located in stream segments of comparatively steep channel slope (i.e., SNT, SNWF, NCC, SN3) tend to have lower values for the following habitat variables compared to sites of more moderate gradient: average depth, distance between riffles, fine-size substrate, instream cover, pool habitat, flow, and silt deposition. These same sites tend to have higher values for the shading and cobble substrate variables.

The relationship between drainage area and habitat similarity failed in Water Year 1997. As indicated by an index value of <0.5, a poor habitat similarity exists between sites SN1 and BR1 (sites with the largest drainage area). Additionally, some of the monitoring sites with intermediate-size drainage areas have high habitat similarity indexes with monitoring sites of the smallest drainage area). A possible explanation for this anomaly is the differences in discharge and sediment loads carried by the streams during Water Year 1997; Bloody Run had a significantly higher discharge and sediment load in 1997 compared to Sny Magill.

One of the original goals of the habitat assessment was to determine if there were any trends related to implementation of the land treatment changes. The annual habitat assessment is appropriate for characterizing habitat but the frequency of the assessment would need to be

Table 23. Matrix of habitat similarity indices* and summary of best and worst (most and least similar) site matches for Water Year 1995.

Site	BR1 (34.1**)							
SN1	0.58	SN1 (27.6)						
BR2	0.33	0.08	BR2 (24.5)					
SN2	0.33	0.17	0.67	SN2 (22.5)				
SN3	0.25	0.08	0.58	0.50	SN3 (7.2)			
NCC	0.33	0.17	0.75	0.67	0.42	NCC (6.0)		
SNT	0.17	0.08	0.33	0.25	0.17	0.42	SNT (3.2)	
SNWF	0.33	0.17	0.25	0.33	0.42	0.50	0.50	SNWF (3.1)

* Similarity index=total number of habitat variable rankings (high, medium, or low value) in common (from Appendix E) divided by the total number of variables (12). Index values may range from 0.0 - 1.0.

** Drainage area above monitoring site (square miles).

Summary

Site	Best match	Similarity index	Common variables	Worst match	Similarity index
BR2	NCC	0.75	CBL,CVR,EMB,FIN,FLW,POL,RRT,SDP,TWD	SN1	0.08
BR1	SN1	0.58	CBL,EMB,FIN,SDP,SHD,TWP,WDP	SNT	0.17
SN3	BR2	0.58	CBL,CVR,FLW,RRT,SER,SHD,TWD	SN1	0.08
SNWF	NCC	0.50	CVR,FIN,RRT,SER,SHD,WDP	SN1	0.17
SNWF	SNT	0.50	CVR,FIN,POL,SHD,TWD,WDP	SN1	0.17
NCC	BR2	0.75	CBL,CVR,EMB,FIN,FLW,POL,RRT,SDP,TWD	SN1	0.17
SNT	SNWF	0.50	CVR,FIN,POL,SHD,TWD,WDP	SN1	0.08
SN2	BR2	0.67	CVR,FIN,FLW,POL,RRT,SDP,SHD,TWD	SN1	0.17
SN2	NCC	0.67	CVR,FIN,FLW,POL,RRT,SDP,SER,TWD	SN1	0.17
SN1	BR1	0.58	CBL,EMB,FIN,SDP,SHD,TWP,WDP	BR2,SN3,SNT	0.08

increased to monitor year-to-year trends attributable to land treatment changes.

BENTHIC BIOMONITORING RESULTS

Personnel from the University of Iowa Hygienic Laboratory completed benthic macroinvertebrate monitoring of Sny Magill and Bloody Run creeks. Samples were collected from eight sites (Figure 1; benthic macroinvertebrate monitoring was not completed at site BRSC). Benthic macroinvertebrate samples were collected from Sny Magill and Bloody Run creeks in April, June, August, and October during 1995 through 1998 using a Modified Hess bottom sampler with a 505 µm mesh netting. Samples were collected in triplicate at each location. All samples were fixed in a 10% formalin solution and returned to the laboratory. Physical and chemical data, including stream discharge, periphyton colonization estimates, temperature, pH, and dissolved oxygen measurements, were taken and recorded at all

Table 24. Matrix of habitat similarity indices* and a summary of best and worst (most and least similar) site matches for Water Year 1996.

Site	BR1 (34.1**)							
SN1	0.58	SN1 (27.6)						
BR2	0.17	0.42	BR2 (24.5)					
SN2	0.25	0.25	0.58	SN2 (22.5)				
SN3	0.17	0.08	0.50	0.67	SN3 (7.2)			
NCC	0.25	0.17	0.42	0.58	0.42	NCC (6.0)		
SNT	0.17	0.25	0.25	0.33	0.17	0.33	SNT (3.2)	
SNWF	0.25	0.08	0.33	0.42	0.58	0.67	0.50	SNWF (3.1)

* Similarity index=total number of habitat variable rankings (high, medium, or low value) in common (from Appendix E) divided by the total number of variables (12). Index values may range from 0.0 - 1.0.

** Drainage area above monitoring site (square miles).

Summary

Site	Best match	Similarity index	Common variables	Worst match	Similarity index
BR2	SN2	0.58	CVR,EMB,FIN,FLW,RRT,SHD,TWD	BR1,SN1,SNT	0.25
BR1	SN1	0.58	CBL,FIN,RRT,SDP,SHD,TWD,WDP	BR2,SN3,SNT	0.17
SN3	SN2	0.67	CVR,FIN,FLW,POL,RRT,SDP,SER,SHD	SN1	0.08
SNWF	NCC	0.67	CBL,FIN,FLW,RRT,SDP,SER,SHD,WDP	SN1	0.08
NCC	SNWF	0.67	CBL,FIN,FLW,RRT,SDP,SER,SHD,WDP	SN1	0.17
SNT	SNWF	0.50	CVR,FLW,POL,SHD,TWD,WDP	BR1,SN3	0.17
SN2	SN3	0.67	CVR,FIN,FLW,POL,RRT,SDP,SER,SHD	BR1,SN1,SNWF	0.25
SN1	BR1	0.58	CBL,FIN,RRT,SDP,SHD,TWD,WDP	SN3,SNWF	0.08

sites on each sampling date (see Schueller and others, 1996; Schueller and Birmingham, 1998; Schueller and Birmingham, 1999; and Birmingham and Schueller, 2000).

In the lab, samples were washed and preserved in a 70% ethanol solution. A randomly selected 100-count subsample was removed from each sample as described in EPA Rapid Bioassessment Protocol III (Plafkin and others, 1989). Organisms in each subsample were identified to the lowest possible taxon. Questionable organisms were either verified through comparison with confirmed specimens in The University Hygienic Laboratory Limnology Section reference collection or sent to an independent taxonomic expert for verification.

To evaluate trends in the benthic population, the following metrics were calculated for all eight sites (Table 27 provides a description of the metrics): the Hilsenhoff Biotic Index (HBI), taxa richness, the EPT index, and the percent dominant taxon. The HBI measures the overall pollution tolerance of a benthic community. HBI values

Table 25. Matrix of habitat similarity indices* and summary of best and worst (most and least similar) site matches for Water Year 1997.

Site	BR1 (34.1**)							
SN1	0.42	SN1 (27.6)						
BR2	0.33	0.33	BR2 (24.5)					
SN2	0.25	0.42	0.42	SN2 (22.5)				
SN3	0.08	0.08	0.33	0.33	SN3 (7.2)			
NCC	0.33	0.17	0.67	0.67	0.42	NCC (6.0)		
SNT	0.17	0.00	0.08	0.08	0.42	0.00	SNT (3.2)	
SNWF	0.08	0.17	0.50	0.25	0.67	0.33	0.58	SNWF (3.1)

* Similarity index=total number of habitat variable rankings (high, medium, or low value) in common (from Appendix E) divided by the total number of variables (12). Index values may range from 0.0 - 1.0.

** Drainage area above monitoring site (square miles).

Summary

Site	Best match	Similarity index	Common variables	Worst match	Similarity index
BR2	NCC	0.67	CBL,EMB,FIN,FLW,POL,RRT,SDP,TWD	BR1	0.17
BR1	SN1	0.42	FIN,FLW,RRT,SHD,TWD	SN3,SNWF	0.08
SN3	SNWF	0.67	EMB,FIN,FLW,POL,RRT,SDP,SER,TWD	BR1,SN1	0.08
SNWF	SN3	0.67	EMB,FIN,FLW,POL,RRT,SDP,SER,TWD	BR1	0.08
NCC	BR2	0.67	CBL,EMB,FIN,FLW,POL,RRT,SDP,TWD	SNT	0.00
NCC	SN2	0.67	CBL,CVR,FIN,FLW,RRT,SDP,SHD,WDP	SNT	0.00
SNT	SNWF	0.58	CVR,POL,RRT,SDP,SHD,TWD,WDP	SN1,NCC	0.00
SN2	NCC	0.67	CBL,CVR,FIN,FLW,RRT,SDP,SHD,WDP		
SN1	BR1	0.42	FIN,FLW,RRT,SHD,TWD	SNT	0.00
SN1	SN2	0.42	CBL,EMB,POL,TWD,WDP	SNT	0.00

range from zero to five and increase as water quality decreases (see Table 28 for the ratings). Taxa richness is a direct measurement of the number of distinct taxa present in a sample. Taxa richness values generally increase with increasing water quality, habitat diversity, and/or habitat suitability. EPT Index values measure the more pollution sensitive insect orders of mayfly, stonefly, and caddisfly (Ephemeroptera, Plecoptera, and Trichoptera, respectively). The EPT Index generally increases with increasing water quality. The percent dominant taxon is a measure of the percent contribution of the numerically dominant taxon to the total population sampled and is a reflection of community evenness and redundancy. A high proportion of dominant taxon (>40%) may be indicative of impairment of water quality.

Previous summaries of benthic biomonitoring in the Sny Magill and Bloody Run watersheds include historical biological data from both watersheds (Birmingham and Kennedy, 1994), data from the 1991 baseline monitoring for the Sny

Table 26. Matrix of habitat similarity indices* and summary of best and worst (most and least similar) site matches for Water Year 1998.

Site	BR1 (34.1**)							
SN1	0.83	SN1 (27.6)						
BR2	0.25	0.08	BR2 (24.5)					
SN2	0.25	0.08	0.67	SN2 (22.5)				
SN3	0.00	0.00	0.42	0.50	SN3 (7.2)			
NCC	0.17	0.17	0.42	0.67	0.25	NCC (6.0)		
SNT	0.08	0.08	0.25	0.17	0.50	0.33	SNT (3.2)	
SNWF	0.08	0.08	0.33	0.42	0.25	0.75	0.33	SNWF (3.1)

* Similarity index=total number of habitat variable rankings (high, medium, or low value) in common (from Appendix E) divided by the total number of variables (12). Index values may range from 0.0 - 1.0.

** Drainage area above monitoring site (square miles).

Summary

Site	Best match	Similarity index	Common variables	Worst match	Similarity index
BR2	SN2	0.67	CVR,FIN,FLW,POL,RRT,SDP,SHD,TWD	SN1	0.08
BR1	SN1	0.83	CBL,EMB,FIN,FLW,RRT,SDP,SER,SHD,TWD,WDP	SN3	0.00
SN3	SN2	0.50	EMB,FIN,FLW,RRT,SHD,WDP	BR1,SN1	0.00
SN3	SNT	0.50	CBL,CVR,EMB,POL,TWD,SER	BR1,SN1	0.00
SNWF	NCC	0.75	CBL,CVR,FIN,FLW,EMB,POL,RRT,TWD,WDP	BR1,SN1	0.08
NCC	SNWF	0.75	CBL,CVR,FIN,FLW,EMB,POL,RRT,TWD,WDP	BR1,SN1	0.17
SNT	SN3	0.50	CBL,CVR,EMB,POL,TWD,SER	BR1,SN1	0.08
SN2	BR2	0.67	CVR,FIN,FLW,POL,RRT,SDP,SHD,TWD	SN1	0.08
SN2	NCC	0.67	CBL,EMB,POL,RRT,SDP,SER,SHD,TWD	SN1	0.08
SN1	BR1	0.83	CBL,EMB,FIN,FLW,RRT,SDP,SER,SHD,TWD,WDP	SN3	0.00

Magill Nonpoint Source Pollution Monitoring Project (Schueller and others, 1992), and benthic results from water years 1992 (Schueller and others, 1993), 1993 (Schueller and others, 1994), and 1994 (Birmingham and others, 1995).

The results presented below for water years 1995 through 1998 are summaries from Schueller and others (1996), Schueller and Birmingham (1997), Schueller and Birmingham (1999), and Birmingham and Schueller (2000).

Water Year 1995

During Water Year 1995, a total of 57 benthic macroinvertebrate taxa were present in the Sny Magill watershed compared to 37 in the Bloody Run watershed. Figure 4 shows the number of taxa collected per site. The number of taxa declined from 1994 to 1995 at the two Bloody Run sites (BR1 and BR2) and increased at all of the Sny Magill sites except site SNT. The five dominant

Table 27. Explanation of the metrics used for analysis of the benthic macroinvertebrate samples collected from the Sny Magill and Bloody Run watersheds.

Taxa Richness
The total number of taxa (genera and/or species) present in a community is a measure of benthic community health. The number of taxa generally increases with increasing habitat diversity, habitat suitability, and improving water quality.

Hilsenhoff Biotic Index (HBI)
The HBI measures the overall pollution tolerance of a benthic community, and generally indicates organic pollution in communities inhabiting rock or gravel riffles. Tolerance values are assigned to each taxa collected and range from zero to five. A zero value is given to taxa collected in unaltered streams of very high water quality, and a value of five is given to taxa known to inhabit severely polluted or disturbed streams. The number of individuals of each taxon is multiplied by the tolerance value assigned to that taxon and divided by the total number of individuals in the sample. The taxa values are added and the sum is the HBI. The HBI value increases as water quality decreases.

EPT Index
The EPT taxa metric is the number of distinct taxa within the generally pollution-sensitive insect orders of Ephemeroptera, Plecoptera, and Trichoptera (mayfly, stonefly, and caddisfly). An increasing value indicates a higher number of EPT taxa and improved water quality.

Percent Dominant Taxon
This metric is a measure of the percent contribution of the numerically dominant taxon to the total number of organisms sampled, and is a reflection of community evenness and redundancy. A high degree of community redundancy, as reflected in a high proportion of the dominant taxa (>40%) may be indicative of impairment.

From Plafkin and others (1989)

taxa in the benthic population were *Certapsyche slossonae, Baetis tricaudatus*, *Optioservus fastiditus*, *Ephemerella inermis/infrequens*, and Chironomidae, which when combined accounted for 59% of the community composition for all sites.

The HBI values and ratings for both watersheds remained nearly the same as in previous years (Table 29). The HBI values decreased for sites SN3 and NCC, remained relatively unchanged for site BR2, and increased for all other sites. Only BR2 had an HBI rating in the “good” category; the rest of the sites had ratings in the “very good” category. The only changes in the rating occurred at sites SNWF and SN2 where an “excellent” rating diminished to a “very good” rating. For combined sites SN1 and SN2, and sites BR1 and BR2, the mean HBI value increased in 1995 (Figure 5). However, the overall rating is still “very good” and there was very little divergence between overall mean HBI values for each stream.

Taxa richness values were consistent with values from the previous years (Table 29). The mean values range from 11.83 at sites SN1 and SNT to 14.58 at site SNWF. The mean values for sites SNWF (14.58) and SN3 (14.42) were the highest taxa richness values to date for those particular sites and are the highest values from the Sny Magill watershed during 1992 through 1997. This was the first time that the mean value for SN1and SN2 was higher than the mean value for BR1 and BR2.

The EPT Index values for 1995 (Table 29) remained relatively unchanged from 1994. Site SNWF, on average, had the highest EPT values, while site SNT had the lowest. Since 1992, the EPT values have increased at every site in the Sny Magill watershed sites, except for site NCC. In contrast, the Bloody Run sites have shown no consistent pattern of improvement or decline since 1992; however, the 1995 values have declined from the 1994 values. In comparing the mean EPT Index values of sites SN1 and SN2 to sites BR1 and BR2, the Sny Magill sites have shown a

Table 28. Water-quality ratings based on Hilsenhoff Biotic Index (HBI) values (from Hilsenhoff, 1982).

Hilsenhoff Biotic Index values	Water quality rating	Degree of Organic Pollution
0.00 - 1.75	Excellent	No organic pollution
1.76 - 2.25	Very Good	Possible slight organic pollution
2.26 - 2.75	Good	Some organic pollution
2.76 - 3.50	Fair	Significant organic pollution
3.51 - 4.25	Poor	Very significant organic pollution
4.26 - 5.00	Very Poor	Severe organic pollution

steady increase in the more pollution sensitive insect taxa (Figure 5) during the monitoring period.

The percent dominant taxon results illustrate that no one specific taxon comprises more than 50% of the benthic community (Table 29). One taxon comprised more than 40% of the benthic population at sites BR2, SNT, and NCC. Additionally, the percent dominant taxa for site BR2 has steadily increased since 1992. Sites SN1, SN2, and SN3 (main stem sites of Sny Magill) have shown a consistent decline in percent dominant taxa since monitoring began. The combined mean percent dominant taxa for sites BR1 and BR2 have remained relatively the same while declining for sites SN1 and SN2 (Figure 5).

Water Year 1996

During Water Year 1996, a total of 52 benthic macroinvertebrate taxa were present in the Sny Magill watershed compared to 37 in the Bloody Run watershed. Figure 4 shows the number of taxa collected per site. From 1995 to 1996, the number of taxa declined or remained the same for all sites except SNT. The decline likely reflects normal variation in benthic population with year-to-year sampling. Additionally, these declines were not substantial except for site SN3 where 14 fewer taxa were recorded. *Ceratopsyche slossonae* (caddisfly), *Baetis tricaudatus* (mayfly), *Ephemerella inermis/infrequens* (mayfly), *Optioservus fastiditus* (beetle), and Chironomidae (midge) continued to dominate the benthic populations of both streams and accounted for 63% of the community composition.

For most sites, the HBI values and ratings for both watersheds remained nearly the same as in previous years (Table 29). The HBI values for the two sites on Bloody Run Creek were rated "good" (site BR2) to "very good" (site BR1). The water quality of Sny Magill Creek and its tributaries rated "good" (site SN1) to "excellent" (site NCC). The water-quality rating only changed for NCC and SN1. NCC obtained an "excellent" rating, although the 1.73 value represents little change from the 1.85 value recorded in 1995. The most notable change was at SN1, where the value increased from 2.19 to 2.39, and the rating changed to "good."

Like 1995, taxa richness values were similar to previous years (Table 29). The taxa richness values ranged from 12.33 to 12.58 for Bloody Run Creek and from 12.50 to 13.75 for sites in the Sny Magill watershed. Consistent with the HBI results, the individual and combined site values remained relatively stable from 1995 to 1996.

The EPT Index values increased from 1995 to 1996 for all sites except SNWF (Table 29). The 1996 EPT Index values for sites SN1, SN2, SN3, and SNT were the highest reported since monitoring began in 1992. On the three main stem sites in Sny Magill, the EPT Index values have steadily increased since 1992. Even though the EPT Index values increased from 1995, a similar long-term trend is not apparent in the Bloody Run sites.

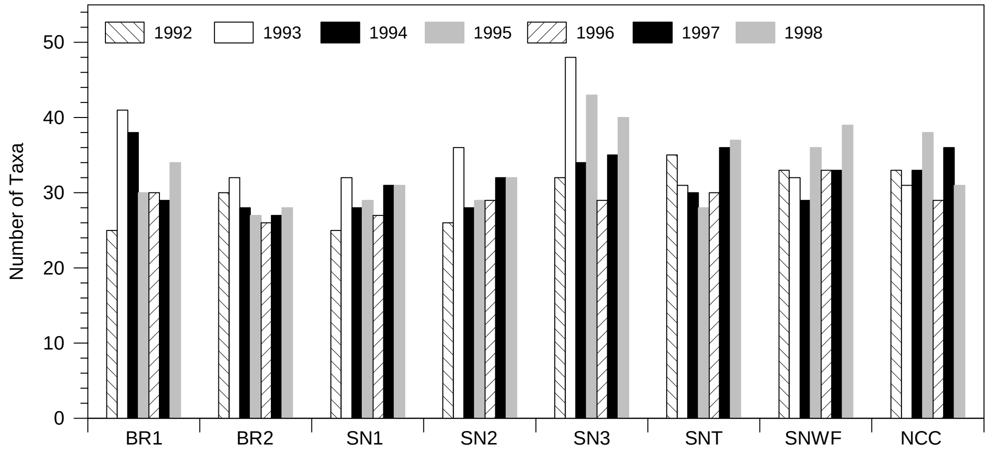


Figure 4. Comparison of the total number of benthic taxa collected per site from the Sny Magill and Bloody Run watersheds, 1992 through 1998 (modified from Birmingham and Schueller, 2000).

The percent dominant taxon results show that no one specific taxon comprises the majority of the benthic community (Table 29). Only at BR2 did one taxon comprise more than 40% of the benthic population. The percent dominant taxon metric for the main stem Sny Magill sites has declined through time, suggesting that the benthic macroinvertebrate population of Sny Magill Creek has become more balanced and evenly distributed. A similar trend is not apparent at the Bloody Run Creek sites; the percent dominant taxon values for BR1 have varied through time, while the values have steadily increased for site BR2. The percent dominant taxon metric for the tributary sites to Sny Magill Creek is also varied and does not support a decline through time.

Water Year 1997

During Water Year 1997, a total of 62 benthic macroinvertebrate taxa were present in the Sny Magill watershed compared to 39 in the Bloody Run watershed. Figure 4 shows the number of taxa collected per site. From 1996 to 1997, the number of taxa increased for all sites except SNWF and BR1 (site SNWF remained unchanged while site BR1 declined). Six taxa dominated the benthic population in both streams, including the same five from 1996 with the addition of *Brachycentrus occidentalis* (caddisfly).

The HBI values had minor variations, which caused the water-quality rating to change at several sites (Table 29). The HBI value for BR2 decreased to 2.21, and represented the first time this site had a "very good" water quality rating. HBI values for the three main stem sites in Sny Magill increased, reducing the water quality rating at SN1 and SN3 from "very good" to "good." At NCC, the HBI value increased to 2.11, which reduced the water-quality rating from "excellent" to "very good." The water quality in the other Sny Magill tributaries continues to be rated "very good."

Taxa richness values are similar to previous years (Table 29). The taxa richness values ranged from 8.83 to 12.25 for Bloody Run Creek and from 12.33 to 14.17 for sites in the Sny Magill watershed. BR2's value of 8.83 represents the lowest taxa richness reported for any site during the first six years of monitoring. All increasing from 1996, the Sny Magill tributaries had mean values of 14.0 or greater.

EPT Index values decreased for all sites except for SNWF and SNT (Table 29). The only increase in EPT Index value was at SNWF; site SNT remained unchanged. The taxa richness values ranged from 7.33 to 8.75 for Bloody Run Creek and from 4.92 to 7.00 for sites in the Sny Magill watershed. BR2's value (4.92) represents the

Table 29. Mean (n=12) metric values for benthic macroinvertebrate samples collected in Bloody Run and Sny Magill watersheds from 1992 through 1998.

METRICS	BR1	BR2	SN1	SN2	SN3	SNT	SNWF	NCC
Taxa Richness								
1992	10.4	13.4	10.5	10.4	9.5	13.1	12.3	12.6
1993	14.3	12.4	12.4	13.3	13.6	12.5	13.3	12.3
1994	13.7	12.9	11.5	12.3	12.9	11.3	13.8	12.3
1995	12.7	12.6	11.8	13.9	14.4	11.8	14.6	13.9
1996	12.3	12.6	13.8	12.8	13.6	12.8	12.5	12.7
1997	12.3	8.8	12.8	13.1	12.3	14.2	14.2	14.0
1998	13.7	12.0	13.6	14.7	14.8	14.2	14.3	14.4
HBI (*)								
1992	2.06 (VG)	2.42 (G)	2.24 (VG)	1.99 (VG)	2.58 (G)	2.04 (VG)	2.21 (VG)	2.18 (VG)
1993	2.02 (VG)	2.31 (G)	2.08 (VG)	1.87 (VG)	2.34 (G)	1.97 (VG)	1.80 (VG)	1.90 (VG)
1994	1.88 (VG)	2.45 (G)	2.04 (VG)	1.73 (E)	2.23 (VG)	1.90 (VG)	1.55 (E)	1.93 (VG)
1995	1.99 (VG)	2.44 (G)	2.19 (VG)	1.82 (VG)	2.12 (VG)	2.21 (VG)	1.82 (VG)	1.85 (VG)
1996	2.00 (VG)	2.44 (G)	2.39 (G)	1.94 (VG)	2.16 (VG)	2.22 (VG)	1.86 (VG)	1.73 (E)
1997	1.98 (VG)	2.21 (VG)	2.51 (G)	2.04 (VG)	2.46 (G)	2.21 (VG)	1.85 (VG)	2.11 (VG)
1998	2.00 (VG)	2.62 (G)	2.26 (G)	2.08 (VG)	2.18 (VG)	2.01 (VG)	1.97 (VG)	1.94 (VG)
EPT Index								
1992	6.2	7.5	6.3	6.3	5.3	5.9	7.3	7.3
1993	7.3	6.3	6.3	7.0	8.0	5.8	8.6	8.1
1994	7.5	7.7	6.5	7.2	8.0	6.0	9.4	7.6
1995	6.8	6.8	7.1	7.8	8.2	6.8	9.3	7.6
1996	7.2	7.1	8.2	8.9	8.5	7.3	8.3	7.7
1997	7.0	4.9	7.3	7.8	7.7	7.3	8.8	7.4
1998	6.3	6.4	7.5	7.4	8.0	7.4	8.0	7.7
% Dominant Taxa								
1992	39.7	29.4	49.2	48.6	58.6	35.1	32.3	39.4
1993	45.5	37.2	48.3	42.2	38.6	41.3	38.6	30.1
1994	32.8	40.3	37.0	34.8	36.6	45.6	28.8	27.5
1995	36.0	42.3	28.8	31.1	35.7	44.0	25.8	41.6
1996	36.4	44.6	27.6	32.1	30.8	37.6	31.0	34.3
1997	40.1	58.6	30.6	33.7	41.9	29.1	32.9	28.6
1998	31.6	52.2	37.1	30.9	29.1	35.1	27.3	30.3

* Water quality rating: E = Excellent; VG = Very Good; G = Good.
Modified from Birmingham and Schueller (2000).

lowest taxa richness reported for any site during the first six years of monitoring.

Several sites had percent dominant taxon values above the critical values of 40% (Table 29). Both sites in Bloody Run Creek had values greater than 40%. BR2 had a value of 58.6%, which matches the highest recorded value set in 1992 at SN3 that was calculated shortly after the stream channel had been modified. For site SNT, the 1997 value of 29.08 represents the lowest for this site. During Water Year 1997, site SN3 was the only site in the Sny Magill watershed with a percent dominant taxon value above the "critical" value of 40%.

Water Year 1998

During Water Year 1998, a total of 62 benthic macroinvertebrate taxa were present in the Sny Magill watershed compared to 39 in the Bloody Run watershed. Figure 4 shows the number of taxa collected per site. Total taxa numbers for individual sites in both watersheds were generally

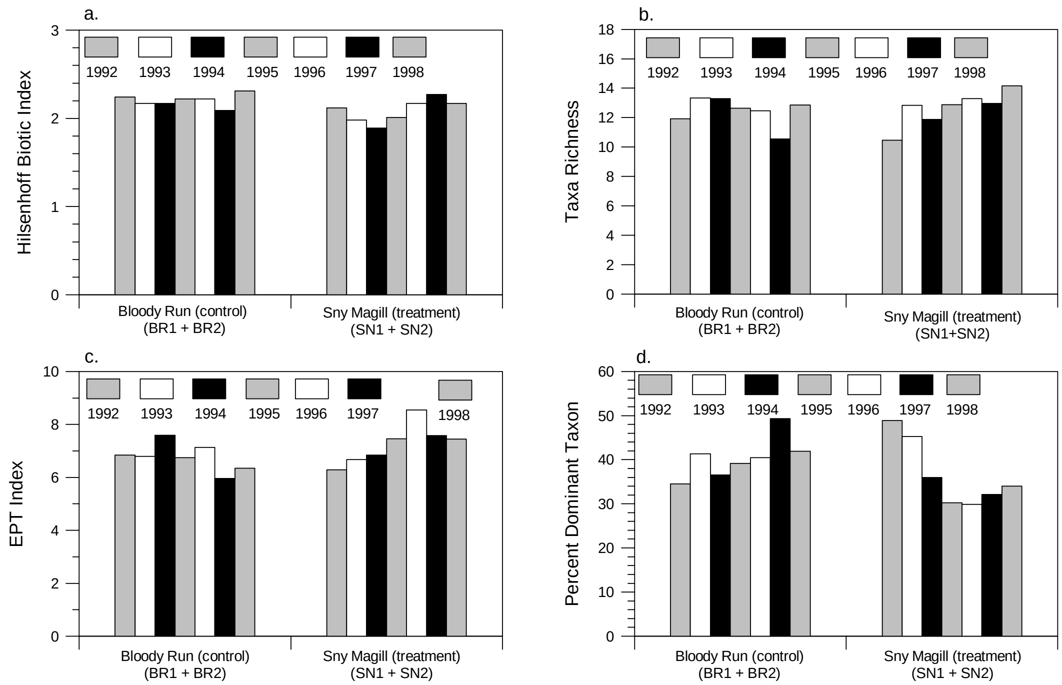


Figure 5. Comparison of the HBI values (a.), the taxa richness (b.), the number of EPT taxa (c.), and the percent dominant taxa (d.) for the combined sites of BR1 and BR2 in the Bloody Run watershed, and the combined sites of SN1 and SN2 in the Sny Magill watershed.

equal to or greater than 1997 values; only site NCC showed a decline. Community composition was similar to previous years with four taxa dominating the benthic macroinvertebrate population: *Baetis tricaudatus* (mayfly), *Ceratopsyche slossonae* (caddisfly), *Optioservus fastiditus* (beetle), and Chironomidae (midge family).

The HBI values and ratings for both watersheds were consistent with previous years (Table 29). Based on the HBI values, water quality from all sites was rated as "very good" with the exception of sites BR2 and SN1, which were rated as "good." The HBI value for SN3 decreased, increasing the rating from "good" to "very good". The HBI value also decreased for SN1, from 2.51 to 2.26, but this did not affect its rating. The largest increase occurred at BR2, where the HBI went from 2.21 to 2.62 and the rating from decreased "very good" to "good." The Sny Magill tributaries still maintained an "excellent" rating.

Taxa richness increased from 1997 to 1998 at all sites (Table 29). The taxa richness values ranged from 12.00 to 12.37 for Bloody Run Creek and from 13.60 to 14.80 for sites in the Sny Magill watershed. In the Sny Magill watershed, all the sites except SN1 had mean values of 14.0 or greater.

Remaining generally within the ranges of previous years, the EPT Index values showed no consistent trend from 1997. EPT values decreased at sites BR1, SN2, and SN3. The largest decrease was at SNWF, whose value changed from 8.75 to 8.00. The remaining sites all had increases. The largest increase was at BR2, which went from 4.92 to 6.40.

For the majority of sites, the percent dominant taxon results show that one specific taxon does not comprise the majority of the benthic community (Table 29). Only at BR2 did one taxon comprised more than 50% of the benthic population. Even though this value is greater than the "critical"

Table 30. Overall metric value rank for benthic macroinvertbrates collected from Sny Magill and Bloody Run watershed during 1992 through 1998.

SITE	1992	1993	1994	1995	1996	1997	1998
BR1	6	4	2	6	7	6	6
BR2	1	6	7	7	8	8	8
SN1	7	8	8	5	3	5	7
SN2	5	3	4	2	2	3	4
SN3	8	5	5	3	1	7	3
SNT	4	7	6	8	6	4	5
SNWF	2	1	1	1	4	1	1
NCC	3	2	3	4	5	2	2

From Birmingham and Schueller (2000).

40%, this is the first year that the percent dominant taxon decreased at BR2. Based on the percent dominant taxa, site BR2 has shown a steady increase in the degree of community redundancy and unevenness of its benthic population, whereas site SN2 has shown a steady decline for the same period of time.

Overall Water Quality

The eight sampling sites were ranked, relative to each other, to provide a more comprehensive evaluation of water quality. For each of the four metrics used (Table 27), each site was ranked from one to eight ("best" to "worst," respectively). Summing the ranks and dividing by the number of metrics determined the average rank for a site. The site with the "best" overall water quality was the site with the lowest average rank. Each metric is given the same weight in the averaging process.

Based on the ranking method, the best overall water quality in either of the watersheds was found at site SNWF in 1995, 1997, and 1998, and at site SN3 during 1996 (Table 30). Site SNWF has consistently had the best ranking of the sites during the monitoring period. Site SNWF ranks best in water quality because a wide range of benthic taxa that have low tolerance for organic pollution consistently inhabit it. A significant portion of the taxa composition at SNWF is comprised of the pollution-sensitive mayflies, stoneflies, and caddisflies (EPT Index), which have low HBI tolerance values in the range of 0-2, or values indicative of good water quality. For most years, sites BR2 and BR1 rank relatively low in terms of water quality, ranking sixth or less since 1995.

Trend Analysis and Discussion

Regression analyses were performed to determine potential water-quality trends during the seven years of monitoring. See Birmingham and Schueller (2000) for a more detailed explanation of the statistical procedures and rationale.

Multiple regressions on means from the control sites (BR1 and BR2) and the treatment sites (SN1 and SN2) indicate trends towards improving water quality. Means from the control sites and the treatment sites were chosen because of their similar position in their respective watersheds and their similar fauna composition. Table 31 summarizes the results of the multiple regressions. For taxa richness, EPT, and percent dominant taxa, the regression results suggest improving water quality. The HBI metric did not show a significant trend through time. Using the control watershed as an independent variable accounted for very little of the variation. Regressions of the Bloody Run data and time showed no significant trend for any of the four metrics.

Further supporting the results of the multiple

Table 31. Results of multiple regressions of mean[1] (n=2) treatment (SN1 + SN2) sites and the variables mean control sites (BR1 + BR2) and time for each bioassessment metric. "Time only" results are from a simple regression[1] of mean (n=2) treatment (SN1 + SN2) sites and time. Modified from Birmingham and Schueller (2000).

Metric	Independent Variable	Coefficient Sign	r^2	significance[2]
	control and time		0.15	NS
HBI	control and time	+		NS
	time	+		NS
	time only	+	0.14	NS
Taxa Richness	control and time		0.47	p=.0004
	control and time	+		NS
	time	+		p=.0001
	time only	+	0.39	p=.0004
	control and time		0.37	p=.0034
EPT	control and time	+		NS
	time	+		p=.0009
	time only	+	0.34	p=.001
	control and time	-	0.53	p=.0001
% Dominant Taxa	control and time	+		NS
	time	+		p<.0001
	time only	-	0.53	p=.00001

[1]28 observations
[2]NS = not significant (p>.05)

Results for simple regressions[1] of combined Sny Magill tributary sites (SN3, SNT, SNWF, NCC) and time for each bioassessment metric.

Metric	Independent Variable	Coefficient Sign	r^2	significance[2]
HBI	time	-	0.005	NS
Taxa Richness	time	+	0.13	p=.00007
EPT	time	+	0.05	p=.021
% Dominant Taxa	time	-	0.07	p=.006

[1]112 observations
[2]NS = not significant (p>.05)

regressions, simple regressions of the combined Sny Magill tributary sites (SN3, SNT, SNWF, and NCC) also indicate trends towards improving water quality. Sites SN3, SNT, SNWF, and NCC were combined since they do not have corresponding counterparts in the Bloody Run watershed for comparison. Table 31 summarizes the results for the simple regressions. For taxa richness, EPT, and percent dominant taxa, the regressions results showed similar trends that suggest improving water quality. Again, the HBI metric did not show a significant trend through time.

STREAM AND SUSPENDED SEDIMENT DISCHARGE

The U.S. Geological Survey collected stream and suspended sediment discharge data from stream gages on Sny Magill and Bloody Run creeks. Stream stage was monitored continually at sites SN1 and BR1, and both creeks were sampled daily for suspended sediment. Monthly stream discharge measurements were made at seven supplemental sites, including several tributaries to Sny Magill Creek and additional sites on the main stem of Sny Magill and Bloody Run creeks (BRSC, BR2, SN3, SNWF, NCC, SNT, and SN2; Figure 1).

The water years 1995, 1996, 1997, and 1998 hydrologic data presented below represents the data reported in May and others (1996, 1997, 1998, and 1999). Stream discharge measurements from the supplemental sites are not included in this report. The reader is referred to May and others (1996, 1997, 1998, and 1999) for this data. Discharge and sediment data for water years 1992 and 1993 can be found in Kalkhoff and Eash (1994), Seigley and others (1994), Southard and others (1993), and Gorman and others (1992). Water Year 1994 data is available in May and others (1995) and Seigley and others (1996).

Based on individual discharge measurements throughout various stages, a stage-discharge relation curve was developed for both Sny Magill and Bloody Run creeks. Continuous records of stream stage were obtained using analog recorders that trace continuous graphs of stage. Stream stage was also recorded by the data collection platforms. By applying the daily mean stage to the stage-discharge curve for each site, daily mean discharges were calculated. For periods when no gage-height record was available, discharge measurements were estimated based on the recorded range in stage and the discharge computed before and after the missing record. Appendix F lists the mean daily discharge measurements for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) for water years 1995 through 1998.

Local observers collected suspended-sediment samples daily at sites SN1 and BR1 (Figure 1). The U.S. Geological Survey sediment laboratory in Iowa City determined suspended-sediment concentrations using standard filtration and evaporation techniques (Guy, 1969). Appendix G lists the daily suspended-sediment concentrations and loads for sites SN1 and BR1 for water years 1995 through 1998.

Water Year 1995

Discharge

Mean daily discharge measurements for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 6. The variability in discharge on a monthly basis for Sny Magill and Bloody Run are illustrated in Figure 7 and Figure 8, respectively.

Sny Magill. The mean daily discharge at site SN1 was 20.2 cfs (0.57 cms). The maximum mean daily discharge (130 cfs; 3.68 cms) occurred on July 27, 1995, and the minimum mean daily discharge (6.8 cfs; 0.19 cms) was recorded January 24 and February 6, 1995. The greatest monthly median discharge was 36 cfs (1.02 cms) in May 1995, and the lowest monthly median discharge was 8.8 cfs (0.25 cms) in January 1995.

Bloody Run. The mean daily discharge at site BR1 was 23.5 cfs (0.67 cms). The maximum mean daily discharge (100 cfs; 2.83 cms) occurred on July 27, 1995, and the minimum mean daily discharge (13 cfs; 0.37 cms) was recorded on several dates: February 9, 15, 17, and 18, 1995. The greatest monthly median discharge was 29 cfs (0.82 cms) in April 1995, and the lowest monthly median discharge was 14 cfs (0.40 cms) in February 1995.

Suspended Sediment

Mean daily suspended-sediment loads for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 6. The variability in monthly sediment loads for sites SN1 and BR1

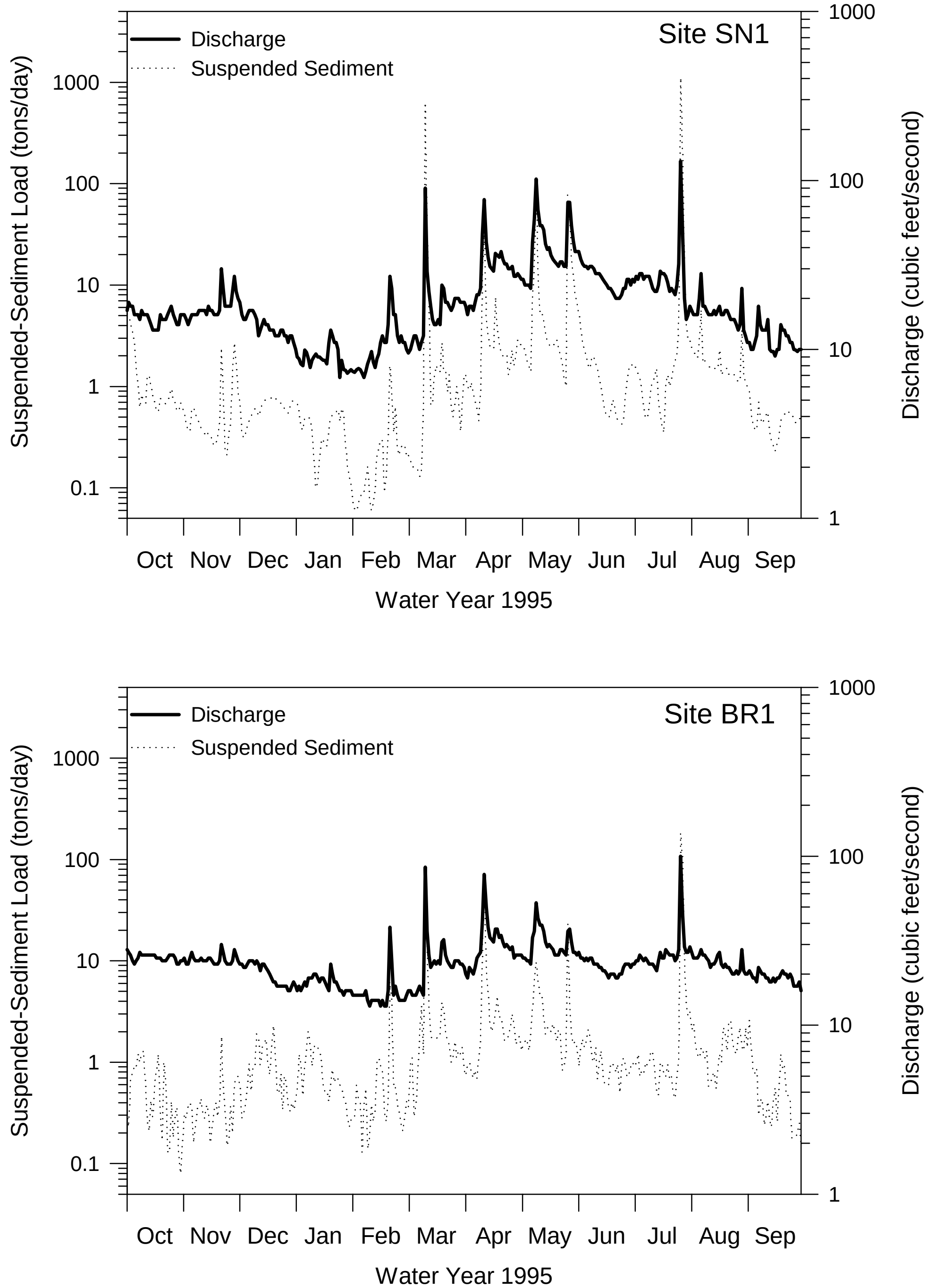


Figure 6. Summary of stream discharge and mean daily suspended-sediment loads for sites SN1 (Sny Magill) and BR1 (Bloody Run) during Water Year 1995.

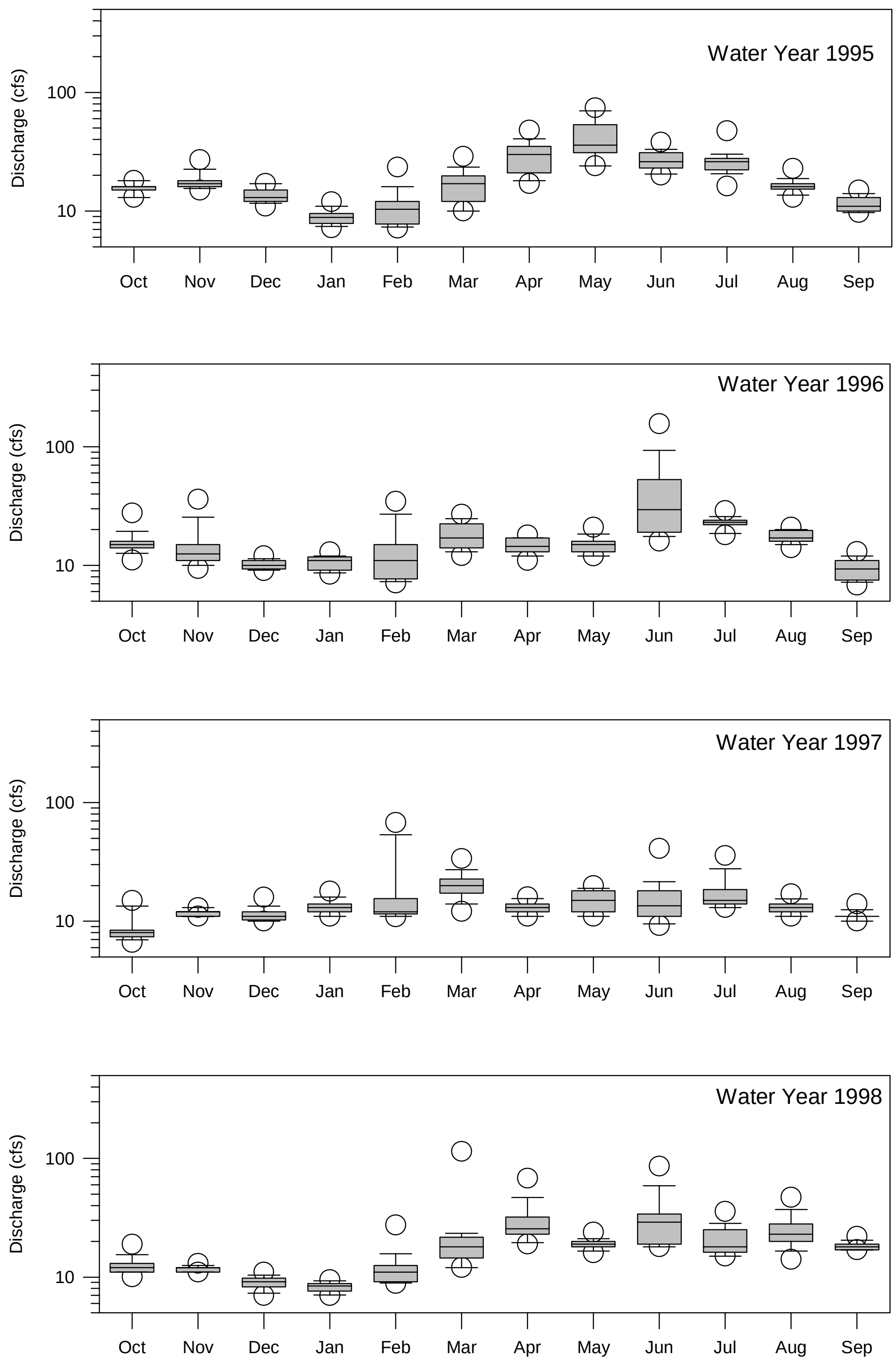


Figure 7. Box plots of discharge on a monthly basis for site SN1 (Sny Magill) for water years 1995 through 1998. Box plots illustrate the 25th, 50th, and 75th percentiles; the whiskers indicate the 10th and 90th percentiles; and the circles represent the 5th and 95th percentiles.

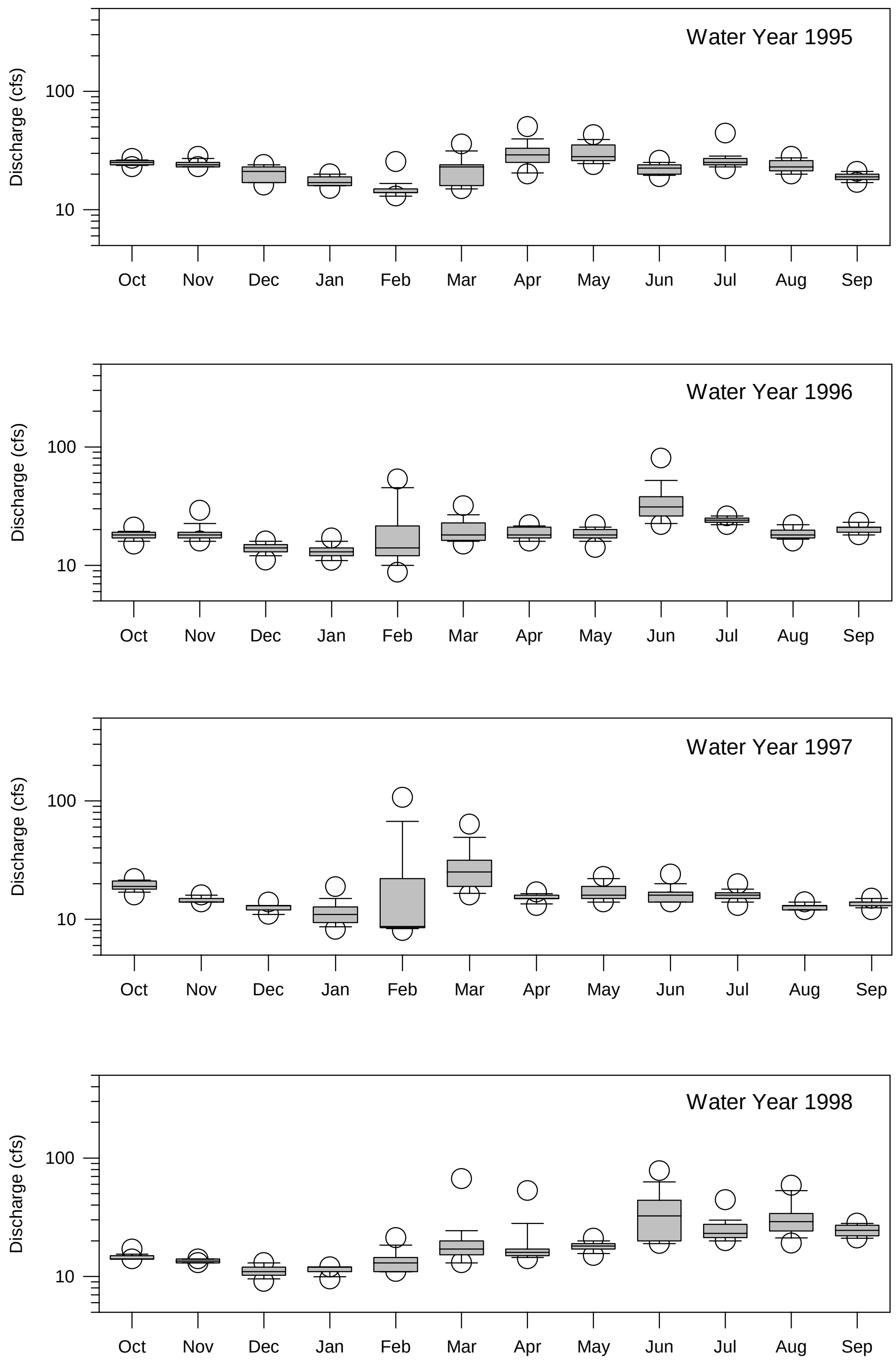


Figure 8. Box plots of discharge on a monthly basis for site BR1 (Bloody Run) for water years 1995 through 1998. Box plots illustrate the 25th, 50th, and 75th percentiles; the whiskers indicate the 10th and 90th percentiles; and the circles represent the 5th and 95th percentiles.

are illustrated in Figure 9 and Figure 10, respectively.

Sny Magill. The maximum daily mean suspended-sediment concentration at site SN1 was 1,440 mg/L on July 28, 1995, and the minimum daily mean suspended-sediment concentration was 2 mg/L on February 10, 1995. The maximum monthly median sediment concentration was 35 mg/L in August 1995, and the minimum was 7 mg/L in February 1995.

The maximum daily suspended-sediment load was 1,110 tons on July 27, 1995, which accounted for 40% of the annual total. The maximum monthly median sediment load was 2.7 tons/day in May 1995, and the minimum was 0.19 tons/day in February 1995.

The total suspended-sediment load at site SN1 was 2,748 tons. This represents an average loss of 100 tons/mi^2, or 0.16 tons/acre, for the drainage area above the gaging station. The maximum monthly discharge of sediment (1,377 tons; 50% of the annual total) occurred in July 1995, and the minimum suspended-sediment load (7 tons; 0.2% of the annual total) occurred in February 1995.

Bloody Run. The maximum daily mean suspended-sediment concentration at site BR1 was 839 mg/L on July 28, 1995, and the minimum daily mean suspended-sediment concentration was 1 mg/L on October 30, 1994. The maximum monthly median sediment concentration was 26 mg/L in March and May 1995, and the minimum was 5 mg/L in November 1994.

The maximum daily suspended-sediment load was 182 tons on July 27, 1995, and accounted for 21% of the annual total. The maximum monthly median sediment load was 1.9 tons/day in both April and May of 1995, and the minimum was 0.35 tons/day in November 1994.

The total suspended-sediment load at site BR1 was 871 tons. This represents an average loss of 26 tons/mi^2, or 0.04 tons/acre, for the drainage area above the gaging station. The greatest monthly discharge of sediment (324 tons; 37% of the annual total) occurred in July 1995, while the minimum monthly suspended-sediment load (12 tons; 1% of the annual total) occurred in November 1994.

Water Year 1996

Discharge

Mean daily discharge measurements for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 11. The variability in discharge on a monthly basis for Sny Magill and Bloody Run are illustrated in Figure 7 and Figure 8, respectfully.

Sny Magill. The mean daily discharge at site SN1 was 17.7 cfs (0.50 cms). The maximum mean daily discharge (260 cfs; 7.36 cms) occurred on June 17, 1996, and the minimum daily discharge (6.3 cfs; 0.18 cms) was recorded on September 30, 1996. The greatest monthly median discharge was 29.5 cfs (0.84 cms) in June 1996, and the lowest monthly median discharge was 9.3 cfs (0.26 cms) in September 1996.

Bloody Run. The mean daily discharge at site BR1 was 20.2 cfs (0.57 cms). The maximum mean daily discharge (89 cfs; 2.52 cms) occurred on January 18 and June 17, 1996, and the minimum daily discharge (8.6 cfs; 0.24 cms) was recorded on February 8, 1996. The greatest monthly median discharge was 31 cfs (0.88 cms) in June 1996, and the lowest monthly median discharge was 13 cfs (0.37 cms) in January 1996.

Suspended Sediment

Mean daily suspended-sediment loads for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 11. The variability in monthly sediment loads for sites SN1 and BR1 are illustrated in Figure 9 and Figure 10, respectfully.

Sny Magill. The maximum daily mean suspended-sediment concentration at site SN1 was 1,640 mg/L on June 17, 1996, and the minimum was 1 mg/L on January 10-13 and February 13-16, 1996. The maximum monthly median sediment concentration was 64 mg/L in June 1996, and the minimum was 7 mg/L in January 1996.

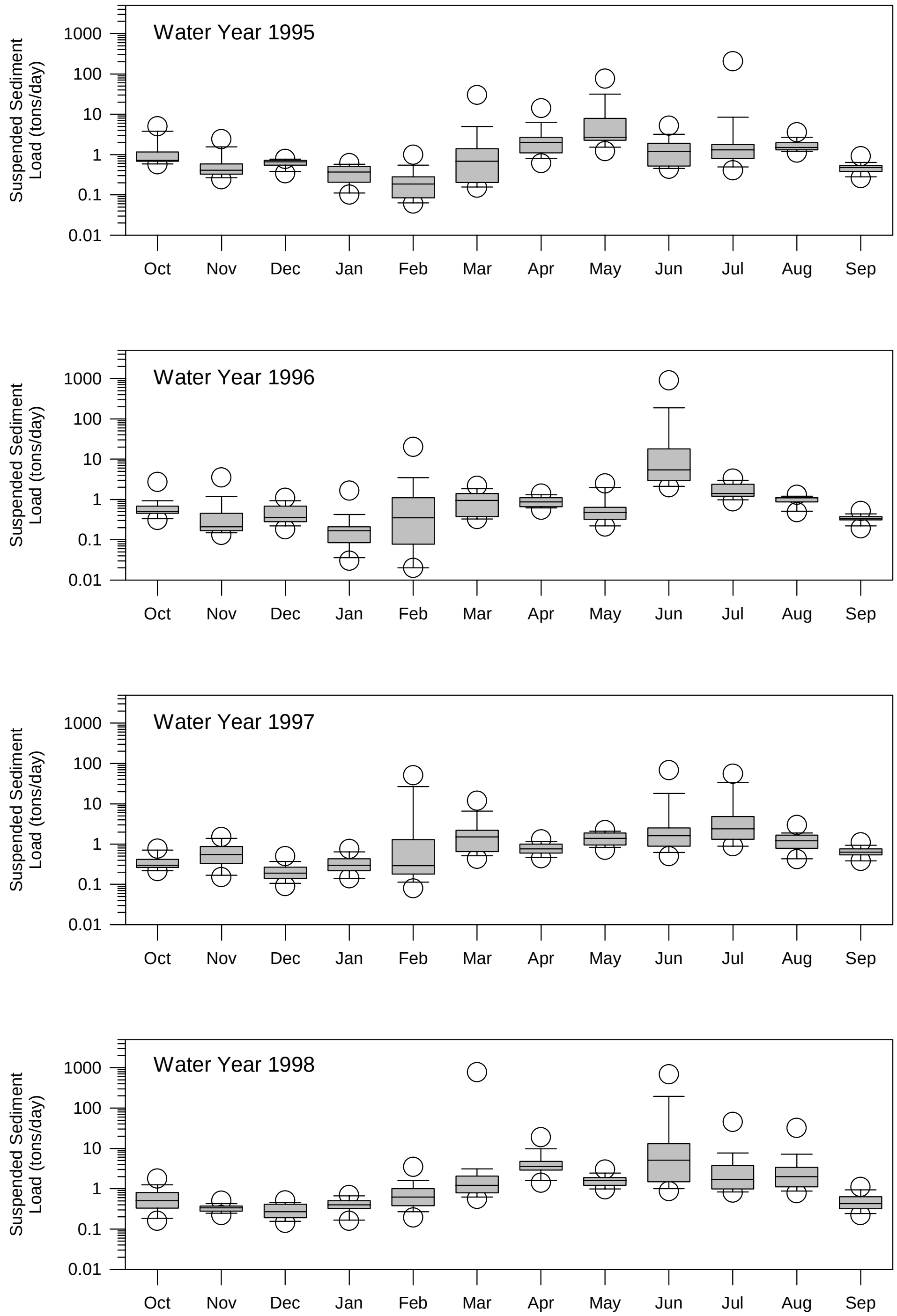


Figure 9. Box plots of suspended-sediment loads on a monthly basis for site SN1 (Sny Magill) for water years 1995 through 1998. Box plots illustrate the 25th, 50th, and 75th percentiles; the whiskers indicate the 10th and 90th percentiles; and the circles represent the 5th and 95th percentiles.

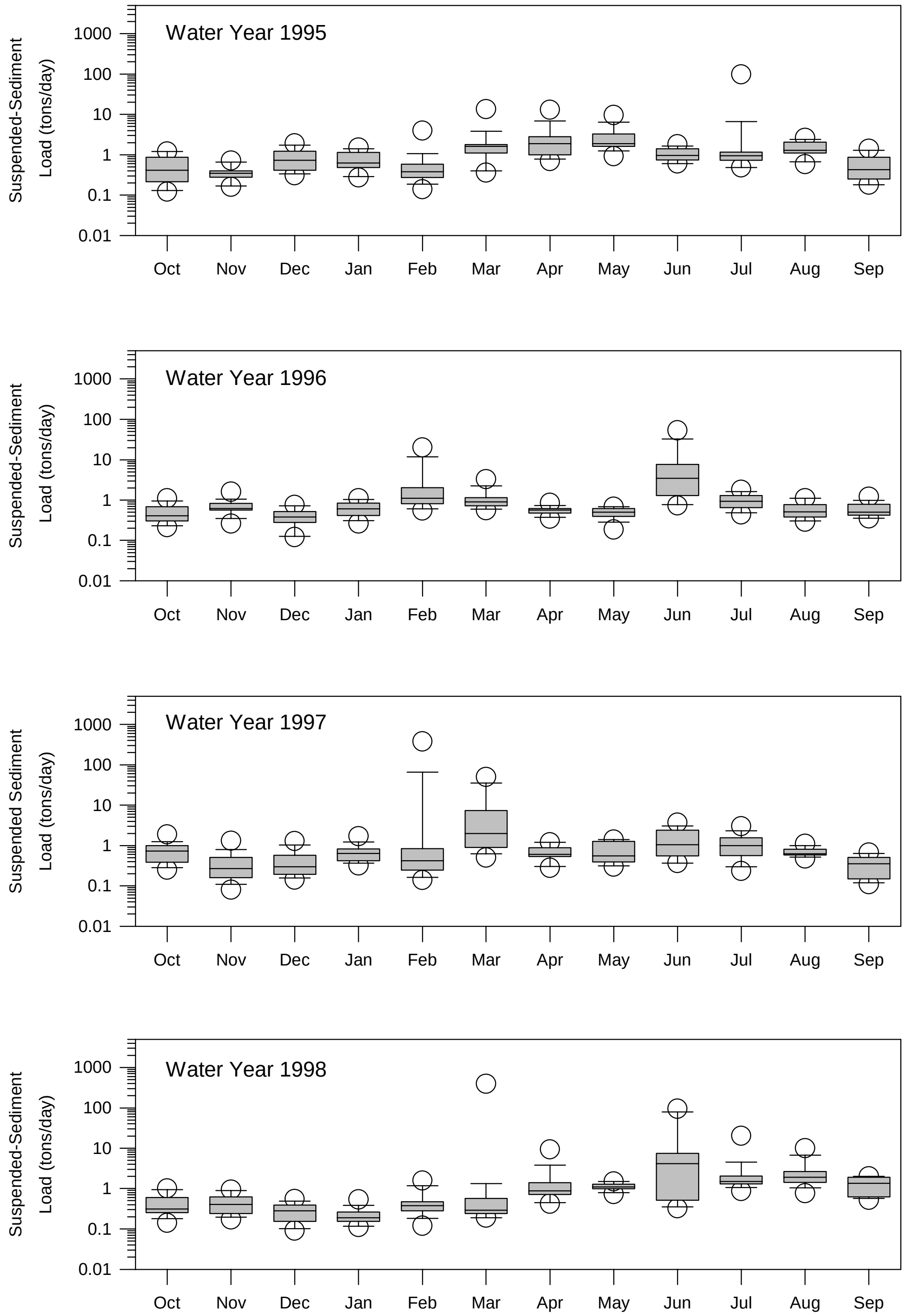
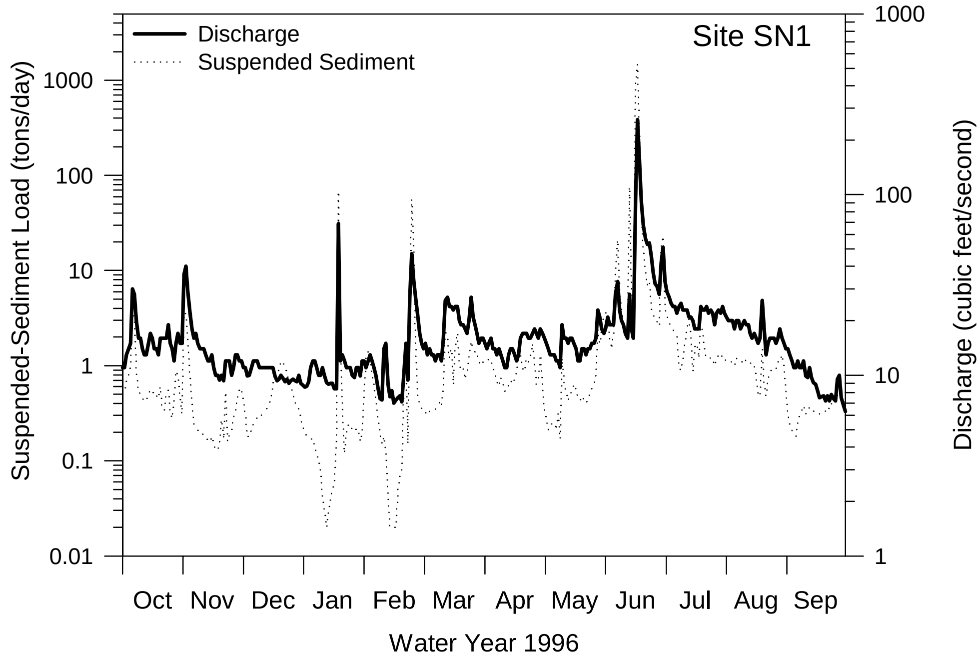


Figure 10. Box plots of discharge on a monthly basis for site BR1 (Bloody Run) for water years 1995 through 1998. Box plots illustrate the 25th, 50th, and 75th percentiles; the whiskers indicate the 10th and 90th percentiles; and the circles represent the 5th and 95th percentiles.



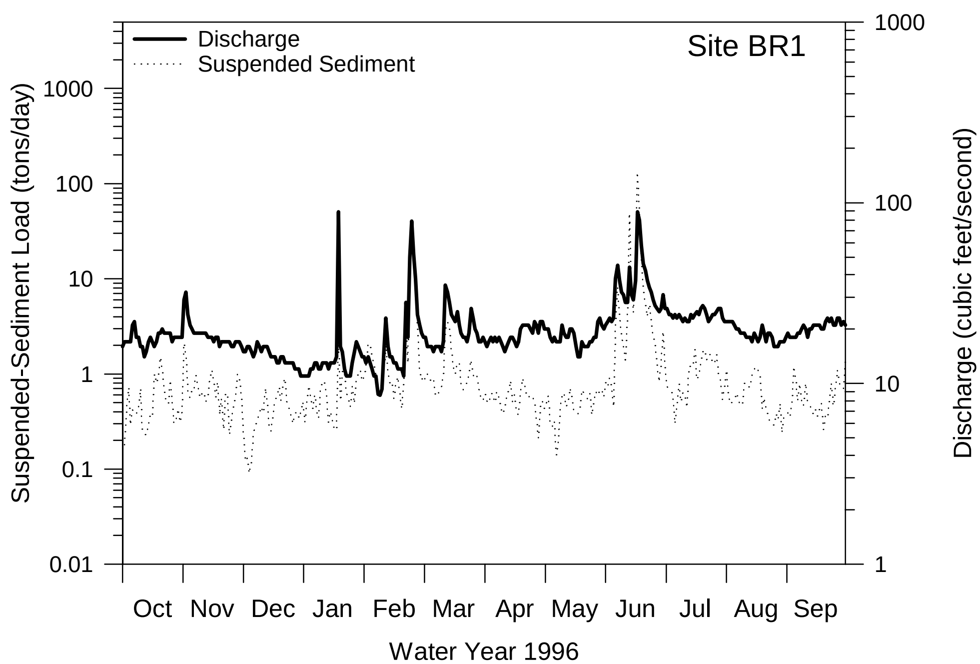


Figure 11. Summary of stream discharge and mean daily suspended-sediment loads for sites SN1 (Sny Magill) and BR1 (Bloody Run) during Water Year 1996.

The maximum daily suspended-sediment load was 1,470 tons on June 17, 1996, which accounted for 44% of the annual total. The maximum monthly median sediment load was 5.5 tons/day in June 1996, and the minimum was 0.18 tons/day in January 1996.

The total suspended-sediment load at site SN1 was 3,342 tons. This represents an average loss of 121 tons/mi^2, or 0.19 tons/acre, for the drainage area above the gaging station. The maximum monthly discharge of sediment (2,947 tons; 88% of the annual total), occurred in June 1996, and the minimum suspended-sediment load (10 tons; <1% of the annual total) occurred September 1996.

Bloody Run. The maximum daily mean suspended-sediment concentration at site BR1 was 550 mg/L on June 17, 1996, and the minimum was 2 mg/L on December 4, 1995. The maximum monthly median sediment concentration was 37 mg/L in June 1996, and the minimum was 8 mg/L in October 1995.

The maximum daily suspended-sediment load was 132 tons on June 17, 1996, and accounted for 20% of the annual total. The maximum monthly median sediment load was 3.5 tons/day in June 1996, and the minimum was 0.38 tons/day in December 1995.

The total suspended-sediment load at site BR1 was 662 tons. This represents an average loss of 19 tons/mi^2, or 0.03 tons/acre, for the drainage area above the gaging station. The greatest monthly discharge of sediment (343 tons; 52% of the annual total) occurred in June 1996, and the minimum monthly suspended-sediment load (12.55 tons; 2% of the annual total) occurred in December 1995.

Water Year 1997

Discharge

Mean daily discharge measurements for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 12. The variability in discharge on a monthly basis for Sny Magill and Bloody Run are illustrated in Figure 7 and Figure 8, respectively.

Sny Magill. The mean daily discharge at site SN1 was 14.7 cfs (0.42 cms). The maximum mean daily discharge (121 cfs; 3.43 cms) occurred on February 18, 1997, and the minimum (6.4 cfs; 0.18 cms) was recorded on October 1, 1996. The greatest monthly median discharge was 20 cfs (0.57 cms) in March 1997, and the lowest monthly median discharge was 8 cfs (0.23 cms) in October 1996.

Bloody Run. The mean daily discharge at site BR1 was 17.2 cfs (0.49 cms). The maximum mean daily discharge (242 cfs; 6.85 cms) occurred on February 18, 1997, and the minimum (7.3 cfs; 0.21 cms) was recorded on February 17, 1997. The greatest monthly median discharge was 25 cfs (0.71 cms) in March 1997, and the lowest monthly median discharge was 8.7 cfs (0.25 cms) in February 1997.

Suspended Sediment

Mean daily suspended-sediment loads for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 12. The variability in monthly sediment loads for sites SN1 and BR1 are illustrated in Figure 9 and Figure 10, respectively.

Sny Magill. The maximum daily mean suspended-sediment concentration at site SN1 was 1,080 mg/L on June 16, 1997, and the minimum was 3 mg/L on December 9, December 13, December 19-20, 1996, and February 14-17, 1997. The maximum monthly median sediment concentration was 53 mg/L in June 1997, and the minimum was 6 mg/L in November 1996.

The maximum daily suspended-sediment load was 432 tons on July 27, 1997, which accounted for 27% of the annual total. The maximum monthly median sediment load was 2.4 tons/day in July 1997, and the minimum was 0.19 tons/day in December 1996.

The total suspended-sediment load at site SN1 was 1,606 tons. This represents an average loss of 58 tons/mi^2, or 0.09 tons/acre, for the drainage area above the gaging station on Sny Magill Creek.

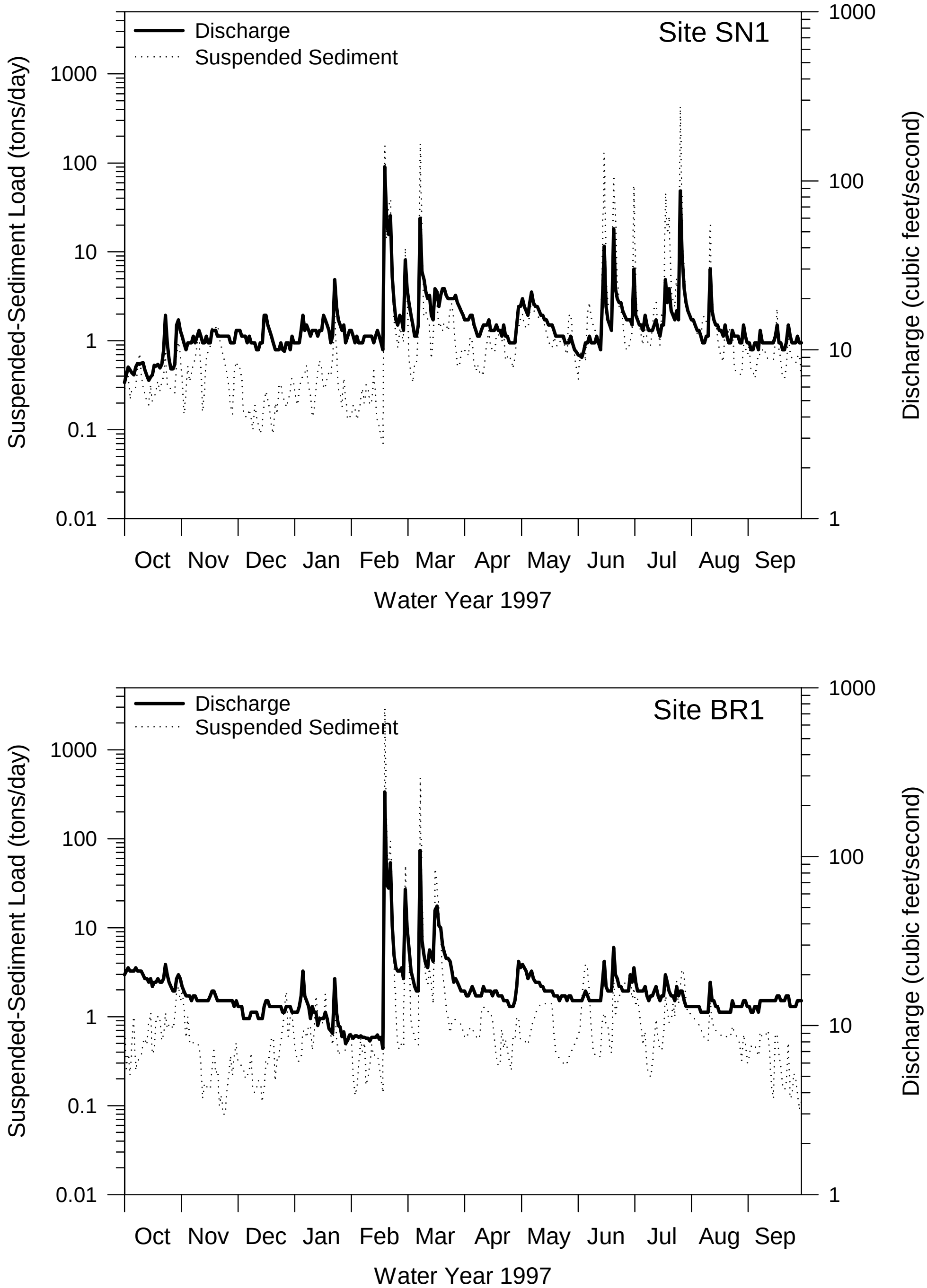


Figure 12. Summary of stream discharge and mean daily suspended-sediment loads for sites SN1 (Sny Magill) and BR1 (Bloody Run) during Water Year 1997.

The maximum monthly discharge of sediment (649 tons; 40% of the annual total), occurred in July 1997, and the minimum suspended-sediment load (6.7 tons; <1% of the annual total) occurred December 1996.

Bloody Run. The maximum daily mean suspended-sediment concentration at site BR1 was 1,470 mg/L on February 18, 1997, and the minimum was 2 mg/L on November 23-24, 1996, and September 29, 1997. The maximum monthly median sediment concentration was 26 mg/L in March 1997, and the minimum was 6.5 mg/L in November 1996.

The maximum daily suspended-sediment load was 2,930 tons on February 18, 1997, and accounted for 71% of the annual total. The maximum monthly median sediment load was 2.0 tons/day in March 1997, and the minimum was 0.27 tons/day in November 1996.

The total suspended-sediment load at site BR1 was 4,121 tons. This represents an average loss of 120 tons/mi^2, or 0.19 tons/acre, for the drainage area above the gaging station. The greatest monthly discharge of sediment (3,184 tons; 77% of the annual total) occurred in February 1997. The minimum monthly suspended-sediment load (10.6 tons; <1% of the annual total) occurred in September 1997.

Water Year 1998

Discharge

Mean daily discharge measurements for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 13. The variability in discharge on a monthly basis for Sny Magill and Bloody Run are illustrated in Figure 7 and Figure 8, respectively.

Sny Magill. The mean daily discharge at site SN1 was 19.2 cfs (0.54 cms) of drainage. The maximum mean daily discharge (200 cfs; 5.66 cms) occurred on March 31, 1998, and the minimum (6.5 cfs; 0.18 cms) was recorded on December 31, 1997. The greatest monthly median discharge was 25.5 cfs (0.72 cms) in April 1998, and the lowest monthly median discharge was 8.4 cfs (0.24 cms) in January 1998.

Bloody Run. The mean daily discharge at site BR1 was 20.9 cfs (0.59 cms). The maximum mean daily discharge (189 cfs; 5.35 cms) occurred on March 31, 1998, and the minimum (8.5 cfs; 0.24 cms) was recorded on December 31, 1997. The greatest monthly median discharge was 33 cfs (0.93 cms) in June 1998, and the lowest monthly median discharge was 11 cfs (0.31 cms) in December 1997.

Suspended Sediment

Mean daily suspended-sediment loads for Sny Magill Creek (site SN1) and Bloody Run Creek (site BR1) are illustrated in Figure 13. The variability in monthly sediment loads for sites SN1 and BR1 are illustrated in Figure 9 and Figure 10, respectively.

Sny Magill. The maximum daily mean suspended-sediment concentration at site SN1 was 4,180 mg/L on March 30, 1998, and the minimum was 4 mg/L on October 25, 1997. The maximum monthly median sediment concentration was 71.5 mg/L in June 1998, and the minimum was 10 mg/L in December 1997.

The maximum daily suspended-sediment load was 3,310 tons on March 30, 1998, which accounted for 45% of the annual total. The maximum monthly median sediment load was 5.51 tons/day in June 1998, and the minimum was 0.27 tons/day in December 1997.

The total suspended-sediment load at site SN1 was 7,315 tons. This represents an average loss of 265 tons/mi^2, or 0.41 tons/acre, for the drainage area above the gaging station. The maximum monthly discharge of sediment (4,164 tons; 57% of the annual total) occurred in March 1998, and the minimum suspended-sediment load (9.24 tons; <1% of the annual total) occurred December 1997.

Bloody Run. The maximum daily mean sus-

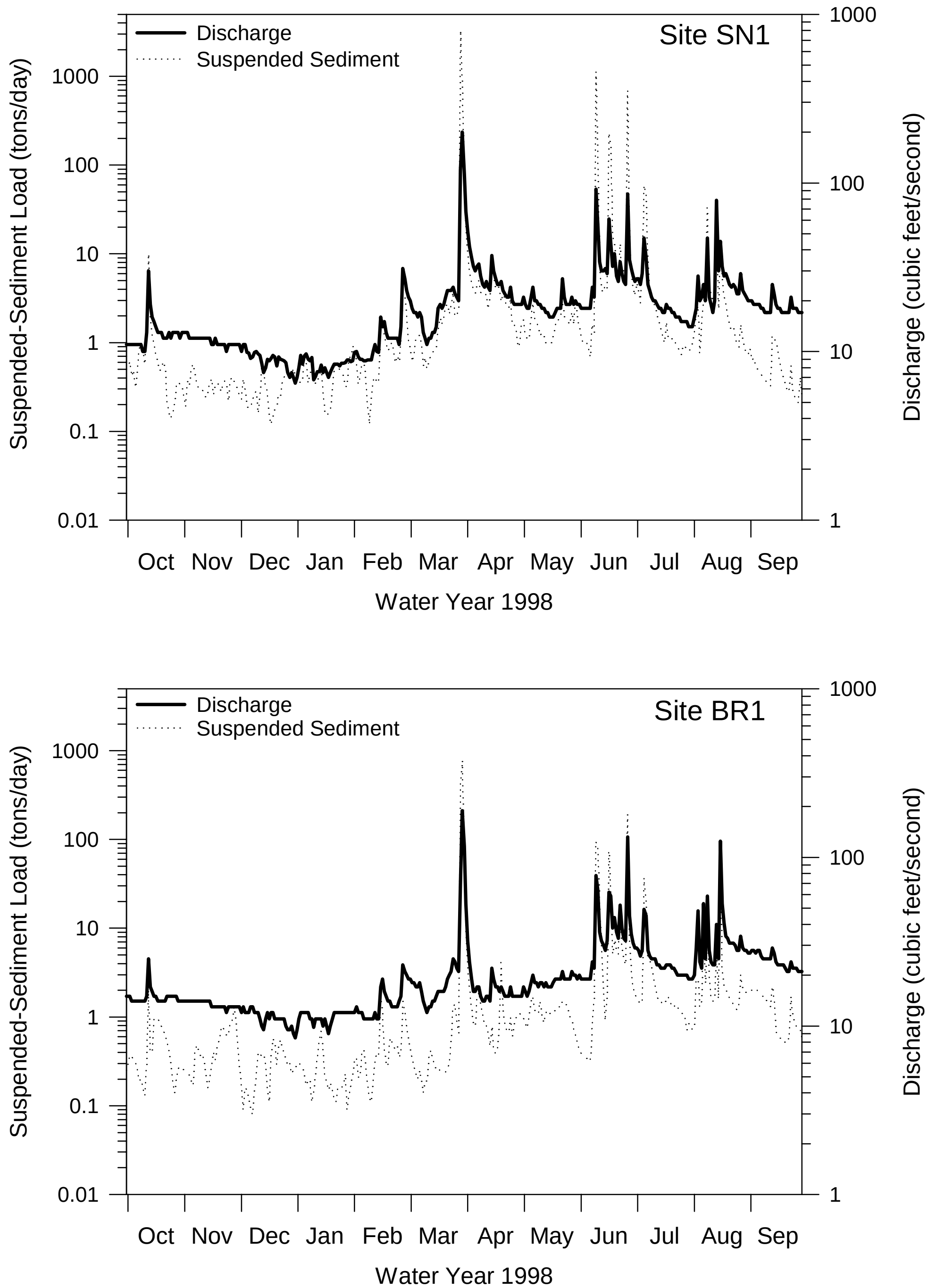


Figure 13. Summary of stream discharge and mean daily suspended-sediment loads for sites SN1 (Sny Magill) and BR1 (Bloody Run) during Water Year 1998.

pended-sediment concentration at site BR1 was 1,300 mg/L on March 31, 1998, and the minimum was 2.0 mg/L on December 8, 1997. The maximum monthly median sediment concentration was 47 mg/L in June 1998, and the minimum was 6 mg/L in January 1998.

The maximum daily suspended-sediment load was 773 tons on March 31, 1998, and accounted for 34% of the annual total. The maximum monthly median sediment load was 4.15 tons/day in June 1998, and the minimum was 0.19 tons/day in January 1998.

The total suspended-sediment load at site BR1 was 2,254 tons. This represents an average loss of 65.7 tons/mi^2, or 0.10 tons/acre, for the drainage area above the gaging station. The greatest monthly discharge of sediment (1,201 tons; 53% of the annual total) occurred in March 1998. The minimum monthly suspended-sediment load (7.02 tons; <1% of the annual total) occurred in January 1998.

Discussion

Table 32 summarizes the discharge and sediment data for water years 1992 through 1998. With the exception of Water Year 1992, the annual mean discharge per square mile of drainage has been higher each year for Sny Magill than Bloody Run. For both streams, the annual mean discharge decreased each year from water year 1993 through 1997. Sny Magill had higher sediment loads than Bloody Run for water years 1994, 1995, 1996, and 1998; Bloody Run had higher sediment loads than Sny Magill for water years 1992, 1993, and 1997.

Sny Magill and Bloody Run tend to be flashy streams, with a majority of the discharge occurring during intermittent high flow events. Figure 14 shows discharge at Sny Magill and Bloody Run since the start of monitoring. For most years, discharge was higher during the spring and summer months and declined during the fall and summer months.

The majority of a water year's total sediment load is delivered during two periods: a spring snowmelt period and a summer storm period. Figure 15 shows each site's monthly sediment load as a percent of each month's respective water year total. The spring snowmelt period tends to occur in February or March, while the summer storm months are typically June and July. Only Water Year 1992 deviates from this trend, as a majority of the sediment discharge occurred in November and April.

In 1995, 46 days accounted for 90% of the year's total sediment load for Sny Magill while 182 days accounted for 90% of Bloody Run's annual total. In 1996, 14 days accounted for 90% of the year's total sediment load for Sny Magill while 204 days accounted for 90% of Bloody Run's annual total. In 1997, 93 days accounted for 90% of the year's total sediment load for Sny Magill while 7 days accounted for 90% of Bloody Run's annual total. In 1998, 9 days accounted for 90% of the year's total sediment load for Sny Magill while 49 days accounted for 90% of Bloody Run's annual total.

Based on the discharge data for water years 1992 through 1998, a mean monthly discharge/mi^2 was calculated for SN1 and BR1. Figure 16 shows the departure from the long-term mean monthly discharge/mi^2. During water year 1992, most months were at or below the long-term monthly mean. For Water Year 1993, monthly means were below normal for October through February and above normal from March through September. For water years 1992, 1993, and 1994, the departure lines for SN1 and BR1 were similar.

Based on the sediment load data for water years 1992 through 1998, a mean monthly sediment load/mi^2 was calculated for SN1 and BR1. Figure 17 shows the departure from the long-term mean monthly sediment load/mi^2. For most months, Sny Magill and Bloody Run means were near the long-term mean. Additionally, the trends between the months are also similar for Bloody Run and Sny Magill. In 1996, 1997, and 1998, there are some variations in the trend between Sny Magill and Bloody Run, which are most likely caused by intense rainstorms affecting one watershed and not the other. For most of Water Year 1993, however, Sny Magill and Bloody Run were at or above the long-term mean.

Although BMPs have effectively reduced the

Table 32. Sediment and discharge data from the U.S. Geological Survey gaging stations at SN1 and BR1.

	WY 1992	WY 1993	WY 1994	WY 1995	WY 1996	WY 1997	WY 1998
Prairie du Chien, WI rainfall (percent of normal)	38.03 inches (124%)	51.85 inches (169%)	30.54 inches (99.8%)	30.54 inches (99.8%)	30.06 (98%)	33.56 (110%)	41.32 (135%)
Annual mean discharge (cubic feet per second; cfs)							
Sny Magill	17.1	36.6	23.4	20.2	17.7	14.7	19.2
Bloody Run	26.3	42.1	26.1	23.5	20.1	17.2	20.9
Annual mean discharge per square mile drainage (cfs/mi^2)							
Sny Magill	0.62	1.33	0.85	0.73	0.64	0.53	0.70
Bloody Run	0.77	1.23	0.77	0.69	0.59	0.50	0.61
Maximum daily discharge (cubic feet per second)							
Sny Magill	90	313	268	130	260	121	200
Bloody Run	205	550	302	100	89	242	189
Total suspended sediment discharge (tons/year)							
Sny Magill	1,937	13,086	4,775	2,748	3,342	1,606	7,315
Bloody Run	2,722	22,174	3,117	871	662	4,121	2,254
Annual suspended sediment load per square mile (tons/acre)							
Sny Magill	70 (0.11)	474 (0.74)	173 (0.27)	100 (0.16)	121 (0.19)	58 (0.09)	265 (0.41)
Bloody Run	80 (0.12)	650 (1.02)	91 (0.14)	26 (0.04)	19 (0.03)	121 (0.19)	66 (0.10)
% of discharge as baseflow							
Sny Magill	80%	73%	82%	79%	75%	75%	76%
Bloody Run	81%	72%	87%	88%	86%	80%	78%
Days required to account for 90% of total water year sediment load							
Sny Magill	120	30	23	46	14	93	9
Bloody Run	82	14	139	182	204	7	49

Long-term average rainfall for Prairie du Chien is 30.60 inches.
Drainage area above the gaging station on Sny Magill Creek is 27.6 mi^2.
Drainage area above the gaging station on Bloody Run Creek is 34.1 mi^2.
Data is reported by water year - WY (a water year is a 12-month period from October 1 through September 30, designated by the calendar year in which it ends)

sediment delivered from the upland to Sny Magill Creek by an estimated 50.7% (Palas and Tisl, 1998), these reductions are not reflected in the sediment loads discharged by Sny Magill Creek. A large amount of post-settlement alluvium continues to be a source of erodible sediment within the Sny Magill and Bloody Run watersheds and may be masking the upland reductions. During the 1800s and early 1900s, much of the prairie, savanna, and forest in the area were converted to pasture and cropland. As the amount of land under cultivation increased, sheet and rill erosion removed large amounts of materials from upland margins and valley slopes into the drainageways (Bettis, 1994). Because the impact of post-settlement alluvium on the sediment loads is poorly understood, whether Sny Magill Creek will show significant reductions in sediment load as a result of BMPs implemented is uncertain.

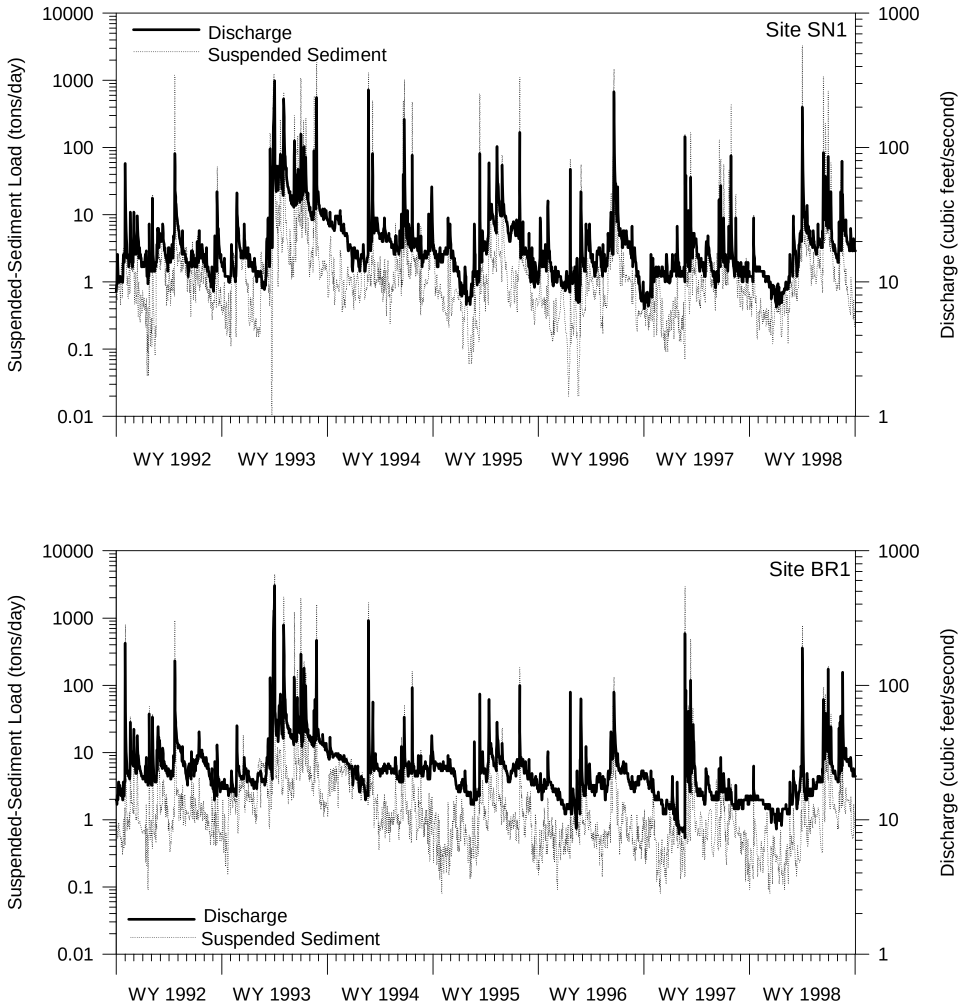


Figure 14. Summary of stream discharge and mean daily suspended-sediment loads for sites SN1 (Sny Magill) and BR1 (Bloody Run) during water years 1992 through 1998.

WATER-QUALITY MONITORING RESULTS

Water quality was monitored at six sites in the Sny Magill watershed and three sites in the Bloody Run watershed (Figure 1). The Iowa Department of Natural Resources-Geological Survey Bureau (IDNR-GSB) and the U.S. National Park Service-Effigy Mounds National Monument conducted the monitoring. Sites BRSC, SN2, and SNT were sampled monthly; all other sites were sampled weekly. Field measurements included temperature, specific conductance, dissolved oxygen, and turbidity. Biological Oxygen Demand (BOD), total phosphorous as P, and immunoassay triazine herbicides were measured only at sites SN1 and BR1.

Table 33 summarizes the chemical parameters analyzed, method detection limit, and method description and reference. Appendix H is a statistical summary of the water-quality results on an annual basis for all sites and on a quarterly basis for sites sampled weekly. Beginning in Water Year 1995, anion analyses were performed by the University of Iowa Hygienic Laboratory. Since Water Year 1997, the only anion to be

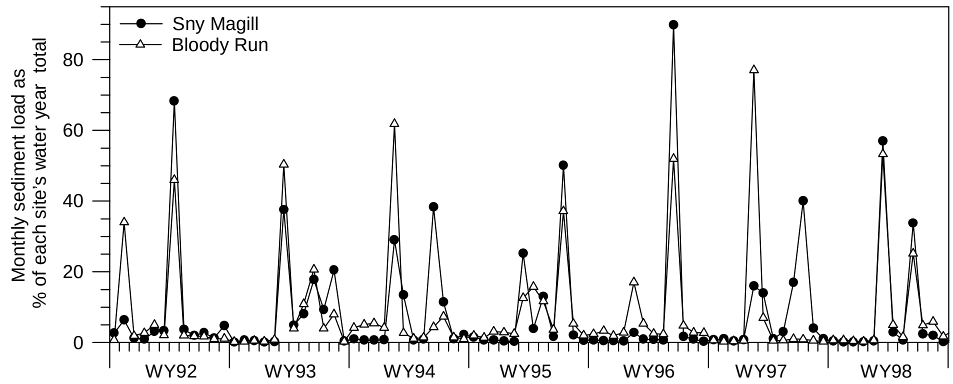


Figure 15. Monthly discharge totals as a percent of each month's respective water year total for sites SN1 (Sny Magill) and BR1 (Bloody Run).

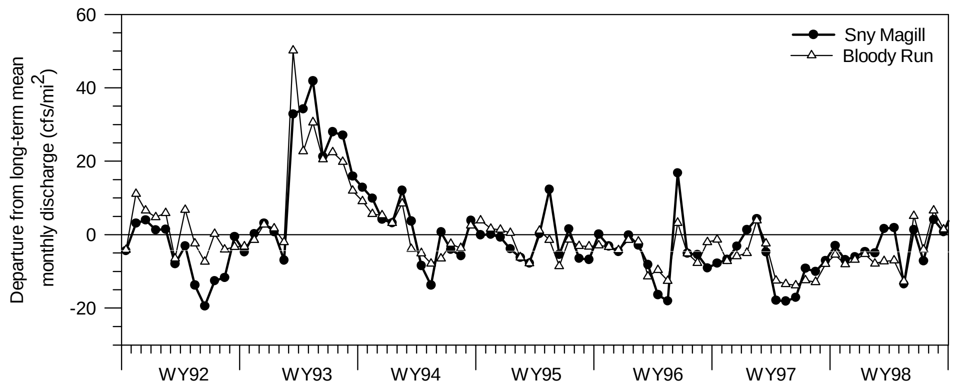


Figure 16. Departure from the long-term mean monthly discharge per square mile for sites SN1 (Sny Magill) and BR1 (Bloody Run). Each mean monthly discharge is calculated by summing the monthly discharge for each month (i.e., October) for each water year from 1992 through 1998.

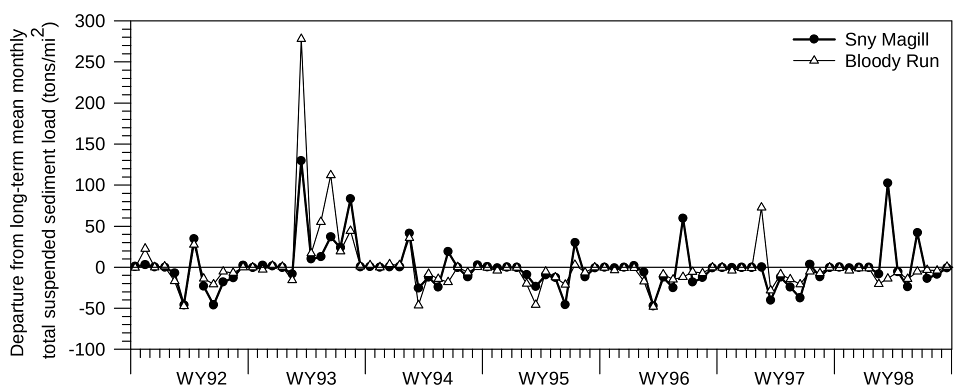


Figure 17. Departure from the long-term mean monthly sediment load per square mile for sites SN1 (Sny Magill) and BR1 (Bloody Run). Each mean monthly discharge is calculated by summing the monthly discharge for each month (i.e., October) for each water year from 1992 through 1998.

Table 33. Summary of chemical parameters analyzed for since Water Year 1995 and the method detection limits for those parameters.

Analyte	Method Detection	Sample Holding Time	Method Description & Reference
Fecal bacteria	count/100 ml.	8 hours	Standard Method 9222D (APHA, 1985) using media fecal coliform at 44.5 °C.
Nitrate & nitrite-N	0.10 mg/L	28 days	Automated, copper-cadmium reduction & colorimetric quantitation, EPA Method 353.2 (USEPA, 1983).
Ammonia-N	0.10 mg/L	28 days	Automated, phenate reaction, & colorimetric quantitation, EPA Method 350.1 & 350.2 (USEPA, 1983).
Organic-N	0.10 mg/L	28 days	Total Kjeldahl procedure, semi-automated block digester, AAII, colorimetric quantitation, EPA Method 351.2 (USEPA, 1983).
Anions			EPA Method 300.0 (USEPA, 1983)
Bromide	0.50 mg/L	14 days	
Chloride	0.50 mg/L	14 days	
Fluoride	0.50 mg/L	14 days	
Nitrate-N	0.50 mg/L	14 days	
Nitrite-N	0.50 mg/L	14 days	
Phosphate	0.50 mg/L	14 days	
Sulfate	0.50 mg/L	14 days	
Total P	0.10 mg/L	28 days	Colorimetric, automated, block digester, EPA Method 365.4 (USEPA, 1983).
5-Day BOD	1.00 mg/L	48 hours	Samples incubated in dark for 5 days at 20 °C, Standard Method 507 (APHA, 1985).
Immunoassay for triazine herbicides	0.10 µg/L	14 days	Immuno assay using spectrophotometric measurement & analysis; Millipore triazine kit.

monitored is chloride. Additionally, nitrate was analyzed and reported as nitrate+nitrite-N, since nitrate-N is no longer measured. Water-quality results for water years 1992 and 1993 are in Seigley and others (1994) and results for Water Year 1994 are in Seigley and others (1996).

Water Year 1995

The mean values for water-quality parameters monitored are summarized in Table 34.

Field Measurements

Mean temperatures for Water Year 1995 varied from 9 to 10°C. Mean specific conductance values ranged from 585 to 711 mS/cm (microsiemens per centimeter). Mean dissolved oxygen concentrations were relatively high, ranging from 10 to 12 mg/L. Turbidity values were low, with annual means varying from 5.0 to 8.4 NTU.

Fecal Bacteria

Median fecal coliform counts varied from 65 (site BR1) to 260 (site BR2) organisms per 100 ml. Figure 18 shows fecal coliform bacteria counts for all sites. The median fecal coliform counts increased from the previous year at all sites except SN2. SN1 and NCC had their highest median fecal

Table 34. Mean water quality parameters for sites monitored monthly in Sny Magill and Bloody Run watersheds; Water Year 1995.

Parameter	Units	SN1	SN2	SN3	NCC	SNT	SNWF	BR1	BR2	BRSC
Drainage Area	sq. mi.	27.6	22.5	7.2	6.0	3.2	3.1	34.1	24.5	10.5
n		52	12	52	52	12	52	52	52	12
Ammonia-N	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Biological Oxygen Demand	mg/L	<1						1		
Bromide	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride	mg/L	6.9	7.5	10.1	6.6	8.1	8.4	10.5	15.7	16.8
Dissolved Oxygen	mg/L	11	11	11	11	11	10	11	11	12
Fecal Bacteria *(median)*	count/100 ml	115	121	165	85	94	235	65	260	205
Fluoride	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
IMA-triazine herbicides	µg/L	0.11						0.29		
% detection of triazines	%	25%						100%		
Nitrate-N	mg/L	2.2	2.9	4.3	2.4	3.1	3.2	5.2	9.1	9.8
Nitrite-N	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
NO_2+NO_3-N	mg/L	2.4						5.5		
Organic-N	mg/L	0.3						0.3		
Phosphorus	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Specific Conductance	µS/cm	591	643	629	585	621	615	592	664	711
Sulfate	mg/L	28	27	26	28	22	37	21	22	26
Temperature	degrees C	10	10	10	10	10	10	10	9	10
Total Phosphorous as P	mg/L	<0.1						<0.1		
Turbidity	NTU	6.4	5.2	5.2	8.4	5.2	5.7	6.4	7.9	5.0
Annual Mean Discharge	cfs	20.2						23.5		
Annual Mean Discharge per square mile drainage	cfs/mi^2	0.73						0.69		
Suspended Sediment Load	tons	2,748						871		
Suspended Sediment Load per square mile drainage	$tons/mi^2$	100						25		

count since the start of monitoring. The highest count (290,000 organisms per 100 ml) occurred at BR2 on August 29, 1995.

Nitrate-N

Mean annual nitrate-N concentrations ranged from 2.2 (site SN1) to 9.8 mg/L (site BRSC). Figure 19 shows nitrate concentrations for all sites. Except for NCC, which remained unchanged, the mean annual nitrate-N concentrations declined from the previous year's concentration. The highest concentration (11.0 mg/L) occurred at BR2 (on Jan. 31, and Feb. 14, 1995) and at BRSC (on Jan. 31, and July 25, 1995). The lowest concentration (1.5 mg/L) occurred at NCC (on Oct. 25,1994; Nov. 1, 1994; Nov. 8, 1994; Sept. 5 1995; Sept. 19, 1995) and at SN1 (on July 4, 1995).

Chloride

Mean annual chloride concentrations varied from 6.6 (site NCC) to 16.8 mg/L (site BRSC). Figure 20 shows chloride concentrations for all sites. Annual mean concentrations ranged from 6.6 to 10.1 mg/L in the Sny Magill watershed and 10.5 to 16.8 mg/L in the Bloody Run watershed. For all sites, the mean annual chloride concentrations declined from 1994 to 1995. The highest concentration (19 mg/L) occurred at BR2 on Oct. 4, 1994, and Sept. 19, 1995. The lowest concentration (4.7 mg/L) occurred at SN1 on July 4, 1995.

Other Parameters

Mean BOD concentrations for Water Year 1995 were <1 mg/L for site SN1 and 1 mg/L for site BR1.

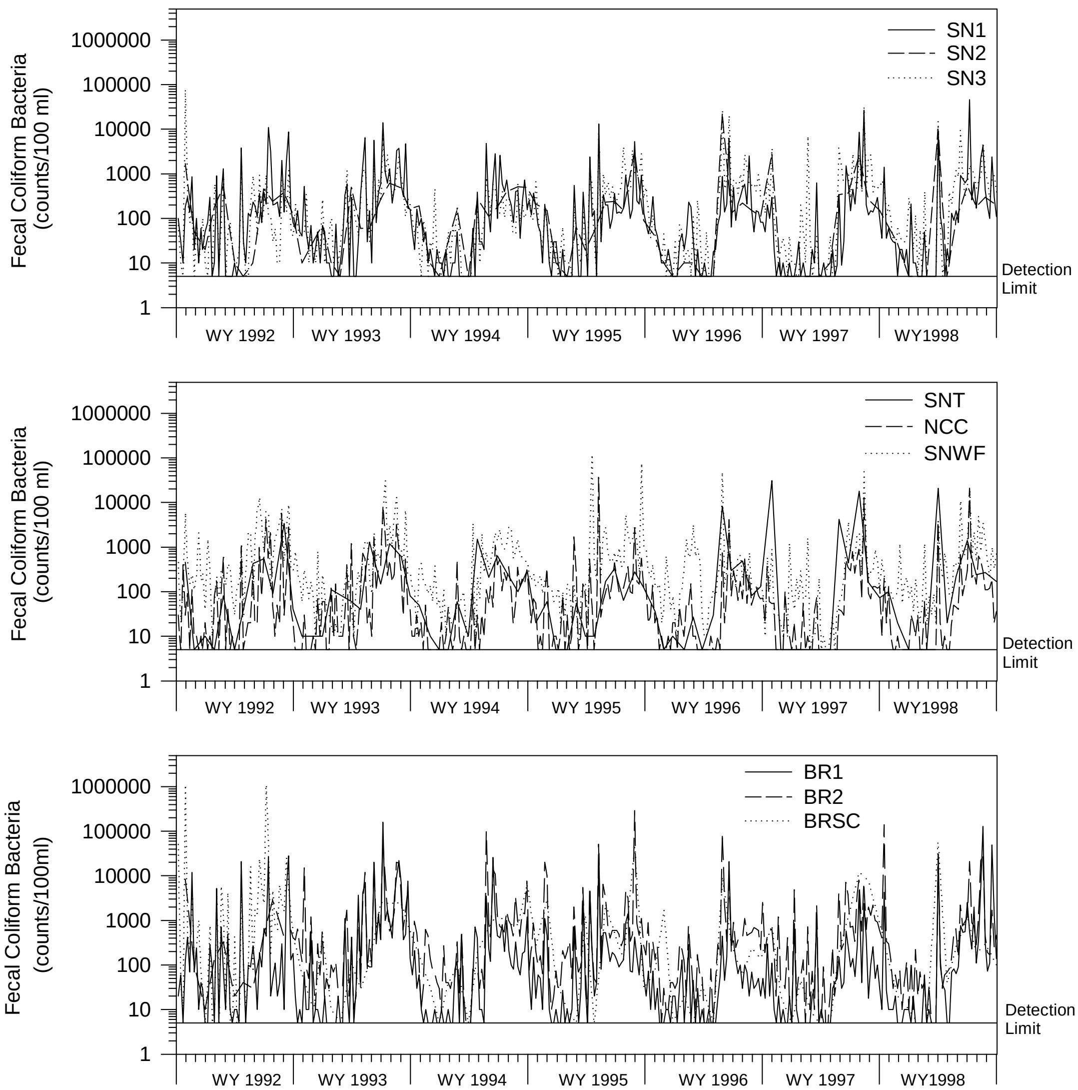


Figure 18. Fecal bacteria counts for all sites for water years 1992 through 1998.

Figure 21 shows BOD levels from sites SN1 and BR1. For Water Year 1995, 56% of the BOD samples from site SN1 were below the detection limit, as were 62% of the samples from site BR1. Occurring on Feb. 21, 1995, the highest BOD concentrations were 8 mg/L for BR1 and 6 mg/L for SN1.

Mean annual triazine concentrations, determined by immunoassay analysis, were 0.11 mg/L for site SN1 and 0.29 mg/L for site BR1. Figure 22 shows triazine herbicide concentrations at sites SN1 and BR1. For Water Year 1995, 25% of the samples collected contained detectable levels of triazines, as were 100% of the samples from BR1. The mean annual triazine concentrations decreased from 1994 to 1995 at both sites. Peak concentrations occurred between May and July. For Water Year 1995, maximum concentrations of the two sites were similar, 1.28 mg/L for SN1 and 1.30 mg/L for BR1.

Table 34 includes annual mean concentrations of several other anions. Nitrite-N, phosphorus, and

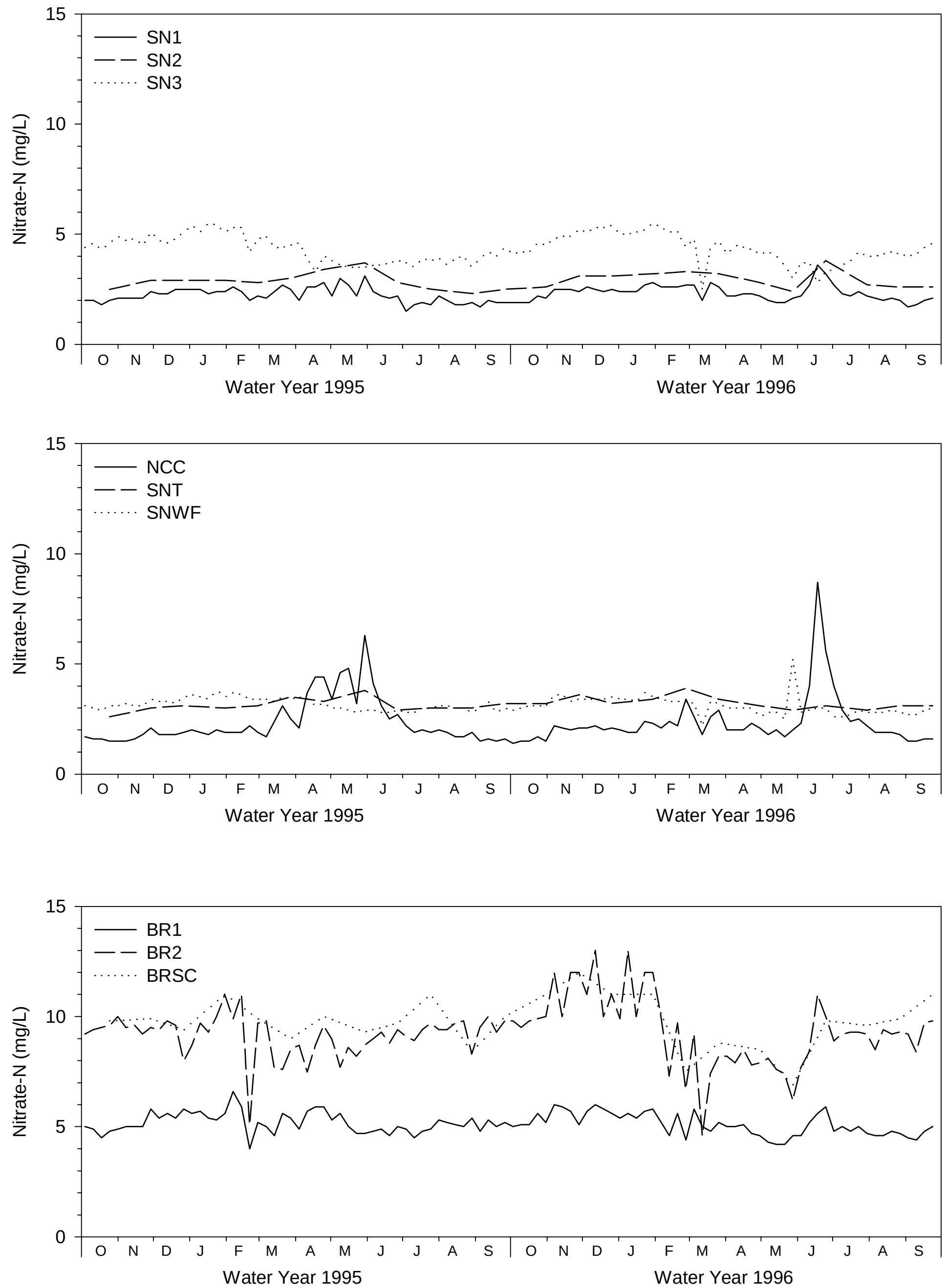


Figure 19. Nitrate-N concentrations for all sites for water years 1995 and 1996.

fluoride concentrations were below the respective detection limits for all sites. Mean annual ammonia-N concentrations were low, with concentrations from <0.1 to 0.1 mg/L for all sites. Total phosphorus averaged <0.1 mg/L at both sites. Mean sulfate concentrations ranged from 21 to 37 mg/L. Site SNWF has consistently had the highest sulfate concentrations since the start of monitoring. Mean sulfate concentrations from sites in Bloody Run were low relative to Sny Magill.

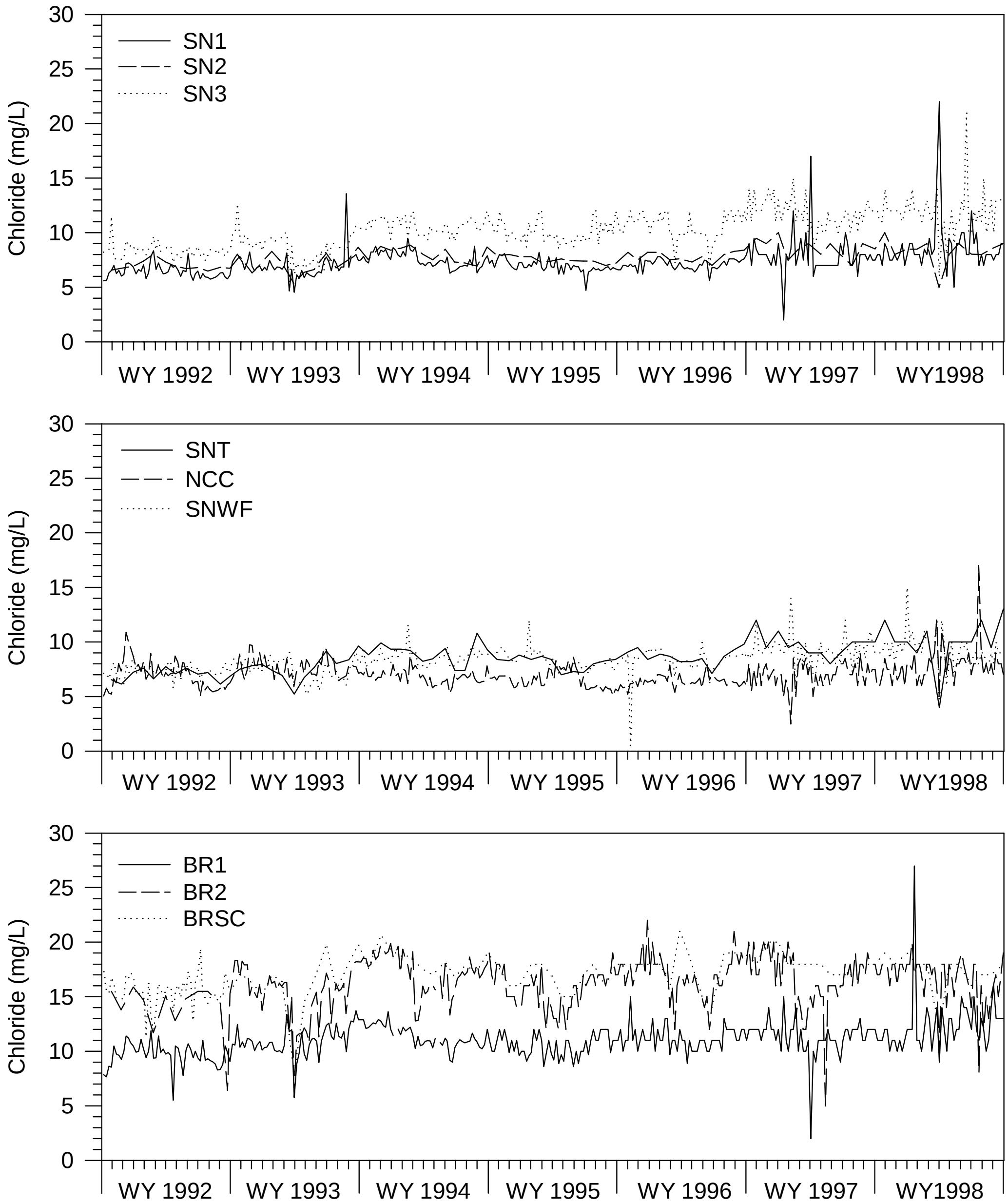


Figure 20. Chloride concentrations for all sites for water years 1992 through 1998.

Water Year 1996

The mean values for water-quality parameters monitored are summarized in Table 35.

Field Measurements

Mean temperatures for Water Year 1996 varied from 9 to 10°C. Mean specific conductance

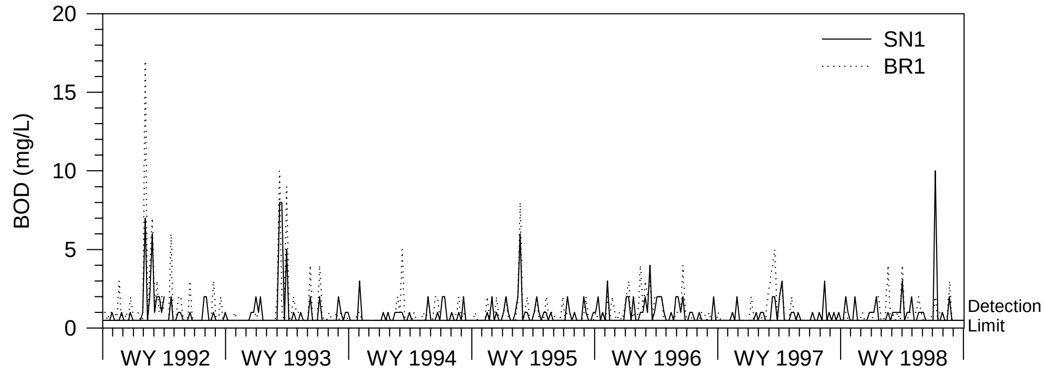


Figure 21. BOD concentrations for sites SN1 (Sny Magill) and BR1(Bloody Run) for water years 1992 through 1998.

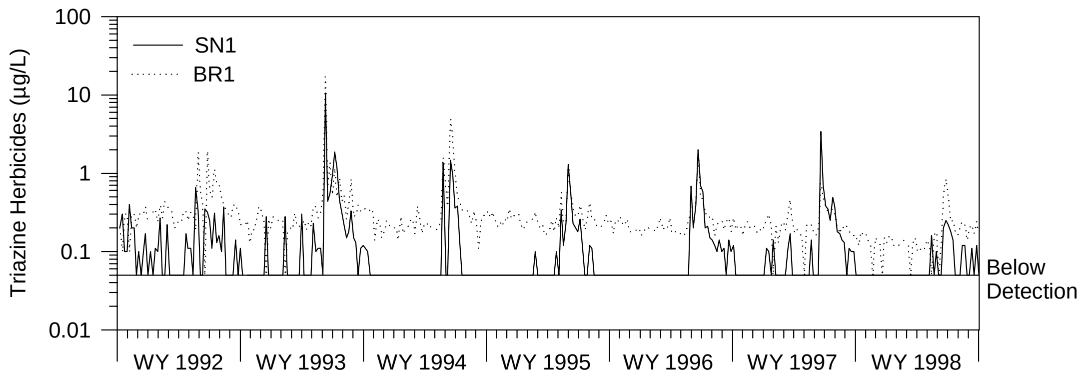


Figure 22. Triazine herbicide concentrations for sites SN1 (Sny Magill) and BR1 (Bloody Run) for water years 1992 through 1998.

values ranged from 596 to 700 mS/cm (microsiemens per centimeter). Mean dissolved oxygen concentrations were relatively high, ranging from 11 to 13 mg/L. Turbidity values were low, with annual means varying from 3.2 to 6.1 NTU.

Fecal Bacteria

Median fecal coliform counts varied from 20 (site NCC) to 253 (site BRSC) organisms per 100 ml. Figure 18 shows fecal coliform bacteria counts for all sites. Fecal coliform counts decreased from the previous year at all sites except BRSC. BR1 and SNT had their lowest median fecal count since monitoring began in 1991. The highest count (90,000 organisms per 100 ml) occurred at BR2 on May 28, 1996.

Nitrate-N

Mean annual nitrate-N concentrations ranged from 2.3 (sites SN1 and NCC) to 9.8 mg/L (site BRSC). Figure 19 shows nitrate concentrations for all sites. The mean concentration decreased only at sites BR1, NCC, and SNWF from the previous year. The highest concentration (13.0 mg/L) occurred at BR2 on Dec. 12, 1995, and Jan. 9, 1996. The lowest concentration (1.4 mg/L) occurred at NCC on Oct. 3, 1995.

Table 35. Mean water quality parameters for sites monitored monthly in Sny Magill and Bloody Run watersheds; Water Year 1996.

Parameter	Units	SN1	SN2	SN3	NCC	SNT	SNWF	BR1	BR2	BRSC
Drainage Area	sq. mi.	27.6	22.5	7.2	6.0	3.2	3.1	34.1	24.5	10.5
n		52	12	52	52	12	52	52	52	12
Ammonia-N	mg/L	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2
Biological Oxygen Demand	mg/L	1						1		
Bromide	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride	mg/L	7.1	7.8	11.0	6.4	8.7	8.3	11.0	17.0	18.0
Dissolved Oxygen	mg/L	12	12	12	12	11	12	13	12	13
Fecal Bacteria *(median)*	count/100 ml	48	25	64	20	33	170	25	170	253
Fluoride	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
IMA-triazine herbicides	µg/L	0.15						0.26		
% detection of triazines	%	33%						100%		
Nitrate-N	mg/L	2.3	3.0	4.4	2.3	3.2	3.1	5.1	9.4	9.8
Nitrite-N	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
NO_2+NO_3-N	mg/L	2.4						5.3		
Organic-N	mg/L	0.2						0.2		
Phosphorus	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Specific Conductance	µS/cm	596	631	642	602	609	630	604	670	700
Sulfate	mg/L	29	30	28	31	23	38	22	23	29
Temperature	degrees C	9	9	10	9	9	9	9	9	9
Total Phosphorous as P	mg/L	<0.1						<0.1		
Turbidity	NTU	5.9	4.5	5.3	4.1	3.2	5.0	5.9	6.1	5.6
Annual Mean Discharge	cfs	17.7						20.1		
Annual Mean Discharge per square mile drainage	cfs/mi^2	0.64						0.59		
Suspended Sediment Load	tons	3,342						662		
Suspended Sediment Load per square mile drainage	$tons/mi^2$	121						19		

Chloride

Chloride concentrations varied from 6.4 (site NCC) to 18.0 mg/L (site BRSC). Figure 20 shows chloride concentrations for all sites. Annual mean concentrations ranged from 6.4 to 11.0 mg/L in the Sny Magill watershed and 11.0 to 18.0 in the Bloody Run watershed. The mean annual chloride concentrations declined only at sites NCC and SNWF from 1995 to 1996. The highest concentration (22.0 mg/L) occurred at BR2 on Dec. 26, 1995. The lowest concentration (5.2 mg/L) occurred at NCC on Oct. 31, 1995.

Other Parameters

Mean BOD concentrations for Water Year 1996 were 1 mg/L for site SN1 and 1 mg/L for site BR1. Figure 21 shows BOD levels from sites SN1 and BR1. For Water Year 1996, 50% of the BOD samples for site SN1 were below the detection limit, as were 44% of the samples from site BR1. The highest BOD concentration (4 mg/L) occurred at BR1 on Feb. 13, 1996, and Jun. 18, 1996, and SN1 on Mar. 12, 1996.

Mean annual triazine concentrations were 0.15 mg/L for site SN1 and 0.26 mg/L for site BR1. Figure 22 shows triazine herbicide concentrations at sites SN1 and BR1. At site SN1, 33% of the samples collected contained detectable levels of triazines, as did 100% of the samples from BR1. From 1995 to 1996, the mean triazine concentration decreased at BR1 and increased at SN1.

Table 36. Mean water quality parameters for sites monitored monthly in Sny Magill and Bloody Run watersheds; Water Year 1997.

Parameter	Units	SN1	SN2	SN3	NCC	SNT	SNWF	BR1	BR2	BRSC
Drainage Area	sq. mi.	27.6	22.5	7.2	6.0	3.2	3.1	34.1	24.5	10.5
n		53	12	53	53	12	53	53	53	12
Ammonia-N	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Biological Oxygen Demand	mg/L	1						<1		
Chloride	mg/L	7.9	8.6	11.7	7.0	9.8	9.2	11.3	16.7	18.1
Dissolved Oxygen	mg/L	12	12	12	12	11	12	13	13	13
Fecal Bacteria *(median)*	count/100 ml	20	39	91	100	36	30	80	300	123
IMA-triazine herbicides	µg/L	0.18						0.23		
% detection of triazines	%	40%						96%		
NO_2+NO_3-N	mg/L	2.4	3.2	4.6	2.2	3.7	3.2	5.0	8.6	9.3
Organic-N	mg/L	0.2						0.2		
Specific Conductance	µS/cm	589	631	629	597	608	626	597	655	682
Temperature	degrees C	9	9	10	9	10	10	10	9	10
Total Phosphorous as P	mg/L	<0.1						<0.1		
Turbidity	NTU	7.4	4.6	7.1	6.1	4.9	6.1	5.0	6.7	4.1
Annual Mean Discharge	cfs	14.7						17.2		
Annual Mean Discharge per square mile drainage	cfs/mi^2	0.53						0.50		
Suspended Sediment Load	tons	1,606						4,121		
Suspended Sediment Load per square mile drainage	tons/mi^2	58						120		

Water Year 1997

The mean values for water-quality parameters monitored are summarized in Table 36.

Field Measurements

Mean temperatures varied from 9 to 10 °C. Mean specific conductance values ranged from 589 to 682 mS/cm (microsiemens per centimeter). Mean dissolved oxygen concentrations were relatively high, ranging from 11 to 13 mg/L. Turbidity values were low, with annual means varying from 4.1 to 7.4 NTU.

Fecal Bacteria

Median fecal coliform counts varied from 20 (site SN1) to 300 (site BR2) organisms per 100 ml. Figure 18 shows fecal coliform bacteria counts for all sites. Only sites SN1, SNWF, and BRSC had median fecal counts that decreased from the previous year. SNWF and SN1 had their lowest median fecal count since monitoring began in 1991. The highest count (90,000 organisms per 100 ml) occurred at SNWF on Aug. 12, 1997.

Nitrate+Nitrite-N

Mean annual nitrate+nitrite-N concentrations ranged from 2.2 (site NCC) to 9.3 mg/L (site BRSC). Figure 23 shows nitrate+nitrite-N concentrations for all sites. The mean concentration decreased from the previous year at all sites in the Bloody Run watershed and site NCC in the Sny Magill watershed. The highest concentration (13.0 mg/L) occurred at BR2 on Jan. 14, 1997. The lowest concentration (0.6 mg/L) occurred at SN3 on Feb. 18, 1997.

Chloride

Chloride concentrations varied from 7.0 (site NCC) to 18.1 mg/L (site BRSC). Figure 20 shows

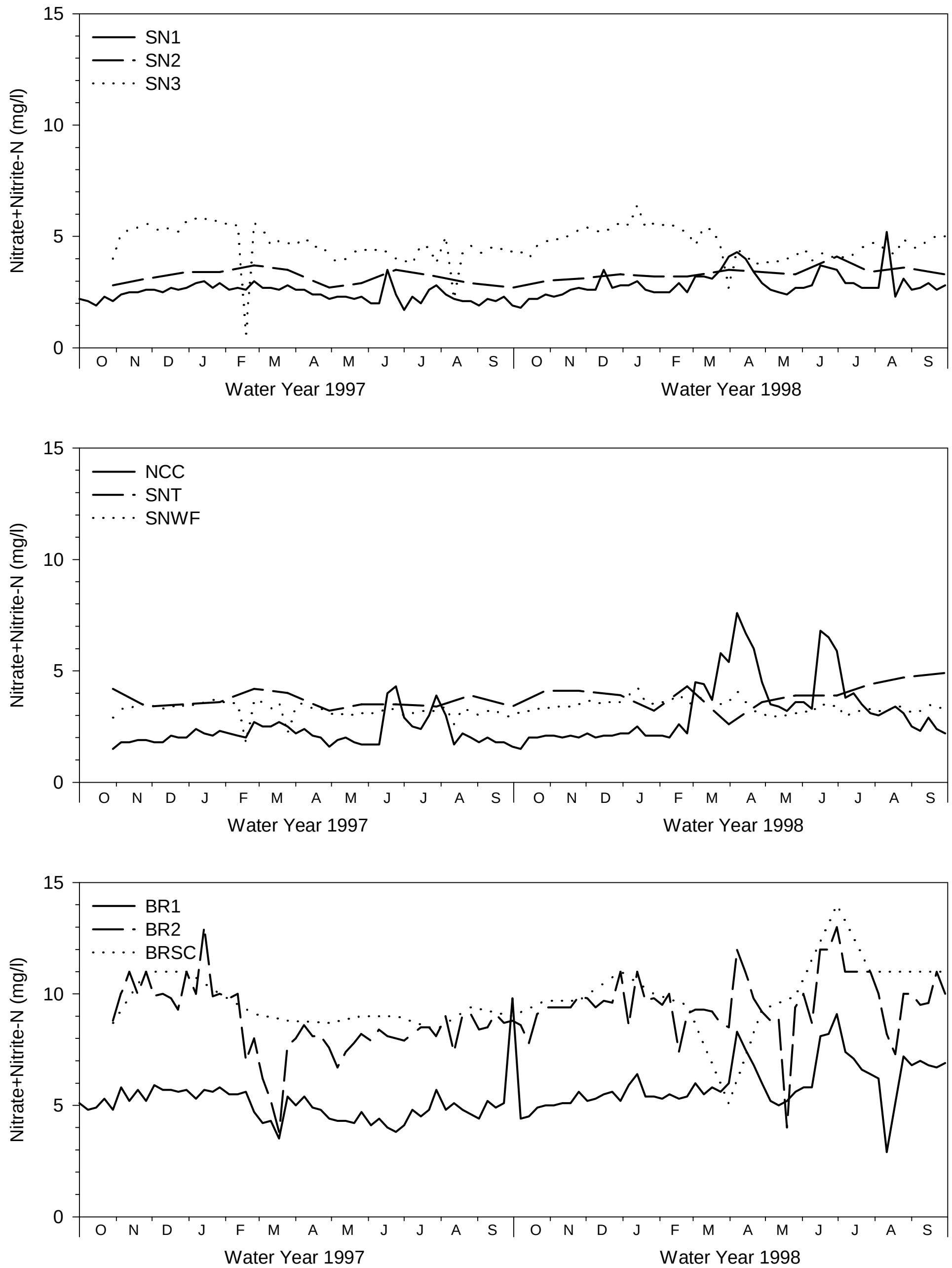


Figure 23. Nitrate+nitrite-N concentrations for all sites for water years 1997 and 1998.

chloride concentrations for all sites. Annual mean concentrations ranged from 7.0 to 11.7 mg/L in the Sny Magill watershed and 11.3 to 18.1 in the Bloody Run watershed. The mean annual chloride concentrates declined only at site BR2 from 1996 to1997. The highest concentration (20.0 mg/L) occurred at BR2 and BRSC numerous times. The lowest concentration (2.0 mg/L) occurred at BR1 on April 1, 1997 and at SN1 on Jan. 14, 1997.

Table 37. Mean water quality parameters for sites monitored monthly in Sny Magill and Bloody Run watersheds; Water Year 1998.

Parameter	Units	SN1	SN2	SN3	NCC	SNT	SNWF	BR1	BR2	BRSC
Drainage Area	sq. mi.	27.6	22.5	7.2	6.0	3.2	3.1	34.1	24.5	10.5
n		52	12	52	52	12	52	52	52	12
Ammonia-N	mg/L	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Biological Oxygen Demand	mg/L	1						<1		
Chloride	mg/L	8.7	8.3	11.8	7.9	10.0	9.3	12.3	16.6	17.3
Dissolved Oxygen	mg/L	13	12	12	13	11	12	13	13	13
Fecal Bacteria *(median)*	count/100 ml	55	77	250	20	135	245	32	150	110
IMA-triazine herbicides	µg/L	<0.10						0.17		
% detection of triazines	%	21%						90%		
NO_2+NO_3-N	mg/L	2.9	3.4	4.7	3.3	4.0	3.4	6.0	9.6	10.1
Organic-N	mg/L	0.3						0.3		
Specific Conductance	µS/cm	604	610	644	598	612	630	611	681	691
Temperature	degrees C	10	11	11	10	11	10	11	9	11
Total Phosphorous as P	mg/L	0.1						0.1		
Turbidity	NTU	8.0	11.4	5.1	6.0	10.1	5.6	6.1	6.1	11.7
Annual Mean Discharge	cfs	19.2						20.9		
Annual Mean Discharge per square mile drainage	cfs/mi^2	0.70						0.61		
Suspended Sediment Load	tons	7,315						2,254		
Suspended Sediment Load per square mile drainage	$tons/mi^2$	265						66		

Other Parameters

Mean BOD concentrations were 1 mg/L for site SN1 and <1 mg/L for site BR1. Figure 21 shows BOD levels from sites SN1 and BR1. For Water Year 1997, 65% of the BOD samples for site SN1 were below the detection limit, as were 73% of the samples from site BR1. The highest BOD concentrations were 5 mg/L for site BR1 (on March 18, 1997) and 3 mg/L for SN1 (on April 8, and Aug. 12, 1997).

Mean annual triazine concentrations were 0.18 mg/L for site SN1 and 0.23 mg/L for site BR1. Figure 22 shows triazine herbicide concentrations at sites SN1 and BR1. At site SN1, 40% of the samples collected contained detectable levels of triazines, as did 96% of the samples from BR1. The mean concentration decreased from the previous year at BR1, but increased at SN1.

Water Year 1998

The mean values for water-quality parameters monitored are summarized in Table 37.

Field Measurements

Mean temperatures varied from 9 to 11°C. Mean specific conductance values ranged from 598 to 691 mS/cm (microsiemens per centimeter). Mean dissolved oxygen concentrations were relatively high, ranging from 11 to 13 mg/L. Turbidity values were low, with annual means varying from 5.1 to 11.7 NTU.

Fecal Bacteria

Median fecal coliform counts varied from 20 (site NCC) to 250 (site SN3) organisms per 100 ml.

Figure 18 shows fecal coliform bacteria counts for all sites. BR2 and SN1 had the lowest median fecal count since monitoring began in 1991, sites SN3 and SNT had the highest count since monitoring began in 1991. The highest count (140,000 organisms per 100 ml) occurred at BR2 on Oct. 14, 1997.

Nitrate+Nitrite-N

Mean annual nitrate+nitrite-N concentrations ranged from 2.9 (site SN1) to 10.1 mg/L (site BRSC). Figure 23 shows nitrate+nitrite-N concentrations for all sites. For all sites, the mean annual nitrate+nitrite-n concentrations increased from the previous year's concentration. The highest concentration (14.0 mg/L) occurred at BRSC on June 30, 1998. The lowest concentration (1.5 mg/L) occurred at NCC on Oct. 7, 1997.

Chloride

Chloride concentrations varied from 7.9 (site NCC) to 17.3 mg/L (site BRSC). Figure 20 shows chloride concentrations for all sites. Annual mean concentrations ranged from 7.9 to 11.8 mg/L in the Sny Magill watershed and 12.3 to 17.3 in the Bloody Run watershed. The mean annual chloride concentrates declined at sites BR2, BRSC, and SN2 from 1997 to 1998. The highest concentration (27.0 mg/L) occurred at BR1 on Jan. 20, 1998. The lowest concentration (4.0 mg/L) occurred at SNT and SNWF on March 31, 1998.

Other Parameters

Mean BOD concentrations were 1 mg/L for site SN1 and <1 mg/L for site BR1. Figure 21 shows BOD levels from sites SN1 and BR1. For Water Year 1998, 58% of the BOD samples for site SN1 were below the detection limit, as were 60% of the samples from site BR1. The highest BOD concentrations were 4 mg/L for site BR1 (on Feb. 17, and March 31, 1998) and 10 mg/L for SN1 (on July 7, 1998).

Mean annual triazine concentrations were <0.10 mg/L for site SN1 and 0.17 mg/L for site BR1. Figure 22 shows triazine herbicide concentrations at sites SN1 and BR1. At site SN1, 21% of the samples collected contained detectable levels of triazines, as did 90% of the samples from BR1. For both sites, the mean concentrations were the lowest since monitoring began in 1992.

Temporal Trends

Several trends established in previous reports are still valid. As a result of higher percentage of row crops in Bloody Run, nitrate+nitrite-N, chloride, fecal bacteria, and triazine concentrations, were consistently higher in Bloody Run than Sny Magill (figures 24, 25, and 26). Nitrate+nitrite-N and chloride concentrations decline in both streams from the upstream sites to the downstream sites (figures 24 and 25).

Fecal coliform bacteria counts continue to show a seasonal trend. Figure 18 illustrates fecal coliform counts since Water Year 1992. Median fecal coliform counts decline during the late fall/winter months and increase during the spring/summer months. During the late fall/winter months, median fecal coliform levels declined to levels at or below the detection limit.

Some chemical parameters in Bloody Run have shown decreasing trends through time. Nitrate+nitrite-N concentration decreased from Water Year 1994 to Water Year 1997 (Figure 24). Since Water Year 1996, chloride concentrations have decreased at BR2, while remaining similar at BRSC (Figure 25). Mean annual triazine herbicide concentrations have steadily declined at BR1 since 1993 (Figure 26). At BR1, the percent detection of triazine herbicides decreased from 100% in 1993 to 90% in 1998 (Figure 26).

Some chemical parameters in Sny Magill have shown increasing trends through time. Nitrate+nitrite-N concentration increased slightly at most sites since Water Year 1995 (Figure 24). Likewise, chloride concentrations have increased at most sites since Water Year 1995 (Figure 25). Mean annual triazine herbicide concentrations have varied with the percent detection (Figure 26). From Water Year 1994 to Water Year 1997, the percent detection of triazine herbicides increased from 15% in 1994 to 40% in 1997 (Figure 26).

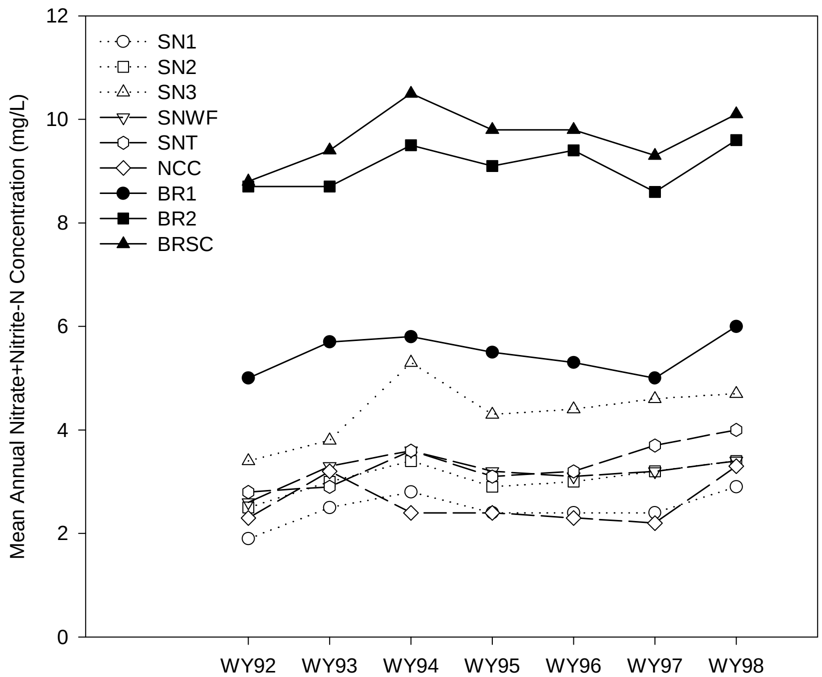


Figure 24. Mean annual nitrate+nitrite-N concentrations for water years 1992 through 1998. For water years 1995 and 1996, nitrate+nitrite-N concentrations were estimated for all sites except BR1 and SN1.

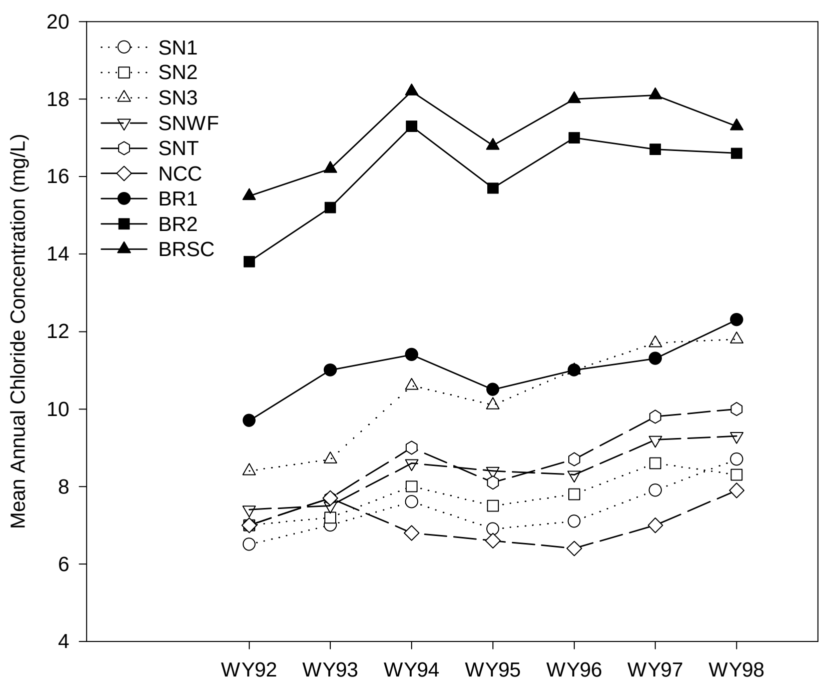


Figure 25. Mean annual chloride concentrations for water years 1992 through 1998.

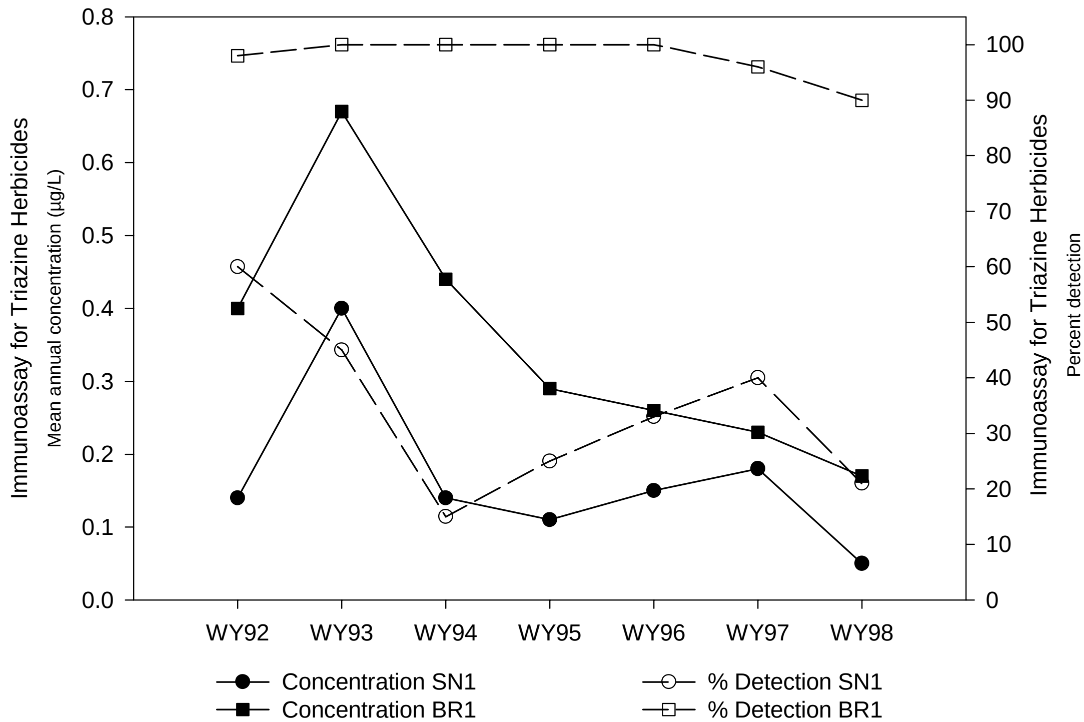


Figure 26. Percent detection and mean annual triazine herbicide concentrations for water years 1992 through 1998.

Trend Analysis

As a preliminary test to evaluate if BMP implementation has affected water quality, data for fecal coliform, atrazine, nitrate+nitrite-N, and suspended sediment was subjected to statistical analysis. Statistical analysis on paired data is required to isolate the effects of BMP implementation from all other variables having the potential to affect water quality, such as rainfall, streamflow, or other hydrologic factors (Grabow and others, 1999). For each parameter, therefore, data from site SN1 was compared with data from BR1.

Because a variety of BMPs were implemented, the BMPs were installed over several years, and the BMPs impact on water quality was not expected to be immediate or discrete, the statistical analysis tested for a gradual change over time.

The statistical method used to detect a gradual change is an analysis of covariance (ANCOVA) or a multiple linear regression analysis. The equation is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

where, Y is either the water-quality variable or log of the variable for the treatment watershed (Sny Magill), X_1 is the same water-quality variable (or log) for the control watershed (Bloody Run), and X_2 is elapsed time in weeks (months for total suspended sediment), and β_0, β_1, β_2 are regression parameters. The estimate of β_2 indicates the magnitude of change over time in units per week (month). By having a control watershed (variable X_1), the analysis blocks out much of the hydrologic variability and the change should be isolated to treatment effects that are being modeled as time (X_2).

Log transformation was done on fecal coliform, atrazine, and total suspended solids data. If autocorrelation was present in the residuals, PROC AUTOREG was used. When autocorrelation is

Table 38. Results of statistical analyses on water-quality parameters from sites SN1 and BR1.

	β_0	p	β_1	p	β_2	p	Comments
Total Suspended Sediment (log)	-0.06676	.7455	0.945	.0001	0.0047[2]	.0806	Used PROC AUTOREG
Fecal Coliform (log)	0.5524	.0001	0.7158	.0001	0.0001	.6863	
Nitrate+Nitrite-N	1.14806	.0001	0.1933	.0001	0.00144[1]	.0001	Used PROC AUTOREG
IMA-Triazine (log)	-0.699	.0001	0.708	.0001	0.00024	.2454	Used PROC AUTOREG

[1] significant at 95% confidence level
[2] significant at 90% confidence level

present, one is more likely to detect a change when in fact there is none; therefore the autocorrelation must be accounted for.

Results

Table 38 shows regression parameter estimates. The parameter β_2 is the parameter for elapsed time, and therefore indicates the magnitude of change. A negative value indicates a decrease and a positive value an increase over time.

Two parameters in Sny Magill, nitrate+nitrite-N and total suspended sediment, had statistically significant increases in concentration relative to Bloody Run. Nitrate+nitrite-N increased by 0.00144 mg/L per week and was significant at the 95% confidence interval. Using the mean value of the control watershed (5.22 mg/L) for X_2 in the ANCOVA equation above, nitrate+nitrite-N increased from 2.16 mg/L to 2.68 mg/L in the treatment watershed since monitoring began in 1991. Total suspended sediment increased by 0.0047 tons/day per week and was significant at the 90% confidence interval.

Several factors may account for these increases, but further investigation is needed. The upland reductions in sediment delivery, a result of BMP implementation, may be masked by erosion of post-settlement alluvium in the Sny Magill watershed. Because the impact of post-settlement alluvium on sediment loads is poorly understood, whether Sny Magill will show significant reductions in sediment load is uncertain. Isolated thunderstorms and improvements in land management in Bloody Run may have influenced the statistical analyses. The paired watershed design in this project was intended to reduce rainfall as a variable in the statistical analysis. However, several thunderstorms affected Sny Magill but not Bloody Run despite their close proximity. These thunderstorms dramatically increased the sediment load of Sny Magill compared to Bloody Run, especially in water years 1996 and 1998. For example, a single storm in June 1996 produced 2.2 inches of rain in Sny Magill, but only 0.86 inches in Bloody Run. This storm accounted for 80% of the total annual sediment load for Sny Magill for that water year, but had little effect on the sediment load in Bloody Run. The Bloody Run watershed, which has a higher percentage of row crops, might show more dramatic improvements in water quality as a result of improvements in land management. From Water Year 1995 to Water Year 1997, mean annual nitrate+nitrite-N concentrations at SN1 remained unchanged, but decreased at BR1 by 0.5 mg/L. Therefore, any improvements in the Sny Magill watershed may be obscured because the control watershed (Bloody Run) also experienced water-quality improvements relative to the treatment watershed (Sny Magill).

SUMMARY

The annual precipitation for water years 1995 and 1996 was near normal, while above normal for water years 1997 and 1998. For both watersheds, the majority of a water year's discharge and sediment load occurs during intermittent high flow events, which traditionally occur during a spring snowmelt period or a summer storm period. Some intense rainfall events have occurred in one watershed while not in the other. These storms increase the discharge in the affected watershed and account for a large percentage of the total annual sediment load for that year.

The fish species sampled were similar to those sampled during previous years and are typical of Iowa cold-water streams. Each watershed was dominated by a single species: the fantail darter in Sny Magill and the slimy sculpin in Bloody Run. Extremely low fish numbers were reported during water years 1995 through 1997 from the sites in Sny Magill and North Cedar Creek; the cause of the low numbers is not known.

The fish data from Sny Magill and Bloody Run creeks were evaluated using the IBI of Lyons and others (1996) and Mundahl and Simon (1999). For most sites, the IBI scores rated the water quality "very poor" to "fair." For both IBIs, Bloody Run had consistently higher IBI scores; a result of a single intolerant coldwater species, the slimy sculpin, present in Bloody Run creek and not Sny Magill. Recalculating both IBIs with tolerance ratings developed from the Iowa Stream Biocriteria Project had little affect on the ratings.

The habitat assessments indicate that, for most years, monitoring sites with similar drainage areas have similar habitat characteristics. In general, sites located in smaller drainage areas tend to have lower values for the following habitat variables compared to sites with larger drainage areas: average depth, distance between riffles, fine-size substrate, instream cover, pool habitat, flow, and silt deposition. The relationship between drainage area and habitat similarity failed in Water Year 1997 and was possibly caused by the significantly higher discharge and sediment load carried by Bloody Run compared to Sny Magill.

The benthic macroinvertebrate communities in Sny Magill and Bloody Run watersheds remained relatively constant. Four taxa dominate the benthic macroinvertebrate population: *Baetis tricaudatus* (mayfly), *Ceratopsyche slossonae* (caddisfly), *Optioservus fastiditus* (beetle), and Chironomidae (midge family). Regression analyses produced strong evidence of significant trends toward improving water quality in the Sny Magill watershed. Multiple regressions comparing means of two treatment and control sites through time showed significant trends in the direction of improving water quality for three bioassessment metrics. Simple regressions of the combined Sny Magill tributary sites and time appear to corroborate the results of the multiple regressions.

Several chemical parameters, including nitrate+nitrite-n, chloride, fecal bacteria, and triazine concentrations, were consistently higher in Bloody Run than Sny Magill. These trends reflect the higher percentage of row crops in the Bloody Run watershed compared to Sny Magill. However, some chemical parameters in Bloody Run have shown decreasing trends through time. The percent detection and annual mean concentration of triazine herbicides decreased steadily since Water Year 1993. At BR1, the mean annual nitrate+nitrite-N concentration declined yearly until 1998.

In contrast, some chemical parameters in the Sny Magill watershed have shown increasing trends through time. Mean annual chloride concentrations have increased yearly at most sites since Water Year 1995. From water year 1995 to 1997, the percent detection and annual mean concentration of triazine herbicides have increased steadily.

As a preliminary test to evaluate if BMP implementation has affected water quality, several chemical parameters were subjected to statistical analyses. Two parameters in Sny Magill, nitrate+nitrite-N and total suspended sediment, had statistically significant increases in concentration relative to Bloody Run. Several factors may account for these increases, but further investigation is needed to identify the cause.

ACKNOWLEDGEMENTS

The Sny Magill Nonpoint Source Pollution Monitoring Project is supported, in part, by the U.S. Environmental Protection Agency, Region VII, Kansas City, through a 319-Nonpoint Source Program Grant to the Iowa Department of Natural Resources (IDNR). The University of Iowa Hygienic Laboratory (UHL) in Iowa City and Des Moines provides analytical support.

This report summarizes the water-quality data collected by various agencies during water years 1995 through1998 from both Sny Magill and Bloody Run watersheds. Fish assessments were completed by Gaige Wunder, Jim Jansen, Vance Polton, Caleb Schnitzler, and Ryan Doorenbos of the IDNR-Fisheries Bureau; the habitat assessment was directed by Tom Wilton of the IDNR-Water Quality Bureau, with the assistance of Mike Birmingham, Matt Coleman, Dennis Heimdal, Todd Hubbard, Jim Luzier, and Mike Schueller of the UHL Limnology Section, Connie Dou, John Olson, and Ralph Turkle of the IDNR-Water Quality Bureau, and Maggie Clover of the IDNR-Compliance and Enforcement Bureau; stream discharge and suspended sediment data was collected and compiled by Von Miller and Jayne May of the U.S. Geological Survey (USGS) in Iowa City, and by local observers Robert Davis and Travis Kruse; benthic work was conducted by Mike Birmingham and Mike Schueller; and water-quality sampling for physical and chemical parameters was completed by Rodney Rovang, Jennette Muller, and Chris Harmon of Effigy Mounds National Monument, and Bob Rowden, Deb Quade, Bob Libra, Paul Liu, Carol Thompson, Mary Skopec, and Lynette Seigley of the IDNR-Geological Survey Bureau.

Nick Rolling and Eric Palas (Iowa State University Extension; ISUE) and Jeff Tisl (Natural Resources Conservation Service; NRCS) coordinated the Sny Magill HUA Project.

Several individuals have played key roles in the coordination of inter-agency activities, and coordination and inter-agency cooperation have been vital components to the on-going success of this program. Those individuals include Ubbo Agena (IDNR-Water Quality Bureau), Rodney Rovang (Effigy Mounds National Monument), Roger Link (U.S. Department of Agriculture), Gerald Miller and Susan Brown (ISUE), Julie Elfving and Paul Schwaab (U.S. EPA, Region VII, Kansas City), Von Miller and Jayne May (USGS), Lynn Hudachek (UHL), and Paul Valin (Iowa Department of Agriculture-Division of Soil Conservation).

Gary Grabow (NCSU Water Quality Group) conducted the statistical analysis. Pat Lohmann oversaw the design and layout of this report. Lynette Seigley reviewed this report and provided editorial comments.

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APPENDIX A.

SUMMARY OF FISH ASSESSMENTS FOR BLOODY RUN AND SNY MAGILL WATERSHED FOR 1992 THROUGH 1998

	Number (%)						
Species (common name)	Site 1 Sny Magill 1992	Site 1 Sny Magill 1993	Site 1 Sny Magill 1994	Site 1 Sny Magill 1995	Site 1 Sny Magill 1996	Site 1 Sny Magill 1997	Site 1 Sny Magill 1998
Campostoma anomalum (Central stoneroller)	-	7 (5%)	1 (<1%)	-	3 (5%)	-	-
Catostomus commersoni (White sucker)	-	6 (4%)	93 (25%)	1 (17%)	7 (11%)	-	2 (10%)
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	2 (<1%)	-	-	-	-	1 (7%)	2 (10%)
Etheostoma flabellare (Fantail darter)	91 (41%)	130 (86%)	225 (61%)	3 (50%)	43 (65%)	13 (86%)	6 (29%)
Etheostoma nigrum (Johnny darter)	-	-	-	-	-	-	-
Lota lota (Burbot)	-	-	-	-	-	-	-
Phoxinus erythrogaster (Southern redbelly dace)	1 (<1%)	-	-	-	-	-	-
Pimephales notatus (Bluntnose minnow)	6 (3%)	-	2 (<1%)	-	-	-	-
Rhinicthys atratulus (Blacknose dace)	122 (54%)	7 (5%)	2 (<1%)	2 (33%)	9 (14%)	-	11 (52%)
Rhinicthys cataractae (Longnose dace)	-	1 (<1%)	43 (12%)	-	-	-	-
Semotilus atromaculatus (Creek chub)	2 (<1%)	-	2 (<1%)	-	4 (6%)	1 (7%)	-
Total	224	151	368	6	66	15	21

	Number (%)						
Species (common name)	Site 2 Sny Magill 1992	Site 2 Sny Magill 1993	Site 2 Sny Magill 1994	Site 2 Sny Magill 1995	Site 2 Sny Magill 1996	Site 2 Sny Magill 1997	Site 2 Sny Magill 1998
Campostoma anomalum (Central stoneroller)	-	14 (4%)	-	-	-	-	-
Catostomus commersoni (White sucker)	-	27 (8%)	294 (46%)	2 (10%)	3 (1%)	1 (4%)	-
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	36 (6%)	-	9 (<1%)	-	-	-	-
Etheostoma flabellare (Fantail darter)	401 (66%)	164 (46%)	272 (42%)	14 (67%)	180 (93%)	10 (40%)	5 (83%)
Etheostoma nigrum (Johnny darter)	16 (3%)	8 (2%)	2 (<1%)	-	-	1 (4%)	-
Lepomis machrochirus (Bluegill)	-	-	-	-	-	-	-
Lota lota (Burbot)	-	-	-	-	-	-	-
Phoxinus erythrogaster (Southern redbelly dace)	1 (<1%)	9 (3%)	-	-	-	-	-
Pimephales notatus (Bluntnose minnow)	35 (6%)	6 (2%)	-	-	-	-	-
Rhinicthys atratulus (Blacknose dace)	114 (19%)	78 (22%)	66 (10%)	5 (24%)	11 (6%)	3 (12%)	1 (17%)
Rhinicthys cataractae (Longnose dace)	-	53 (15%)	3 (<1%)	-	-	10 (40%)	-
Semotilus atromaculatus (Creek chub)	2 (<1%)	-	-	-	-	-	-
Total	605	359	646	21	194	25	6

	Number (%)						
Species (common name)	Site 3 Sny Magill 1992	Site 3 Sny Magill 1993	Site 3 Sny Magill 1994	Site 3 Sny Magill 1995	Site 3 Sny Magill 1996	Site 3 Sny Magill 1997	Site 3 Sny Magill 1998
Campostoma anomalum (Central stoneroller)	-	-	-	-	-	-	-
Catostomus commersoni (White sucker)	-	4 (3%)	30 (25%)	1 (4%)	-	51 (40%)	10 (13%)
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	1 (<1%)	-	-	4 (17%)	17 (22%)	25 (19%)	2 (3%)
Etheostoma flabellare (Fantail darter)	307 (79%)	112 (94%)	70 (58%)	3 (13%)	36 (47%)	16 (12%)	26 (34%)
Etheostoma nigrum (Johnny darter)	6 (2%)	-	-	-	-	7 (5%)	15 (20%)
Lota lota (Burbot)	-	1 (1%)	-	-	-	-	-
Phoxinus erythrogaster (Southern redbelly dace)	-	-	-	-	-	4 (3%)	-
Pimephales notatus (Bluntnose minnow)	1 (<1%)	-	-	-	-	4 (3%)	-
Rhinicthys atratulus (Blacknose dace)	62 (16%)	2 (2%)	19 (16%)	14 (61%)	23 (30%)	21 (16%)	7 (9%)
Rhinicthys cataractae (Longnose dace)	11 (3%)	-	2 (2%)	-	-	-	6 (8%)
Semotilus atromaculatus (Creek chub)	-	-	-	1 (4%)	-	1 (<1%)	10 (13%)
Total	388	119	121	23	76	129	76

	Number (%)						
Species (common name)	Site 4 Sny Magill 1992	Site 4 Sny Magill 1993	Site 4 Sny Magill 1994	Site 4 Sny Magill 1995	Site 4 Sny Magill 1996	Site 4 Sny Magill 1997	Site 4 Sny Magill 1998
Campostoma anomalum (Central stoneroller)	3 (3%)	3 (2%)	-	-	-	-	-
Catostomus commersoni (White sucker)	-	6 (4%)	7 (8%)	1 (25%)	1 (2%)	24 (16%)	5 (10%)
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	3 (3%)	-	-	-	4 (6%)	1 (<1%)	-
Etheostoma flabellare (Fantail darter)	41 (38%)	119 (74%)	56 (67%)	3 (75%)	36 (56%)	90 (62%)	27 (53%)
Etheostoma nigrum (Johnny darter)	16 (15%)	1 (1%)	-	-	-	1 (<1%)	-
Ictulurus melas (Black bullhead)	-	-	-	-	-	-	-
Lepomis cyanellus (Green Sunfish)	-	-	-	-	-	-	3 (6%)
Lota lota (Burbot)	-	-	5 (6%)	-	-	2 (1%)	8 (16%)
Phoxinus erythrogaster (Southern redbelly dace)	-	-	-	-	-	-	-
Pimephales notatus (Bluntnose minnow)	-	-	2 (2%)	-	-	-	-
Rhinicthys atratulus (Blacknose dace)	44 (40%)	29 (18%)	9 (11%)	-	23 (36%)	13 (9%)	4 (8%)
Rhinicthys cataractae (Longnose dace)	2 (2%)	2 (1%)	4 (5%)	-	-	15 (10%)	3 (6%)
Semotilus atromaculatus (Creek chub)	-	-	-	-	-	-	1 (2%)
Total	109	160	83	4	64	146	51

	Number (%)						
Species (common name)	Site 5 Sny Magill (North Cedar) 1992	Site 5 Sny Magill (North Cedar) 1993	Site 5 Sny Magill (North Cedar) 1994	Site 5 Sny Magill (North Cedar) 1995	Site 5 Sny Magill (North Cedar) 1996	Site 5 Sny Magill (North Cedar) 1997	Site 5 Sny Magill (North Cedar) 1998
Campostoma anomalum (Central stoneroller)	1 (1%)	-	-	-	-	-	-
Catostomus commersoni (White sucker)	-	-	-	-	-	1 (6%)	-
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	-	-	-	-	-	-	-
Etheostoma flabellare (Fantail darter)	60 (50%)	99 (52%)	101 (84%)	18 (75%)	12 (50%)	1 (6%)	36 (49%)
Etheostoma nigrum (Johnny darter)	-	-	-	1 (4%)	3 (13%)	-	-
Lota lota (Burbot)	1 (1%)	-	1 (1%)	-	-	-	-
Phoxinus erythrogaster (Southern redbelly dace)	1 (1%)	-	-	-	-	-	-
Pimephales notatus (Bluntnose minnow)	1 (1%)	7 (4%)	-	-	-	-	-
Pimephales promelas (Fathead minnow)	-	-	-	-	-	1 (6%)	-
Rhinicthys atratulus (Blacknose dace)	53 (44%)	84 (44%)	18 (15%)	4 (17%)	6 (25%)	15 (82%)	34 (47%)
Rhinicthys cataractae (Longnose dace)	-	1 (1%)	-	-	-	-	3 (4%)
Semotilus atromaculatus (Creek chub)	3 (3%)	1 (1%)	-	1 (4%)	3 (13%)	-	-
Total	120	192	120	24	24	18	73

	Number (%)						
Species (common name)	Site 6 Bloody Run 1992	Site 6 Bloody Run 1993	Site 6 Bloody Run 1994	Site 6 Bloody Run 1995	Site 6 Bloody Run 1996	Site 6 Bloody Run 1997	Site 6 Bloody Run 1998
Campostoma anomalum (Central stoneroller)	-	1 (<1%)	-	-	-	-	6 (6%)
Catostomus commersoni (White sucker)	-	34 (10%)	15 (2%)	11 (2%)	5 (2%)	10 (3%)	3 (3%)
Cottus cognatus (Slimy sculpin)	64 (52%)	153 (43%)	650 (96%)	476 (97%)	283 (98%)	300 (96%)	68 (71%)
Culaea inconstans (Brook stickleback)	-	-	-	-	-	-	-
Etheostoma flabellare (Fantail darter)	25 (20%)	91 (25%)	3 (<1%)	-	-	-	3 (3%)
Etheostoma nigrum (Johnny darter)	-	-	-	-	-	-	-
Lota lota (Burbot)	-	-	-	-	-	-	-
Phoxinus erythrogaster (Southern redbelly dace)	-	-	-	-	-	-	-
Pimephales notatus (Bluntnose minnow)	-	-	-	-	-	-	-
Rhinicthys atratulus (Blacknose dace)	29 (23%)	37 (10%)	8 (1%)	3 (<1%)	1 (<1%)	1 (<1%)	3 (3%)
Rhinicthys cataractae (Longnose dace)	6 (5%)	41 (11%)	-	-	-	1 (<1%)	13 (14%)
Semotilus atromaculatus (Creek chub)	-	-	-	-	-	-	-
Total	124	357	676	490	289	312	96

Species (common name)	Number (%) Sny Magill sites 1,2,3,4 1992	Sny Magill sites 1,2,3,4 1993	Sny Magill sites 1,2,3,4 1994	Sny Magill sites 1,2,3,4 1995	Sny Magill sites 1,2,3,4 1996	Sny Magill sites 1,2,3,4 1997	Sny Magill sites 1,2,3,4 1998
Campostoma anomalum (Central stoneroller)	3 (<1%)	24 (3%)	1 (<1%)	-	3 (1%)	-	-
Catostomus commersoni (White sucker)	-	43 (5%)	424 (35%)	5 (9%)	11 (3%)	76 (24%)	17 (11%)
Cottus cognatus (Slimy sculpin)	-	-	-	-	-	-	-
Culaea inconstans (Brook stickleback)	42 (3%)	-	9 (1%)	4 (8%)	21 (5%)	27 (9%)	4 (3%)
Etheostoma flabellare (Fantail darter)	840 (63%)	525 (67%)	623 (51%)	23 (43%)	295 (74%)	129 (41%)	64 (42%)
Etheostoma nigrum (Johnny darter)	38 (3%)	9 (1%)	2 (<1%)	-	-	9 (3%)	15 (10%)
Ictulurus melas (Black bullhead)	-	-	-	-	-	-	-
Lepomis cyanellus (Green Sunfish)	-	-	-	-	-	-	3 (2%)
Lepomis machrochirus (Bluegill)	-	-	-	-	-	-	-
Lota lota (Burbot)	-	1 (<1%)	5 (<1%)	-	-	2 (<1%)	8 (5%)
Phoxinus erythrogaster (Southern redbelly dace)	2 (<1%)	9 (1%)	-	-	-	4 (1%)	-
Pimephales notatus (Bluntnose minnow)	42 (3%)	6 (1%)	4 (<1%)	-	-	4 (1%)	-
Rhinicthys atratulus (Blacknose dace)	342 (26%)	116 (15%)	96 (8%)	21 (40%)	66 (17%)	37 (12%)	23 (15%)
Rhinicthys cataractae (Longnose dace)	13 (1%)	56 (7%)	52 (4%)	-	-	25 (8%)	9 (6%)
Semotilus atromaculatus (Creek chub)	4 (<1%)	-	2 (<1%)	1 (2%)	4 (1%)	2 (<1%)	11 (7%)
Total	1,326	789	1,218	54	400	315	154

	Number (%)						
Species (common name)	All Sites 1992	All Sites 1993	All Sites 1994	All Sites 1995	All Sites 1996	All Sites 1997	All Sites 1998
Campostoma anomalum (Central stoneroller)	4 (<1%)	25 (2%)	1 (<1%)	-	3 (<1%)	-	6 (2%)
Catostomus commersoni (White sucker)	-	77 (6%)	439 (22%)	16 (3%)	16 (2%)	87 (13%)	20 (6%)
Cottus cognatus (Slimy sculpin)	64 (4%)	153 (11%)	650 (32%)	476 (84%)	283 (40%)	300 (47%)	68 (21%)
Culaea inconstans (Brook stickleback)	42 (3%)	-	9 (<1%)	4 (<1%)	21 (3%)	27 (4%)	4 (1%)
Etheostoma flabellare (Fantail darter)	925 (59%)	715 (53%)	727 (36%)	41 (7%)	307 (43%)	130 (20%)	103 (32%)
Etheostoma nigrum (Johnny darter)	38 (2%)	9 (1%)	2 (<1%)	1 (<1%)	3 (<1%)	9 (1%)	15 (5%)
Ictulurus melas (Black bullhead)	-	-	-	-	-	-	-
Lepomis cyanellus (Green sunfish)	-	-	-	-	-	-	3 (1%)
Lepomis machrochirus (Bluegill)	-	-	-	-	-	-	-
Lota lota (Burbot)	1 (<1%)	1 (<1%)	6 (<1%)	-	-	2 (<1%)	8 (2%)
Phoxinus erythrogaster (Southern redbelly dace)	3 (<1%)	9 (1%)	-	-	-	4 (1%)	-
Pimephales notatus (Bluntnose minnow)	43 (3%)	13 (1%)	4 (<1%)	-	-	4 (1%)	-
Pimephales promelas (Fathead minnow)	-	-	-	-	-	1 (<1%)	-
Rhinicthys atratulus (Blacknose dace)	424 (27%)	237 (18%)	122 (6%)	28 (5%)	73 (10%)	53 (8%)	60 (19%)
Rhinicthys cataractae (Longnose dace)	19 (1%)	98 (7%)	52 (3%)	-	-	26 (4%)	25 (8%)
Semotilus atromaculatus (Creek chub)	7 (<1%)	1 (<1%)	2 (<1%)	2 (<1%)	7 (1%)	2 (<1%)	11 (3%)
Total	1,570	1,338	2,014	568	713	645	323

APPENDIX B.

INDEX OF BIOTIC INTEGRITY SCORES
FOR SNY MAGILL, NORTH CEDAR, AND BLOODY RUN CREEKS
(WATER YEARS 1992 THROUGH 1998)

CALCULATED USING THE IBI OF MUNDAHL AND SIMON (1999).

SCORES FROM TABLE 18

Sny Magill Creek #1	1992	1993	1994	1995 (a)	1996	1997 (a)	1998 (a)
			Number or percent (score)				
Number of species	6 (5)	5 (5)	7 (5)	-----	5 (5)	-----	-----
Number of coldwater species	1 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Number of minnow species	4 (0)	3 (5)	5 (0)	-----	3 (5)	-----	-----
Number of benthic species	1 (10)	3 (0)	3 (0)	-----	2 (5)	-----	-----
Number of tolerant species	3 (5)	2 (5)	4 (0)	-----	3 (5)	-----	-----
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Percent intolerant individuals	0 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Percent coldwater individuals	<1 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Percent white suckers	0 (10)	4 (0)	25 (0)	-----	11 (0)	-----	-----
Percent top carnivores	0 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Number of coldwater individuals	2 (0)	0 (0)	0 (0)	-----	0 (0)	-----	-----
Number of warmwater individuals	222 (0)	151 (0)	368 (0)	-----	66 (0)	-----	-----
IBI Score	**30**	**15**	**5**	**-----**	**20**	**-----**	-----
Integrity Rating	**Poor**	**Poor**	**Very Poor**	**-----**	**Poor**	**-----**	-----

Sny Magill Creek #2	1992	1993	1994	1995 (a)	1996	1997	1998 (a)
			Number or percent (score)				
Number of species	7 (5)	8 (5)	6 (5)	-----	3 (10)	5 (5)	-----
Number of coldwater species	1 (0)	0 (0)	1 (0)	-----	0 (0)	0 (0)	-----
Number of minnow species	4 (0)	5 (0)	2 (5)	-----	1 (10)	2 (5)	-----
Number of benthic species	2 (5)	4 (0)	4 (0)	-----	2 (5)	4 (0)	-----
Number of tolerant species	3 (5)	3 (5)	2 (5)	-----	2 (5)	2 (5)	-----
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	-----
Percent intolerant individuals	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	-----
Percent coldwater individuals	6 (0)	0 (0)	<1 (0)	-----	0 (0)	0 (0)	-----
Percent white suckers	0 (10)	8 (0)	46 (0)	-----	1 (5)	4 (0)	-----
Percent top carnivores	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	-----
Number of coldwater individuals	36 (5)	0 (0)	9 (0)	-----	0 (0)	0 (0)	-----
Number of warmwater individuals	569 (0)	359 (0)	637 (0)	-----	194 (0)	25 (0)	-----
IBI Score	**30**	**10**	**15**	**-----**	**35**	**15**	-----
Integrity Rating	**Poor**	**Poor**	**Poor**	-----	**Fair**	**Poor**	-----

(a) Fish numbers were less than 25, therefore, an IBI was not calculated.

Sny Magill Creek #3	1992	1993	1994	1995 (a)	1996	1997	1998
				Number or percent (score)			
Number of species	6 (5)	4 (10)	4 (10)	-----	3 (10)	8 (5)	7 (5)
Number of coldwater species	1 (0)	1 (0)	0 (0)	-----	1 (0)	1 (0)	1 (0)
Number of minnow species	3 (5)	1 (10)	2 (5)	-----	1 (10)	4 (0)	3 (5)
Number of benthic species	3 (0)	2 (5)	3 (0)	-----	1 (10)	3 (0)	4 (0)
Number of tolerant species	2 (5)	2 (5)	2 (5)	-----	1 (10)	4 (0)	3 (5)
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent intolerant individuals	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent coldwater individuals	<1 (0)	1 (0)	0 (0)	-----	22 (0)	19 (0)	3 (0)
Percent white suckers	0 (10)	3 (0)	25 (0)	-----	0 (10)	40 (0)	13 (0)
Percent top carnivores	0 (0)	1 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Number of coldwater individuals	1 (0)	1 (0)	0 (0)	-----	17 (0)	25 (0)	2 (0)
Number of warmwater individuals	387 (0)	118 (0)	121 (0)	-----	59 (5)	104 (0)	74 (0)
IBI Score	**25**	**30**	**20**	**-----**	**55**	**5**	**15**
Integrity Rating	**Poor**	**Poor**	**Poor**	**-----**	**Fair**	**Very Poor**	**Poor**

Sny Magill Creek #4	1992	1993	1994	1995 (a)	1996	1997	1998
				Number or percent (score)			
Number of species	6 (5)	6 (5)	6 (5)	-----	4 (10)	7 (5)	7 (5)
Number of coldwater species	1 (0)	0 (0)	1 (0)	-----	1 (0)	2 (5)	1 (0)
Number of minnow species	3 (5)	3 (5)	3 (5)	-----	1 (10)	2 (5)	3 (5)
Number of benthic species	3 (0)	4 (0)	3 (0)	-----	2 (5)	4 (0)	3 (0)
Number of tolerant species	1 (10)	2 (5)	3 (0)	-----	2 (5)	2 (5)	4 (0)
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent intolerant individuals	0 (0)	0 (0)	0 (0)	-----	0 (0)	0 (0)	0 (0)
Percent coldwater individuals	3 (0)	0 (0)	0 (0)	-----	6 (0)	1 (0)	16 (0)
Percent white suckers	0 (10)	4 (0)	8 (0)	-----	2 (0)	16 (0)	10 (0)
Percent top carnivores	0 (0)	0 (0)	6 (0)	-----	0 (0)	1 (0)	16 (0)
Number of coldwater individuals	3 (0)	0 (0)	5 (0)	-----	4 (0)	3 (0)	8 (0)
Number of warmwater individuals	106 (0)	160 (0)	78 (0)	-----	60 (5)	143 (0)	43 (5)
IBI Score	**30**	**15**	**10**	**-----**	**35**	**20**	**15**
Integrity Rating	**Poor**	**Poor**	**Poor**	**-----**	**Fair**	**Poor**	**Poor**

(a) Fish numbers were less than 25, therefore, an IBI was not calculated.

North Cedar Creek	1992	1993	1994	1995 (a)	1996 (a)	1997(a)	1998
				Number or percent (score)			
Number of species	7 (5)	5 (5)	3 (10)	-----	-----	-----	3 (10)
Number of coldwater species	1 (0)	0 (0)	1 (0)	-----	-----	-----	0 (0)
Number of minnow species	5 (0)	4 (0)	1 (10)	-----	-----	-----	2 (5)
Number of benthic species	1 (10)	2 (5)	1 (10)	-----	-----	-----	2 (5)
Number of tolerant species	3 (5)	3 (5)	1 (10)	-----	-----	-----	1 (10)
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	-----	-----	-----	0 (0)
Percent intolerant individuals	0 (0)	0 (0)	0 (0)	-----	-----	-----	0 (0)
Percent coldwater individuals	1 (0)	0 (0)	1 (0)	-----	-----	-----	0 (0)
Percent white suckers	0 (10)	0 (10)	0 (10)	-----	-----	-----	0 (10)
Percent top carnivores	1 (0)	0 (0)	1 (0)	-----	-----	-----	0 (0)
Number of coldwater individuals	1 (0)	0 (0)	1 (0)	-----	-----	-----	0 (0)
Number of warmwater individuals	119 (0)	192 (0)	119 (0)	-----	-----	-----	73 (0)
IBI Score	**30**	**25**	**50**	**-----**	**-----**	**-----**	**40**
Integrity Rating	**Poor**	**Poor**	**Fair**	**-----**	**-----**	**-----**	**Fair**

Bloody Run Creek	1992	1993	1994	1995	1996	1997	1998
				Number or percent (score)			
Number of species	4 (10)	6 (5)	4 (10)	3 (10)	3 (10)	4 (10)	6 (5)
Number of coldwater species	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)
Number of minnow species	2 (5)	3 (5)	1 (10)	1 (10)	1 (10)	2 (5)	3 (5)
Number of benthic species	3 (0)	4 (0)	3 (0)	2 (5)	2 (5)	3 (0)	4 (0)
Number of tolerant species	1 (10)	2 (5)	2 (5)	2 (5)	2 (5)	2 (5)	2 (5)
Percent salmonids as brook trout	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Percent intolerant individuals	52 (10)	43 (5)	96 (10)	97 (10)	98 (10)	96 (10)	71 (10)
Percent coldwater individuals	52 (5)	43 (5)	96 (10)	97 (10)	98 (10)	96 (10)	71 (5)
Percent white suckers	0 (10)	10 (0)	2 (0)	2 (0)	2 (0)	3 (0)	3 (0)
Percent top carnivores	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Number of coldwater individuals	64 (5)	153 (10)	650 (10)	476 (10)	283 (10)	300 (10)	68 (5)
Number of warmwater individuals	60 (5)	204 (0)	26 (5)	14 (10)	6 (10)	12 (10)	28 (5)
IBI Score	**60**	**35**	**60**	**70**	**70**	**60**	**40**
Integrity Rating	**Fair**	**Fair**	**Fair**	**Good**	**Good**	**Fair**	**Fair**

(a) Fish numbers were less than 25, therefore, an IBI was not calculated.

APPENDIX C.

SUMMARY OF AQUATIC HABITAT EVALUATIONS FOR BLOODY RUN AND SNY MAGILL WATERSHEDS FOR 1991 THROUGH 1998

	Site SN1							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	33,226.3	31,309.2	32,947.5	34,433.0	33,374.6	32,779.0	32,723.6	33,110.9
(square meters)	(3,086.8)	(2,908.7)	(3,060.9)	(3,198.9)	(3,100.6)	(3,047.1)	(3,041.1)	(3,076.1)
Length: feet	951.4	951.4	951.4	952.1	951.4	952.1	952.1	952.1
(meters)	(290.0)	(290.0)	(290.0)	(290.2)	(290.0)	(290.2)	(290.2)	(290.2)
Flow: cubic feet per second	10.95	8.48	28.95	15.89	9.89	6.40	10.95	16.95
(cubic meters per second)	(0.31)	(0.24)	(0.82)	(0.45)	(0.28)	(0.18)	(0.31)	(0.48)
Average width: feet	35.1	32.8	34.8	36.1	35.1	34.3	34.4	34.8
(meters)	(10.7)	(10.0)	(10.6)	(11.0)	(10.7)	(10.5)	(10.5)	(10.6)
Maximum depth: feet	6.20	5.18	6.49	4.9+	4.9+	4.9+	4.2	4.9+
(meters)	(1.89)	(1.58)	(1.98)	(1.5+)	(1.5+)	(1.5+)	(1.28)	(1.5+)
Average transect maximum depth: feet	3.05	2.72	3.28	2.79	2.79	2.72	2.46	2.40
(meters)	(0.93)	(0.83)	(1.00)	(0.85)	(0.85)	(0.83)	(0.75)	(0.73)
Average depth: feet	2.13	1.83	2.19	1.80	1.87	1.77	1.74	1.48
(meters)	(0.65)	(0.56)	(0.67)	(0.55)	(0.57)	(0.54)	(0.53)	(0.45)
INSTREAM HABITAT:								
Dominant habitat type	POOL	POOL	POOL	POOL	POOL	POOL	POOL	POOL
Riffle repeat frequency (X average width)	14	10	27	13	27	14	14	14
% reach with instream cover	70	70	50	40	40	30	25	5
Dominant cover type	POOL	POOL	POOL	POOL	POOL	POOL	POOL	POOL
% reach with pool habitat	60	85	75	80	70	65	70	80
Dominant pool size class *	1	1	1	1	1	1	1	1
% reach with silt deposition	65	80	65	75	80	85	85	85
% reach with scoured substrate	10	5	<5	<5	<5	<5	0	0
% reach with vascular aquatic vegetation	-	10	5	15	5	5	10	<5
Dominant vascular aquatic vegetation type	-	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG
SUBSTRATE COMPOSITION								
% clay	2	2	4	4	8	2	2	2
% silt	48	68	52	52	64	76	63	54
% sand	8	2	0	8	0	0	1	8
% gravel	10	20	29	18	2	4	4	10
% cobble	22	6	10	14	18	16	26	16
% boulder	10	2	5	0	8	2	4	4
% wood	0	0	0	2	0	0	0	4
% other	0	0	0	2	0	0	0	2
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	HVY	LGHT	HVY/MOD	MOD	MOD	LGHT/MOD	HVY/MOD
Dominant periphyton form	-	FLMNT	NONFLMNT	FLMNT	NONFLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.1	3.0	3.5	2.7	2.7	1.3	2.0
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	1.7	1.5	2.3	2.0	1.9	2.2	2.2
Avg. streambank tree coverage rating	1.9	1.9	1.1	1.8	2.0	2.4	2.3	1.4
Avg. streambank shrub coverage rating	1.0	1.0	1.2	1.0	1.0	1.0	1.0	1.0
Avg. streambank herbaceous coverage rating	4.3	3.8	4.0	3.8	4.4	4.4	4.6	3.9
Avg. streambank instability rating	1.2	1.6	2.9	2	1.6	1.6	1.7	2.2

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site SN2							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	8,986.9	8,962.1	11,599.3	10,857.7	11,044.9	11,401.2	11,724.1	10,601.4
(square meters)	(834.9)	(832.6)	(1,077.6)	(1,008.8)	(1,026.1)	(1,059.2)	(1,089.2)	(984.9)
Length: feet	482.3	482.3	482.3	482.3	482.3	482.3	482.3	482.3
(meters)	(147.0)	(147.0)	(147.0)	(147.0)	(147.0)	(147.0)	(147.0)	(147.0)
Flow: cubic feet per second	8.12	9.89	20.83	9.89	9.18	10.24	8.83	
(cubic meters per second)	(0.23)	(0.28)	(0.59)	(0.28)	(0.26)	(0.29)	(0.25)	
Average width: feet	18.7	18.7	23.9	22.3	23.0	23.6	24.3	22.0
(meters)	(5.7)	(5.7)	(7.3)	(6.8)	(7.0)	(7.2)	(7.4)	(6.7)
Maximum depth: feet	5.93	5.57	4.9+	4.9+	4.9+	4.9+	4.9+	4.9+
(meters)	(1.81)	(1.70)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)
Average transect maximum depth: feet	1.67	1.34	1.96	1.57	1.57	1.74	2.27	1.54
(meters)	(0.51)	(0.41)	(0.60)	(0.48)	(0.48)	(0.53)	(0.69)	(0.47)
Average depth: feet	1.01	0.82	1.24	0.85	0.85	0.98	1.31	0.85
(meters)	(0.31)	(0.25)	(0.38)	(0.26)	(0.26)	(0.30)	(0.40)	(0.26)
INSTREAM HABITAT:								
Dominant habitat type	RUN	POOL	RUN	RUN	RUN	RUN	POOL	RUN
Riffle repeat frequency (X average width)	6	9	10	7	7	7	10	6
% reach with instream cover	30	25	25	10	5	10	15	10
Dominant cover type	POOL	POOL	POOL	POOL/OV	POOL	POOL	POOL	POOL
% reach with pool habitat	30	55	20	25	25	25	52	20
Dominant pool size class *	1	1	1	1	1	1	1	1
% reach with silt deposition	30	45	50	30	45	30	60	30
% reach with scoured substrate	<5	10	5	<5	<5	<5	0	0
% reach with vascular aquatic vegetation	-	15	0	5	5	<5	5	<5
Dominant vascular aquatic vegetation type	-	SUBMERG	NA	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG
SUBSTRATE COMPOSITION								
% clay	0	0	2	0	0	2	0	0
% silt	18	44	42	18	30	16	7	16
% sand	10	4	2	11	2	10	7	8
% gravel	36	32	48	35	36	24	33	36
% cobble	34	20	6	27	26	43	38	34
% boulder	0	0	0	2	2	1	0	0
% wood	0	0	0	2	0	0	0	0
% other	0	0	0	5	4	4	15	6
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	MOD	MOD	MOD/LGHT	LGHT/MOD	MOD/HVY	MOD	HVY
Dominant periphyton form	-	FLMNT	NONFLMNT	FLMNT	NONFLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.0	3.4	2.5	3.0	2.4	1.5	2.9
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	2.4	2.8	3.1	3.3	2.8	3.3	2.9
Avg. streambank tree coverage rating	2.1	1.6	1.5	2.6	3.0	2.5	2.9	1.7
Avg. streambank shrub coverage rating	1.2	2.0	1.0	1.3	1.4	1.3	1.4	1.2
Avg. streambank herbaceous coverage rating	4.2	4.1	3.4	3.8	4.1	4.0	4.7	3.7
Avg. streambank instability rating	1.3	2.0	2.0	1.8	2.8	2.0	1.6	2.6

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site SN3							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	3,647.9	4,918.1	4,344.4	3,647.9	4,102.2	4,401.4	4,079.6	4,249.59
(square meters)	(338.9)	(456.9)	(403.6)	(358.2)	(381.1)	(408.9)	(379.0)	(394.8)
Length: feet	315.6	311.7	311.7	311.7	311.7	312.0	312.0	312.01
(meters)	(96.2)	(95.0)	(95.0)	(95.0)	(95.0)	(95.1)	(95.1)	(95.1)
Flow: cubic feet per second	1.76	1.76	5.65	3.18	6.00	2.82	2.12	
(cubic meters per second)	(0.05)	(0.05)	(0.16)	(0.09)	(0.17)	(0.08)	(0.06)	
Average width: feet	11.8	15.7	13.7	12.5	13.5	14.1	13.1	13.78
(meters)	(3.6)	(4.8)	(4.2)	(3.8)	(4.1)	(4.3)	(4.0)	(4.2)
Maximum depth: feet	2.16	2.03	2.49	2.10	2.49	2.10	2.00	
(meters)	(0.66)	(0.62)	(0.76)	(0.64)	(0.76)	(0.64)	(0.61)	
Average transect maximum depth: feet	0.95	0.59	1.18	0.82	0.98	0.92	0.69	0.82
(meters)	(0.29)	(0.18)	(0.36)	(0.25)	(0.30)	(0.28)	(0.21)	(0.25)
Average depth: feet	0.45	0.26	0.59	0.46	0.52	0.46	0.36	0.52
(meters)	(0.14)	(0.08)	(0.18)	(0.14)	(0.16)	(0.14)	(0.11)	(0.16)
INSTREAM HABITAT:								
Dominant habitat type	RUN	RN/RFFL	RUN	RFFL	RUN	RUN	RUN	RUN
Riffle repeat frequency (X average width)	5	6	10	6	8	7	6	6
% reach with instream cover	15	<5	5	<5	5	5	<5	0
Dominant cover type	POOL	POOL	OVRVEG	UBNK	OVRVEG	UBNK/ OVRVEG	UBNK	NA
% reach with pool habitat	30	10	10	15	5	30	5	0
Dominant pool size class *	3	3	3	3	2	3	3	NA
% reach with silt deposition	10	30	20	20	5	40	35	20
% reach with scoured substrate	5	5	<5	<5	5	<5	0	0
% reach with vascular aquatic vegetation	-	15	0	<5	<5	0	<5	0
Dominant vascular aquatic vegetation type	-	EMERG	NA	EMERG/ SUBMERG	SUBMERG	NA	SUBMERG	NA
SUBSTRATE COMPOSITION								
% clay	1	0	2	0	0	2	0	2
% silt	0	21	16	14	4	32	14	12
% sand	3	5	1	4	2	0	0	2
% gravel	33	42	45	44	42	32	22	34
% cobble	54	32	31	36	46	34	56	46
% boulder	7	0	3	0	6	0	4	4
% wood	0	0	0	0	0	0	2	0
% other	1	0	2	2	0	0	2	0
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	HVY	MOD	MOD	LGHT	LGHT/MOD	MOD	HVY
Dominant periphyton form	-	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.5	2.2	2.2	1.4	1.4	1.9	2.7
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	2.0	2.3	2.6	3.4	2.9	2.7	2.7
Avg. streambank tree coverage rating	2.0	1.6	1.3	1.3	2.4	1.5	2.4	1.8
Avg. streambank shrub coverage rating	1.6	1.4	1.6	1.4	1.3	1.2	1.6	1.5
Avg. streambank herbaceous coverage rating	2.7	3.4	2.5	2.8	4.0	4.4	4.4	4.1
Avg. streambank instability rating	1.9	1.3	2.3	1.8	2.0	2.0	2.2	1.8

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site SNWF							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	1,871.8	2,061.3	2,549.9	2,146.3	2,553.2	2,476.8	2,547.8	2,637.2
(square meters)	(173.9)	(191.5)	(236.9)	(199.4)	(237.2)	(230.1)	(236.7)	(245)
Length: feet	232.3	236.2	236.2	236.2	235.9	235.9	235.9	235.9
(meters)	(70.8)	(72.0)	(72.0)	(72.0)	(71.9)	(71.9)	(71.9)	(71.9)
Flow: cubic feet per second	1.76	2.12	5.65	2.12	3.53	1.76	2.12	
(cubic meters per second)	(0.05)	(0.06)	(0.16)	(0.06)	(0.10)	(0.05)	(0.06)	
Average width: feet	7.8	8.5	10.8	8.9	10.8	10.5	10.8	11.2
(meters)	(2.4)	(2.6)	(3.3)	(2.7)	(3.3)	(3.2)	(3.3)	(3.4)
Maximum depth: feet	1.44	1.51	2.19	2.00	2.00	2.00	1.84	2.10
(meters)	(0.44)	(0.46)	(0.67)	(0.61)	(0.61)	(0.61)	(0.56)	(0.64)
Average transect maximum depth: feet	0.78	0.78	0.95	0.79	0.92	0.85	0.75	0.98
(meters)	(0.24)	(0.24)	(0.29)	(0.24)	(0.28)	(0.26)	(0.23)	(0.3)
Average depth: feet	0.49	0.39	0.52	0.39	0.52	0.52	0.43	0.52
(meters)	(0.15)	(0.12)	(0.16)	(0.12)	(0.16)	(0.16)	(0.13)	(0.16)
INSTREAM HABITAT:								
Dominant habitat type	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN
Riffle repeat frequency (X average width)	5	7	11	9	7	6	6	7
% reach with instream cover	5	5	<5	5	5	5	0	5
Dominant cover type	UCUTBNK	WDDEBR	UCUTBNK	WDDEBR	OVRVEG	WDDEBR	NA	WDDEBR
% reach with pool habitat	10	20	5	15	5	10	5	15
Dominant pool size class *	3	3	3	3	3	3	3	2
% reach with silt deposition	25	35	5	10	<5	30	40	15
% reach with scoured substrate	5	5	5	5	<5	<5	<5	<5
% reach with vascular aquatic vegetation	-	0	0	0	0	0	0	0
Dominant vascular aquatic vegetation type	-	NA	NA	NA	NA	NA	NA	NA
SUBSTRATE COMPOSITION								
% clay	6	5	6	8	10	0	0	8
% silt	5	16	2	6	6	30	11	5
% sand	5	4	4	6	2	2	6	1
% gravel	49	50	54	52	58	36	29	46
% cobble	31	22	28	16	24	30	40	24
% boulder	4	0	0	2	0	0	0	6
% wood	0	3	6	2	0	2	8	2
% other	0	0	0	8	0	0	6	8
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	MOD	MOD	MOD	LGHT	MOD	LGHT	HVY/MOD
Dominant periphyton form	-	FLMNT	NONFLMNT	FLMNT	NONFLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.2	1.6	1.9	1.3	1.3	1.8	2.8
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	4.0	3.6	4.2	4.1	3.8	3.5	4.4
Avg. streambank tree coverage rating	2.2	2.0	1.5	1.6	3.2	3.1	2.8	2.4
Avg. streambank shrub coverage rating	1.1	1.2	2.0	1.4	1.4	1.7	1.9	1.8
Avg. streambank herbaceous coverage rating	3.9	2.9	2.4	2.6	3.9	3.6	5.0	2.4
Avg. streambank instability rating	1.8	2.6	3.5	2.4	2.4	2.3	2.0	3.1

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site NCC							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	3,281.9	3,298.1	3,970.8	3,635.0	3,966.5	3,840.6	3,895.5	4,122.6
(square meters)	(304.9)	(306.4)	(368.9)	(337.7)	(368.5)	(356.8)	(361.9)	(383.0)
Length: feet	324.7	324.7	323.1	325.1	325.1	325.1	325.1	325.1
(meters)	(99.0)	(99.0)	(98.5)	(99.1)	(99.1)	(99.1)	(99.1)	(99.1)
Flow: cubic feet per second	1.05	2.11	4.94	1.41	4.24	1.76		
(cubic meters per second)	(0.03)	(0.06)	(0.14)	(0.04)	(0.12)	(0.05)		
Average width: feet	10.1	10.1	12.5	11.2	12.1	11.8	11.8	12.8
(meters)	(3.1)	(3.1)	(3.8)	(3.4)	(3.7)	(3.6)	(3.6)	(3.9)
Maximum depth: feet	3.41	3.21	3.15	2.79	2.89	2.59	2.49	2.40
(meters)	(1.04)	(0.98)	(0.96)	(0.85)	(0.88)	(0.79)	(0.76)	(0.73)
Average transect maximum depth: feet	0.78	0.75	1.11	0.92	0.98	0.98	1.02	0.95
(meters)	(0.24)	(0.23)	(0.34)	(0.28)	(0.30)	(0.30)	(0.31)	(0.29)
Average depth: feet	0.52	0.42	0.65	0.49	0.66	0.59	0.62	0.59
(meters)	(0.16)	(0.13)	(0.20)	(0.15)	(0.20)	(0.18)	(0.19)	(0.18)
INSTREAM HABITAT:								
Dominant habitat type	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN
Riffle repeat frequency (X average width)	6	8	10	10	9	7	9	6
% reach with instream cover	20	10	<5	<5	5	<5	<5	<5
Dominant cover type	WDDEBR	OVRVEG	WDDEBR	OV/UBNK	OVRVEG	OVRVEG	OVRVEG	OVRVEG
% reach with pool habitat	15	20	15	20	10	35	30	20
Dominant pool size class *	2	2	2	2	2	2	2	2
% reach with silt deposition	15	35	10	30	15	25	50	30
% reach with scoured substrate	5	<5	<5	<5	<5	<5	<5	0
% reach with vascular aquatic vegetation	-	<5	<5	0	0	0	0	0
Dominant vascular aquatic vegetation type	-	SUBMERG	EMERG	NA	NA	NA	NA	NA
SUBSTRATE COMPOSITION								
% clay	8	0	7	2	6	0	6	0
% silt	2	12	12	6	10	24	16	7
% sand	0	10	2	0	0	2	2	5
% gravel	56	46	55	54	36	44	36	32
% cobble	34	28	22	36	48	20	28	32
% boulder	0	4	1	2	0	4	2	4
% wood	0	0	0	0	0	2	0	2
% other	0	0	1	0	0	4	10	18
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	HVY	MOD	HVY	HVY/MOD	MOD	MOD	HVY/MOD
Dominant periphyton form	-	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.7	2.1	2.0	1.8	1.8	2.2	2.3
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	3.3	2.9	3.8	4.2	3.7	3.2	3.3
Avg. streambank tree coverage rating	1.8	2.3	1.2	3.6	3.7	2.2	2.8	1.6
Avg. streambank shrub coverage rating	1.0	1.6	1.3	1.1	1.0	1.1	1.2	1.1
Avg. streambank herbaceous coverage rating	3.6	4.1	3.2	4.3	3.8	3.6	4.2	3.2
Avg. streambank instability rating	1.2	1.8	2.4	1.8	2.5	2.4	2.6	2.5

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site SNT							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	976.2	975.2	1,133.4	1,068.9	1,141.0	1,180.8	1.026.9	1,119.4
(square meters)	(90.7)	(90.6)	(105.3)	(99.3)	(106.0)	(109.7)	(95.4)	(104.0)
Length: feet	149.9	150.9	150.9	150.9	150.9	149.9	149.9	149.9
(meters)	(45.7)	(46.0)	(46.0)	(46.0)	(46.0)	(45.7)	(45.7)	(45.7)
Flow: cubic feet per second	0.35	0.35	1.41	1.06	0.71	0.71	0.35	
(cubic meters per second)	(0.01)	(0.01)	(0.04)	(0.03)	(0.02)	(0.02)	(0.01)	
Average width: feet	6.5	6.5	7.5	7.2	7.5	7.9	6.9	7.5
(meters)	(2.0)	(2.0)	(2.3)	(2.2)	(2.3)	(2.4)	(2.1)	(2.3)
Maximum depth: feet	0.78	0.78	0.85	1.08	0.95	0.89	0.98	
(meters)	(0.24)	(0.24)	(0.26)	(0.33)	(0.29)	(0.27)	(0.30)	
Average transect maximum depth: feet	0.45	0.45	0.59	0.59	0.59	0.62	0.45	0.56
(meters)	(0.14)	(0.14)	(0.18)	(0.18)	(0.18)	(0.19)	(0.14)	(0.17)
Average depth: feet	0.26	0.29	0.39	0.30	0.39	0.33	0.23	0.33
(meters)	(0.08)	(0.09)	(0.12)	(0.09)	(0.12)	(0.10)	(0.07)	(0.10)
INSTREAM HABITAT:								
Dominant habitat type	RUN	RUN	RUN	RUN	RUN	RUN	RUN	RUN
Riffle repeat frequency (X average width)	6	12	7	7	4	4	6	5
% reach with instream cover	0	5	<5	<5	<5	5	0	0
Dominant cover type	NA	OVRVEG	BOULD	OVRVEG	OVRVEG	OVRVEG	NA	NA
% reach with pool habitat	<5	20	<5	<5	<5	<5	<5	0
Dominant pool size class *	3	3	3	3	3	3	3	NA
% reach with silt deposition	25	15	10	10	15	15	35	25
% reach with scoured substrate	30	<5	<5	<5	5	<5	5	5
% reach with vascular aquatic vegetation	-	5	<5	<5	0	0	<5	0
Dominant vascular aquatic vegetation type	-	EMERG	EMERG	EMERG	NA	NA	EMERG	NA
SUBSTRATE COMPOSITION								
% clay	3	0	0	0	0	0	0	0
% silt	3	10	0	7	3	17	3	10
% sand	3	7	17	3	14	0	2	5
% gravel	17	43	47	53	36	20	22	15
% cobble	57	33	30	33	41	57	60	53
% boulder	17	7	6	3	3	6	10	10
% wood	0	0	0	0	0	0	0	0
% other	0	0	0	0	3	0	3	7
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	MOD	MOD/HVY	LGHT	LGHT/MOD	LGHT	LGHT	LGHT/MOD
Dominant periphyton form	-	FLMNT	NONFLMNT	NONFLMNT	NONFLMNT	NONFLMNT	FLMNT	NONFLMNT
Average embeddedness rating **	-	2.3	1.9	1.6	2.3	1.8	2.9	2.5
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	4.7	2.6	3.3	4.2	3.4	4.0	4.0
Avg. streambank tree coverage rating	2.5	1.2	1.2	2.8	3.8	1.5	2.8	2.0
Avg. streambank shrub coverage rating	1.0	1.8	2.2	1.6	1.0	1.2	3.1	1.1
Avg. streambank herbaceous coverage rating	4.9	4.2	3.5	4.8	4.6	5.0	5.0	5.0
Avg. streambank instability rating	1.0	1.0	1.0	1.1	1.8	1.4	1.3	1.8

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

	Site BR1							
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet	35,821.5	38,990.4	40,010.8	39,103.5	39,384.4	37,727.8	37,279.0	37,843.8
(square meters)	(3,327.9)	(3,622.3)	(3,717.1)	(3,632.8)	(3,658.9)	(3,505.0)	(3,463.3)	(3,515.8)
Length: feet	1,149.9	1,151.5	1,151.5	1,151.6	1,149.9	1,149.90	1,149.9	1149.93
(meters)	(350.5)	(351.0)	(351.0)	(351.0)	(350.5)	(350.5)	(350.5)	(350.5)
Flow: cubic feet per second	10.95	16.95	32.84	22.95	20.13	20.83	14.83	20.84
(cubic meters per second)	(0.31)	(0.48)	(0.93)	(0.65)	(0.57)	(0.59)	(0.42)	(0.59)
Average width: feet	28.8	33.8	34.7	34.1	34.1	32.8	32.5	32.8
(meters)	(8.8)	(10.3)	(10.6)	(10.4)	(10.4)	(10.0)	(9.9)	(10.0)
Maximum depth: feet	6.00	5.90	4.9+	4.9+	4.9+	4.9+	4.9+	4.9+
(meters)	(1.83)	(1.80)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)
Average transect maximum depth: feet	3.21	2.98	2.91	2.79	2.85	2.59	2.36	2.49
(meters)	(0.98)	(0.91)	(0.89)	(0.85)	(0.87)	(0.79)	(0.72)	(0.76)
Average depth: feet	1.93	1.74	1.77	1.61	1.57	1.38	1.31	1.35
(meters)	(0.59)	(0.53)	(0.54)	(0.49)	(0.48)	(0.42)	(0.40)	(0.41)
INSTREAM HABITAT:								
Dominant habitat type	POOL	POOL	POOL	POOL	RUN	RUN	RUN	RUN
Riffle repeat frequency (X average width)	13	17	17	17	17	17	18	18
% reach with instream cover	50	35	10	15	20	15	10	10
Dominant cover type	POOL	POOL	WDDEB	WDDEB	POOL	POOL	POOL	POOL
% reach with pool habitat	50	60	55	55	20	30	35	25
Dominant pool size class *	1	1	1	1	1	1	1	1
% reach with silt deposition	80	40	35	80	70	80	65	70
% reach with scoured substrate	<5	<5	<5	<5	<5	<5	0	0
% reach with vascular aquatic vegetation	-	15	5	50	55	75	55	60
Dominant vascular aquatic vegetation type	-	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG	SUBMERG
SUBSTRATE COMPOSITION								
% clay	4	2	8	4	6	6	6	4
% silt	34	30	16	48	62	68	56	53
% sand	8	20	24	18	4	10	6	3
% gravel	14	24	28	18	6	6	16	18
% cobble	34	20	14	4	16	8	6	14
% boulder	6	2	6	4	2	2	6	0
% wood	0	0	2	4	0	0	0	2
% other	0	2	2	0	4	0	4	6
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	-	HVY	MOD	HVY	MOD	MOD/LGHT	LGHT	HVY/MOD
Dominant periphyton form	-	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	-	2.1	2.7	4.0	3.0	3.8	3.0	2.0
STREAMSIDE OBSERVATIONS:								
Avg. stream shading rating	-	1.7	2.0	2.2	2.0	2.0	2.3	2.3
Avg. streambank tree coverage rating	1.9	1.7	1.3	1.4	1.7	2.2	1.8	1.7
Avg. streambank shrub coverage rating	1.0	1.2	2.0	1.0	1.2	1.4	1.2	1.4
Avg. streambank herbaceous coverage rating	3.2	3.9	3.4	3.6	4.2	3.6	4.0	3.2
Avg. streambank instability rating	2.1	2.0	2.4	2.3	1.8	2.2	2.4	2.6

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

					Site BR2			
	'91	'92	'93	'94	'95	'96	'97	'98
STREAM REACH DIMENSIONS:								
Area: square feet		15,535.6	14,930.7	15,544.3	14,498.0	14,195.6	16,825.0	17,491.4
(square meters)	N	(1,443.3)	(1,387.1)	(1,444.1)	(1,346.9)	(1,318.4)	(1,563.1)	(1625.0)
Length: feet		757.8	757.8	758.8	758.8	758.8	758.8	758.9
(meters)	O	(231.0)	(231.0)	(231.3)	(231.3)	(231.3)	(231.3)	(231.3)
Flow: cubic feet per second		7.06	19.06	7.42	12.01	6.71	4.94	
(cubic meters per second)	T	(0.20)	(0.54)	(0.21)	(0.34)	(0.19)	(0.14)	
Average width: feet		20.6	19.7	20.3	19.0	18.7	22.3	23.0
(meters)		(6.3)	(6.0)	(6.2)	(5.8)	(5.7)	(6.8)	(7.0)
Maximum depth: feet		4.9	4.9+	4.9+	4.9+	4.9+	4.9+	4.9+
(meters)		(1.5)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)	(1.5+)
Average transect maximum depth: feet		2.16	1.80	2.03	1.90	1.94	1.61	1.80
(meters)		(0.66)	(0.55)	(0.62)	(0.58)	(0.59)	(0.49)	(0.55)
Average depth: feet		1.37	1.08	1.12	1.15	1.12	0.89	0.98
(meters)		(0.42)	(0.33)	(0.34)	(0.35)	(0.34)	(0.27)	(0.30)
INSTREAM HABITAT:								
Dominant habitat type	E	POOL	POOL	POOL	RUN	POOL	RUN	RUN
Riffle repeat frequency (X average width)	V	9	10	12	10	10	7	7
% reach with instream cover	L	50	15	15	15	10	20	15
Dominant cover type	U	POOL	POOL	POOL	POOL	POOL	POOL	POOL
% reach with pool habitat	A	75	50	45	30	50	30	30
Dominant pool size class *	T	2	2	2	2	2	2	2
% reach with silt deposition	E	65	35	40	35	65	65	40
% reach with scoured substrate	D	10	<5	<5	<5	<5	<5	0
% reach with vascular aquatic vegetation		0	0	<5	0	0	0	0
Dominant vascular aquatic vegetation type		NA	NA	EMERG	NA	NA	NA	NA
SUBSTRATE COMPOSITION								
% clay	N	2	0	4	2	0	0	0
% silt	O	30	24	24	26	44	20	22
% sand	T	10	8	2	0	0	2	2
% gravel		34	40	30	24	12	20	18
% cobble		18	24	38	44	26	36	54
% boulder		6	4	2	2	10	8	4
% wood		0	0	0	2	0	2	0
% other		0	0	0	0	8	12	0
RIFFLE/RUN COARSE SUBSTRATE OBSERVATIONS:								
Periphyton colonization amount	E	MOD	MOD	MOD	MOD/HVY	MOD/LGHT	LGHT	MOD/HVY
Dominant periphyton form	V	FLMNT	FLMNT	FLMNT	NONFLMNT	FLMNT	FLMNT	FLMNT
Average embeddedness rating **	A	2.8	3.3	2.8	2.3	2.0	2.2	3.4
	L							
STREAMSIDE OBSERVATIONS:	U							
Avg. stream shading rating	A	2.1	2.0	2.8	3.2	2.8	2.1	2.9
Avg. streambank tree coverage rating	T	1.4	1.2	2.9	2.8	2.0	3.1	1.6
Avg. streambank shrub coverage rating	E	1.2	1.6	1.4	1.2	1.0	2.1	1.0
Avg. streambank herbaceous coverage rating	D	3.6	3.8	3.8	4.3	4.0	4.5	3.8
Avg. streambank instability rating		3.6	2.2	1.8	1.8	1.6	2.2	2.8

* Pool class rating: 1=large and deep pools; 2=pools of moderate size and depth; 3=small and shallow pools.

** 1-5 rating scale: 1 = 0-20%; 2 = 20-40%; 3 = 40-60%; 4 = 60-80%; 5 = 80-100%.

APPENDIX D.

RANKING OF HABITAT VARIABLE DATA FROM HIGHEST TO LOWEST FOR HABITAT SIMILARITY ANALYSIS

Water year 1995.

SITE	CBL	SITE	CVR	SITE	EMB	SITE	FIN	SITE	FLW	SITE	POL
NCC	48	SN1	40	SN2	3.0	SN1	72	BR1	0.57	SN1	70
SN3	46	BR1	20	BR1	3.0	BR1	72	BR2	0.34	BR2	30
BR2	44	BR2	15	SN1	2.7	SN2	32	SN1	0.28	SN2	25
SNT	41	SN2	5	SNT	2.3	BR2	28	SN2	0.26	BR1	20
SN2	26	SN3	5	BR2	2.3	SNWF	18	SN3	0.17	NCC	10
SNWF	24	SNWF	5	NCC	1.8	SNT	17	NCC	0.12	SN3	5
SN1	18	NCC	5	SN3	1.4	NCC	16	SNWF	0.10	SNWF	5
BR1	16	SNT	<5	SNWF	1.3	SN3	6	SNT	0.02	SNT	<5
median	34		5		2.3		23		0.22		15

SITE	RRT	SITE	SDP	SITE	SER	SITE	SHD	SITE	TWD	SITE	WDP
SN1	27	SN1	80	SN2	2.8	NCC	4.2	BR1	0.87	SN2	26.9
BR1	17	BR1	70	NCC	2.5	SNT	4.2	SN1	0.85	SN3	25.6
BR2	10	SN2	45	SNWF	2.4	SNWF	4.1	BR2	0.58	BR1	21.7
NCC	9	BR2	35	SN3	2.0	SN3	3.4	SN2	0.48	SNWF	20.6
SN3	8	NCC	15	SNT	1.8	SN2	3.3	SN3	0.30	SNT	19.2
SN2	7	SNT	15	BR1	1.8	BR2	3.2	NCC	0.30	SN1	18.8
SNWF	7	SN3	5	BR2	1.8	SN1	2.0	SNWF	0.28	NCC	18.5
SNT	4	SNWF	<5	SN1	1.6	BR1	2.0	SNT	0.18	BR2	16.6
median	9		25		1.9		3.4		0.39		19.9

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area providing instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic meters per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: Average Stream shading rating
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1996

SITE	CBL	SITE	CVR	SITE	EMB	SITE	FIN	SITE	FLW	SITE	POL
SNT	57	SN1	30	BR1	3.8	BR1	84	BR1	0.59	SN1	65
SN2	43	BR1	15	SN1	2.7	SN1	78	SN2	0.29	BR2	50
SN3	34	BR2	10	SN2	2.4	BR2	44	BR2	0.19	NCC	35
SNWF	30	SN2	10	BR2	2.0	SN3	34	SN1	0.18	BR1	30
BR2	26	SN3	5	NCC	1.8	SNWF	32	SN3	0.08	SN3	30
NCC	20	SNT	5	SNT	1.8	SN2	28	NCC	0.05	SN2	25
SN1	16	SNWF	5	SN3	1.4	NCC	26	SNWF	0.05	SNWF	10
BR1	8	NCC	<5	SNWF	1.3	SNT	17	SNT	0.02	SNT	<5
median	28		8		1.9		33		0.13		30

SITE	RRT	SITE	SDP	SITE	SER	SITE	SHD	SITE	TWD	SITE	WDP
BR1	17	SN1	85	NCC	2.4	SNWF	3.8	SN1	0.83	SN3	30.7
SN1	14	BR1	80	SNWF	2.3	NCC	3.7	BR1	0.79	SN2	24.0
BR2	10	BR2	65	BR1	2.2	SNT	3.4	BR2	0.59	SNT	24.0
NCC	7	SN3	40	SN2	2.0	SN3	2.9	SN2	0.53	BR1	23.8
SN2	7	SN2	30	SN3	2.0	BR2	2.8	NCC	0.30	NCC	20.0
SN3	7	SNWF	30	BR2	1.6	SN2	2.8	SN3	0.28	SNWF	20.0
SNWF	6	NCC	25	SN1	1.6	BR1	2.0	SNWF	0.26	SN1	19.4
SNT	4	SNT	15	SNT	1.4	SN1	1.9	SNT	0.19	BR2	16.8
median	7		35		2.0		2.9		0.42		21.9

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area providing instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic meters per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: Average Stream shading rating
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1997

SITE	CBL	SITE	CVR	SITE	EMB	SITE	FIN	SITE	FLW	SITE	POL
SNT	60	SN1	25	BR1	3.0	BR1	68	BR1	0.42	SN1	70
SN3	56	BR2	20	SNT	2.9	SN1	66	SN1	0.31	SN2	52
SNWF	40	SN2	15	BR2	2.2	NCC	24	SN2	0.25	BR1	35
SN2	38	BR1	10	NCC	2.2	BR2	22	BR2	0.14	BR2	30
BR2	36	NCC	<5	SN3	1.9	SNWF	17	NCC	0.06*	NCC	30
NCC	28	SN3	<5	SNWF	1.8	SN2	14	SN3	0.06	SN3	5
SN1	26	SNT	0	SN2	1.5	SN3	14	SNWF	0.06	SNWF	5
BR1	6	SNWF	0	SN1	1.3	SNT	5	SNT	0.01	SNT	<5
median	37		6		2.1		20		0.10		30

SITE	RRT	SITE	SDP	SITE	SER	SITE	SHD	SITE	TWD	SITE	WDP
BR1	18	SN1	85	NCC	2.6	SNT	4.0	SN1	0.75	SN3	36.4
SN1	14	BR1	65	BR1	2.4	SNWF	3.5	BR1	0.72	SNT	30.0
SN2	10	BR2	65	BR2	2.2	SN2	3.3	SN2	0.69	SNWF	25.4
NCC	9	SN2	60	SN3	2.2	NCC	3.2	BR2	0.49	BR2	25.2
BR2	7	NCC	50	SNWF	2.0	SN3	2.7	NCC	0.31	BR1	24.8
SN3	6	SNWF	40	SN1	1.7	BR1	2.3	SNWF	0.23	SN1	19.8
SNT	6	SN3	35	SN2	1.6	SN1	2.2	SN3	0.21	NCC	18.9
SNWF	6	SNT	35	SNT	1.3	BR2	2.1	SNT	0.14	SN2	18.5
median	8		55		2.1		3.0		0.40		25.0

* Value estimated

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area providing instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic meters per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: Average Stream shading rating
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1998

SITE	CBL	SITE	CVR	SITE	EMB	SITE	FIN	SITE	FLW	SITE	POL
BR2	54	BR2	15	BR2	3.4	SN1	64	BR1	0.59	SN1	80
SNT	53	BR1	10	SN2	2.9	BR1	60	SN1	0.48	BR2	30
SN3	46	SN2	10	SNWF	2.8	BR2	24	SN2	0.37*	BR1	25
SN2	34	SN1	5	SN3	2.7	SN2	24	BR2	0.34*	NCC	20
NCC	32	SNWF	5	SNT	2.5	SN3	16	SN3	0.12*	SN2	20
SNWF	24	NCC	<5	NCC	2.3	SNT	15	SNWF	0.09*	SNWF	15
SN1	16	SN3	0	BR1	2.0	SNWF	14	NCC	0.07*	SN3	0
BR1	14	SNT	0	SN1	2.0	NCC	12	SNT	0.03*	SNT	0
median	33		5		2.6		20		0.23		20

SITE	RRT	SITE	SDP	SITE	SER	SITE	SHD	SITE	TWD	SITE	WDP
BR1	18	SN1	85	SNWF	3.1	SNWF	4.4	BR1	0.76	SN3	26.3
SN1	14	BR1	70	BR2	2.8	SNT	4.0	SN1	0.73	SN2	25.8
BR2	7	BR2	40	SN2	2.6	NCC	3.3	BR2	0.55	BR1	24.4
SNWF	7	NCC	30	BR1	2.6	BR2	2.9	SN2	0.47	SN1	23.6
NCC	6	SN2	30	NCC	2.5	SN2	2.9	SNWF	0.30	BR2	23.3
SN2	6	SNT	25	SN1	2.2	SN3	2.7	NCC	0.29	SNT	23.0
SN3	6	SN3	20	SN3	1.8	BR1	2.3	SN3	0.25	NCC	21.7
SNT	5	SNWF	15	SNT	1.8	SN1	2.2	SNT	0.17	SNWF	21.3
median	7		30		2.6		2.9		0.39		23.4

* Value Estimated

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area providing instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic meters per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: Average Stream shading rating
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

APPENDIX E.

RESULTS OF HABITAT VARIABLE RANKINGS BY SAMPLING SITE FOR HABITAT SIMILARITY ANALYSIS

Water year 1995

Site	High	Medium	Low	Site	High	Medium	Low
BR2	CBL	CVR	WDP	**NCC**	CBL	CVR	
		EMB			SER	EMB	
		FIN			SHD	FIN	
		FLW				FLW	
		POL				POL	
		RRT				RRT	
		SDP				SDP	
		SER				TWD	
		SHD				WDP	
		TWD					
BR1	EMB	CVR	CBL	**SNT**	SHD	CBL	CVR
	FIN	POL	SHD			EMB	FLW
	FLW	RRT				FIN	POL
	SDP	SER				SDP	RRT
	TWD	WDP				SER	TWD
						WDP	
SN3	CBL	CVR	EMB	**SN2**	EMB	CBL	
	WDP	FLW	FIN		SER	CVR	
		RRT	POL		WDP	FIN	
		SER	SDP			FLW	
		SHD				POL	
		TWD				RRT	
						SDP	
						SHD	
						TWD	
SNWF	SER	CVR	CBL	**SN1**	CVR	FLW	CBL
	SHD	FIN	EMB		EMB	WDP	SER
		RRT	FLW		FIN		SHD
		WDP	POL		POL		
			SDP		RRT		
			TWD		SDP		
					TWD		

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area that provides instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic feet per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: % Stream reach surface area shaded between the hours of 10:00 and 14:00.
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1996

Site	High	Medium	Low	Site	High	Medium	Low
BR2	POL	CBL	SER	**NCC**	SER	CBL	CVR
	SDP	CVR	WDP		SHD	EMB	FLW
		EMB				FIN	
		FIN				POL	
		FLW				RRT	
		RRT				SDP	
		SHD				TWD	
		TWD				WDP	
BR1	EMB	CVR	CBL	**SNT**	CBL	CVR	FIN
	FIN	POL	SHD		SHD	EMB	FLW
	FLW	WDP				WDP	POL
	RRT						RRT
	SDP						SDP
	SER						SER
	TWD						TWD
SN3	WDP	CBL	EMB	**SN2**	CBL	CVR	
		CVR	TWD			EMB	
		FIN				FIN	
		FLW				FLW	
		POL				POL	
		RRT				RRT	
		SDP				SDP	
		SER				SER	
		SHD				SHD	
						TWD	
						WDP	
SNWF	SER	CBL	EMB	**SN1**	CVR	EMB	CBL
	SHD	CVR	FLW		FIN	FLW	SER
		FIN	POL		POL	WDP	SHD
		RRT	TWD		RRT		
		SDP			SDP		
		WDP			TWD		

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area that provides instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic feet per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: % Stream reach surface area shaded between the hours of 10:00 and 14:00.
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1997

Site	High	Medium	Low	Site	High	Medium	Low
BR2	CVR	CBL	SHD	**NCC**	SER	CBL	WDP
		EMB				CVR	
		FIN				EMB	
		FLW				FIN	
		POL				FLW	
		RRT				POL	
		SDP				RRT	
		SER				SDP	
		TWD				SHD	
		WDP				TWD	
BR1	EMB	CVR	CBL	**SNT**	CBL	WDP	CVR
	FIN	POL	SHD		EMB		FIN
	FLW	SDP			SHD		FLW
	RRT	WDP					POL
	SER						RRT
	TWD						SDP
							SER
							TWD
SN3	CBL	CVR	POL	**SN2**	POL	CBL	EMB
	WDP	EMB	RRT		TWD	CVR	SER
		FIN	SDP			FIN	WDP
		FLW	TWD			FLW	
		SER				RRT	
		SHD				SDP	
						SHD	
SNWF	SHD	CBL	CVR	**SN1**	CVR	CBL	EMB
		EMB	POL		FIN	SER	SHD
		FIN	RRT		FLW		WDP
		FLW	SDP		POL		
		SER	TWD		RRT		
		WDP			SDP		
					TWD		

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area that provides instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic feet per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: % Stream reach surface area shaded between the hours of 10:00 and 14:00.
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

Water year 1998

Site	High	Medium	Low	Site	High	Medium	Low
BR2	CBL	FIN		**NCC**		CBL	FIN
	CVR	FLW				CVR	FLW
	EMB	POL				EMB	WDP
	SER	RRT				POL	
		SDP				RRT	
		SHD				SDP	
		TWD				SER	
		WDP				SHD	
						TWD	
BR1	CVR	POL	CBL	**SNT**	CBL	EMB	CVR
	FIN	SER	EMB		SHD	SDP	FIN
	FLW	WDP	SHD			WDP	FLW
	RRT						POL
	SDP						RRT
	TWD						SER
							TWD
SN3	CBL	EMB	CVR	**SN2**	CVR	CBL	
	WDP	FIN	POL		WDP	EMB	
		FLW	SDP			FIN	
		RRT	SER			FLW	
		SHD	TWD			POL	
						RRT	
						SDP	
						SER	
						SHD	
						TWD	
SNWF	SER	CBL	FIN	**SN1**	FIN	CVR	CBL
	SHD	CVR	FLW		FLW	SER	EMB
		EMB	SDP		POL	WDP	SHD
		POL	WDP		RRT		
		RRT			SDP		
		TWD			TWD		

Habitat variable codes:
CBL: % Stream bottom area consisting of cobble substrate.
CVR: % Stream reach area that provides instream cover.
EMB: Average rating of coarse substrate embeddedness in riffles and runs.
FIN: % Stream bottom area consisting of fine particle (sand, silt, clay) substrates.
FLW: Stream flow (cubic feet per second).
POL: % Stream reach area consisting of pool habitat.
RRT: Riffle repeat frequency (expressed as a multiple of average stream width).
SDP: % Stream bottom area affected by silt deposition.
SER: Average rating of eroding/unstable streambank area.
SHD: Average Stream Shading rating
TWD: Thalweg depth (average maximum depth in meters).
WDP: Ratio of average stream width to average stream depth.

APPENDIX F.

DAILY MEAN DISCHARGE AT SITES BR1 AND SN1 IN THE BLOODY RUN AND SNY MAGILL WATERSHEDS

Daily mean discharge (in cubic feet per second) at site BR1; Water Year 1995

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	28	25	23	16*	15	15	22	26	26	23	29	20
2	27	23	23	17*	15	16	20	26	27	23	27	21
3	26	23	22	16*	15	16	19	25	25	24	25	20
4	24	25	22	17*	15	15	22	25	25	24	25	19
5	23	27	23	18*	15	15	21	24	24	26	25	19
6	24	25	24	17*	15	15	20	24	25	25	26	18
7	25	24	24	19*	16	16	22	23	24	24	28	22
8	27	24	24	19*	14	17	25	33	25	25	26	21
9	26	24	23	19*	13	16	26	36	25	24	26	20
10	26	25	24*	20*	14	15	27	53	23	23	25	20
11	26	24	23*	20*	14	86	41	43	23	23	24	19
12	26	24	21*	19*	14	36	78	39	23	23	22	19
13	26	24	23*	18*	14	26	50	39	22	22	23	18
14	26	25	23*	19*	14	22	38	36	22	21	23	18
15	26	25	22*	19*	13	23	33	31	21	24	24	19
16	26	24	21*	18*	14	24	32	29	21	27	26	18
17	25	23	20*	17*	13	23	31	30	20	25	27	19
18	25	23	19*	16*	13	24	37	29	19	25	23	19
19	25	23	18*	23*	16	23	37	28	20	28	22	20
20	24	24	18*	20*	38	31	33	26	20	27	23	21
21	24	30	17*	18*	24	32	34	26	20	26	22	20
22	24	27	17*	18*	15	26	31	26	19	26	22	20
23	25	24	17*	17*	17	24	29	28	19	26	21	19
24	26	23	17*	16*	15	23	30	28	20	24	20	20
25	26	23	17*	16	14	22	29	27	20	25	20	19
26	26	23	17*	15	14	22	28	26	22	28	21	17
27	25	24	16*	16	14	24	29	36	23	100	20	17
28	23	28	16*	16	14	24*	25	37	23	45	21	17
29	23	26	17*	16	---	24*	26	31	23	29	28	18
30	24	24	18*	16	---	23*	26	27	22	27	21	16
31	24	---	17*	15	---	23	---	27	---	27	20	---
TOTAL	781	736	626	546	437	741	921	944	671	869	735	573
MEAN	25.2	24.5	20.2	17.6	15.6	23.9	30.7	30.5	22.4	28	23.7	19.1
MEDIAN	25.0	24.0	21.0	17.0	14.0	23.0	29.0	28.0	22.5	25.0	23.0	19.0
MAX	28	30	24	23	38	86	78	53	27	100	29	22
MIN	23	23	16	15	13	15	19	23	19	21	20	16
AC-FT	1550	1460	1240	1080	867	1470	1830	1870	1330	1720	1460	1140
CFSM	0.74	0.72	0.59	0.52	0.46	0.70	0.90	0.89	0.66	0.82	0.69	0.56
IN.	0.85	0.80	0.68	0.60	0.48	0.81	1.00	1.03	0.73	0.95	0.80	0.62

* estimated value

Source: May and others (1996)

Daily mean discharge (in cubic feet per second) at site SN1; Water Year 1995

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	17	16	19	9*	7.3	10*	19	27	38	26	18	11
2	19	15	16	8.8*	7.6	9.5*	18	26	38	25	17	11
3	18	14	15	8.2*	7.7	10*	16	26	34	27	16	10
4	18	15	15	8*	7.6*	11*	18	24	32	26	16	10
5	16	16	16	9.9	7.2*	12	18	24	31	28	16	11
6	16	16	17	9.6	6.8*	12	17	24	31	28	20	12
7	16	16	17	8.8*	7.4*	11*	19	23	30	26	28	18
8	15	16	17	7.8*	8.2*	10*	21	43	31	27	18	14
9	17	17	16	8.6*	8.9	11*	21	59	31	27	18	13
10	16	17	15*	9*	9.7	12	23	102	30	27	17	13
11	16	17	12*	9.4	8.4*	90	48	67	28	25	16	13
12	16	17	13*	9	7.8*	29	77	54	28	23	16	15
13	15	16	14*	9	8.8*	22	43	54	28	22	16	10
14	14	18	15	8.8	9.4*	18	35	51	27	22	17	9.7
15	13	17	14	8.6	11	15	31	42	26	24	16	9.7
16	13	17	14	8.6	12	14	30	39	25	29	17	9.1
17	13	16	13	8.2	11	14	29	40	24	28	18	10
18	13	16	13	11	11	15	37	36	23	28	16	10
19	16	16	13	13*	14	14	36	34	23	27	16	14
20	15	17	12	12*	27	24	35	33	22	25	17	13
21	15	30	12	11*	23	23	38	32	21	22	17	13
22	15	23	12	11*	16	19	34	31	20	23	16	12
23	16	18	13	10*	16	19	32	33	20	22	15	12
24	17	18	13	6.8*	12	18	32	33	20	21	15	11
25	18	18	12	8.6*	11	17	30	31	21	24	15	11
26	16	18	12	7.6*	12	18	30	31	23	32	14	10
27	15	22	11	7.5	11	20	31	74	23	130	13	9.9
28	14	27	12	7.2	11*	20	27	74	26	48	14	9.7
29	14	22	12	7.4	---	20	27	54	26	20	23	10
30	16	20	11	7.6	---	19	28	44	24	15	13	10
31	16	---	10*	7.4	---	19	---	38	---	16	12	---
TOTAL	484	541	426	277.4	310.8	575.5	900	1303	804	893	516	345.1
MEAN	15.6	18	13.7	8.95	11.1	18.6	30	42	26.8	28.8	16.6	11.5
MEDIAN	16.0	17.0	13.0	8.8	10.4	17.0	30.0	36.0	26.0	26.0	16.0	11.0
MAX	19	30	19	13	27	90	77	102	38	130	28	18
MIN	13	14	10	6.8	6.8	9.5	16	23	20	15	12	9.1
AC-FT	960	1070	845	550	616	1140	1790	2580	1590	1770	1020	685
CFSM	0.57	0.65	0.50	0.32	0.40	0.67	1.09	1.52	0.97	1.04	0.60	0.42
IN.	0.65	0.73	0.57	0.37	0.42	0.78	1.21	1.76	1.08	1.20	0.70	0.47

* estimated value

Source: May and others (1996)

Daily mean discharge (in cubic feet per second) at site BR1; Water Year 1996

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	16	29	15	11	13	18	17	20	21	26	22	19
2	17	32	15	11	14	18	16	20	22	26	22	18
3	17	24	16	11	13	16	17	20	23	24	22	18
4	17	21	16	12	12	16	18	18	22	24	22	18
5	17	20	15	12	11	16	17	17	23	23	21	18
6	21	19	14	13	11	15	18	18	38	24	20	19
7	22	19	15	13	8.7	16	17	17	45	23	20	19
8	18	19	17	12	8.6	16	18	17	37	24	19	20
9	18	19	16	12	9.3	16	17	17	32	23	19	21
10	16	19	15	13	15	15	16	21	31	22	19	20
11	16	19	16	13	23	17	15	19	28	23	18	18
12	14	19	16	13	16	35	16	18	28	22	18	20
13	15	18	16	12	14	32	17	18	44	22	18	20
14	17	18	15	13	14	28	18	20	31	24	17	21
15	18	18	14	13	13	24	18	20	29	23	19	21
16	17	17	14	13	13	23	17	19	37	24	18	21
17	16	18	14	14	12	22	16	16	89	25	17	21
18	17	18	13	89	12	25	17	14	80	24	18	20
19	19	16	13	16	12	21	20	14	58	26	21	20
20	19	17	14	15	11	19	21	17	46	27	19	22
21	20	17	14	12	28	18	21	16	42	26	17	23
22	19	17	13	11	18	18	21	16	37	24	19	22
23	19	17	13	11	50	17	21	16	34	22	19	23
24	19	17	13	11	79	19	20	17	32	23	18	21
25	19	16	13	13*	52	26	19	17	29	24	16	21
26	17	16	13	15*	38	23	22	18	27	24	16	23
27	18	17	12	17*	24	20	21	18	26	25	16	23
28	18	17	12	16*	21	19	19	22	25	26	17	21
29	18	17	12	15*	19	17	23	23	26	26	17	22
30	18	16	11	14	---	17	22	21	31	23	17	21
31	18	---	11	14	---	18	---	20	---	22	18	---
TOTAL	550	566	436	480	584.6	620	554	564	1073	744	579	614
MEAN	17.7	18.9	14.1	15.5	20.2	20.0	18.5	18.2	35.8	24.0	18.7	20.5
MEDIAN	18	18	14	13	14	18	18	18	31	24	18	21
MAX	22	32	17	89	79	35	22	23	89	27	22	23
MIN	14	16	11	11	8.6	15	15	14	21	22	16	18
AC-FT	1090	1120	865	952	1160	1230	1100	1120	2130	1480	1150	1220
CFSM	0.52	0.55	0.41	0.45	0.59	0.59	0.54	0.53	1.05	0.7	0.55	0.6
IN.	0.60	0.62	0.48	0.52	0.64	0.68	0.60	0.61	1.17	0.81	0.63	0.67

* estimated value

Source: May and others (1997)

Daily mean discharge (in cubic feet per second) at site SN1; Water Year 1996

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	11	36	11	8.6	11*	14	15	16	18	33	21	14
2	11	40	11	8.7	12	15	14	15	21	29	20	13
3	13	29	9.9	9.2	13	13	15	14	19	27	20	12
4	14	22	10	11	12*	14	16	13	19	25	20	11
5	15	18	11	12	11*	13	14	13	19	24	18	11
6	30	16	12	12	10*	13	14	13	28	24	20	12
7	28	17	12	11	8.4	12	13	12	33	22	20	11
8	20	15	12	10	7.4	13	14	12	23	24	18	11
9	16	14	11	10	7.3	13	13	11	20	25	19	12
10	16	14	11	11	14	12	12	19	19	23	20	9.9
11	14	14	11	10	15	16	11	16	17	23	19	9.7
12	13	13	11	9.1	8.9	26	11	16	16	23	19	11
13	13	12	11	8.9	7.6	27	13	15	28	21	17	9.7
14	15	12	11	9	8.2	24	14	16	18	21	16	9.1
15	17	13	11	9	7	24	14	16	16	20	17	8.9
16	16	11	11	8.4	7.3	23	13	15	95	18	16	8.2
17	14	10	9.8	8.4	7.5	24	12	14	260	18	15	7.5
18	14	10	9.3	69	7.7	24	13	12	156	18	16	7.6
19	13	9.4	9.5	12	7.1	20	16	12	91	24	26	7.7
20	16	10	10	13	9.9	19	17	14	68	23	18	7.2
21	16	9.3	9.6	12	15	19	17	14	57	23	13	7.7
22	16	12	9.2	11	9.4	18	17	13	53	24	15	7.2
23	16	12	9.5	11	27	17	16	14	54	22	16	7.8
24	19	12	9.0	11	47	20	16	14	46	23	16	7.4
25	15	10	9.3	10	34	27	17	15	37	22	16	7.2
26	14	11	9.5	9.7	27	21	18	15	32	19	15	9.5
27	12	13	9.3	11	22	19	17	16	31	22	16	10
28	15	13	9.2	11	17	17	16	23	28	23	18	7.5
29	17	12	10	9.9	15	15	18	21	42	22	16	6.8
30	15	12	9.0	12	---	16	17	18	51	24	15	6.3
31	15	---	8.8	12*	---	16	---	17	---	22	14	---
TOTAL	489	451.7	317.9	380.9	403.9	564	443	464	1415	711	545	280.9
MEAN	15.8	15.1	10.3	12.3	13.9	18.2	14.8	15.0	47.2	22.9	17.6	9.36
MEDIAN	15	12.5	10	10.5	9.9	17.5	14.5	14.5	29.5	23	17.5	9.3
MAX	30	40	12	69	47	27	18	23	260	33	26	14
MIN	11	9.3	8.8	8.4	7	12	11	11	16	18	13	6.3
AC-FT	970	896	631	756	801	1120	879	920	2810	1410	1080	557
CFSM	0.57	0.55	0.37	0.45	0.5	0.66	0.54	0.54	1.71	0.83	0.64	0.34
IN.	0.66	0.61	0.43	0.51	0.54	0.76	0.6	0.63	1.91	0.96	0.73	0.38

* estimated value

Source: May and others (1997)

Daily mean discharge (in cubic feet per second) at site BR1; Water Year 1997

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	20	17	13	12	8.4	64	16	24	14	18	13	13
2	21	16	13	12	8.7	38	16	22	14	22	13	13
3	22	15	13	13	8.7	29	15	23	14	18	13	12
4	21	15	11	15	8.5	21	15	22	14	16	13	12
5	21	15	11	21	8.7	19	16	21	15	16	13	13
6	21	14	11	15	8.5	17	17	19	16	16	13	13
7	22	15	11	14	8.5	16	16	20	15	16	12	12
8	21	15	12	13	8.4	16	15	21	14	17	12	14
9	21	14	12	11	8.4	109	15	19	14	15	12	14
10	21	14	12	13	8.1	32	15	18	14	14	12	14
11	20	14	12	12	8.5	26	15	18	14	15	12	14
12	19	14	11	12	8.5	23	17	18	14	15	18	14
13	19	14	11	10	8.5	22	16	17	14	16	14	14
14	18	14	11	11	8.8	28	16	17	14	17	14	14
15	19	14	13	11	8.3	26	16	16	18	15	13	14
16	17	15	14	11	8.5	24	16	16	24	14	13	14
17	18	16	14	12	7.3	48	15	16	17	15	12	15
18	18	16	13	11	242	51	16	16	16	15	12	15
19	19	15	13	9.6	68	39	16	16	16	20	12	14
20	18	14	13	9.3	65	38	15	15	16	18	12	14
21	18	14	13	9	92	30	15	15	29	16	12	14
22	19	14	13	19	39	27	15	15	20	15	12	15
23	23	14	13	12	26	25	14	14	19	15	12	15
24	20	14	13	10	22	25	14	15	17	14	14	13
25	18	14	12	9.8	21	24	14	15	17	17	13	13
26	17	14	12	8.6	21	21	13	15	16	15	13	13
27	16	14	13	9.2	22	18	13	14	16	16	13	13
28	16	14	13	7.8	19	19	13	15	16	16	13	14
29	19	13	13	8.2		18	14	15	16	14	13	14
30	20	14	12	8.8		17	17	14	20	13	14	14
31	19		12	8.7		16		14		13	14	
TOTAL	601	435	383	359	780.3	926	456	535	493	492	401	410
MEAN	19.4	14.5	12.4	11.6	27.9	29.9	15.2	17.3	16.4	15.9	12.9	13.7
MEDIAN	19	14	13	11	8.7	25	15	16	16	16	13	14
MAX	23	17	14	21	242	109	17	24	29	22	18	15
MIN	16	13	11	7.8	7.3	16	13	14	14	13	12	12
AC-FT	1190	863	760	712	1550	1840	904	1060	978	976	795	813
CFSM	0.57	0.42	0.36	0.34	0.82	0.88	0.45	0.51	0.48	0.47	0.38	0.40
IN.	0.66	0.47	0.42	0.39	0.85	1.01	0.50	0.58	0.54	0.54	0.44	0.45

* estimated value

Source: May and others (1998)

Daily mean discharge (in cubic feet per second) at site SN1; Water Year 1997

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6.4	12	13	11	12	34	16	18	9.7	14	16	11
2	7.1	11	13	11	11	23	15	18	9.3	30	15	11
3	7.9	10	12	11	12	19	15	20	9.2	16	15	10
4	7.6	11	12	13	11	16	15	18	9	15	14	10
5	7.3	11	12	16	11	14	16	17	9.8	14	13	11
6	7.1	11	11	13	11	12	16	16	11	14	13	11
7	7.9	12	12	14	12	12	14	19	11	13	12	10
8	8.3	11	11	13	12	14	13	22	12	16	11	13
9	8.2	12	11	12	12	60	12	19	11	14	11	11
10	8.3	13	11	13	12	29	12	18	11	13	12	11
11	8.4	12	10	13	12	26	13	18	11	13	12	11
12	7.6	11	10	13	11	22	14	17	12	13	30	11
13	7	11	11	12	12	20	14	16	11	14	17	11
14	6.6	12	11	13	13	21	14	16	10	15	15	11
15	6.9	11	16	13	12	16	15	15	20	13	14	11
16	7.1	11	16	16	11	15	13	15	41	12	14	12
17	8.1	13	14	15	10	23	13	14	18	14	13	14
18	8	13	13	14	121	22	13	14	15	14	13	11
19	8.2	13	12	13	56	18	14	14	14	26	12	11
20	7.8	12	11	11	48	21	13	13	13	19	14	10
21	8.2	12	10	12	62	23	13	12	52	23	12	10
22	9.9	12	10	26	27	23	12	12	23	17	11	11
23	16	12	10	18	19	21	14	12	20	16	11	14
24	11	12	11	15	15	20	12	12	19	15	13	12
25	8.8	12	10	14	14	20	12	12	19	17	12	11
26	7.7	12	9.8	13	16	20	11	11	17	15	12	11
27	7.7	11	11	14	15	20	11	11	16	87	12	11
28	8.2	11	11	11	13	21	11	11	15	36	11	12
29	14	11	10	12		19	11	12	15	23	11	11
30	15	13	12	13		18	14	11	15	19	14	11
31	13		11	13		17		10		17	12	
TOTAL	271.3	351	357.8	421	603	659	401	463	479	597	417	336
MEAN	8.75	11.7	11.5	13.6	21.5	21.3	13.4	14.9	16	19.3	13.5	11.2
MEDIAN	8	12	11	13	12	20	13	15	13.5	15	13	11
MAX	16	13	16	26	121	60	16	22	52	87	30	14
MIN	6.4	10	9.8	11	10	12	11	10	9	12	11	10
AC-FT	538	696	710	835	1200	1310	795	918	950	1180	827	666
CFSM	0.32	0.42	0.42	0.49	0.78	0.77	0.48	0.54	0.58	0.7	0.49	0.41
IN.	0.37	0.47	0.48	0.57	0.81	0.89	0.54	0.62	0.65	0.8	0.56	0.45

* estimated value

Source: May and others (1998)

Daily mean discharge (in cubic feet per second) at site BR1; Water Year 1998

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	15	14	13	9.5	12	20	116	15	19	31	19	27
2	15	14	12	11	13	19	53	15	20	29	19	27
3	15	14	13	12	12	19	32	17	19	29	20	28
4	14	14	12	12	12	18	24	16	19	28	29	28
5	14	14	12	12	12	18	19	15	19	26	48	27
6	14	14	12	12	11	17	16	16	19	28	24	28
7	14	14	13	12	11	17	16	18	19	49	22	28
8	14	14	13	11	11	18	17	20	19	45	53	26
9	14	14	12	11	11	16	17	18	24	28	25	25
10	14	14	12	9.8	11	14	15	18	22	26	59	25
11	14	14	12	11	11	13	14	17	78	25	28	25
12	15	14	11	11	12	12	14	18	64	25	24	25
13	25	14	10	11	11	13	15	18	36	25	23	25
14	17	14	9.5	11	11	13	15	17	32	23	23	29
15	16	14	11	10	17	14	14	18	30	23	40	27
16	15	13	12	11	19	14	22	17	28	22	25	24
17	15	13	11	10	16	15	19	17	32	22	125	23
18	14	13	12	9.0	15	16	17	17	62	22	53	23
19	14	13	12	10	14	16	17	18	59	23	41	23
20	14	13	11	11	14	16	16	19	38	23	34	23
21	14	13	11	12	13	16	17	19	44	23	33	22
22	14	13	11	12	13	17	16	19	36	22	31	21
23	15	13	11	12	13	19	15	19	33	22	31	21
24	15	12	11	12	13	20	15	21	52	21	31	24
25	15	13	11	12	14	21	15	19	38	20	30	22
26	15	13	10	12	15	25	17	19	33	20	28	22
27	15	13	9.5	12	23	24	15	19	32	20	28	22
28	15	13	9.5	12	21	22	15	19	132	20	34	21
29	14	13	10	12		21	15	21	45	20	29	21
30	14	13	9	12		69	15	20	35	20	28	21
31	14		8.5	12		189		20		19	28	
TOTAL	462	404	347	349.3	381	761	643	559	1138	779	1065	733
MEAN	14.9	13.5	11.2	11.3	13.6	24.5	21.4	18.0	37.9	25.1	34.4	24.4
MEDIAN	14	14	11	12	13	17	16	18	33	23	29	25
MAX	25	14	13	12	23	189	116	21	132	49	125	29
MIN	14	12	9	9	11	12	14	15	19	19	19	21
AC-FT	916	801	688	693	756	1510	1280	1110	2260	1550	2110	1450
CFSM	0.44	0.39	0.33	0.33	0.40	0.72	0.63	0.53	1.11	0.74	1.01	0.72
IN.	0.50	0.44	0.38	0.38	0.42	0.83	0.70	0.61	1.24	0.85	1.16	0.80

Source: May and others (1999)

Daily mean discharge (in cubic feet per second) at site SN1; Water Year 1998

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	11	13	11	7.0	9.9	23	113	19	19	28	14	20
2	11	13	10	8.0	10	21	68	19	19	26	14	20
3	11	13	11	9.5	9.3	20	52	21	18	27	16	20
4	11	12	11	8.4	9.0	18	42	19	18	27	18	19
5	11	12	9.9	9.4	9.0	17	36	18	18	25	28	19
6	11	12	9.8	9.7	8.8	17	32	18	18	29	20	19
7	11	12	9.1	9.0	8.8	16	30	21	18	47	21	19
8	11	12	9.3	8.8	8.9	17	32	24	18	36	25	18
9	11	12	9.9	9.2	8.9	16	33	20	24	25	20	18
10	10	12	10	6.8	8.9	13	28	20	21	23	47	17
11	10	12	9.7	7.1	10	12	25	19	92	21	21	17
12	13	12	9.5	7.6	11	11	24	19	57	20	19	17
13	30	12	8.5	7.6	10	12	26	18	34	20	17	17
14	19	12	7.5	8.3	9.9	12	24	18	30	19	20	25
15	16	12	8.0	7.5	16	13	23	17	30	18	79	22
16	15	11	9.0	8.0	14	13	37	17	31	18	30	19
17	14	11	8.8	7.5	15	14	30	16	29	17	45	18
18	13	12	9.1	7.0	13	18	27	16	61	17	32	18
19	13	11	9.5	7.5	12	19	25	16	44	19	28	17
20	13	11	9.3	8.0	12	18	25	17	32	18	29	17
21	12	11	8.2	8.4	12	19	26	18	38	18	27	17
22	12	11	9.3	8.4	12	21	23	18	28	17	25	17
23	12	11	9.0	8.4	12	23	22	18	26	17	24	17
24	13	10	8.9	8.2	12	23	21	27	34	16	25	21
25	12	11	8.8	8.5	11	23	21	21	29	16	24	18
26	13	11	8.6	8.5	14	24	24	19	26	16	22	18
27	13	11	7.5	8.6	31	22	20	19	25	15	22	18
28	13	11	7.0	8.9	27	21	19	19	86	15	29	17
29	13	11	7.5	8.9		20	19	21	35	15	23	17
30	12	11	7.0	8.7		119	19	19	31	15	22	17
31	13		6.5	8.8		200		20		14	21	
TOTAL	403	348	278.2	256.2	345.4	835	946	591	989	654	807	553
MEAN	13.0	11.6	9.0	8.3	12.3	26.9	31.5	19.1	33.0	21.1	26.0	18.4
MEDIAN	12	12	9.1	8.4	11	18	25.5	19	29	18	23	18
MAX	30	13	11	9.7	31	200	113	27	92	47	79	25
MIN	10	10	6.5	6.8	8.8	11	19	16	18	14	14	17
AC-FT	799	690	552	508	685	1660	1880	1170	1960	1300	1600	1100
CFSM	0.47	0.42	0.33	0.30	0.45	0.98	1.14	0.69	1.19	0.76	0.94	0.67
IN.	0.54	0.47	0.37	0.35	0.47	1.13	1.28	0.80	1.33	0.88	1.09	0.75

Source: May and others (1999)

APPENDIX G.

DAILY MEAN SUSPENDED-SEDIMENT CONCENTRATION AND DAILY SUSPENDED-SEDIMENT LOAD AT SITES BR1 AND SN1 IN THE BLOODY RUN AND SNY MAGILL WATERSHEDS

Daily mean suspended-sediment concentration and daily suspended-sediment load at site BR1; Water Year 1995.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
					Mean daily suspended-sediment concentration, in milligrams per liter							
1	4	5	10	12	7	10	14	26	19	16	40	26
2	3	4	4	25	14	8	14	19	12	15	28	47
3	9	6	5	22	11	22	19	22	21	15	35	25
4	12	6	6	10	10	27	17	24	25	19	23	17
5	14	5	10	19	3	7	14	26	22	10	18	15
6	13	2	15	31	9	9	13	20	24	12	16	18
7	17	3	8	38	13	18	14	31	33	12	19	5
8	14	6	13	28	4	39	10	38	27	15	18	7
9	17	6	14	18	5	84	15	65	16	14	15	8
10	19	6	29	25	10	29	25	68	16	17	19	4
11	9	5	28	27	7	215	117	55	23	22	9	6
12	4	4	17	28	9	140	298	43	11	19	10	8
13	3	6	22	27	26	54	64	43	17	14	12	6
14	6	5	24	19	28	31	49	29	22	9	13	5
15	4	2	29	11	26	27	28	22	13	7	9	8
16	9	3	18	10	23	26	24	28	11	13	12	12
17	13	5	14	11	9	27	28	27	11	15	17	5
18	18	6	25	9	7	28	33	25	12	11	17	11
19	5	5	47	10	9	28	45	32	18	9	38	22
20	3	6	27	16	61	47	32	29	18	13	32	15
21	16	22	12	13	57	37	30	23	17	10	21	17
22	10	7	11	15	14	29	25	30	15	11	40	9
23	2	5	17	15	13	24	20	25	19	7	46	9
24	2	2	7	14	9	24	21	11	9	7	30	8
25	6	3	16	13	9	17	23	12	17	11	24	3
26	3	6	14	11	7	19	28	17	18	15	21	4
27	5	3	9	9	6	25	39	232	16	674	33	4
28	6	8	8	7	8	18	35	40	11	839	40	4
29	2	10	9	5	---	20	21	23	12	145	18	5
30	1	11	7	6	---	19	24	20	15	51	24	3
31	2	---	10	7	---	23	---	22	---	40	40	---
					Suspended-sediment load, in tons per day							
1	0.32	0.31	0.59	0.51	0.29	0.41	0.84	1.8	1.4	1.0	3.2	1.4
2	0.23	0.28	0.28	1.2	0.59	0.36	0.74	1.3	0.91	0.90	2.1	2.6
3	0.67	0.36	0.31	0.97	0.43	0.94	0.96	1.5	1.4	0.99	2.4	1.4
4	0.78	0.40	0.38	0.47	0.41	1.1	0.99	1.6	1.7	1.2	1.5	0.86
5	0.90	0.35	0.61	0.92	0.13	0.29	0.82	1.7	1.4	0.72	1.2	0.77
6	0.87	0.16	0.97	1.4	0.38	0.38	0.70	1.3	1.6	0.83	1.1	0.87
7	1.2	0.23	0.52	2.0	0.55	0.76	0.83	1.9	2.1	0.78	1.4	0.30
8	1.0	0.36	0.87	1.4	0.14	1.8	0.69	3.4	1.8	1.0	1.3	0.42
9	1.2	0.37	0.88	0.91	0.18	3.6	1.1	6.4	1.1	0.93	1.1	0.44
10	1.3	0.44	1.9	1.4	0.38	1.2	1.8	9.7	1.0	1.0	1.3	0.24
11	0.62	0.32	1.8	1.5	0.26	50	13	6.4	1.4	1.3	0.58	0.29
12	0.26	0.28	0.94	1.4	0.34	14	63	4.6	0.68	1.2	0.60	0.41
13	0.21	0.38	1.4	1.3	0.99	3.8	8.7	4.6	1.0	0.85	0.73	0.27
14	0.42	0.33	1.5	1.0	1.1	1.8	5.0	2.8	1.3	0.48	0.80	0.23
15	0.29	0.16	1.7	0.58	0.92	1.7	2.5	1.9	0.72	0.48	0.55	0.43
16	0.61	0.22	1.0	0.51	0.88	1.7	2.0	2.2	0.60	0.97	0.83	0.56
17	0.84	0.33	0.75	0.52	0.32	1.7	2.3	2.2	0.61	1.0	1.2	0.26
18	1.2	0.40	1.3	0.41	0.26	1.8	3.2	2.0	0.60	0.74	1.0	0.55
19	0.33	0.29	2.3	0.61	0.40	1.8	4.5	2.4	0.98	0.72	2.2	1.2
20	0.17	0.39	1.3	0.85	6.2	3.9	2.8	2.0	0.97	0.95	2.0	0.87
21	1.0	1.8	0.54	0.63	3.7	3.2	2.8	1.6	0.89	0.69	1.3	0.94
22	0.66	0.51	0.49	0.72	0.57	2.0	2.1	2.1	0.79	0.74	2.4	0.47
23	0.13	0.35	0.77	0.69	0.58	1.6	1.6	1.9	0.96	0.49	2.6	0.47
24	0.13	0.15	0.34	0.60	0.38	1.5	1.7	0.83	0.50	0.44	1.6	0.42
25	0.41	0.18	0.73	0.55	0.32	1.0	1.8	0.90	0.90	0.75	1.3	0.18
26	0.18	0.37	0.62	0.45	0.25	1.1	2.2	1.2	1.1	1.1	1.2	0.18
27	0.31	0.20	0.38	0.40	0.21	1.6	3.0	23	0.97	182	1.8	0.18
28	0.36	0.60	0.33	0.29	0.30	1.1	2.4	4.0	0.71	102	2.2	0.20
29	0.12	0.71	0.40	0.23	---	1.3	1.5	1.9	0.75	11	1.4	0.25
30	0.08	0.72	0.34	0.27	---	1.2	1.7	1.5	0.90	3.7	1.3	0.15
31	0.16	---	0.44	0.29	---	1.4	---	1.6	---	2.9	2.2	---
Total:	16.96	11.95	26.68	24.98	21.46	110.04	137.27	102.23	31.74	323.85	46.39	17.81
											Water year total:	***871.36***
Mean:	0.55	0.40	0.86	0.81	0.77	3.55	4.58	3.30	1.06	10.45	1.50	0.59
Median:	0.41	0.35	0.73	0.63	0.38	1.60	1.90	1.90	0.97	0.95	1.30	0.43
Maximum:	1.30	1.80	2.30	2.00	6.20	50.00	63.00	23.00	2.10	182.00	3.20	2.60
Minimum:	0.08	0.15	0.28	0.23	0.13	0.29	0.69	0.83	0.50	0.44	0.55	0.15

Source: May and others (1996)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site SN1; Water Year 1995.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean daily suspended-sediment concentration, in milligrams per liter												
1	110	12	14	28	3	8	27	37	64	24	57	35
2	100	11	8	23	3	8	28	36	51	23	53	29
3	86	9	8	17	3	7	24	36	40	21	50	19
4	73	9	8	17	4	5	19	34	32	18	47	15
5	61	14	9	18	4	5	23	27	27	16	44	13
6	39	14	10	20	5	5	19	24	23	13	44	12
7	24	12	11	21	6	5	14	23	20	9	63	14
8	15	11	12	22	7	5	11	57	18	7	36	13
9	18	9	13	16	3	5	8	91	23	7	38	12
10	16	8	15	8	2	19	14	327	24	9	37	13
11	15	8	16	4	3	1240	75	64	22	15	36	15
12	30	8	16	5	5	365	141	36	20	18	35	14
13	33	7	17	8	9	131	42	37	17	22	34	12
14	27	7	18	12	10	13	33	34	13	25	34	11
15	23	7	19	13	10	17	30	30	11	12	33	10
16	19	7	20	11	9	34	30	27	8	7	33	9
17	16	6	21	12	3	42	29	24	8	5	44	10
18	15	6	23	13	4	35	72	25	8	5	32	11
19	17	7	24	14	8	36	36	27	8	15	32	12
20	17	9	23	16	16	42	28	30	13	19	32	14
21	17	29	22	17	14	23	22	33	12	17	31	16
22	16	13	21	19	8	31	21	29	10	20	31	17
23	17	5	20	22	14	17	23	23	9	26	31	18
24	18	4	19	25	7	25	24	18	8	31	31	18
25	20	7	18	26	7	14	16	15	8	28	31	18
26	16	9	17	25	8	10	20	12	7	43	30	17
27	16	21	18	13	9	13	27	165	13	1130	30	16
28	15	37	20	9	9	19	21	233	17	1440	31	16
29	15	28	22	7	---	15	27	130	21	225	53	17
30	16	16	24	5	---	7	37	102	23	100	37	18
31	14	---	26	3	---	13	---	81	---	67	36	---
Suspended-sediment load, in tons per day												
1	5.2	0.54	0.71	0.68	0.06	0.20	1.3	2.7	6.7	1.7	2.8	1.0
2	5.0	0.44	0.35	0.55	0.06	0.21	1.3	2.5	5.2	1.6	2.4	0.90
3	4.2	0.37	0.31	0.39	0.07	0.19	1.0	2.5	3.7	1.5	2.2	0.53
4	3.5	0.36	0.34	0.37	0.08	0.16	0.92	2.2	2.7	1.3	2.0	0.43
5	2.7	0.58	0.40	0.49	0.09	0.16	1.1	1.8	2.3	1.2	1.9	0.38
6	1.6	0.62	0.46	0.51	0.09	0.16	0.87	1.6	2.0	0.96	2.6	0.37
7	1.0	0.54	0.50	0.50	0.12	0.15	0.71	1.4	1.6	0.62	5.7	0.70
8	0.62	0.48	0.57	0.47	0.16	0.13	0.60	7.3	1.5	0.48	1.7	0.49
9	0.83	0.44	0.60	0.36	0.08	0.15	0.46	17	1.9	0.50	1.8	0.43
10	0.72	0.39	0.59	0.19	0.06	0.65	0.93	96	2.0	0.63	1.7	0.47
11	0.68	0.36	0.51	0.10	0.07	631	14	12	1.7	1.0	1.6	0.52
12	1.2	0.34	0.58	0.11	0.10	31	34	5.3	1.5	1.1	1.5	0.56
13	1.3	0.32	0.66	0.19	0.21	8.5	5.0	5.4	1.2	1.3	1.5	0.35
14	1.0	0.35	0.72	0.30	0.25	0.65	3.2	4.6	0.96	1.5	1.5	0.29
15	0.81	0.33	0.74	0.30	0.30	0.70	2.5	3.4	0.75	0.73	1.5	0.26
16	0.69	0.30	0.76	0.26	0.29	1.3	2.4	2.8	0.58	0.52	1.5	0.23
17	0.58	0.26	0.76	0.26	0.09	1.6	2.3	2.6	0.51	0.40	2.3	0.27
18	0.56	0.27	0.77	0.37	0.13	1.4	7.6	2.4	0.49	0.35	1.3	0.31
19	0.76	0.31	0.81	0.50	0.33	1.4	3.6	2.5	0.52	1.1	1.4	0.46
20	0.71	0.43	0.77	0.52	1.6	2.7	2.7	2.7	0.74	1.3	1.5	0.50
21	0.70	2.4	0.72	0.52	0.91	1.5	2.2	2.9	0.70	1.0	1.5	0.53
22	0.67	0.85	0.68	0.56	0.35	1.5	2.0	2.4	0.52	1.2	1.3	0.58
23	0.70	0.24	0.68	0.59	0.63	0.88	2.0	2.1	0.46	1.5	1.3	0.56
24	0.84	0.21	0.67	0.45	0.25	1.3	2.1	1.7	0.44	1.8	1.3	0.55
25	0.95	0.35	0.60	0.61	0.21	0.64	1.3	1.2	0.42	2.0	1.3	0.54
26	0.71	0.44	0.56	0.51	0.25	0.50	1.6	1.0	0.45	4.6	1.2	0.47
27	0.69	1.4	0.54	0.27	0.27	0.67	2.3	77	0.78	1110	1.1	0.44
28	0.58	2.7	0.63	0.17	0.26	1.0	1.6	50	1.2	214	1.2	0.44
29	0.57	1.7	0.71	0.13	---	0.79	2.0	19	1.5	14	3.6	0.48
30	0.69	0.88	0.73	0.11	---	0.36	2.9	12	1.5	4.1	1.3	0.49
31	0.63	---	0.70	0.07	---	0.68	---	8.0	---	2.8	1.1	---
Total:	41.39	19.20	19.13	11.41	7.37	692.23	106.19	356.40	46.52	1376.79	56.60	14.53
										Water year total:		***2747.76***
Mean:	1.34	0.64	0.62	0.37	0.26	22.33	3.55	11.48	1.55	44.41	1.83	0.48
Median:	0.72	0.41	0.66	0.37	0.19	0.68	2.00	2.70	1.20	1.30	1.50	0.48
Maximum:	5.20	2.70	0.81	0.68	1.60	631.00	34.00	96.00	6.70	1110.00	5.70	1.00
Minimum:	0.56	0.21	0.31	0.07	0.06	0.13	0.46	1.00	0.42	0.35	1.10	0.23

Source: May and others (1996)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site BR1; Water Year 1996.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
					Mean daily suspended-sediment concentration, in milligrams per liter							
1	5	22	6	11	33	19	14	8	14	17	18	8
2	4	18	3	17	54	18	12	9	12	11	10	7
3	9	10	3	24	60	23	11	11	15	11	8	10
4	16	10	2	17	47	20	13	6	12	10	9	25
5	6	13	3	13	44	20	13	6	7	9	10	18
6	7	13	6	18	31	21	10	6	25	5	11	10
7	7	19	7	12	25	14	14	3	66	7	10	15
8	8	14	7	10	26	14	12	4	41	12	9	10
9	9	11	9	20	35	16	10	9	29	8	10	8
10	16	12	11	23	28	17	9	11	22	11	16	15
11	6	13	9	22	31	20	11	12	17	9	17	10
12	6	10	17	17	24	26	13	9	59	8	15	9
13	6	12	12	9	21	40	15	10	379	20	15	8
14	6	18	7	11	22	44	18	13	92	19	21	7
15	8	22	7	9	15	28	11	10	56	19	22	7
16	8	18	10	7	24	19	13	8	117	16	24	6
17	24	12	14	7	28	18	9	9	550	13	25	8
18	17	17	16	10	19	21	8	10	239	15	19	9
19	18	8	21	12	14	23	12	12	97	19	8	5
20	28	12	14	27	27	15	16	15	61	24	11	6
21	20	6	21	29	40	14	14	14	48	26	9	6
22	13	13	25	22	27	16	10	13	40	22	7	9
23	10	14	14	18	72	17	10	12	58	27	6	13
24	9	5	12	15	142	20	11	14	40	25	6	8
25	17	8	10	21	130	20	11	8	32	20	7	12
26	11	11	9	12	66	16	9	10	26	20	9	17
27	6	12	11	20	49	16	6	13	17	25	8	13
28	7	22	13	23	20	19	4	10	12	13	11	12
29	9	19	11	27	16	15	8	11	18	12	5	12
30	7	14	14	23	---	12	9	12	34	9	8	23
31	8	---	17	26	---	11	---	11	---	12	8	---
					Suspended-sediment load, in tons per day							
1	0.21	2.1	0.24	0.31	1.2	0.96	0.62	0.43	0.81	1.2	1.1	0.39
2	0.18	1.6	0.12	0.51	2.0	0.87	0.52	0.49	0.73	0.73	0.59	0.35
3	0.41	0.66	0.13	0.75	2.1	1.0	0.49	0.59	0.90	0.71	0.48	0.47
4	0.72	0.56	0.09	0.56	1.5	0.90	0.62	0.29	0.74	0.68	0.51	1.2
5	0.29	0.69	0.12	0.43	1.3	0.82	0.62	0.28	0.45	0.57	0.53	0.87
6	0.42	0.68	0.23	0.60	0.90	0.88	0.50	0.32	3.4	0.30	0.63	0.52
7	0.38	0.97	0.29	0.41	0.60	0.59	0.65	0.14	8.2	0.45	0.55	0.79
8	0.38	0.74	0.32	0.34	0.60	0.59	0.57	0.18	4.1	0.79	0.46	0.51
9	0.45	0.56	0.38	0.66	0.89	0.66	0.44	0.41	2.6	0.51	0.49	0.46
10	0.70	0.62	0.45	0.85	1.1	0.69	0.38	0.62	1.9	0.64	0.81	0.80
11	0.24	0.65	0.39	0.80	2.0	1.0	0.46	0.62	1.3	0.59	0.79	0.51
12	0.23	0.51	0.71	0.61	1.1	2.9	0.57	0.45	4.5	0.44	0.73	0.48
13	0.23	0.57	0.52	0.31	0.78	3.5	0.69	0.49	49	1.2	0.73	0.42
14	0.28	0.90	0.28	0.40	0.82	3.3	0.85	0.71	7.8	1.2	0.96	0.37
15	0.39	1.1	0.25	0.32	0.55	1.8	0.51	0.56	4.4	1.2	1.1	0.42
16	0.37	0.83	0.37	0.26	0.80	1.2	0.60	0.40	16	1.8	1.2	0.36
17	1.0	0.57	0.52	0.26	0.93	1.0	0.39	0.39	132	0.87	1.1	0.43
18	0.80	0.82	0.58	2.4	0.62	1.3	0.37	0.38	53	0.95	0.95	0.49
19	0.92	0.37	0.73	0.52	0.43	1.3	0.66	0.45	15	1.3	0.43	0.26
20	1.5	0.55	0.52	1.1	0.83	0.78	0.90	0.68	7.6	1.7	0.56	0.37
21	1.1	0.26	0.76	0.99	3.1	0.68	0.78	0.63	5.4	1.8	0.43	0.35
22	0.66	0.62	0.90	0.66	1.3	0.77	0.58	0.58	4.0	1.4	0.37	0.54
23	0.51	0.62	0.51	0.53	15	0.80	0.56	0.54	5.4	1.6	0.31	0.80
24	0.48	0.23	0.44	0.45	41	0.99	0.61	0.62	3.5	1.6	0.29	0.46
25	0.86	0.33	0.37	0.74	19	1.4	0.58	0.37	2.5	1.3	0.29	0.71
26	0.54	0.46	0.30	0.49	6.9	1.0	0.52	0.50	2.0	1.3	0.38	1.1
27	0.30	0.58	0.38	0.92	3.2	0.88	0.34	0.65	1.2	1.6	0.33	0.80
28	0.32	1.0	0.40	0.99	1.1	0.94	0.21	0.59	0.82	0.93	0.49	0.71
29	0.43	0.87	0.34	1.1	0.86	0.70	0.48	0.68	1.3	0.86	0.24	0.70
30	0.31	0.6	0.40	0.84	---	0.55	0.52	0.68	2.8	0.54	0.36	1.4
31	0.39	---	0.51	0.94	---	0.52	---	0.57	---	0.72	0.38	---
Total:	16.00	21.62	12.55	21.05	112.51	35.27	16.59	15.29	343.35	31.48	18.57	18.04
											Water year total:	***662.32***
Mean:	0.52	0.72	0.40	0.68	3.88	1.14	0.55	0.49	11.45	1.02	0.60	0.60
Median:	0.41	0.62	0.38	0.60	1.1	0.90	0.57	0.50	3.5	0.93	0.51	0.50
Maximum:	1.5	2.1	0.90	2.4	41	3.5	0.90	0.71	132	1.8	1.2	1.4
Minimum:	0.18	0.23	0.09	0.26	0.43	0.52	0.21	0.14	0.45	0.30	0.24	0.26

Source: May and others (1997)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site SN1; Water Year 1996.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean daily suspended-sediment concentration, in milligrams per liter												
1	17	32	14	9	44	8	27	8	73	44	21	8
2	18	32	10	8	43	8	30	6	57	42	21	7
3	20	20	7	7	33	9	29	5	40	40	21	7
4	21	13	6	6	26	9	26	6	29	38	21	6
5	23	8	7	5	20	10	24	7	42	37	21	6
6	45	6	7	5	16	10	22	7	131	35	21	8
7	35	5	8	4	12	10	19	6	212	32	22	10
8	15	5	9	4	10	11	16	10	97	15	22	11
9	12	5	9	3	7	11	22	6	73	13	22	11
10	12	5	10	1	5	12	20	22	55	19	22	12
11	12	5	11	1	3	13	18	15	42	28	22	12
12	12	5	12	1	2	26	18	13	55	41	22	13
13	12	5	13	1	1	24	18	11	709	56	23	13
14	13	5	14	2	1	17	18	11	121	34	23	14
15	13	5	15	2	1	22	17	13	110	16	23	14
16	13	5	24	3	1	10	21	15	844	34	17	15
17	13	5	30	8	2	22	26	15	1640	28	12	15
18	13	5	33	256	3	34	34	14	653	21	11	16
19	13	6	36	55	4	19	31	13	146	43	21	17
20	14	9	39	10	17	17	20	13	85	37	13	17
21	8	7	43	4	21	19	19	12	64	22	14	18
22	8	17	39	6	6	15	26	11	49	19	17	18
23	12	5	33	8	42	19	26	12	53	19	19	19
24	10	6	28	8	218	23	27	13	31	19	21	19
25	8	8	24	8	188	24	37	14	35	20	23	20
26	7	9	20	8	21	26	23	16	35	20	23	20
27	14	10	17	7	9	28	14	18	34	20	25	21
28	22	13	15	7	9	29	17	37	34	20	22	22
29	17	18	13	7	9	27	26	29	64	20	29	23
30	11	17	11	7	---	24	14	51	119	20	23	24
31	7	---	10	16	---	25	---	73	---	20	14	---
Suspended-sediment load, in tons per day												
1	0.50	3.6	0.43	0.20	1.3	0.32	1.1	0.35	3.6	4.0	1.1	0.31
2	0.52	3.5	0.30	0.18	1.4	0.32	1.1	0.27	3.2	3.3	1.1	0.23
3	0.71	1.6	0.18	0.17	1.1	0.30	1.2	0.21	2.0	2.9	1.1	0.21
4	0.78	0.78	0.18	0.17	0.84	0.33	1.1	0.23	1.5	2.6	1.1	0.19
5	1	0.4	0.21	0.17	0.59	0.33	0.93	0.25	2.2	2.4	1.0	0.18
6	3.6	0.24	0.24	0.14	0.43	0.35	0.84	0.25	11	2.2	1.2	0.24
7	2.8	0.23	0.26	0.12	0.28	0.35	0.68	0.21	21	2.0	1.1	0.31
8	0.85	0.21	0.29	0.10	0.19	0.39	0.61	0.31	6.0	0.95	1.1	0.33
9	0.52	0.19	0.28	0.08	0.15	0.41	0.75	0.17	3.9	0.89	1.1	0.38
10	0.51	0.19	0.30	0.04	0.18	0.37	0.66	1.2	2.8	1.2	1.2	0.31
11	0.46	0.19	0.32	0.03	0.12	0.66	0.54	0.68	2.0	1.7	1.1	0.32
12	0.42	0.18	0.34	0.02	0.04	2.4	0.55	0.53	2.3	2.5	1.1	0.37
13	0.43	0.16	0.36	0.03	0.02	1.9	0.62	0.43	76	3.1	1.1	0.34
14	0.50	0.16	0.40	0.04	0.02	1.2	0.7	0.49	6.0	2.0	0.98	0.33
15	0.56	0.18	0.43	0.05	0.02	1.5	0.64	0.55	4.9	0.87	1.0	0.34
16	0.55	0.15	0.68	0.06	0.02	0.63	0.72	0.64	892	1.6	0.75	0.33
17	0.47	0.13	0.80	0.18	0.05	1.6	0.87	0.57	1470	1.7	0.49	0.31
18	0.48	0.13	0.82	68	0.07	2.2	1.3	0.45	302	1.2	0.48	0.32
19	0.45	0.15	0.92	1.7	0.08	1.0	1.4	0.43	37	2.8	1.5	0.34
20	0.60	0.27	1.1	0.36	0.8	0.90	0.93	0.48	16	2.3	0.65	0.33
21	0.35	0.17	1.1	0.12	1.1	0.95	0.87	0.43	9.8	1.4	0.48	0.37
22	0.34	0.53	0.96	0.19	0.15	0.72	1.2	0.40	7	1.2	0.73	0.35
23	0.49	0.16	0.84	0.24	4.7	0.86	1.1	0.44	7.8	1.2	0.84	0.40
24	0.55	0.19	0.68	0.24	56	1.2	1.2	0.51	3.9	1.2	0.94	0.38
25	0.32	0.21	0.60	0.21	18	1.8	1.7	0.58	3.5	1.2	0.97	0.39
26	0.28	0.28	0.52	0.2	1.7	1.5	1.1	0.64	3	1.0	0.93	0.51
27	0.46	0.34	0.43	0.22	0.51	1.4	0.64	0.78	2.9	1.2	1.1	0.57
28	0.88	0.45	0.36	0.21	0.4	1.4	0.72	2.4	2.6	1.3	1.1	0.45
29	0.78	0.57	0.35	0.19	0.35	1.1	1.3	1.7	18	1.2	1.3	0.42
30	0.45	0.57	0.27	0.21	---	1.0	0.66	2.5	23	1.3	0.96	0.41
31	0.31	---	0.23	0.52	---	1.1	---	3.4	---	1.2	0.53	---
Total:	21.92	16.11	15.18	74.39	90.61	30.49	27.73	22.48	2946.90	55.61	30.13	10.27
										Water year total:		***3341.82***
Mean:	0.71	0.54	0.49	2.40	3.1	0.98	0.92	0.73	98	1.8	0.97	0.34
Median:	0.5	0.21	0.36	0.18	0.35	0.95	0.87	0.48	5.5	1.4	1.1	0.34
Maximum	3.6	3.6	1.1	68.0	56	2.4	1.7	3.4	1470	4.0	1.5	0.57
Minimum:	0.28	0.13	0.18	0.02	0.02	0.30	0.54	0.17	1.5	0.87	0.48	0.18

Source: May and others (1997)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site BR1; Water Year 1997.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean daily suspended-sediment concentration, in milligrams per liter												
1	16	43	8	12	9	183	16	15	15	33	31	8
2	5	30	8	9	5	107	14	9	17	34	30	10
3	6	14	8	9	7	52	14	8	21	28	28	14
4	4	24	9	9	13	15	16	9	41	35	27	13
5	10	12	7	12	25	14	17	9	70	26	25	13
6	18	13	7	18	18	12	16	9	92	16	24	12
7	4	13	8	15	22	11	15	11	91	11	22	11
8	5	13	12	24	7	11	15	14	46	15	19	17
9	6	13	5	26	9	1060	14	18	21	7	17	16
10	7	12	4	12	14	203	14	22	11	6	17	16
11	9	7	5	20	21	58	30	24	10	5	16	17
12	11	3	6	54	16	45	30	27	10	8	34	19
13	9	5	6	39	17	39	28	29	9	13	25	10
14	17	5	4	34	15	46	26	30	9	20	20	4
15	22	4	4	30	12	33	27	31	17	15	20	3
16	8	4	9	27	9	23	27	31	17	11	19	16
17	8	6	8	55	7	124	21	32	17	11	19	15
18	20	11	12	30	1470	149	13	32	17	16	19	10
19	20	6	17	30	258	134	8	32	10	28	19	7
20	20	6	15	25	205	68	7	15	9	23	19	4
21	11	3	6	20	361	41	8	10	37	20	18	4
22	12	3	10	24	185	26	18	9	19	22	18	5
23	18	2	10	17	47	17	12	8	27	36	18	12
24	13	2	15	13	18	15	15	8	36	26	21	3
25	17	4	24	15	8	10	12	7	41	53	19	3
26	19	6	40	18	8	16	9	7	47	34	18	7
27	17	9	53	17	9	18	7	8	54	50	17	6
28	22	6	18	20	9	18	16	9	62	80	14	4
29	36	10	28	26		19	15	10	61	77	10	2
30	42	14	32	27		19	19	12	56	38	17	3
31	28		20	27		18		13		32	13	
Suspended-sediment load, in tons per day												
1	0.78	2	0.3	0.4	0.21	50	0.69	0.96	0.55	1.6	1.1	0.3
2	0.26	1.3	0.29	0.31	0.13	13	0.59	0.55	0.62	2.1	1	0.35
3	0.38	0.58	0.28	0.32	0.16	4.9	0.57	0.52	0.77	1.3	0.98	0.47
4	0.22	1	0.26	0.36	0.29	0.9	0.68	0.51	1.5	1.6	0.93	0.44
5	0.54	0.49	0.2	0.67	0.58	0.71	0.75	0.53	2.9	1.1	0.87	0.47
6	1	0.5	0.22	0.71	0.41	0.57	0.75	0.49	3.9	0.7	0.81	0.42
7	0.25	0.51	0.24	0.58	0.51	0.5	0.66	0.59	3.7	0.48	0.74	0.36
8	0.3	0.52	0.39	0.8	0.17	0.48	0.61	0.8	1.8	0.68	0.64	0.67
9	0.35	0.51	0.16	0.77	0.21	485	0.56	0.9	0.81	0.28	0.57	0.6
10	0.37	0.47	0.14	0.42	0.31	20	0.57	1.1	0.41	0.23	0.55	0.58
11	0.51	0.29	0.16	0.64	0.48	4.2	1.2	1.2	0.37	0.21	0.53	0.63
12	0.57	0.12	0.19	1.7	0.36	2.8	1.3	1.3	0.37	0.31	1.7	0.7
13	0.48	0.18	0.18	1.1	0.38	2.3	1.2	1.4	0.37	0.56	0.92	0.39
14	0.83	0.17	0.11	0.97	0.37	3.5	1.2	1.4	0.35	0.93	0.73	0.15
15	1.1	0.15	0.15	0.87	0.28	2.3	1.1	1.4	0.94	0.59	0.7	0.12
16	0.38	0.16	0.32	0.83	0.2	1.4	1.1	1.4	1.1	0.42	0.66	0.64
17	0.42	0.24	0.29	1.8	0.14	46	0.88	1.4	0.79	0.43	0.62	0.63
18	1	0.45	0.42	0.84	2930	28	0.56	1.4	0.77	0.64	0.62	0.4
19	1	0.23	0.59	0.78	70	19	0.37	1.4	0.46	1.7	0.61	0.26
20	1	0.25	0.54	0.62	57	8.3	0.28	0.6	0.39	1.2	0.63	0.16
21	0.54	0.1	0.19	0.48	94	3.4	0.3	0.39	3.1	0.86	0.59	0.15
22	0.62	0.13	0.35	1.4	21	2	0.72	0.36	1	0.91	0.57	0.19
23	1.1	0.08	0.34	0.57	3.4	1.2	0.44	0.33	1.4	1.4	0.6	0.51
24	0.73	0.08	0.53	0.37	1.1	0.99	0.55	0.32	1.7	1	0.78	0.12
25	0.81	0.14	0.78	0.4	0.45	0.66	0.43	0.3	1.9	2.5	0.66	0.13
26	0.84	0.22	1.3	0.42	0.43	0.89	0.31	0.28	2.1	1.4	0.61	0.23
27	0.73	0.36	1.9	0.42	0.51	0.89	0.25	0.3	2.4	2.2	0.58	0.2
28	0.97	0.22	0.6	0.42	0.47	0.94	0.57	0.35	2.6	3.4	0.47	0.13
29	1.9	0.36	0.98	0.58		0.91	0.54	0.4	2.6	3	0.32	0.09
30	2.2	0.51	1.1	0.64		0.87	1	0.44	3	1.4	0.63	0.11
31	1.5		0.64	0.65		0.81		0.49		1.1	0.5	
Total:	23.68	12.32	14.14	21.84	3183.55	707.42	20.73	23.81	44.67	36.23	22.22	10.60
											Water year total:	***4121.21***
Mean:	0.76	0.41	0.46	0.70	113.70	22.82	0.69	0.77	1.49	1.17	0.72	0.35
Median:	0.73	0.27	0.30	0.64	0.4	2.00	0.60	0.55	1.1	1.00	0.63	0.36
Maximum:	2.2	2	1.90	1.8	2930	485	1.30	1.4	3.9	3.4	1.7	0.7
Minimum:	0.22	0.08	0.11	0.31	0.13	0.48	0.25	0.28	0.35	0.21	0.32	0.09

Source: May and others (1998)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site SN1; Water Year 1997.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
					Mean daily suspended-sediment concentration, in milligrams per liter							
1	17	10	15	8	6	95	19	28	19	33	41	24
2	22	5	15	7	6	44	18	35	15	560	39	30
3	19	9	11	10	4	12	19	36	31	98	45	17
4	11	18	5	10	5	10	17	31	27	49	39	17
5	14	12	4	9	7	9	25	32	34	39	35	14
6	15	15	5	12	10	15	23	33	20	31	33	19
7	14	17	6	14	6	16	16	43	68	26	38	25
8	23	21	5	9	10	32	13	48	86	40	58	20
9	33	28	3	7	9	786	17	43	60	29	61	25
10	19	34	6	4	6	143	13	41	50	25	52	28
11	13	15	5	5	6	27	14	40	43	26	44	24
12	12	5	4	8	16	36	11	39	37	39	192	22
13	11	9	3	14	7	30	18	38	34	65	66	22
14	11	21	4	17	3	27	27	42	32	65	47	21
15	17	27	5	14	3	15	32	37	78	38	44	21
16	11	30	6	7	3	28	24	31	1080	26	30	27
17	10	41	5	7	3	43	24	27	97	53	21	60
18	12	42	5	10	370	39	21	23	63	46	19	28
19	16	40	3	12	74	29	29	22	66	373	17	20
20	13	44	3	14	149	27	33	31	62	282	37	14
21	15	35	7	21	199	22	31	28	522	351	29	14
22	15	27	6	35	50	27	30	27	417	85	45	18
23	16	22	11	15	32	26	29	30	98	67	41	29
24	11	17	11	7	29	24	18	33	48	60	33	24
25	13	14	9	7	20	40	21	31	42	107	17	20
26	13	10	8	5	33	50	23	27	36	50	14	20
27	12	6	6	10	30	31	20	25	22	838	13	20
28	12	5	7	7	27	16	16	63	19	167	14	20
29	17	16	10	4		10	22	63	21	89	15	25
30	23	17	12	4		11	38	36	23	58	24	14
31	19		11	4		16		26		52	27	
					Suspended-sediment load, in tons per day							
1	0.29	0.33	0.51	0.24	0.19	11	0.83	1.4	0.5	1.3	1.8	0.7
2	0.43	0.15	0.51	0.19	0.17	2.9	0.77	1.8	0.37	56	1.6	0.88
3	0.41	0.25	0.37	0.29	0.13	0.6	0.78	2	0.77	4.2	1.8	0.48
4	0.22	0.52	0.15	0.36	0.16	0.42	0.68	1.5	0.66	1.9	1.5	0.47
5	0.28	0.35	0.14	0.41	0.22	0.34	1.1	1.4	0.92	1.5	1.2	0.38
6	0.3	0.43	0.14	0.42	0.29	0.52	0.96	1.4	0.58	1.1	1.1	0.54
7	0.3	0.55	0.17	0.53	0.2	0.53	0.58	2.2	2.1	0.9	1.2	0.72
8	0.5	0.64	0.14	0.3	0.32	1.4	0.46	2.9	2.7	1.8	1.8	0.69
9	0.72	0.93	0.1	0.24	0.3	166	0.54	2.2	1.8	1.1	1.9	0.77
10	0.42	1.2	0.19	0.14	0.19	12	0.44	2	1.5	0.88	1.6	0.83
11	0.3	0.49	0.14	0.17	0.21	1.9	0.47	1.9	1.3	0.88	1.4	0.69
12	0.25	0.16	0.11	0.29	0.5	2.1	0.4	1.8	1.2	1.4	20	0.63
13	0.21	0.29	0.09	0.47	0.21	1.7	0.67	1.7	1	2.5	3	0.63
14	0.19	0.64	0.11	0.6	0.12	1.5	1	1.8	0.89	2.7	1.9	0.64
15	0.32	0.77	0.21	0.49	0.11	0.63	1.3	1.5	8.9	1.3	1.7	0.62
16	0.21	0.87	0.27	0.29	0.08	1.2	0.83	1.2	130	0.89	1.1	0.99
17	0.23	1.4	0.21	0.3	0.07	3.6	0.81	1	4.7	2.1	0.76	2.3
18	0.27	1.5	0.17	0.38	156	2.5	0.74	0.88	2.5	1.7	0.65	0.79
19	0.35	1.4	0.11	0.44	14	1.4	1.1	0.83	2.5	46	0.58	0.59
20	0.27	1.5	0.09	0.41	32	1.5	1.2	1.1	2.2	16	1.4	0.39
21	0.34	1.1	0.2	0.7	39	1.3	1.1	0.9	67	25	0.97	0.38
22	0.42	0.86	0.15	2.5	4	1.6	1	0.86	27	4	1.4	0.53
23	0.77	0.68	0.31	0.75	1.6	1.5	1.1	0.94	5.3	2.9	1.2	1.1
24	0.31	0.54	0.33	0.29	1.2	1.3	0.6	1.1	2.4	2.4	1.2	0.76
25	0.31	0.45	0.24	0.26	0.84	2.2	0.66	0.99	2.2	5	0.51	0.63
26	0.28	0.32	0.21	0.18	1.4	2.6	0.7	0.82	1.7	2.1	0.44	0.58
27	0.26	0.18	0.18	0.38	1.2	1.6	0.61	0.7	0.96	432	0.43	0.57
28	0.26	0.15	0.21	0.21	0.96	0.9	0.49	1.9	0.78	18	0.42	0.67
29	0.68	0.45	0.27	0.13		0.51	0.66	2	0.83	5.7	0.42	0.7
30	0.97	0.58	0.38	0.14		0.53	1.4	1.1	0.95	3	0.91	0.38
31	0.7		0.33	0.14		0.75		0.71		2.4	0.84	
Total:	11.77	19.68	6.74	12.64	255.67	228.53	23.98	44.53	276.21	648.65	56.73	21.03
											Water year total:	***1606.16***
Mean:	0.38	0.66	0.22	0.41	9.1	7.37	0.80	1.44	9	20.9	1.83	0.70
Median:	0.3	0.545	0.19	0.3	0.295	1.5	0.755	1.4	1.6	2.4	1.2	0.64
Maximum	1.0	1.5	0.5	2.5	156	166.0	1.4	2.9	130	432.0	20.0	2.3
Minimum:	0.19	0.15	0.09	0.13	0.07	0.34	0.4	0.70	0.37	0.88	0.42	0.38

Source: May and others (1998)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site BR1; Water Year 1998.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean daily suspended-sediment concentration, in milligrams per liter												
1	6	7	8	10	10	15	212	26	10	24	15	27
2	7	6	5	9	10	11	62	25	8	25	14	27
3	9	6	3	9	7	8	40	22	8	21	14	26
4	9	6	5	8	7	7	33	19	7	20	29	26
5	9	5	5	7	13	6	25	18	7	20	19	26
6	8	4	4	5	14	5	19	24	7	20	20	26
7	7	11	3	6	9	4	19	31	6	133	26	25
8	5	13	2	6	6	5	35	32	6	143	63	25
9	5	11	4	4	4	4	42	24	12	62	35	24
10	4	10	7	5	4	3	34	23	28	63	49	24
11	4	10	13	8	7	5	27	23	363	53	41	22
12	6	8	13	12	10	6	22	30	466	42	26	20
13	27	6	14	19	13	10	20	19	189	33	25	18
14	9	4	14	23	12	12	17	19	69	26	26	26
15	10	5	10	16	35	9	13	24	25	25	51	21
16	23	8	5	7	18	8	13	25	12	25	24	10
17	25	11	4	7	10	6	8	25	20	24	122	9
18	25	9	12	6	7	6	9	24	266	23	27	9
19	24	13	18	6	7	6	10	23	119	25	22	9
20	21	15	16	5	16	6	20	24	49	27	23	8
21	19	20	10	4	15	5	92	24	63	24	22	8
22	16	22	15	4	13	5	25	25	56	21	20	10
23	13	23	18	5	12	5	21	26	57	22	18	9
24	10	23	15	5	13	6	17	26	98	25	17	25
25	7	21	13	5	9	10	16	27	57	24	17	17
26	5	25	12	5	10	19	21	27	49	22	17	14
27	4	26	11	7	24	21	15	23	45	20	18	13
28	5	36	11	3	22	16	21	20	377	21	35	12
29	7	27	9	4		12	25	16	59	19	27	12
30	7	14	11	5		576	25	14	35	13	26	10
31	7		11	7		1300		12		16	26	
Suspended-sediment load, in tons per day												
1	0.25	0.25	0.26	0.27	0.32	0.80	71	1.1	0.51	2.1	0.79	2.0
2	0.29	0.24	0.17	0.30	0.35	0.55	9.3	1.0	0.43	1.9	0.72	2.0
3	0.37	0.23	0.09	0.29	0.21	0.43	3.5	0.98	0.39	1.6	0.76	2.0
4	0.36	0.22	0.16	0.27	0.21	0.34	2.1	0.83	0.37	1.5	2.5	2.0
5	0.33	0.19	0.15	0.22	0.40	0.28	1.3	0.75	0.36	1.4	2.7	1.9
6	0.31	0.17	0.12	0.17	0.43	0.23	0.82	1.0	0.34	1.5	1.3	2.0
7	0.26	0.41	0.09	0.20	0.28	0.20	0.79	1.5	0.32	37	1.5	1.9
8	0.19	0.48	0.08	0.19	0.18	0.25	1.6	1.7	0.32	21	10	1.8
9	0.2	0.42	0.15	0.11	0.12	0.19	1.9	1.2	0.80	4.7	2.4	1.7
10	0.16	0.36	0.21	0.14	0.11	0.14	1.4	1.1	1.6	4.4	8.3	1.7
11	0.13	0.38	0.40	0.24	0.19	0.19	1.1	1.1	95	3.6	3.0	1.5
12	0.29	0.31	0.39	0.35	0.32	0.19	0.83	1.5	83	2.8	1.7	1.4
13	2.0	0.21	0.36	0.54	0.39	0.35	0.82	0.96	19	2.2	1.5	1.3
14	0.40	0.16	0.38	0.69	0.37	0.42	0.66	0.86	6.0	1.7	1.6	2.2
15	0.41	0.20	0.30	0.43	2.1	0.34	0.47	1.1	2.1	1.5	5.6	1.6
16	0.93	0.29	0.15	0.21	1.1	0.29	0.79	1.2	0.91	1.5	1.6	0.69
17	1.0	0.40	0.11	0.19	0.44	0.25	0.42	1.1	1.7	1.4	60	0.62
18	0.96	0.33	0.38	0.15	0.29	0.26	0.39	1.1	74	1.4	3.5	0.58
19	0.89	0.47	0.57	0.18	0.28	0.25	0.43	1.1	25	1.6	2.2	0.57
20	0.79	0.54	0.50	0.15	0.58	0.24	0.89	1.2	5.1	1.7	2.0	0.52
21	0.72	0.71	0.29	0.12	0.53	0.23	4.1	1.2	7.4	1.5	1.9	0.52
22	0.62	0.79	0.48	0.11	0.47	0.24	1.1	1.3	5.5	1.3	1.6	0.58
23	0.52	0.68	0.55	0.16	0.43	0.26	0.86	1.3	5.1	1.3	1.5	0.56
24	0.42	0.62	0.44	0.16	0.47	0.30	0.71	1.5	15	1.4	1.4	1.7
25	0.29	0.62	0.40	0.16	0.35	0.57	0.67	1.4	5.8	1.3	1.3	1.0
26	0.20	0.87	0.32	0.17	0.40	1.3	0.98	1.4	4.4	1.2	1.2	0.86
27	0.14	0.9	0.28	0.23	1.5	1.4	0.61	1.2	3.9	1.1	1.3	0.78
28	0.20	1.3	0.30	0.09	1.2	0.95	0.83	1.0	192	1.1	3.0	0.75
29	0.26	0.93	0.23	0.13		0.66	0.98	0.92	7.4	1.0	2.1	0.74
30	0.28	0.50	0.25	0.17		416	1.0	0.73	3.3	0.71	1.9	0.58
31	0.27		0.28	0.23		773		0.62		0.85	1.9	
Total:	14.44	14.18	8.84	7.02	14.02	1201.1	112.35	34.95	567.05	109.26	132.77	38.05
										Water year total: 2,254.03		
Mean:	0.47	0.47	0.29	0.23	0.50	38.75	3.75	1.13	18.90	3.52	4.28	1.27
Median:	0.31	0.41	0.28	0.19	0.38	0.29	0.88	1.1	4.15	1.5	1.9	1.4
Maximum:	2.0	1.3	0.57	0.69	2.1	773	71	1.7	192	37	60	2.2
Minimum:	0.13	0.16	0.08	0.09	0.11	0.14	0.39	0.62	0.32	0.71	0.72	0.52

Source: May and others (1999)

Daily mean suspended-sediment concentration and daily suspended-sediment load at site SN1; Water Year 1998.

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
					Mean daily suspended-sediment concentration, in milligrams per liter							
1	17	8	10	19	33	32	264	19	37	54	23	17
2	18	6	10	16	22	19	103	34	29	48	27	21
3	20	11	14	14	14	16	69	31	25	66	32	15
4	15	11	11	17	17	12	55	24	21	52	40	17
5	17	16	7	26	25	16	50	23	21	42	34	15
6	11	18	7	23	27	24	45	22	22	88	14	13
7	16	14	8	14	16	28	44	32	18	352	30	12
8	29	11	9	19	8	26	53	44	15	459	37	12
9	34	10	10	21	5	23	56	35	24	117	40	12
10	31	10	10	22	10	17	49	32	24	67	207	11
11	21	10	6	18	13	22	49	29	1780	62	85	11
12	29	9	10	18	14	19	51	23	596	55	71	11
13	116	8	25	21	13	21	50	26	79	47	61	10
14	36	10	24	22	14	24	38	25	48	40	63	21
15	28	12	15	14	30	24	55	21	45	34	123	25
16	24	14	12	8	40	22	103	21	54	29	37	27
17	20	10	6	7	31	24	70	22	53	25	84	23
18	16	12	5	8	29	28	57	23	769	23	78	17
19	14	12	6	9	24	36	64	28	1220	33	57	14
20	15	12	7	15	27	32	59	33	189	24	44	12
21	19	10	9	21	33	37	42	37	125	23	35	10
22	16	12	10	25	26	46	56	37	91	24	29	9
23	7	14	10	24	18	45	53	41	73	24	27	9
24	5	14	15	22	22	34	43	40	131	23	29	13
25	4	8	17	20	20	42	44	35	71	21	24	8
26	5	14	18	18	27	56	48	34	94	19	21	7
27	6	16	19	14	44	34	30	32	78	18	19	7
28	9	14	21	14	47	35	30	31	1820	23	26	6
29	11	13	23	28		46	28	39	196	22	22	9
30	11	11	27	30		4180	17	30	72	21	20	5
31	10		24	38		1370		46		20	18	
					Suspended-sediment load, in tons per day							
1	0.50	0.25	0.25	0.36	0.87	2.0	84	0.97	1.9	4.1	0.85	0.73
2	0.53	0.19	0.23	0.37	0.60	1.1	19	1.7	1.5	3.4	1.0	0.86
3	0.61	0.38	0.39	0.35	0.34	0.83	9.7	1.8	1.2	4.7	1.3	0.63
4	0.42	0.34	0.30	0.39	0.41	0.61	6.3	1.2	1.0	3.8	2.0	0.67
5	0.49	0.50	0.19	0.66	0.61	0.73	4.8	1.1	1.0	2.8	2.6	0.56
6	0.31	0.57	0.18	0.61	0.63	1.1	3.9	1.1	1.0	7.4	0.76	0.50
7	0.48	0.45	0.19	0.35	0.38	1.2	3.6	1.9	0.87	59	1.7	0.47
8	0.83	0.34	0.22	0.45	0.20	1.2	4.6	2.8	0.69	47	3.0	0.44
9	1.0	0.31	0.27	0.51	0.12	0.99	5.0	1.9	1.6	8.2	3.3	0.40
10	0.84	0.31	0.28	0.40	0.24	0.55	3.7	1.7	1.3	4.1	33	0.38
11	0.57	0.30	0.16	0.34	0.37	0.68	3.4	1.5	1130	3.6	4.9	0.36
12	1.3	0.26	0.25	0.37	0.41	0.51	3.4	1.2	129	3.0	3.6	0.34
13	10	0.24	0.57	0.43	0.35	0.62	3.5	1.3	7.3	2.5	2.9	0.32
14	1.8	0.28	0.49	0.48	0.37	0.71	2.4	1.2	3.9	2.0	4.3	1.2
15	1.2	0.35	0.32	0.30	1.6	0.78	3.4	0.99	3.7	1.7	42	1.1
16	0.96	0.39	0.28	0.16	1.6	0.8	10	0.95	4.5	1.4	2.4	1.0
17	0.74	0.26	0.14	0.15	1.2	0.9	5.6	0.95	4.1	1.2	10	0.82
18	0.59	0.34	0.12	0.16	1.0	1.4	4.1	0.99	229	1.0	5.4	0.60
19	0.48	0.35	0.15	0.17	0.81	1.9	4.4	1.2	158	1.7	3.4	0.48
20	0.51	0.33	0.18	0.30	0.87	1.6	4.0	1.5	16	1.1	2.7	0.40
21	0.61	0.28	0.19	0.47	1.0	1.9	2.9	1.8	13	1.1	2.0	0.34
22	0.52	0.33	0.26	0.56	0.83	2.6	3.5	1.8	6.8	1.1	1.5	0.29
23	0.22	0.37	0.25	0.55	0.59	2.7	3.1	2.0	5.1	1.1	1.4	0.28
24	0.16	0.35	0.35	0.49	0.71	2.1	2.5	3.0	13	0.98	1.5	0.55
25	0.14	0.22	0.41	0.46	0.61	2.6	2.5	1.9	5.6	0.89	1.2	0.27
26	0.16	0.37	0.42	0.42	1.1	3.7	3.1	1.8	6.7	0.81	0.93	0.25
27	0.20	0.41	0.41	0.32	3.7	2.0	1.6	1.7	5.2	0.73	0.89	0.22
28	0.32	0.37	0.43	0.32	3.4	2.0	1.6	1.6	692	0.94	1.6	0.21
29	0.36	0.33	0.43	0.67		2.5	1.4	2.2	19	0.90	1.1	0.41
30	0.34	0.30	0.51	0.69		3310	0.89	1.6	6.1	0.85	0.89	0.23
31	0.33		0.42	0.91		812		3		0.79	0.76	
Total:	27.52	10.07	9.24	13.17	24.92	4164.31	211.89	49.85	2470.06	173.89	144.88	15.31
										Water year total: 7,315.11		
Mean:	0.89	0.34	0.30	0.42	0.89	134.33	7.06	1.61	82.34	5.61	4.67	0.51
Median:	0.51	0.34	0.27	0.40	0.62	1.2	3.55	1.6	5.15	1.7	2.0	0.43
Maximum:	10	0.57	0.57	0.91	3.7	3310	84	3	1130	59	42	1.2
Minimum:	0.14	0.19	0.12	0.15	0.12	0.51	0.89	0.95	0.69	0.73	0.76	0.21

Source: May and others (1999)

APPENDIX H.

SUMMARY OF WATER-QUALITY DATA FOR WATER YEARS 1995 THROUGH 1998

Summary of water-quality data on an annual and quarterly basis; Water Year 1995.

Site SN1
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	51	0-22	1	3	11	17	19	7.04	10
Conductivity	umhos/cm	51	340-708	540	570	597	626	659	65.32	591
Dissolved Oxygen	mg/L	50	6-14	9	9.25	11	13	14	2.04	11
Turbidity	NTU	50	0.1-22.0	2.9	3.9	4.9	7.4	14.1	4.41	6.4
NO2+NO3-N	mg/L	52	1.8-3.1	1.9	2.1	2.4	2.7	2.9	0.36	2.4
Ammonium-N	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.07	<0.1
Organic-N	mg/L	52	<0.1-1.8	<0.1	0.1	0.2	0.3	0.4	0.29	0.3
Fecal Bacteria	count 100 ml.	52	<10-13000	<10	18	115	220	534	1933.08	546
Total P	mg/L	52	<0.1-0.4	<0.1	<0.1	<0.1	0.1	0.2	0.07	<0.1
BOD	mg/L	52	<1-6	<1	<1	<1	1	2	0.86	<1
Triazine Herbicides	ug/L	52	<0.10-1.28	<0.10	<0.10	<0.10	0.10	0.23	0.19	0.11
Nitrate-N	mg/L	52	1.5-3.1	1.8	2.0	2.2	2.4	2.6	0.34	2.2
Nitrite-N	mg/L	52	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	52	20-43	24	26	27	29	30	3.29	28
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	52	4.7-8.2	6.5	6.6	6.9	7.2	7.7	0.57	6.9
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	365	6.8-130	9.4	12.0	16.0	24.0	32.0	13.5	20.2
Susp. Sed. Conc.	mg/L	365	2-1440	7	11	18	29	43	118.41	36
Susp. Sed. Load	tons/day	365	0.06-1110	0.25	0.45	0.71	1.6	2.9	67.89	7.5

Site SN1
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	1-15	3	3	5	10	15	4.93	7
Conductivity	umhos/cm	13	540-674	575	600	635	654	664	39.97	623
Dissolved Oxygen	mg/L	12	6-14	9	9	11	13	14	2.49	11
Turbidity	NTU	11	3-14	3.5	3.8	4.1	6.6	12.0	3.79	6.0
NO2+NO3-N	mg/L	13	2.0-2.9	2.1	2.2	2.5	2.7	2.8	0.29	2.5
Ammonium-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
Organic-N	mg/L	13	<0.1-0.3	<0.1	0.1	0.2	0.2	0.3	0.09	0.2
Fecal Bacteria	count 100 ml.	13	<10-370	10	30	70	180	240	111.87	108
Total P	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	<1	1	0.43	<1
Triazine Herbicides	ug/L	13	<0.10-<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0	<0.10
Nitrate-N	mg/L	13	1.8-2.5	2.0	2.0	2.1	2.3	2.5	0.21	2.2
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	25-30	25	26	28	29	30	1.76	27
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	6.6-8.1	6.7	6.9	7.3	7.5	8.0	0.49	7.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	92	10-30	12.0	14.0	16.0	17.0	18.0	3.07	15.8
Susp. Sed. Conc.	mg/L	92	4-110	7	11	16	21	29	17.91	20
Susp. Sed. Load	tons/day	92	0.21-5.2	0.34	0.46	0.67	0.76	1.4	0.90	0.87

Site SN1
Jan-Feb-Mar

				---------------------- Percentile ----------------------						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-11	0	0	1	3	7	3.47	3
Conductivity	umhos/cm	13	340-708	506	540	600	658	676	98.28	591
Dissolved Oxygen	mg/L	12	9-14	9	11	12	13	14	1.8	12
Turbidity	NTU	13	2.7-9.5	3.6	4.2	5.0	5.5	7.7	1.84	5.2
NO2+NO3-N	mg/L	13	2.1-2.9	2.2	2.4	2.6	2.7	2.9	0.25	2.6
Ammonium-N	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.2	0.13	0.1
Organic-N	mg/L	13	<0.1-1.1	0.1	0.2	0.2	0.3	0.3	0.26	0.3
Fecal Bacteria	count 100 ml.	13	<10-550	<10	<10	<10	45	323	174.74	85
Total P	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1
BOD	mg/L	13	<1-6	<1	<1	1	1	2	1.49	1
Triazine Herbicides	ug/L	13	<0.10-0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.01	<0.10
Nitrate-N	mg/L	13	2.0-2.7	2.1	2.3	2.4	2.5	2.6	0.2	2.4
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	24-43	26	27	28	31	33	4.7	30
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	6.5-8.2	6.8	6.8	6.9	7.3	7.7	0.47	7.1
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	90	6.8-90	7.6	8.6	11.0	14.0	20.0	10	12.9
Susp. Sed. Conc.	mg/L	90	2-1240	4	6	12	19	28	134.85	32
Susp. Sed. Load	tons/day	90	0.06-631	0.09	0.16	0.32	0.64	1.4	67	7.9

Site SN1
Apr-May-June

				---------------------- Percentile ----------------------						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	5-18	7	11	13	16	18	4.33	13
Conductivity	umhos/cm	13	377-623	540	560	580	600	608	61.84	565
Dissolved Oxygen	mg/L	13	7-14	9	10	11	11	13	1.72	11
Turbidity	NTU	13	0.1-22.0	1.9	4.0	7.0	9.8	15.8	6.23	8.3
NO2+NO3-N	mg/L	13	2.0-3.1	2.2	2.2	2.6	2.8	3.0	0.36	2.6
Ammonium-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
Organic-N	mg/L	13	<0.1-1.8	<0.1	0.1	0.2	0.4	0.7	0.47	0.4
Fecal Bacteria	count 100 ml.	13	<10-13000	10	60	150	340	1992	3570.81	1305
Total P	mg/L	13	0.1-0.2	<0.1	<0.1	<0.1	0.1	0.2	0.06	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	1	0.43	1
Triazine Herbicides	ug/L	13	<0.10-1.28	<0.10	<0.10	0.18	0.23	0.51	0.34	0.26
Nitrate-N	mg/L	13	2.0-3.1	2.1	2.2	2.4	2.7	3.0	0.36	2.5
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	20-32	24	24	26	29	29	3.12	26
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	6.2-7.7	6.2	6.6	6.9	7.0	7.2	0.42	6.8
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	91	16-102	20.0	24.0	30.0	36.0	51.0	14.48	33.0
Susp. Sed. Conc.	mg/L	91	7-327	10	18	24	35	72	7.01	37
Susp. Sed. Load	tons/day	91	0.42-96	0.58	1.2	2.0	2.9	8.0	14.02	5.6

Site SN1
July-Aug-Sept

				---------------------- Percentile ----------------------						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	13-22	14	17	19	20	21	2.82	18
Conductivity	umhos/cm	12	510-622	560	580	582	606	613	29.73	585
Dissolved Oxygen	mg/L	13	7-14	9	9	11	13	13	2.14	11
Turbidity	NTU	13	2.2-16	2.5	3.9	4.7	7.0	13.4	4.42	6.2
NO2+NO3-N	mg/L	13	1.8-2.3	1.8	1.9	1.9	2.0	2.2	0.16	2.0
Ammonium-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	0.1	0.1	0.02	<0.1
Organic-N	mg/L	13	<0.1-0.6	<0.1	<0.1	0.2	0.3	0.4	0.16	0.2
Fecal Bacteria	count 100 ml.	13	100-5300	130	130	170	350	938	1415.82	688
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	0.1	0.2	0.06	0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	2	0.55	1
Triazine Herbicides	ug/L	13	<0.10-0.26	<0.10	<0.10	<0.10	0.11	0.12	0.06	<0.10
Nitrate-N	mg/L	13	1.5-2.2	1.7	1.8	1.9	1.9	2.0	0.17	1.9
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	24-30	25	25	27	29	30	2.06	27
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	4.7-6.9	6.4	6.5	6.6	6.8	6.8	0.56	6.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	92	9.1-130	10.0	13.0	16.0	23.0	27.0	14	19.1
Susp. Sed. Conc.	mg/L	92	5-1440	10	14	22	34	50	188	55
Susp. Sed. Load	tons/day	92	0.23-1110	0.40	0.52	1.2	1.5	2.6	117.46	15.7

Site BR1
Annual

				---------------------- Percentile ----------------------						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	52	0-21	2	4	11	15	20	6.32	10
Conductivity	umhos/cm	51	380-684	530	560	600	630	651	59.23	592
Dissolved Oxygen	mg/L	51	8-15	9	10	11	13	14	1.99	11
Turbidity	NTU	51	1.2-31.0	2.3	3.1	4.8	7.5	10.0	5.92	6.4
NO2+NO3-N	mg/L	52	4.4-7.2	4.9	5.1	5.5	5.9	6.2	0.58	5.5
Ammonium-N	mg/L	52	<0.1-0.7	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1
Organic-N	mg/L	52	<0.1-1.9	<0.1	<0.1	0.2	0.3	0.4	0.35	0.3
Fecal Bacteria	count 100 ml.	52	<10-32000	<10	10	65	218	874	4462.79	936
Total P	mg/L	51	<0.1-0.6	<0.1	<0.1	<0.1	<0.1	0.2	0.09	<0.1
BOD	mg/L	52	<1-8	<1	<1	<1	1	2	1.14	1
Triazine Herbicides	ug/L	52	0.16-1.30	0.19	0.22	0.26	0.29	0.35	0.17	0.29
Nitrate-N	mg/L	52	4.0-6.6	4.7	4.9	5.1	5.5	5.8	0.46	5.2
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	52	17-29	19	20	21	22	23	1.98	21
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	52	8.6-12.0	9.1	9.9	11.0	11.0	12.0	0.99	10.5
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	365	13-100	16.0	19.0	23.0	26.0	29.0	8.26	23.5
Susp. Sed. Conc.	mg/L	365	1-839	5	9	15	25	36	60.88	24
Susp. Sed. Load	tons/day	365	0.08-182	0.28	0.43	0.90	1.5	2.4	11.71	2.4

Site BR1
Oct-Nov-Dec

Parameters	Units	Number	Range	10th	25th	50th (Percentile)	75th	90th	std. dev.	Mean
Temperature	degree C	13	2-16	4	4	7	10	13	4.29	8
Conductivity	umhos/cm	13	520-684	542	560	625	638	659	50.59	606
Dissolved Oxygen	mg/L	12	9-15	9	10	12	13	14	2.15	12
Turbidity	NTU	12	1.8-31.0	2.8	3.0	4.4	5.6	8.9	7.95	6.7
NO2+NO3-N	mg/L	13	5.1-6.3	5.2	5.6	5.7	6.1	6.3	0.4	5.8
Ammonium-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Organic-N	mg/L	13	<0.1-0.4	<0.1	<0.1	0.1	0.2	0.3	0.12	0.2
Fecal Bacteria	count 100 ml.	13	<10-1100	<10	10	18	60	406	312.24	150
Total P	mg/L	12	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	<1	2	0.56	<1
Triazine Herbicides	ug/L	13	0.21-0.35	0.22	0.24	0.26	0.29	0.33	0.04	0.27
Nitrate-N	mg/L	13	4.5-5.8	4.8	4.9	5.0	5.4	5.8	0.4	5.2
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	18-21	20	20	20	21	21	0.83	20
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	9.6-12.0	9.9	10.0	11.0	11.0	11.8	0.78	10.7
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	92	16-30	17.1	23.0	24.0	25.0	26.0	3.04	23.3
Susp. Sed. Conc.	mg/L	92	1-47	3.0	5.0	7.0	14.0	18.9	7.89	9.9
Susp. Sed. Load	tons/day	92	0.08-2.3	0.18	0.31	0.40	0.80	1.3	0.46	0.60

Site BR1
Jan-Feb-Mar

Parameters	Units	Number	Range	10th	25th	50th (Percentile)	75th	90th	std. dev.	Mean
Temperature	degree C	13	0-14	1	1	3	4	10	4.19	4
Conductivity	umhos/cm	13	380-676	530	540	600	650	664	82.53	585
Dissolved Oxygen	mg/L	13	8-14	8	10	11	12	13	1.91	11
Turbidity	NTU	13	2.5-9.5	3.3	4.5	5.4	6.8	7.5	1.94	5.5
NO2+NO3-N	mg/L	13	4.4-6.8	4.9	5.1	5.6	5.9	6.3	0.66	5.6
Ammonium-N	mg/L	13	<0.1-0.7	<0.1	<0.1	<0.1	0.1	0.2	0.18	0.1
Organic-N	mg/L	13	<0.1-1.7	0.1	0.2	0.2	0.3	0.6	0.43	0.4
Fecal Bacteria	count 100 ml.	13	<10-3200	<10	<10	10	30	590	889.22	315
Total P	mg/L	13	<0.1-0.6	<0.1	<0.1	<0.1	<0.1	0.3	0.16	0.1
BOD	mg/L	13	<1-8	<1	<1	<1	2	2	2.05	2
Triazine Herbicides	ug/L	13	0.16-0.32	0.17	0.20	0.23	0.26	0.29	0.05	0.23
Nitrate-N	mg/L	13	4.0-6.6	4.7	5.2	5.4	5.6	5.9	0.63	5.4
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	17-23	19	20	22	23	23	1.91	21
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.6-12.0	9.2	9.8	10.0	11.0	11.8	1.04	10.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	90	13-86	14.0	15.0	16.5	22.0	24.0	8.67	19.2
Susp. Sed. Conc.	mg/L	90	3-215	7	9	17	27	37	27.69	23
Susp. Sed. Load	tons/day	90	0.13-50	0.29	0.40	0.81	1.4	2.0	5.41	1.7

Site BR1
Apr-May-June

	Units	Number	Range	------ Percentile ------ 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	7-18	7	10	12	16	18	4.01	13
Conductivity	umhos/cm	13	397-631	536	560	608	621	626	63.65	581
Dissolved Oxygen	mg/L	13	8-13	8	10	11	13	13	1.87	11
Turbidity	NTU	13	1.2-30.0	2.4	4.3	6.5	10.0	14.9	7.68	8.7
NO2+NO3-N	mg/L	13	4.4-7.2	4.7	5.0	5.2	5.9	6.1	0.75	5.4
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.06	<0.1
Organic-N	mg/L	13	<0.1-1.9	<0.1	<0.1	0.2	0.3	0.6	0.5	0.4
Fecal Bacteria	count 100 ml.	13	<10-32000	24	80	190	530	3786	8805.24	2981
Total P	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.2	0.08	<0.1
BOD	mg/L	13	<1-2	<1	<1	1	1	2	0.61	1
Triazine Herbicides	ug/L	13	0.18-1.30	0.19	0.23	0.27	0.35	0.59	0.31	0.38
Nitrate-N	mg/L	13	4.6-5.9	4.7	4.8	5.0	5.6	5.9	0.47	5.2
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	17-29	18	19	21	22	24	3.03	21
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.6-11.0	8.9	9.1	10.0	10.0	11.0	0.84	9.8
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	91	19-78	20.0	23.0	26.0	30.5	37.0	8.53	27.9
Susp. Sed. Conc.	mg/L	91	9-298	12	17	22	29	43	38.84	31
Susp. Sed. Load	tons/day	91	0.5-63	0.74	0.97	1.6	2.2	4.6	7.01	3.0

Site BR1
July-Aug-Sept

	Units	Number	Range	------ Percentile ------ 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	11-21	12	14	19	20	20	3.59	17
Conductivity	umhos/cm	12	560-665	561	585	598	609	622	28.84	598
Dissolved Oxygen	mg/L	13	9-15	9	9	12	13	14	2.14	12
Turbidity	NTU	13	1.8-16.0	2.1	2.7	3.4	4.4	9.3	4.01	4.8
NO2+NO3-N	mg/L	13	4.8-6.1	4.8	5.0	5.3	5.5	5.7	0.37	5.3
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	0.1	0.2	0.06	0.1
Organic-N	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	0.2	0.3	0.1	0.1
Fecal Bacteria	count 100 ml.	13	50-1400	62	73	130	280	796	403.91	296
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	1	0.44	<1
Triazine Herbicides	ug/L	13	0.19-0.42	0.21	0.21	0.26	0.28	0.37	0.07	0.26
Nitrate-N	mg/L	13	4.5-5.4	4.8	4.9	5.0	5.2	5.3	0.25	5.0
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	20-24	20	21	22	22	24	1.38	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	9.7-12.0	10.1	11.0	11.0	12.0	12.0	0.78	11.2
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Discharge	cfs	92	16-100	19.0	20.0	23.0	25.0	27.0	8.97	23.7
Susp. Sed. Conc.	mg/L	92	3-839	5	9	15	22	40	110.29	34
Susp. Sed. Load	tons/day	92	0.15-182	0.27	0.54	0.94	1.3	2.4	21.52	4.2

Site NCC
Annual

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	50	0-20	1	3	11	16	18	6.59	10
Conductivity	umhos/cm	51	360-700	485	570	605	630	655	74.62	585
Dissolved Oxygen	mg/L	50	6-14	8	10	11	12	13	2	11
Turbidity	NTU	51	0.9->100	2.5	3.2	4.5	8.0	11.5	15.35	8.4
Ammonium-N	mg/L	52	<0.1-0.6	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1
Fecal Bacteria	count 100 ml.	52	<10-37000	<10	10	85	155	432	5123.45	897
Nitrate-N	mg/L	52	1.5-6.3	1.6	1.7	1.9	2.5	4.1	1.04	2.4
Nitrite-N	mg/L	52	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	52	19-45	25	27	28	30	32	3.75	28
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	52	5.1-8.6	5.7	5.9	6.6	7.0	7.7	0.81	6.6
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site NCC
Oct-Nov-Dec

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	11	1-15	2	3	4	10	15	5.2	7
Conductivity	umhos/cm	13	570-671	575	610	630	654	657	33.06	625
Dissolved Oxygen	mg/L	12	6-14	8	10	12	13	14	2.48	11
Turbidity	NTU	12	1.6-44.0	2.2	2.7	3.2	5.1	7.5	11.76	7.1
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	<10-330	<10	<10	10	70	98	89.66	55
Nitrate-N	mg/L	13	1.5-2.1	1.5	1.6	1.7	1.8	1.9	0.18	1.7
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	25-31	28	28	28	30	30	1.51	29
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	5.8-6.9	6.0	6.5	6.7	6.9	6.9	0.38	6.6
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site NCC
Jan-Feb-Mar

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	0-10	0	1	2	3	8	3.22	3
Conductivity	umhos/cm	13	360-700	446	540	610	643	681	102.01	579
Dissolved Oxygen	mg/L	12	8-13	9	11	13	13	13	1.78	12
Turbidity	NTU	13	2.1-11.5	2.7	3.7	4.5	5.2	6.7	2.37	4.8
Ammonium-N	mg/L	13	<0.1-0.6	<0.1	<0.1	<0.1	0.1	0.4	0.17	0.1
Fecal Bacteria	count 100 ml.	13	<10-1700	<10	<10	10	90	214	462.2	179
Nitrate-N	mg/L	13	1.7-3.1	1.8	1.9	1.9	2.2	2.5	0.38	2.1
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	26-45	27	29	32	33	33	4.71	32
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	5.9-7.6	5.9	6.0	6.4	6.9	7.4	0.6	6.6
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site NCC
Apr-May-June

	Units	Number	Range	---------------------- Percentile 10th	25th	50th	75th	90th ----------------------	std. dev.	Mean
Parameters										
Temperature	degree C	13	5-17	6	11	12	15	16	3.85	12
Conductivity	umhos/cm	13	375-614	492	530	570	600	607	65.94	552
Dissolved Oxygen	mg/L	13	6-12	7	9	11	11	12	1.96	10
Turbidity	NTU	13	0.9->100	3.1	4.6	8.5	9.5	16.0	27.36	15.2
Ammonium-N	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1
Fecal Bacteria	count 100 ml.	13	<10-37000	<10	27	70	170	512	10226.04	2970
Nitrate-N	mg/L	13	2.1-6.3	2.5	3.1	3.7	4.4	4.8	1.14	3.8
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Sulfate	mg/L	13	19-29	22	24	25	27	29	2.93	25
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	5.9-8.6	6.6	7.1	7.5	7.9	8.3	0.75	7.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site NCC
July-Aug-Sept

	Units	Number	Range	---------------------- Percentile 10th	25th	50th	75th	90th ----------------------	std. dev.	Mean
Parameters										
Temperature	degree C	13	12-20	14	16	18	19	19	2.31	17
Conductivity	umhos/cm	12	380-630	564	578	604	625	629	69.04	585
Dissolved Oxygen	mg/L	13	7-12	8	10	10	10	11	1.28	10
Turbidity	NTU	13	2.5-23.0	2.7	3.0	4.0	8.5	10.0	5.63	6.5
Ammonium-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Fecal Bacteria	count 100 ml.	13	91-2700	100	120	150	210	520	708.07	385
Nitrate-N	mg/L	13	1.5-2.2	1.5	1.6	1.9	1.9	2.0	0.22	1.8
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	24-30	25	27	28	30	30	2.02	28
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	5.1-6.2	5.5	5.7	5.7	5.8	5.9	0.25	5.7
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNWF
Annual

	Units	Number	Range	---------------------- Percentile 10th	25th	50th	75th	90th ----------------------	std. dev.	Mean
Parameters										
Temperature	degree C	51	0-20	1	4	12	16	18	6.5	10
Conductivity	umhos/cm	50	412-704	530	592	623	661	681	61.11	615
Dissolved Oxygen	mg/L	51	4-16	8	9	10	12	13	2.22	10
Turbidity	NTU	51	0.9-41.0	2.0	2.8	4.5	6.5	8.2	5.89	5.7
Ammonium-N	mg/L	52	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.1	0.05	<0.1
Fecal Bacteria	count 100 ml.	52	<10-120000	42	120	235	923	2720	19422.07	4497
Nitrate-N	mg/L	52	2.8-3.8	2.8	3.0	3.2	3.4	3.5	0.27	3.2
Nitrite-N	mg/L	52	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	51	28-51	33	35	37	39	41	3.89	37
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	52	7.1-12.0	7.6	7.9	8.2	8.8	9.2	0.78	8.4
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNWF
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-15	3	4	7	11	15	4.91	8
Conductivity	umhos/cm	12	570-682	601	614	652	677	681	38.65	644
Dissolved Oxygen	mg/L	12	4-16	7	10	12	12	14	3.25	11
Turbidity	NTU	12	1.4-41.0	2.2	2.5	2.8	4.7	7.7	10.98	6.6
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	60-270	74	110	160	200	246	67.75	157
Nitrate-N	mg/L	13	2.9-3.5	3.0	3.1	3.1	3.3	3.4	0.16	3.2
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	33-42	33	34	35	37	39	2.69	36
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.0-9.6	8.3	8.4	8.8	9.1	9.2	0.44	8.8
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNWF
Jan-Feb-Mar

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-12	0	0	2	4	11	4.25	3
Conductivity	umhos/cm	13	450-704	502	530	628	688	693	86.27	609
Dissolved Oxygen	mg/L	13	8-14	9	12	12	13	14	1.89	12
Turbidity	NTU	13	1.6-6.5	3.0	4.2	4.3	5.0	6.5	1.42	4.5
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.06	<0.1
Fecal Bacteria	count 100 ml.	13	<10-160	20	30	100	130	148	55.99	85
Nitrate-N	mg/L	13	3.3-3.8	3.4	3.4	3.5	3.6	3.7	0.14	3.5
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	34-49	34	36	38	41	42	4.07	39
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	7.9-12.0	8.0	8.4	8.8	8.9	9.3	1.02	8.9
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNWF
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	6-18	7	10	12	15	17	3.86	12
Conductivity	umhos/cm	13	412-647	574	590	600	626	638	59.15	595
Dissolved Oxygen	mg/L	13	8-12	8	9	10	11	12	1.41	10
Turbidity	NTU	13	0.9-19.0	1.7	4.0	6.9	8.2	9.7	4.70	6.6
Ammonium-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Fecal Bacteria	count 100 ml.	13	20-120000	192	470	770	2000	6000	32940.07	10536
Nitrate-N	mg/L	13	2.8-3.5	2.8	2.9	2.9	3.1	3.4	0.23	3.0
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	12	28-39	32	33	36	37	38	3.18	35
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	7.1-8.6	7.5	7.6	7.9	8.0	8.2	0.38	7.9
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNWF

July-Aug-Sept

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	12-20	13	16	18	19	20	2.53	17
Conductivity	umhos/cm	12	530-663	562	603	622	648	662	42.29	617
Dissolved Oxygen	mg/L	13	7-11	7	9	9	10	11	1.3	9
Turbidity	NTU	13	2-12	2.8	3.6	4.8	6.0	7.2	2.58	5.2
Ammonium-N	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.2	0.08	<0.1
Fecal Bacteria	count 100 ml.	13	270-76000	366	430	1200	2000	4860	20715.78	7209
Nitrate-N	mg/L	13	2.8-3.3	2.8	2.8	3.0	3.0	3.1	0.15	3.0
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	34-51	35	36	38	39	41	4.27	38
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	7.1-8.6	7.4	7.8	8.0	8.1	8.2	0.40	7.9
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN3

Annual

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std	Mean
Parameters										
Temperature	degree C	52	0-23	0	3	12	17	21	7.52	10
Conductivity	umhos/cm	51	380-767	560	615	640	663	707	73.82	629
Dissolved Oxygen	mg/L	51	6-15	8	9	11	12	13	2.04	11
Turbidity	NTU	51	0.7-26.0	1.9	2.4	3.7	6.8	10.0	4.42	5.2
Ammonium-N	mg/L	52	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.1	0.08	<0.1
Fecal Bacteria	count 100 ml.	52	<10-8500	10	20	165	528	1000	1381.18	617
Nitrate-N	mg/L	52	3.3-5.5	3.5	3.8	4.4	4.8	5.1	0.62	4.3
Nitrite-N	mg/L	52	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	52	18-36	22	25	26	28	30	3.19	26
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	52	8.5-12.0	9.2	9.3	9.9	11.0	11.9	0.97	10.1
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN3

Oct-Nov-Dec

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-14	2	3	7	10	14	4.78	7
Conductivity	umhos/cm	13	570-716	622	644	693	702	707	43.39	668
Dissolved Oxygen	mg/L	12	6-13	7	10	12	13	13	2.56	11
Turbidity	NTU	12	1.1-26.0	1.6	1.9	2.4	4.3	8.9	7.01	5.1
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	0.1	0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	10-670	12	30	64	100	322	187.31	133
Nitrate-N	mg/L	13	4.3-5.1	4.4	4.6	4.7	4.8	5.1	0.24	4.7
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	21-29	23	24	26	26	27	2.02	25
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	9.2-12.0	9.3	9.8	10.0	11.0	11.0	0.85	10.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN3
Jan-Feb-Mar

				---------------------- Percentile				----------------------		
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-13	0	0	1	3	8	4	3
Conductivity	umhos/cm	13	380-767	458	580	650	711	735	115.88	623
Dissolved Oxygen	mg/L	13	8-15	10	11	11	13	14	1.91	12
Turbidity	NTU	13	1.2-9.5	2.4	3.5	3.9	4.6	6.2	2.05	4.2
Ammonium-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1
Fecal Bacteria	count 100 ml.	13	<10-190	<10	10	20	45	125	57.94	42
Nitrate-N	mg/L	13	4.2-5.5	4.4	4.5	5.1	5.3	5.4	0.45	5.0
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	25-31	25	25	28	29	30	2.07	28
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.7-12.0	9.2	9.4	10	11	11.8	1.05	10.2
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN3
Apr-May-June

				---------------------- Percentile				----------------------		
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	6-20	7	11	12	17	19	4.64	13
Conductivity	umhos/cm	13	422-648	552	560	620	624	634	60.28	592
Dissolved Oxygen	mg/L	13	7-13	8	9	11	12	12	1.76	10
Turbidity	NTU	13	0.7-12.0	2.0	3.0	6.5	8.8	10.8	3.69	6.3
Ammonium-N	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1
Fecal Bacteria	count 100 ml.	13	<10-8500	14	30	330	650	1320	2280.33	1039
Nitrate-N	mg/L	13	3.3-4.6	3.5	3.5	3.6	3.8	4.0	0.32	3.7
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	18-30	20	22	24	27	29	3.61	24
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.5-9.9	8.8	9.2	9.3	9.7	9.8	0.42	9.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN3
July-Aug-Sept

				---------------------- Percentile				----------------------		
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	12-23	15	17	20	22	23	3.4	19
Conductivity	umhos/cm	12	570-659	611	628	641	647	653	24.15	633
Dissolved Oxygen	mg/L	13	8-12	8	9	10	11	12	1.42	10
Turbidity	NTU	13	2.2-14.0	2.2	2.5	3.1	5.4	12.0	4.02	5.2
Ammonium-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	13	260-4000	300	410	890	1000	3280	1276.34	1252
Nitrate-N	mg/L	13	3.5-4.4	3.5	3.7	3.9	4.0	4.2	0.26	3.9
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	22-36	24	26	27	28	32	3.49	28
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	8.9-12.0	9.3	9.8	10.0	11.0	12.0	1.09	10.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BR2

Annual

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	52	0-21	0	3	11	16	19	6.99	9
Conductivity	umhos/cm	51	370-804	600	633	670	701	748	78.07	664
Dissolved Oxygen	mg/L	49	7-15	8	10	12	13	14	2.01	11
Turbidity	NTU	51	1.1-50.0	3.1	4.2	5.2	7.5	17.0	8.25	7.9
Ammonium-N	mg/L	52	<0.1-0.7	<0.1	<0.1	<0.1	0.1	0.2	0.13	0.1
Fecal Bacteria	count 100 ml.	52	<10-290000	41	86	260	848	5420	40604.02	7923
Nitrate-N	mg/L	51	5.1-11.0	8.0	8.7	9.4	9.7	9.9	0.94	9.1
Nitrite-N	mg/L	52	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	52	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	52	15-26	19	21	22	23	24	2.04	22
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	51	12.0-19.0	14.0	14.0	16.0	17.0	18.0	1.75	15.7
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BR2

Oct-Nov-Dec

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	0-16	2	3	5	10	13	4.96	6
Conductivity	umhos/cm	13	600-767	611	635	690	738	760	60.78	687
Dissolved Oxygen	mg/L	10	8-15	9	11	13	14	14	2.28	12
Turbidity	NTU	12	2.2-50.0	3.0	4.4	4.9	7.3	9.9	13.07	9.1
Ammonium-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	10-20000	26	64	100	210	8174	5936.89	2448
Nitrate-N	mg/L	12	8.0-10.0	9.2	9.4	9.5	9.6	9.8	0.5	9.4
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	19-24	20	20	21	22	24	1.59	21
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	14-19	14.2	15.0	16.0	18.0	18.0	1.69	16.2
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BR2

Jan-Feb-Mar

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	0-12	0	0	1	2	6	3.59	2
Conductivity	umhos/cm	13	370-804	572	600	640	744	774	116.76	653
Dissolved Oxygen	mg/L	13	8-15	9	12	12	13	15	2.04	12
Turbidity	NTU	13	2.2-22.0	3.4	4.3	5.2	6.0	7.2	4.91	6.3
Ammonium-N	mg/L	13	<0.1-0.7	<0.1	<0.1	<0.1	0.1	0.3	0.19	0.1
Fecal Bacteria	count 100 ml.	13	27-5500	39	70	140	210	1668	1537.71	688
Nitrate-N	mg/L	13	5.1-11.0	7.6	8.5	9.7	9.9	10.8	1.6	9.1
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	16-24	19	21	22	23	24	2.39	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	12.0-18.0	14.0	14.0	16.0	16.0	17.0	1.65	15.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BR2
Apr-May-June

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	13	4-18	7	9	12	16	17	4.35	12
Conductivity	umhos/cm	13	397-711	612	630	660	671	685	77.49	638
Dissolved Oxygen	mg/L	13	7-14	8	9	11	12	13	1.98	11
Turbidity	NTU	13	1.1-30.0	3.9	5.0	7.4	10.0	16.6	7.57	9.4
Ammonium-N	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	0.1	0.2	0.08	0.1
Fecal Bacteria	count 100 ml.	13	<10-51000	42	110	600	3500	6080	13899.79	5247
Nitrate-N	mg/L	13	7.5-9.6	7.8	8.6	8.7	9.0	9.4	0.62	8.7
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	19-25	20	21	22	22	24	1.55	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	13	1.02-17.0	12.2	13.0	14.0	15.0	16.0	1.54	14.2
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BR2
July-Aug-Sept

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	13	11-21	12	15	18	21	21	3.75	17
Conductivity	umhos/cm	12	660-721	660	675	683	693	695	19.89	680
Dissolved Oxygen	mg/L	13	8-12	8	10	11	12	12	1.49	11
Turbidity	NTU	13	2.1-22.0	3.1	3.1	5.0	6.0	16.2	6.14	6.9
Ammonium-N	mg/L	13	<0.1-0.6	<0.1	<0.1	<0.1	0.1	0.2	0.15	0.1
Fecal Bacteria	count 100 ml.	13	230-290000	272	370	490	1100	4400	80141.78	23309
Nitrate-N	mg/L	13	8.3-10.0	8.9	9.3	9.4	9.7	9.8	0.45	9.4
Nitrite-N	mg/L	13	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	13	15-26	21	21	21	23	24	2.61	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	12	16.0-19.0	16.0	16.8	17.0	17.0	17.0	0.79	16.9
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site BRSC
Annual

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	Std	Mean
Temperature	degree C	12	4-18	4	5	8	16	18	5.85	10
Conductivity	umhos/cm	12	668-747	676	689	716	728	742	25.59	711
Dissolved Oxygen	mg/L	12	9-13	10	12	12	13	13	1.27	12
Turbidity	NTU	12	2.6-11.0	2.8	3.4	4.3	5.9	7.1	2.41	5.0
Ammonium-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.19	0.06	<0.1
Fecal Bacteria	count 100 ml.	12	<10-44000	<10	25	205	1550	2930	12542.04	4301
Nitrate-N	mg/L	12	8.4-11.0	9.0	9.4	9.9	10.0	10.9	0.74	9.8
Nitrite-N	mg/L	12	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	12	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	12	19-30	23	26	27	28	29	2.96	26
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	12	15.0-18.0	15.1	16.0	17.0	18.0	18.0	1.19	16.8
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SN2

Annual

	Units	Number	Range	---------- Percentile ----------					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	12	3-19	4	4	11	15	18	6.05	10
Conductivity	umhos/cm	12	604-672	616	626	643	666	670	23.23	643
Dissolved Oxygen	mg/L	12	9-13	9	11	11	12	13	1.42	11
Turbidity	NTU	12	2.5-10.0	2.8	3.4	4.3	6.5	8.8	2.47	5.2
Ammonium-N	mg/L	12	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Fecal Bacteria	count 100 ml.	12	<10-3300	11	43	121	215	239	924.54	377
Nitrate-N	mg/L	12	2.3-3.7	2.5	2.5	2.9	2.9	3.4	0.4	2.9
Nitrite-N	mg/L	12	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	12	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	12	20-32	22	27	28	29	31	3.6	27
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	12	7.0-8.0	7.2	7.4	7.4	7.8	7.9	0.3	7.5
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Site SNT

Annual

	Units	Number	Range	---------- Percentile ----------					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	12	4-17	5	6	9	15	17	5.01	10
Conductivity	umhos/cm	12	600-640	606	608	624	630	635	13.11	621
Dissolved Oxygen	mg/L	12	9-12	9	9	11	11	12	1.24	11
Turbidity	NTU	12	2.5-8.6	3.5	3.8	5.1	6.2	7.0	1.77	5.2
Ammonium-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.06	<0.1
Fecal Bacteria	count 100 ml.	12	<10-330	<10	10	58	133	269	111.09	94
Nitrate-N	mg/L	12	2.6-3.8	2.9	3.0	3.1	3.2	3.5	0.3	3.1
Nitrite-N	mg/L	12	<0.05-<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0	<0.05
Phosphorus	mg/L	12	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	<0.1
Sulfate	mg/L	12	15-25	16	22	23	23	24	3.06	22
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5
Chloride	mg/L	12	7.0-8.7	7.2	7.8	8.4	8.4	8.7	0.6	8.1
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	<0.5

Summary of water-quality data on an annual and quarterly basis; Water Year 1996.

Site SN1
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	51	0-19	1	3	9	15	17	6.38	9
Conductivity	umhos/cm	51	480-677	530	588	603	631	645	46.26	596
Dissolved Oxygen	mg/L	52	7-15	10	11	12	13	14	1.64	12
Turbidity	NTU	52	1.1-57.0	2.6	2.9	4.0	5.6	10.0	7.84	5.9
NO2+NO3-N	mg/L	52	1.8-3.6	2.0	2.2	2.4	2.6	2.9	0.37	2.4
Ammonia-N	mg/L	52	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.08	<0.1
Organic-N	mg/L	52	<0.1-1.3	<0.1	<0.1	0.2	0.3	0.4	0.24	0.2
Fecal Bacteria	count 100 ml.	52	<10-6200	<10	10	48	158	445	915.73	279
Total P	mg/L	52	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.06	<0.1
BOD	mg/L	52	<1-4	<1	<1	<1	2	2	0.78	1
Triazine Herbicides	ug/L	52	<0.10-2.00	<0.10	<0.10	<0.10	0.11	0.21	0.30	0.15
Nitrate-N	mg/L	52	1.7-3.6	1.9	2.1	2.3	2.6	2.7	0.36	2.3
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	52	17-39	25	27	30	31	33	3.52	29
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	5.6-7.8	6.6	6.8	7.0	7.4	7.6	0.45	7.1
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	358	6.3-260	9.2	11	14	19	24.5	17.83	17.67
Susp. Sed. Conc.	mg/L	366	1-1640	5.5	9	17	24	42	109.85	32.8
Susp. Sed. Load	tons/day	366	0.02-1470	0.18	0.31	0.58	1.2	2.8	91.19	9.13

Site SN1
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-16	0	3	5	9	12	5.14	6
Conductivity	umhos/cm	12	560-655	592	597	636	645	653	30.41	624
Dissolved Oxygen	mg/L	13	10-15	11	12	13	14	14	1.41	13
Turbidity	NTU	13	1.1-6.5	2.0	2.7	3.9	4.7	5.6	1.54	3.7
NO2+NO3-N	mg/L	13	1.9-2.6	1.9	2.1	2.4	2.5	2.6	0.25	2.3
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Organic-N	mg/L	13	<0.1-0.40	<0.1	<0.1	<0.1	0.2	0.3	0.12	0.1
Fecal Bacteria	count 100 ml.	13	<10-310	10	10	20	60	79	81.31	53
Total P	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
BOD	mg/L	13	<1-3	<1	<1	<1	1	2	0.77	<1
Triazine Herbicides	ug/L	13	<0.10-<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	<0.10
Nitrate-N	mg/L	13	1.9-2.6	1.9	2.1	2.4	2.5	2.5	0.26	2.3
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	27-32	28	29	30	31	32	1.58	30
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.2-7.8	6.4	6.6	7.0	7.1	7.5	0.46	7.0
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	92	8.8-40	9.41	10.75	12	15	17	5.43	13.68
Susp. Sed. Conc.	mg/L	92	5-45	5	7.75	12	17	31.8	9.62	14.49
Susp. Sed. Load	tons/day	92	0.13-3.60	0.18	0.25	0.43	0.58	0.92	0.66	0.58

Site SN1
Jan-Feb-Mar

	Units	Number	Range	---------------------- Percentile ----------------------						
				10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-6	0	1	2	4	4	1.89	2
Conductivity	umhos/cm	13	500-677	542	560	613	640	669	54.79	604
Dissolved Oxygen	mg/L	13	7-15	10	12	13	13	15	2.14	12
Turbidity	NTU	13	2.1-11.0	2.5	2.8	3.6	4.2	9.9	3.14	4.9
NO2+NO3-N	mg/L	13	2.0-3.0	2.3	2.3	2.8	2.9	3.0	0.33	2.7
Ammonia-N	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	0.1	0.2	0.10	0.1
Organic-N	mg/L	13	<0.1-1.3	<0.1	<0.1	0.2	0.2	0.8	0.38	0.3
Fecal Bacteria	count 100 ml.	13	<10-230	<10	<10	20	45	153	71.79	49
Total P	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.2	0.08	<0.1
BOD	mg/L	13	<1-4	<1	<1	1	2	2	1.00	1
Triazine Herbicides	ug/L	13	<0.10-<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	<0.10
Nitrate-N	mg/L	13	2.0-2.8	2.4	2.4	2.6	2.7	2.8	0.22	2.6
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	22-39	28	29	32	33	34	4.07	31
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.6-7.8	6.9	7.0	7.3	7.5	7.8	0.36	7.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	83	7-69	8.4	9.9	12	17	24	8.85	14.84
Susp. Sed. Conc.	mg/L	91	1-256	2	5.5	9	21	29	39.19	19.91
Susp. Sed. Load	tons/day	91	0.02-68	0.04	0.16	0.33	1.05	1.7	9.28	2.15

Site SN1
Apr-May-June

	Units	Number	Range	---------------------- Percentile ----------------------						
				10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	5-18	9	9	9	13	15	3.41	11
Conductivity	umhos/cm	13	480-617	539	588	601	606	607	38.62	585
Dissolved Oxygen	mg/L	13	9-14	11	11	13	13	14	1.42	12
Turbidity	NTU	13	2.6-57.0	2.6	3.2	4.2	5.7	11.9	14.70	9.0
NO2+NO3-N	mg/L	13	2.0-3.6	2.1	2.4	2.4	2.5	3.2	0.46	2.6
Ammonia-N	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1
Organic-N	mg/L	13	<0.1-0.7	0.1	0.2	0.2	0.3	0.4	0.17	0.3
Fecal Bacteria	count 100 ml.	13	<10-6200	<10	10	64	140	738	1699.93	595
Total P	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1
BOD	mg/L	13	<1-2	<1	<1	1	2	2	0.69	1
Triazine Herbicides	ug/L	13	<0.10-2.00	<0.10	<0.10	<0.10	0.39	0.69	0.55	0.34
Nitrate-N	mg/L	13	1.9-3.6	1.9	2.1	2.2	2.3	3.1	0.51	2.4
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	17-35	25	26	29	30	33	4.42	28
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	5.6-7.5	6.5	6.7	6.8	7.0	7.3	0.47	6.8
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	91	11-260	13	14	16	19.5	46	32.48	25.52
Susp. Sed. Conc.	mg/L	91	5-1640	11	14.5	26	45.5	110	211.39	76
Susp. Sed. Load	tons/day	91	0.17-1470	0.4	0.58	1.1	2.95	11	181.30	32.94

Site SN1
July-Aug-Sept

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	13-19	14	16	17	18	19	1.81	17
Conductivity	umhos/cm	13	480-613	502	588	590	603	612	45.80	575
Dissolved Oxygen	mg/L	13	9-14	10	11	12	12	12	1.27	11
Turbidity	NTU	13	2.7-15.0	2.9	3.9	4.5	6.8	12.9	4.04	6.2
NO2+NO3-N	mg/L	13	1.8-2.8	2.0	2.1	2.2	2.4	2.5	0.26	2.2
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.9	<0.1	0.2	0.2	0.3	0.3	0.21	0.3
Fecal Bacteria	count 100 ml.	13	50-2500	84	140	210	460	564	648.46	417
Total P	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	1	0.44	<1
Triazine Herbicides	ug/L	13	<0.10-0.58	0.10	0.10	0.14	0.15	0.21	0.13	0.16
Nitrate-N	mg/L	13	1.7-2.7	1.8	2.0	2.1	2.2	2.4	0.26	2.1
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	25-31	25	26	27	29	30	2.15	27
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.7-7.6	6.8	7.0	7.4	7.6	7.6	0.33	7.3
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	92	6.3-33	7.7	11	17.5	22	24	6.16	16.71
Susp. Sed. Conc.	mg/L	92	6-56	11.1	15	20	23	34.9	9.19	21.08
Susp. Sed. Load	tons/day	92	0.18-4.0	0.32	0.39	0.99	1.2	2.18	0.77	1.04

Site BR1
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	50	1-18	3	5	10	14	16	5.09	9
Conductivity	umhos/cm	51	500-681	530	592	610	632	653	43.84	604
Dissolved Oxygen	mg/L	52	5-16	11	12	13	14	15	1.76	13
Turbidity	NTU	51	1.0-80.0	1.8	2.6	3.8	5.6	8.5	10.87	5.9
NO2+NO3-N	mg/L	52	2.0-6.5	4.7	5.0	5.3	5.7	6.1	0.71	5.3
Ammonia-N	mg/L	52	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.1	0.11	<0.1
Organic-N	mg/L	52	<0.1-1.3	<0.1	<0.1	0.2	0.3	0.4	0.26	0.2
Fecal Bacteria	count 100 ml.	52	<10-21000	<10	<10	25	70	148	2905.46	462
Total P	mg/L	52	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.1	0.09	<0.1
BOD	mg/L	52	<1-4	<1	<1	1	1	2	0.91	1
Triazine Herbicides	ug/L	52	0.16-1.80	0.17	0.18	0.22	0.27	0.36	0.23	0.26
Nitrate-N	mg/L	52	4.2-6.0	4.5	4.7	5.0	5.6	5.8	0.51	5.1
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	52	17-34	19	21	22	23	24	2.51	22
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	8.9-15	10	11	11	12	12	1.06	11
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	356	8.6-89	13	16	18	22	26	9.33	20.12
Susp. Sed. Conc.	mg/L	366	2-550	7	9	13	20	28	38.94	20.34
Susp. Sed. Load	tons/day	366	0.09-132	0.32	0.44	0.62	0.94	1.75	8.25	1.8

Site BR1
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	12	2-15	3	4	6	9	12	4.07	7
Conductivity	umhos/cm	12	591-670	596	607	632	652	656	26.11	629
Dissolved Oxygen	mg/L	13	11-15	11	13	14	15	15	1.50	14
Turbidity	NTU	13	1.2-5.3	1.8	2.1	3.6	4.1	5.0	1.34	3.3
NO2+NO3-N	mg/L	13	5.1-6.3	5.2	5.4	5.7	5.9	6.0	0.35	5.6
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Organic-N	mg/L	13	<0.1-0.3	<0.1	<0.1	0.1	0.2	0.3	0.10	0.1
Fecal Bacteria	count 100 ml.	13	<10-73	<10	<10	10	20	64	24.15	21
Total P	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
BOD	mg/L	13	<1-2	<1	<1	1	1	2	0.53	<1
Triazine Herbicides	ug/L	13	0.17-0.28	0.18	0.18	0.22	0.25	0.26	0.04	0.22
Nitrate-N	mg/L	13	5.0-6.0	5.1	5.1	5.6	5.8	6.0	0.37	5.5
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	20-25	21	21	23	23	24	1.45	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	10-15	10	11	11	12	12	1.26	11
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	90	11-32	13	15	17	18	19	3.18	16.87
Susp. Sed. Conc.	mg/L	92	2-28	6	7	11	14.5	19	5.50	11.74
Susp. Sed. Load	tons/day	92	0.09-2.10	0.23	0.33	0.5	0.68	0.9	0.32	0.55

Site BR1
Jan-Feb-Mar

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	13	1-6	2	3	4	5	5	1.48	4
Conductivity	umhos/cm	13	520-681	532	560	627	651	678	58.30	608
Dissolved Oxygen	mg/L	13	11-16	12	12	13	14	15	1.34	13
Turbidity	NTU	12	2.3-12.0	2.6	4.5	7.6	9.1	10.0	3.16	6.9
NO2+NO3-N	mg/L	13	2.0-6.5	4.8	5.2	5.9	6.1	6.5	1.19	5.5
Ammonia-N	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	0.2	0.5	0.18	0.2
Organic-N	mg/L	13	<0.1-1.0	<0.1	0.1	0.2	0.4	0.9	0.35	0.4
Fecal Bacteria	count 100 ml.	13	<10-290	<10	<10	20	40	113	80.35	48
Total P	mg/L	13	<0.1-0.4	<0.1	<0.1	0.1	0.1	0.4	0.13	0.1
BOD	mg/L	13	<1-4	<1	1	2	3	3	1.16	2
Triazine Herbicides	ug/L	13	0.16-0.27	0.18	0.19	0.19	0.21	0.26	0.03	0.20
Nitrate-N	mg/L	13	4.4-5.8	4.6	5.0	5.4	5.6	5.8	0.46	5.3
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	17-34	19	20	23	23	26	4.20	23
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	9.7-13	10	11	11	12	13	1.15	11
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	83	8.6-89	11	13	15	19	26	12.42	18.51
Susp. Sed. Conc.	mg/L	91	7-142	12	16	20	27	44	20.67	25.43
Susp. Sed. Load	tons/day	91	0.26-41.00	0.43	0.6	0.86	1.1	2.4	4.86	1.86

Site BR1
Apr-May-June

	Units	Number	Range	Percentile					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	13	8-17	8	10	10	13	15	2.79	11
Conductivity	umhos/cm	13	500-624	542	598	610	615	620	37.17	595
Dissolved Oxygen	mg/L	13	5-14	11	12	13	14	14	2.40	12
Turbidity	NTU	13	1.0-80.0	1.6	2.3	2.7	4.7	6.2	21.36	9.1
NO2+NO3-N	mg/L	13	4.5-6.1	4.6	5.1	5.2	5.6	5.6	0.45	5.2
Ammonia-N	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	<0.1
Organic-N	mg/L	13	<0.1-1.3	<0.1	0.2	0.2	0.3	0.5	0.32	0.3
Fecal Bacteria	count 100 ml.	13	<10-21000	<10	<10	18	150	412	5801.83	1696
Total P	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1
BOD	mg/L	13	<1-4	<1	<1	1	2	2	1.01	1
Triazine Herbicides	ug/L	13	0.16-1.80	0.16	0.18	0.19	0.37	0.47	0.44	0.38
Nitrate-N	mg/L	13	4.2-5.9	4.2	4.6	4.7	5.1	5.5	0.52	4.9
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	18-24	18	20	22	23	24	2.06	21
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	8.9-11	10	10	11	11	11	0.68	10
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	91	14-89	16	17	20	26	37	12.29	24.08
Susp. Sed. Conc.	mg/L	91	3-550	8	10	12	17.5	58	73.25	31.65
Susp. Sed. Load	tons/day	91	0.14-132	0.38	0.49	0.62	1.25	5.4	15.62	4.13

Site BR1
July-Aug-Sept

	Units	Number	Range	Percentile					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	12	12-18	13	14	15	16	17	1.75	15
Conductivity	umhos/cm	13	510-640	532	554	603	614	615	39.86	587
Dissolved Oxygen	mg/L	13	10-15	10	13	13	14	14	1.57	13
Turbidity	NTU	13	1.5-6.5	2.9	3.1	4.1	4.8	6.4	1.49	4.1
NO2+NO3-N	mg/L	13	4.5-5.2	4.7	4.8	4.9	5.0	5.2	0.21	4.9
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.3	<0.1	<0.1	0.1	0.1	0.3	0.09	0.1
Fecal Bacteria	count 100 ml.	13	20-350	22	30	64	100	124	87.38	82
Total P	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
BOD	mg/L	13	<1-1	<1	<1	<1	1	1	0.24	<1
Triazine Herbicides	ug/L	13	0.16-0.47	0.18	0.22	0.25	0.28	0.31	0.08	0.26
Nitrate-N	mg/L	13	4.4-5.0	4.5	4.6	4.8	4.8	5.0	0.19	4.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	20-24	21	21	22	23	24	1.21	22
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	10-13	11	11	12	12	12	0.78	12
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Discharge	cfs	92	16-27	18	19	21	23	24	2.76	21.05
Susp. Sed. Conc.	mg/L	92	5-27	7	8	11	17	22	5.89	12.74
Susp. Sed. Load	tons/day	92	0.24-1.80	0.36	0.45	0.61	0.95	1.3	0.39	0.74

Site NCC
Annual

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	51	0-19	1	2	9	15	16	6.48	9
Conductivity	umhos/cm	50	475-670	510	584	608	639	651	48.59	602
Dissolved Oxygen	mg/L	51	6-15	11	11	12	13	14	1.75	12
Turbidity	NTU	51	0.4-25.0	1.4	2.2	3.3	5.0	6.8	3.76	4.1
Ammonia-N	mg/L	52	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	52	<10-4100	<10	<10	20	81	169	573.62	152
Nitrate-N	mg/L	52	1.4-8.7	1.5	1.9	2.1	2.3	2.9	1.15	2.3
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	52	21-39	26	28	32	33	34	3.70	31
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	5.2-8.0	5.9	6.1	6.3	6.6	7.0	0.51	6.4
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site NCC
Oct-Nov-Dec

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	12	0-15	1	1	5	9	12	5.16	6
Conductivity	umhos/cm	12	581-665	595	602	644	648	651	27.49	629
Dissolved Oxygen	mg/L	13	11-15	12	12	13	13	14	1.01	13
Turbidity	NTU	13	0.4-4.3	1.1	1.5	2.3	3.4	3.7	1.22	2.4
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	<10-150	<10	<10	20	27	118	49.88	34
Nitrate-N	mg/L	13	1.4-2.2	1.5	1.5	2.0	2.1	2.2	0.31	1.9
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	31-37	31	32	32	33	34	1.55	33
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	5.2-6.7	5.6	5.9	6.1	6.3	6.6	0.43	6.1
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site NCC
Jan-Feb-Mar

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	13	0-5	0	1	1	2	3	1.39	1
Conductivity	umhos/cm	13	475-670	522	575	627	655	664	61.54	607
Dissolved Oxygen	mg/L	13	8-15	11	13	13	14	15	1.85	13
Turbidity	NTU	13	1.1-12.0	1.2	2.2	3.0	3.7	5.4	2.87	3.6
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	13	<10-150	<10	<10	10	45	49	39.98	29
Nitrate-N	mg/L	13	1.8-3.4	1.9	2.0	2.3	2.6	2.8	0.45	2.4
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	24-39	28	31	32	34	37	4.04	32
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	5.4-7.9	6.2	6.3	6.5	7.0	7.1	0.59	6.6
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site NCC
Apr-May-June

	Units	Number	Range	---------- Percentile ---------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	3-16	8	9	10	13	16	3.62	11
Conductivity	umhos/cm	12	500-639	546	587	596	606	613	36.13	589
Dissolved Oxygen	mg/L	12	10-14	11	11	12	13	14	1.24	12
Turbidity	NTU	12	2.0-25.0	2.5	3.1	5.0	6.6	7.1	6.15	6.2
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	<10-4100	<10	<10	10	80	614	1131.96	392
Nitrate-N	mg/L	13	1.7-8.7	1.8	2.0	2.0	2.3	5.3	2.04	3.0
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	21-39	24	27	30	32	33	4.57	29
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	5.8-8.0	6.1	6.1	6.3	6.7	7.0	0.57	6.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site NCC
July-Aug-Sept

	Units	Number	Range	---------- Percentile ---------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	14-19	15	15	16	18	18	1.50	16
Conductivity	umhos/cm	13	480-630	502	582	605	616	623	51.32	583
Dissolved Oxygen	mg/L	13	6-12	8	11	11	11	12	1.66	10
Turbidity	NTU	13	1.5-11.0	1.9	3.2	3.6	5.1	6.8	2.51	4.4
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	50-540	57	70	82	170	278	138.05	153
Nitrate-N	mg/L	13	1.5-4.0	1.5	1.6	1.9	2.4	2.8	0.70	2.1
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	24-34	26	28	29	31	32	2.73	29
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	5.9-6.8	6.0	6.3	6.4	6.5	6.6	0.24	6.4
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SNWF
Annual

	Units	Number	Range	---------- Percentile ---------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	51	0-18	1	3	9	15	17	6.38	9
Conductivity	umhos/cm	51	474-694	550	621	640	664	682	48.08	630
Dissolved Oxygen	mg/L	52	8-15	10	11	11	12	13	1.36	12
Turbidity	NTU	52	0.9-55.0	1.5	2.2	3.0	3.7	5.3	9.26	5.0
Ammonia-N	mg/L	52	<0.1-1.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.20	<0.1
Fecal Bacteria	count 100 ml.	52	10-48000	28	91	170	520	813	6628.57	1310
Nitrate-N	mg/L	52	2.2-5.2	2.7	2.8	3.0	3.3	3.5	0.44	3.1
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	52	28-46	34	36	39	41	42	3.77	38
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	<0.5-10.0	7.6	8.2	8.5	8.8	9.2	1.32	8.3
Bromide	mg/L	52	<0.5-0.82	<0.5	<0.5	<0.5	<0.5	<0.5	0.08	<0.5

Site SNWF
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-15	1	2	5	10	14	5.38	6
Conductivity	umhos/cm	12	621-685	626	639	669	678	685	24.05	660
Dissolved Oxygen	mg/L	13	10-14	10	11	12	13	13	1.24	12
Turbidity	NTU	13	0.9-3.6	1.0	1.7	2.6	3.0	3.0	0.85	2.3
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	20-820	41	80	150	310	586	243.94	241
Nitrate-N	mg/L	13	2.9-3.6	3.0	3.1	3.4	3.4	3.6	0.23	3.3
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-0.53	<0.5	<0.5	<0.5	<0.5	<0.5	0.08	<0.5
Sulfate	mg/L	13	36-43	36	38	40	42	43	2.54	40
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	<0.5-9.3	8.1	8.2	8.6	8.9	9.0	2.35	8.0
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SNWF
Jan-Feb-Mar

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-6	0	0	2	3	4	1.85	2
Conductivity	umhos/cm	13	474-694	560	610	664	675	683	63.45	634
Dissolved Oxygen	mg/L	13	11-14	11	12	13	13	14	1.13	13
Turbidity	NTU	13	1.1-42.0	1.3	1.8	3.3	4.1	5.4	10.87	6.1
Ammonia-N	mg/L	13	<0.1-1.4	<0.1	<0.1	<0.1	0.1	0.3	0.37	0.2
Fecal Bacteria	count 100 ml.	13	10-3200	21	91	500	740	1382	875.42	668
Nitrate-N	mg/L	13	2.2-3.7	3.2	3.3	3.3	3.4	3.5	0.35	3.3
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-0.51	<0.5	<0.5	<0.5	<0.5	<0.5	0.07	<0.5
Sulfate	mg/L	13	29-46	36	39	40	41	44	4.17	40
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.8-9.5	8.0	8.3	8.7	9.2	9.5	0.77	8.7
Bromide	mg/L	13	<0.5-0.82	<0.5	<0.5	<0.5	<0.5	<0.5	0.16	<0.5

Site SNWF
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	6-18	8	9	11	13	16	3.53	11
Conductivity	umhos/cm	13	510-646	541	590	622	632	644	42.62	607
Dissolved Oxygen	mg/L	13	10-15	11	11	11	12	13	1.25	12
Turbidity	NTU	13	1.8-55.0	2.1	2.5	3.1	4.9	17.1	14.75	8.5
Ammonia-N	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1
Fecal Bacteria	count 100 ml.	13	10-48000	18	60	150	310	2256	13230.44	4031
Nitrate-N	mg/L	13	2.5-5.2	2.6	2.8	3.0	3.0	3.0	0.67	3.1
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	28-42	34	35	37	40	41	3.77	37
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.2-10.0	7.5	7.8	8.2	8.4	8.6	0.84	8.1
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SNWF

July-Aug-Sept

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				----------------------		Percentile		----------------------		
Parameters										
Temperature	degree C	13	14-18	15	16	17	17	18	1.20	16
Conductivity	umhos/cm	13	540-660	548	630	640	644	650	41.13	622
Dissolved Oxygen	mg/L	13	8-12	9	11	11	11	11	1.13	11
Turbidity	NTU	13	1.3-6.5	2.1	2.4	2.9	3.5	4.3	1.29	3.1
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	90-750	100	120	200	450	646	238.19	300
Nitrate-N	mg/L	13	2.6-3.0	2.6	2.7	2.8	2.9	2.9	0.12	2.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	32-43	33	34	36	40	42	3.75	37
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	7.5-9.2	7.8	8.3	8.7	8.8	9.0	0.50	8.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN3

Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std	Mean
				----------------------		Percentile		----------------------		
Parameters										
Temperature	degree C	51	0-21	0	3	9	17	19	7.32	10
Conductivity	umhos/cm	50	422-746	574	619	637	692	715	60.80	642
Dissolved Oxygen	mg/L	51	6-15	11	11	12	13	14	1.88	12
Turbidity	NTU	51	0.5->100	1.3	1.7	2.4	3.5	6.0	14.74	5.3
Ammonia-N	mg/L	52	<0.1-2.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.34	0.1
Fecal Bacteria	count 100 ml.	52	<10-25000	<10	16	64	513	942	4364.96	1151
Nitrate-N	mg/L	52	2.5-5.5	3.6	4.0	4.4	4.9	5.2	0.68	4.4
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	52	14-41	24	26	28	30	32	4.31	28
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	6.8-12.0	9.5	9.9	11	11	12	1.19	11
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN3

Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				----------------------		Percentile		----------------------		
Parameters										
Temperature	degree C	12	0-16	0	2	4	10	14	5.81	6
Conductivity	umhos/cm	12	615-724	630	647	688	705	716	37.30	678
Dissolved Oxygen	mg/L	13	10-15	11	12	13	14	15	1.57	13
Turbidity	NTU	13	0.7-3.6	1.0	1.6	1.8	2.7	3.3	0.89	2.1
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	<10-500	<10	10	20	55	136	134.76	75
Nitrate-N	mg/L	13	4.1-5.4	4.2	4.5	4.9	5.2	5.3	0.45	4.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	25-33	26	27	29	30	32	2.31	29
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	10-12	10	11	11	11	12	0.64	11
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN3
Jan-Feb-Mar

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-4	0	0	1	3	4	1.61	2
Conductivity	umhos/cm	13	422-746	579	619	702	711	724	88.73	653
Dissolved Oxygen	mg/L	13	12-15	12	12	13	14	14	1.00	13
Turbidity	NTU	13	0.5->100	0.96	2	2.5	3.5	7.4	28.40	11
Ammonia-N	mg/L	13	<0.1-2.4	<0.1	<0.1	<0.1	<0.1	0.6	0.66	0.3
Fecal Bacteria	count 100 ml.	13	<10-260	<10	<10	20	50	103	70.86	49
Nitrate-N	mg/L	13	2.5-5.5	4.4	4.7	5.0	5.1	5.3	0.76	4.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	14-41	28	30	31	33	34	5.99	31
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	7.2-12.0	9.4	9.9	11	11	12	1.34	10.5
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN3
Apr-May-June

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	6-20	8	9	11	14	19	4.27	12
Conductivity	umhos/cm	12	530-655	576	609	623	633	648	34.41	615
Dissolved Oxygen	mg/L	12	11-15	11	12	13	13	15	1.36	13
Turbidity	NTU	12	1.3-27.0	1.3	1.6	2.8	3.6	5.9	7.15	4.8
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-25000	<10	<10	210	730	16156	8431.32	3652
Nitrate-N	mg/L	13	2.8-4.5	3.1	3.6	4.0	4.2	4.4	0.53	3.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	15-31	21	24	26	28	30	4.24	25
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	6.8-12	8.8	9.8	9.8	10	10	1.13	9.7
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN3
July-Aug-Sept

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	14-21	15	18	18	19	20	1.87	18
Conductivity	umhos/cm	13	520-680	548	627	636	651	660	47.23	622
Dissolved Oxygen	mg/L	13	6-13	7	10	11	11	13	2.14	10
Turbidity	NTU	13	1.3-7.5	1.5	2.1	2.8	4.5	6.4	2.02	3.6
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	320-2700	370	460	630	960	1320	638.10	829
Nitrate-N	mg/L	13	3.4-4.6	3.6	4.0	4.1	4.2	4.4	0.31	4.0
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	24-28	25	26	26	28	28	1.26	26
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	9.0-12	9.8	10	11	12	12	1.07	11
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BR2
Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	51	0-18	0	3	8	15	17	6.23	9
Conductivity	umhos/cm	51	480-777	560	641	678	721	745	68.72	670
Dissolved Oxygen	mg/L	52	6-15	10	11	12	14	14	1.84	12
Turbidity	NTU	52	1.0-56.0	1.9	2.5	3.3	5.5	8.7	9.23	6.1
Ammonia-N	mg/L	52	<0.1-2.8	<0.1	<0.1	<0.1	<0.1	0.3	0.51	0.2
Fecal Bacteria	count 100 ml.	52	<10-90000	10	40	170	423	874	12481.67	2180
Nitrate-N	mg/L	52	4.6-13.0	7.4	8.2	9.3	10.0	12.0	1.69	9.4
Nitrite-N	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	52	<0.5-0.54	<0.5	<0.5	<0.5	<0.5	<0.5	0.04	<0.5
Sulfate	mg/L	52	13-28	21	22	24	25	26	2.65	23
Fluoride	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	52	12-22	15	16	17	18	19	1.89	17
Bromide	mg/L	52	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BR2
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	12	0-15	0	3	5	8	13	5.03	6
Conductivity	umhos/cm	12	574-759	652	676	732	745	745	54.43	706
Dissolved Oxygen	mg/L	13	11-15	11	12	13	14	14	1.29	13
Turbidity	NTU	13	1.0-5.0	1.7	3.0	3.3	3.7	4.7	1.12	3.3
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-890	10	30	40	170	316	243.39	155
Nitrate-N	mg/L	13	9.5-13.0	9.8	9.9	10.0	12.0	12.0	1.14	10.8
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	22-27	22	23	24	25	25	1.41	24
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	16-22	16	17	18	18	20	1.63	18
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BR2
Jan-Feb-Mar

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	13	0-8	0	0	2	3	4	2.31	2
Conductivity	umhos/cm	13	480-777	563	600	675	730	772	89.74	666
Dissolved Oxygen	mg/L	13	8-15	10	12	13	14	14	1.94	13
Turbidity	NTU	13	1.8-25.0	2.0	3.6	5.4	7.9	11.4	6.17	7.0
Ammonia-N	mg/L	13	<0.1-2.4	<0.1	<0.1	0.1	0.5	0.8	0.65	0.4
Fecal Bacteria	count 100 ml.	13	10-730	22	30	64	170	284	195.26	150
Nitrate-N	mg/L	13	4.6-13.0	6.8	7.4	9.7	10.0	12.0	2.37	9.2
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-0.54	<0.5	<0.5	<0.5	<0.5	<0.5	0.08	<0.5
Sulfate	mg/L	13	13-28	18	21	25	26	28	4.45	23
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	12-20	14	16	17	18	19	2.10	17
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BR2
Apr-May-June

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	7-17	8	8	11	13	15	3.13	11
Conductivity	umhos/cm	13	540-687	573	627	670	677	678	47.03	645
Dissolved Oxygen	mg/L	13	10-15	11	12	13	13	14	1.39	13
Turbidity	NTU	13	1.8-56.0	2.2	2.5	3.0	6.3	31.8	16.86	10.1
Ammonia-N	mg/L	13	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.2	0.08	<0.1
Fecal Bacteria	count 100 ml.	13	<10-90000	<10	<10	160	340	7640	24799.92	7872
Nitrate-N	mg/L	13	6.2-11.0	7.4	7.7	7.9	8.4	9.7	1.18	8.2
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	17-25	21	22	23	25	25	2.31	23
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	12-17	14	15	16	16	17	1.45	15
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BR2
July-Aug-Sept

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	13-18	14	16	16	17	18	1.52	16
Conductivity	umhos/cm	13	520-743	564	658	694	708	717	68.59	667
Dissolved Oxygen	mg/L	13	6-13	8	11	11	12	13	2.03	11
Turbidity	NTU	13	1.6-9.5	2.0	2.1	2.6	5.1	7.4	2.53	3.9
Ammonia-N	mg/L	13	<0.1-2.8	<0.1	<0.1	<0.1	<0.1	<0.1	0.76	0.3
Fecal Bacteria	count 100 ml.	13	220-1100	268	370	500	650	866	252.96	541
Nitrate-N	mg/L	13	8.4-9.8	8.6	9.2	9.2	9.3	9.6	0.40	9.2
Nitrite-N	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	13	22-27	22	23	24	24	24	1.33	24
Fluoride	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	13	16-21	16	17	18	18	19	1.36	18
Bromide	mg/L	13	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site BRSC
Annual

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	Std	Mean
				Percentile						
Temperature	degree C	12	3-16	4	4	9	15	16	5.38	9
Conductivity	umhos/cm	12	584-753	644	687	704	742	746	49.24	700
Dissolved Oxygen	mg/L	12	10-15	11	12	13	13	13	1.24	13
Turbidity	NTU	12	0.7-33.0	1.2	2.5	3.1	4.3	5.7	8.75	5.6
Ammonia-N	mg/L	12	<0.1-0.8	<0.1	<0.1	<0.1	0.2	0.6	0.25	0.2
Fecal Bacteria	count 100 ml.	12	<10-9400	<10	16	67	253	1559	2687.92	998
Nitrate-N	mg/L	12	6.9-12.0	7.6	8.7	9.9	11.0	11.0	1.57	9.8
Nitrite-N	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	12	23-31	25	29	29	30	30	2.35	29
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	12	14-21	15	18	18	19	19	1.91	18
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SN2

Annual

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-18	2	2	9	14	17	6.50	9
Conductivity	umhos/cm	12	574-684	587	610	630	661	677	35.95	631
Dissolved Oxygen	mg/L	12	10-13	11	11	12	12	13	0.87	12
Turbidity	NTU	12	1-21	2.3	2.4	3.1	4.1	4.7	5.28	4.5
Ammonia-N	mg/L	12	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.1	0.07	<0.1
Fecal Bacteria	count 100 ml.	12	<10-23000	<10	<10	25	135	213	6621.69	1975
Nitrate-N	mg/L	12	2.4-3.8	2.6	2.6	3.0	3.2	3.3	0.40	3.0
Nitrite-N	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	12	23-37	24	29	31	32	33	3.93	30
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	12	7.0-8.4	7.3	7.5	7.9	8.2	8.3	0.45	7.8
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Site SNT

Annual

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	1-19	3	4	9	15	16	6.05	9
Conductivity	umhos/cm	12	579-649	589	594	603	618	644	22.27	609
Dissolved Oxygen	mg/L	12	10-13	10	10	10	11	12	1.00	11
Turbidity	NTU	12	0.6-7.8	1.4	1.9	3.0	4.1	4.8	1.95	3.2
Ammonia-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.05	<0.1
Fecal Bacteria	count 100 ml.	12	<10-8300	<10	<10	33	173	471	2371.27	785
Nitrate-N	mg/L	12	2.9-3.9	2.9	3.1	3.2	3.4	3.6	0.29	3.2
Nitrite-N	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Phosphorus	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Sulfate	mg/L	12	20-26	21	22	24	25	25	1.91	23
Fluoride	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5
Chloride	mg/L	12	7.1-9.8	8.2	8.4	8.7	9.2	9.5	0.71	8.7
Bromide	mg/L	12	<0.5-<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.00	<0.5

Summary of water-quality data on an annual and quarterly basis; Water Year 1997.

Site SN1
Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile	----------					
Parameters										
Temperature	degree C	53	0-21	1	2	10	15	17	6.65	9
Conductivity	umhos/cm	52	412-684	531	579	595	622	647	52.75	589
Dissolved Oxygen	mg/L	53	8-16	10	11	12	13	14	1.51	12
Turbidity	NTU	53	1.3-61	2.4	3.3	4.0	6.8	13.6	9.68	7.4
NO2+NO3-N	mg/L	53	1.7-3.5	2.0	2.2	2.4	2.6	2.8	0.34	2.4
Ammonia-N	mg/L	53	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	0.1	0.06	<0.1
Organic-N	mg/L	53	<0.1-1.4	<0.1	0.1	0.1	0.3	0.4	0.27	0.2
Fecal Bacteria	count 100 ml.	53	<10-27000	<10	<10	20	200	564	3851.15	812
Total P	mg/L	53	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.2	0.09	<0.1
BOD	mg/L	52	<1-3	<1	<1	<1	1	2	0.61	1
Triazine Herbicides	ug/L	53	<0.10-3.40	<0.10	<0.10	<0.10	0.13	0.33	0.47	0.18
Chloride	mg/L	53	2.0-17.0	7.0	7.0	7.5	8.0	9.4	1.85	7.9
Discharge	cfs	365	6.4-121	10	11	13	15	20	9.45	15
Susp. Sed. Conc.	mg/L	365	3-1080	6	12	22	35	60	99.15	42
Susp. Sed. Load	tons/day	365	0.07-432	0.19	0.36	0.72	1.4	2.5	26.94	4.4

Site SN1
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile	----------					
Parameters										
Temperature	degree C	14	0-14	0	1	4	10	11	4.76	5
Conductivity	umhos/cm	14	480-672	576	608	626	647	650	47.51	617
Dissolved Oxygen	mg/L	14	10-14	10	11	13	13	13	1.46	12
Turbidity	NTU	14	1.3-6.7	2.0	2.7	3.4	3.9	4.4	1.30	3.4
NO2+NO3-N	mg/L	14	1.9-2.7	2.1	2.2	2.5	2.6	2.7	0.25	2.4
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	14	<0.1-0.3	<0.1	<0.1	0.1	0.1	0.2	0.07	0.1
Fecal Bacteria	count 100 ml.	14	<10-300	<10	<10	10	74	170	89.24	58
Total P	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	<1	<1	0.43	<1
Triazine Herbicides	ug/L	14	<0.10-0.12	<0.10	<0.10	<0.10	<0.10	<0.10	0.02	<0.10
Chloride	mg/L	14	7.0-9.5	7.0	7.6	8.0	8.4	9.0	0.77	8.0
Discharge	cfs	92	6.4-16	7.6	8.4	11	12	13	2.21	11
Susp. Sed. Conc.	mg/L	92	3-44	5	7	12	17	27	9.37	14
Susp. Sed. Load	tons/day	92	0.09-1.5	0.14	0.21	0.30	0.51	0.85	0.32	0.42

Site SN1
Jan-Feb-Mar

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-5	0	1	2	3	5	1.82	2
Conductivity	umhos/cm	12	412-684	501	525	604	636	647	79.03	579
Dissolved Oxygen	mg/L	12	10-14	11	12	14	14	14	1.40	13
Turbidity	NTU	12	1.6-33	1.9	3.3	4.0	6.5	11.7	8.67	7.1
NO2+NO3-N	mg/L	12	2.6-3.0	2.6	2.7	2.7	2.9	3.0	0.15	2.8
Ammonia-N	mg/L	12	<0.1-0.3	<0.1	<0.1	<0.1	0.1	0.3	0.10	0.1
Organic-N	mg/L	12	<0.1-1.4	<0.1	<0.1	0.8	0.2	0.4	0.38	0.2
Fecal Bacteria	count 100 ml.	12	<10-630	<10	<10	<10	13	29	179.14	62
Total P	mg/L	12	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	0.3	0.12	0.1
BOD	mg/L	12	<1-2	<1	<1	<1	1	2	0.57	1
Triazine Herbicides	ug/L	12	<0.10-0.17	<0.10	<0.10	<0.10	0.11	0.14	0.04	<0.10
Chloride	mg/L	12	2.0-12.0	7.0	7.0	7.8	8.8	10.0	2.39	7.8
Discharge	cfs	90	10-121	11	12	14	20	26	14.63	19
Susp. Sed. Conc.	mg/L	90	3-786	5	7	14	29	45	93.24	35
Susp. Sed. Load	tons/day	90	0.07-166	0.16	0.25	0.51	1.5	3.0	24.23	5.5

Site SN1
Apr-May-June

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	4-21	5	11	11	16	17	4.82	12
Conductivity	umhos/cm	13	576-616	580	581	587	590	594	10.08	587
Dissolved Oxygen	mg/L	13	11-16	12	12	13	13	14	1.28	13
Turbidity	NTU	13	2.3-20	2.8	3.2	3.5	4.5	8.3	4.76	5.2
NO2+NO3-N	mg/L	13	2.0-3.5	2.0	2.2	2.3	2.4	2.6	0.38	2.4
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Organic-N	mg/L	13	<0.1-0.4	0.1	0.1	0.2	0.3	0.4	0.12	0.2
Fecal Bacteria	count 100 ml.	13	<10-1500	<10	<10	<10	30	532	429.54	194
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
BOD	mg/L	13	<1-3	<1	<1	<1	1	2	0.76	<1
Triazine Herbicides	ug/L	13	<0.10-3.40	<0.10	<0.10	<0.10	<0.10	0.60	0.93	0.37
Chloride	mg/L	13	6.0-17.0	7.0	7.0	7.0	7.0	8.6	2.82	7.8
Discharge	cfs	91	9.0-52	11	12	14	16	19	5.74	15
Susp. Sed. Conc.	mg/L	91	11-1080	18	22	31	41	63	127.67	55
Susp. Sed. Load	tons/day	91	0.37-130	0.58	0.78	1.1	1.8	2.5	15.31	3.8

Site SN1
July-Aug-Sept

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	13-19	14	15	17	18	19	1.91	16
Conductivity	umhos/cm	13	445-621	540	542	594	599	607	47.12	572
Dissolved Oxygen	mg/L	14	8-13	10	10	11	12	13	1.35	11
Turbidity	NTU	14	3.8-61	4.9	5.4	8.7	13.0	23.8	15.01	13.6
NO2+NO3-N	mg/L	14	1.7-2.8	1.9	2.0	2.2	2.3	2.5	0.29	2.2
Ammonia-N	mg/L	14	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Organic-N	mg/L	14	0.1-1.4	0.1	0.1	0.3	0.3	0.5	0.34	0.3
Fecal Bacteria	count 100 ml.	14	100-27000	126	150	205	488	6235	7309.29	2782
Total P	mg/L	14	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	0.2	0.13	0.11
BOD	mg/L	14	<1-3	<1	<1	<1	1	1	0.66	<1
Triazine Herbicides	ug/L	14	<0.10-0.49	<0.10	0.10	0.16	0.33	0.38	0.14	0.21
Chloride	mg/L	14	6.0-10.0	7.0	7.5	8.0	8.0	9.0	0.98	7.9
Discharge	cfs	92	10-87	11	11	13	15	17	8.81	15
Susp. Sed. Conc.	mg/L	92	13-838	17	21	31	51	89	114.80	63
Susp. Sed. Load	tons/day	92	0.38-432	0.48	0.67	1.1	1.9	4.2	45.45	7.9

Site BR1
Annual

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	53	0-20	3	4	10	14	16	5.60	10
Conductivity	umhos/cm	52	386-677	552	579	603	626	650	46.73	597
Dissolved Oxygen	mg/L	53	10-18	11	12	13	14	15	1.94	13
Turbidity	NTU	53	1.3-49	2.0	2.3	3.1	4.2	7.8	7.23	5.0
NO2+NO3-N	mg/L	53	3.5-9.8	4.2	4.5	4.9	5.5	5.7	0.89	5.0
Ammonia-N	mg/L	53	<0.1-0.7	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1
Organic-N	mg/L	53	<0.1-2	<0.1	<0.1	0.1	0.2	0.4	0.32	0.2
Fecal Bacteria	count 100 ml.	53	<10-4700	<10	<10	30	100	380	735.56	239
Total P	mg/L	53	<0.1-0.8	<0.1	<0.1	<0.1	<0.1	0.18	0.13	<0.1
BOD	mg/L	52	<1-5	<1	<1	<1	1	2	0.95	<1
Triazine Herbicides	ug/L	53	<0.10-0.75	0.16	0.18	0.21	0.24	0.33	0.11	0.23
Chloride	mg/L	53	2.0-15.0	10.0	11.0	12.0	12.0	12.0	1.71	11.3
Discharge	cfs	365	7.3-242	11	13	15	17	22	15.06	17
Susp. Sed. Conc.	mg/L	365	2-1470	6	9	16	25	41	99.89	30
Susp. Sed. Load	tons/day	365	0.08-2930	0.21	0.37	0.59	1.0	2.0	155.47	11

Site BR1
Oct-Nov-Dec

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	14	1-13	2	3	5	9	11	3.78	6
Conductivity	umhos/cm	14	570-659	583	598	630	649	653	30.01	623
Dissolved Oxygen	mg/L	14	10-15	10	11	13	14	14	1.56	13
Turbidity	NTU	14	1.3-6.5	1.9	2.2	2.6	3.2	3.6	1.24	2.8
NO2+NO3-N	mg/L	14	4.8-5.9	4.8	5.1	5.5	5.7	5.8	0.39	5.4
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	14	<0.1-0.3	<0.1	<0.1	<0.1	0.2	0.2	0.08	0.1
Fecal Bacteria	count 100 ml.	14	<10-300	<10	<10	14	20	92	79.50	42
Total P	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
BOD	mg/L	13	<1-1	<1	<1	<1	<1	<1	0.14	<1
Triazine Herbicides	ug/L	14	0.16-0.27	0.17	0.19	0.21	0.22	0.24	0.03	0.21
Chloride	mg/L	14	11.0-14.0	11.0	12.0	12.0	12.0	12.0	0.73	11.9
Discharge	cfs	92	11-23	12	13	14	18	21	3.22	15
Susp. Sed. Conc.	mg/L	92	2-53	4	6	10	17	24	9.95	13
Susp. Sed. Load	tons/day	92	0.08-2.2	0.15	0.23	0.39	0.73	1.1	0.45	0.55

Site BR1
Jan-Feb-Mar

Parameters	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Temperature	degree C	12	0-7	2	3	4	5	7	2.03	4
Conductivity	umhos/cm	12	386-677	510	555	606	637	662	80.86	587
Dissolved Oxygen	mg/L	12	11-18	11	13	13	14	15	1.88	13
Turbidity	NTU	12	2.5-4.9	3.5	3.7	6.6	9.4	24.6	13.47	11.2
NO2+NO3-N	mg/L	12	3.5-5.8	4.2	4.6	5.5	5.6	5.7	0.74	5.1
Ammonia-N	mg/L	12	<0.10-0.70	<0.1	<0.1	<0.1	0.3	0.5	0.22	0.2
Organic-N	mg/L	12	<0.10-2	<0.1	<0.1	0.2	0.6	1.1	0.59	0.5
Fecal Bacteria	count 100 ml.	12	<10-1300	<10	<10	<10	22.5	777	427.19	188
Total P	mg/L	12	<0.10-0.80	<0.1	<0.1	0.1	0.3	0.5	0.24	0.2
BOD	mg/L	12	<1-5	<1	<1	<1	2	4	1.57	2
Triazine Herbicides	ug/L	12	<0.10-0.46	0.14	0.21	0.22	0.27	0.30	0.10	0.23
Chloride	mg/L	12	10.0-15.0	10.0	10.0	11.0	12.0	13.8	1.68	11.4
Discharge	cfs	90	7.3-242	8.5	9.1	15	24	39	29.31	23
Susp. Sed. Conc.	mg/L	90	5-1470	9	13	19	38	136	193.53	68
Susp. Sed. Load	tons/day	90	0.13-2930	0.3	0.4	0.7	1.8	20.1	312.19	43

Site BR1
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	4-20	5	10	13	15	16	4.57	12
Conductivity	umhos/cm	13	552-613	555	573	585	605	610	21.13	584
Dissolved Oxygen	mg/L	13	13-18	13	13	15	16	18	1.85	15
Turbidity	NTU	13	1.7-3.8	2.0	2.1	2.4	3.1	3.7	0.72	2.6
NO2+NO3-N	mg/L	13	3.8-5.4	4.0	4.2	4.4	4.8	5.0	0.45	4.5
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.4	<0.1	0.1	0.1	0.3	0.4	0.13	0.2
Fecal Bacteria	count 100 ml.	13	<10-580	<10	<10	30	50	220	162.09	92
Total P	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
BOD	mg/L	13	<1-3	<1	<1	<1	1	2	0.82	1
Triazine Herbicides	ug/L	13	<0.10-0.75	0.14	0.17	0.19	0.22	0.44	0.18	0.25
Chloride	mg/L	13	2.0-12.0	9.0	10.0	11.0	11.0	11.0	2.53	9.9
Discharge	cfs	91	13-29	14	15	16	17	20	2.75	16
Susp. Sed. Conc.	mg/L	91	7-92	8	10	16	28	41	17.21	22
Susp. Sed. Load	tons/day	91	0.25-3.9	0.35	0.45	0.69	1.3	1.9	0.78	0.98

Site BR1
July-Aug-Sept

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	12-19	13	14	15	16	18	2.02	15
Conductivity	umhos/cm	13	550-640	551	580	592	613	616	27.99	592
Dissolved Oxygen	mg/L	14	10-15	11	11	12	13	14	1.44	12
Turbidity	NTU	14	1.6-11	2.2	2.4	3.7	4.3	7.0	2.54	4.1
NO2+NO3-N	mg/L	14	4.1-9.8	4.4	4.7	4.8	5.1	5.6	1.38	5.2
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	14	<0.1-0.4	<0.1	0.1	0.2	0.2	0.3	0.12	0.2
Fecal Bacteria	count 100 ml.	14	18-4700	33	51	100	268	18000	1326.02	618
Total P	mg/L	14	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.1	0.04	<0.1
BOD	mg/L	14	<1-1	<1	<1	<1	<1	<1	0.18	<1
Triazine Herbicides	ug/L	14	0.16-0.38	0.16	0.17	0.21	0.32	0.34	0.08	0.24
Chloride	mg/L	14	11.0-13.0	11.0	11.3	12.0	12.0	12.0	0.58	11.8
Discharge	cfs	92	12-22	12	13	14	15	16	1.87	14
Susp. Sed. Conc.	mg/L	92	2-80	5	11	17	23	34	13.50	19
Susp. Sed. Load	tons/day	92	0.09-3.4	0.19	0.42	0.62	0.91	1.4	0.60	0.75

Site NCC
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	52	0-19	1	2	11	15	17	6.54	9
Conductivity	umhos/cm	52	364-684	551	575	600	627	650	52.11	597
Dissolved Oxygen	mg/L	52	8-15	10	11	12	13	14	1.72	12
Turbidity	NTU	53	1.1-90.0	2.0	2.4	3.5	5.5	8.3	12.27	6.1
Ammonia-N	mg/L	53	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.22	<0.1
Fecal Bacteria	count 100 ml.	53	<10-13000	<10	<10	36	120	482	1781.38	363
NO2+NO3-N	mg/L	49	1.5-4.3	1.7	1.8	2.0	2.4	2.9	0.60	2.2
Chloride	mg/L	53	2.5-9.0	5.6	6.0	7.0	8.0	8.0	1.17	7.0

Site NCC
Oct-Nov-Dec

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	0-14	10	1	3	9	11	4.74	5
Conductivity	umhos/cm	14	560-684	581	684	581	621	670	36.33	630
Dissolved Oxygen	mg/L	14	8-14	9	10	12	13	14	1.91	12
Turbidity	NTU	14	1.1-6.2	1.7	2.1	2.7	4.4	5.7	1.65	3.2
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	14	<10-370	<10	<10	15	59	92	95.81	55
NO2+NO3-N	mg/L	10	1.5-2.1	1.8	1.8	1.9	2.0	2.0	0.17	1.9
Chloride	mg/L	14	5.5-8.0	6.0	6.0	7.0	7.5	8.0	0.88	6.9

Site NCC
Jan-Feb-Mar

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	11	0-6	1	1	1	3	4	1.79	2
Conductivity	umhos/cm	12	506-667	516	558	607	644	649	57.03	596
Dissolved Oxygen	mg/L	11	13-15	13	13	14	14	15	0.75	14
Turbidity	NTU	12	1.1-18	1.6	2.9	3.8	5.8	8.2	4.55	5.1
Ammonia-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	12	<10-73	<10	<10	<10	24	53	23.27	19
NO2+NO3-N	mg/L	12	2.0-2.7	2.1	2.2	2.4	2.5	2.7	0.24	$2.4
Chloride	mg/L	12	2.5-8.5	5.0	5.4	7.0	8.1	8.5	1.84	6.6

Site NCC
Apr-May-June

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	2-19	10	11	11	16	16	4.31	13
Conductivity	umhos/cm	13	566-619	568	571	578	588	599	15.10	582
Dissolved Oxygen	mg/L	13	9-15	11	11	13	13	14	1.61	12
Turbidity	NTU	13	1.8-19	2.2	2.6	3.3	3.6	7.2	4.57	4.7
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-510	<10	<10	<10	36	288	160.40	77
NO2+NO3-N	mg/L	13	1.6-4.3	1.7	1.7	2.0	2.2	3.7	0.87	2.3
Chloride	mg/L	13	5.0-8.0	6.0	6.0	7.0	7.0	8.0	0.90	6.8

Site NCC
July-Aug-Sept

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	13-19	14	15	16	17	18	1.69	16
Conductivity	umhos/cm	13	364-627	534	575	601	613	621	69.92	577
Dissolved Oxygen	mg/L	14	10-12	10	10	11	12	12	0.83	11
Turbidity	NTU	14	2.1-90	2.5	3.3	4.6	6.5	11.0	22.85	11.2
Ammonia-N	mg/L	14	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	14	70-13000	76	123	195	663	853	3399.65	1230
NO2+NO3-N	mg/L	14	1.6-3.9	1.7	1.8	2.1	2.8	3.0	0.66	2.3
Chloride	mg/L	14	6.0-9.0	6.3	7.0	7.5	8.0	8.4	0.85	7.4

Site SNWF
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	52	0-19	1	3	11	15	17	6.39	10
Conductivity	umhos/cm	51	361-696	570	618	637	659	680	64.35	626
Dissolved Oxygen	mg/L	53	9-15	10	11	12	13	13	1.42	12
Turbidity	NTU	52	0.6-87	1.4	2.1	2.6	4.8	8.0	13.97	6.1
Ammonia-N	mg/L	53	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	53	<10-49000	10	27	91	590	1142	6710.96	1307
NO2+NO3-N	mg/L	49	1.8-3.7	3.0	3.1	3.3	3.5	3.6	0.35	3.2
Chloride	mg/L	53	5.0-14.0	8.0	9.0	9.0	10.0	10.0	1.38	9.2

Site SNWF
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	0-15	1	3	4	10	11	4.57	6
Conductivity	umhos/cm	14	589-696	606	654	662	683	691	33.42	660
Dissolved Oxygen	mg/L	14	9-15	10	11	13	13	14	1.73	12
Turbidity	NTU	14	1-8.2	1.1	1.5	2.1	3.2	5.9	2.14	2.9
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	14	10-1200	10	22	50	108	814	384.27	229
NO2+NO3-N	mg/L	10	2.9-3.6	3.2	3.3	3.4	3.5	3.5	0.20	3.4
Chloride	mg/L	14	8.5-12.0	8.7	9.0	9.3	10.0	10.0	0.90	9.5

Site SNWF
Jan-Feb-Mar

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-7	0	2	2	3	6	2.24	3
Conductivity	umhos/cm	11	361-695	370	575	631	663	680	117.27	588
Dissolved Oxygen	mg/L	12	11-14	12	13	13	13	14	0.84	13
Turbidity	NTU	12	0.6-87	1.8	2.2	2.8	3.7	10.4	24.28	10.3
Ammonia-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	12	<10-1600	10	25	67	200	290	445.56	217
NO2+NO3-N	mg/L	12	1.8-3.7	2.3	3.4	3.6	3.6	3.7	0.62	3.3
Chloride	mg/L	12	5.0-14.0	7.1	8.8	9.5	10.0	10.0	2.13	9.3

Site SNWF
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	4-19	11	12	13	16	17	3.84	13
Conductivity	umhos/cm	13	607-658	615	618	622	630	637	12.91	625
Dissolved Oxygen	mg/L	13	9-14	11	11	12	12	13	1.17	12
Turbidity	NTU	12	1.1-8.1	2.1	2.5	2.6	3.5	6.2	2.01	3.4
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-3700	<10	<10	30	80	734	1023.39	385
NO2+NO3-N	mg/L	13	3.0-3.6	3.0	3.1	3.1	3.3	3.4	0.18	3.2
Chloride	mg/L	13	7.0-10.0	7.2	8.0	9.0	9.0	9.4	0.91	8.6

Site SNWF
July-Aug-Sept

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	13	13-19	14	15	15	18	19	2.00	16
Conductivity	umhos/cm	13	524-655	562	621	637	647	653	41.89	621
Dissolved Oxygen	mg/L	14	9-12	10	10	11	11	11	0.75	11
Turbidity	NTU	14	1.6-59	2.03	2.2	3.5	6.6	8.5	14.85	8.1
Ammonia-N	mg/L	14	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	14	110-49000	209	290	640	898	2000	12915.27	4176
NO2+NO3-N	mg/L	14	2.6-3.4	2.93	3.0	3.2	3.2	3.3	0.20	3.1
Chloride	mg/L	14	7.0-12.0	8.2	9.0	10.0	10.0	10.7	1.25	9.5

Site SN3
Annual

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std	Mean
				Percentile						
Temperature	degree C	53	0-22	0	2	12	17	19	7.44	10
Conductivity	umhos/cm	51	167-751	572	600	645	681	707	88.97	629
Dissolved Oxygen	mg/L	53	9-15	10	11	12	14	14	1.61	12
Turbidity	NTU	52	1-110	1.4	2.2	3.2	5.2	10.6	16.35	7.1
Ammonia-N	mg/L	53	<0.1-2.1	<0.1	<0.1	<0.1	<0.1	0.9	0.28	<0.1
Fecal Bacteria	count 100 ml.	53	<10-31000	<10	10	100	640	2700	4362.52	1253
NO2+NO3-N	mg/L	49	0.6-5.8	3.9	4.3	4.6	5.3	5.6	0.92	4.6
Chloride	mg/L	53	9.0-15.0	10.0	11.0	12.0	12.0	13.8	1.32	11.7

Site SN3
Oct-Nov-Dec

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	14	0-16	0	2	4	9	11	5.05	6
Conductivity	umhos/cm	14	572-751	586	650	687	714	725	55.70	674
Dissolved Oxygen	mg/L	14	11-15	11	11	13	14	15	1.54	13
Turbidity	NTU	14	1.3-17	1.3	1.6	2.9	6.2	10.5	4.66	4.7
Ammonia-N	mg/L	14	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	14	<10-3700	10	20	38	220	651	976.81	389
NO2+NO3-N	mg/L	10	4.0-5.7	5.0	5.2	5.3	5.4	5.6	0.47	5.2
Chloride	mg/L	14	11.0-14.0	11.0	12.0	13.0	13.8	14.0	1.15	12.6

Site SN3
Jan-Feb-Mar

Parameters	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Temperature	degree C	12	0-7	0	0	2	3	6	2.35	2
Conductivity	umhos/cm	11	167-735	520	599	660	691	703	157.80	606
Dissolved Oxygen	mg/L	12	12-14	13	13	13	14	14	0.65	13
Turbidity	NTU	12	1-110	1.5	2.4	3.4	5.4	7.1	30.77	12.5
Ammonia-N	mg/L	12	<0.1-2.1	<0.1	<0.1	<0.1	<0.1	0.2	0.59	0.2
Fecal Bacteria	count 100 ml.	12	<10-7000	<10	<10	10	44	186	2011.37	615
NO2+NO3-N	mg/L	12	0.6-5.8	4.6	4.8	5.5	5.7	5.8	1.44	5.0
Chloride	mg/L	12	10.0-15.0	11.0	11.0	12.0	13.0	13.9	1.40	12.2

Site SN3
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	3-21	12	12	14	19	19	4.80	15
Conductivity	umhos/cm	13	539-661	570	583	610	633	645	34.60	606
Dissolved Oxygen	mg/L	13	10-15	10	12	13	14	15	1.69	13
Turbidity	NTU	12	1.3-11	1.8	2.2	2.4	4.0	6.9	2.80	3.6
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-3800	<10	<10	40	750	1260	1069.13	595
NO2+NO3-N	mg/L	13	3.8-5.0	4.0	4.2	4.4	4.5	4.6	0.31	4.3
Chloride	mg/L	13	9.0-12.0	9.2	10.0	11.0	11.0	11.0	0.88	10.5

Site SN3
July-Aug-Sept

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	14-22	15	16	17	20	21	2.47	18
Conductivity	umhos/cm	13	425-666	600	602	647	658	665	64.51	623
Dissolved Oxygen	mg/L	14	9-12	9	10	11	12	12	1.05	11
Turbidity	NTU	14	2.1-53	2.2	2.9	3.8	5.1	9.5	13.25	7.7
Ammonia-N	mg/L	14	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	14	280-31000	383	483	535	2600	2770	8042.46	3274
NO2+NO3-N	mg/L	14	2.2-5.0	3.8	4.0	4.4	4.5	4.6	0.66	4.2
Chloride	mg/L	14	10.0-13.0	10.3	11.0	12.0	12.0	12.0	0.85	11.6

Site BR2
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	53	0-22	0	1	9	15	18	7.08	9
Conductivity	umhos/cm	51	354-780	562	627	660	698	737	73.92	655
Dissolved Oxygen	mg/L	53	10-18	11	11	12	14	16	1.90	13
Turbidity	NTU	51	1.4-60	1.9	3.2	4.5	6.7	8.2	9.46	6.7
Ammonia-N	mg/L	53	<0.1-1	<0.1	<0.1	<0.1	<0.1	0.1	0.16	<0.1
Fecal Bacteria	count 100 ml.	53	<10-8000	6	30	300	990	3960	1943.77	1144
NO2+NO3-N	mg/L	49	3.8-13.0	7.3	8.0	8.5	9.8	10.0	1.52	8.6
Chloride	mg/L	53	5.0-20.0	14.0	16.0	17.0	18.0	19.8	2.63	16.7

Site BR2
Oct-Nov-Dec

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	0-14	0	0	2	9	10	5.01	4
Conductivity	umhos/cm	14	600-780	619	661	721	745	759	58.16	701
Dissolved Oxygen	mg/L	14	10-16	10	11	13	14	14	1.69	13
Turbidity	NTU	13	1.7-7.0	1.9	2.9	3.1	4.7	6.7	1.85	4.0
Ammonia-N	mg/L	14	<0.1-0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.07	<0.1
Fecal Bacteria	count 100 ml.	14	<10-2500	20	33.75	195	558	1032	680.76	454
NO2+NO3-N	mg/L	10	8.8-11.0	9.3	9.8	10.0	10.8	11.0	0.74	10.1
Chloride	mg/L	14	16.0-20.0	17.0	17.3	19.0	20.0	20.0	1.40	18.6

Site BR2
Jan-Feb-Mar

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-6	0	0	1	2	5	2.11	2
Conductivity	umhos/cm	11	354-737	477	547	618	635	714	107.59	586
Dissolved Oxygen	mg/L	12	11-17	12	13	14	14	15	1.62	14
Turbidity	NTU	11	1.4-60	3.8	4.5	8.2	14.3	39.0	18.33	15.0
Ammonia-N	mg/L	12	<0.1-1	<0.1	<0.1	<0.1	0.3	0.6	0.30	0.2
Fecal Bacteria	count 100 ml.	12	<10-4900	<10	10	58	278	2052	1471.31	682
NO2+NO3-N	mg/L	12	3.8-13.0	5.3	6.8	8.9	10.0	10.0	2.56	8.4
Chloride	mg/L	12	12.0-20.0	12.1	13.8	15.5	18.3	19.0	2.89	15.8

Site BR2
Apr-May-June

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	2-22	9	10	11	16	17	4.99	12
Conductivity	umhos/cm	13	562-690	627	637	653	678	685	34.78	652
Dissolved Oxygen	mg/L	13	11-18	12	12	13	16	17	2.28	14
Turbidity	NTU	13	1.7-7.5	1.8	2.1	3.5	4.9	6.5	1.89	3.8
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	<10-7200	<10	20	90	300	3960	2288.24	1230
NO2+NO3-N	mg/L	13	6.7-8.6	7.4	7.8	8.0	8.1	8.4	0.48	7.9
Chloride	mg/L	13	5.0-16.0	14.2	15.0	16.0	16.0	16.0	2.98	14.7

Site BR2
July-Aug-Sept

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	14	12-20	13	14	16	18	19	2.52	16
Conductivity	umhos/cm	13	620-737	628	636	671	691	699	34.99	668
Dissolved Oxygen	mg/L	14	10-13	10	11	11	12	12	0.84	11
Turbidity	NTU	14	3.1-8	3.4	3.8	5.1	7.2	7.6	1.82	5.4
Ammonia-N	mg/L	14	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	14	340-8000	583	648	955	2150	6170	2485.79	2149
NO2+NO3-N	mg/L	14	7.4-9.1	8.0	8.3	8.5	9.0	9.1	0.49	8.5
Chloride	mg/L	14	16.0-19.0	16.0	17.0	18.0	18.0	18.7	1.02	17.6

Site BRSC
Annual

	Units	Number	Range	Percentile 10th	25th	50th	75th	90th	Std	Mean
Parameters										
Temperature	degree C	12	3-20	4	5	10	14	18	5.77	10
Conductivity	umhos/cm	12	640-778	644	667	680	686	705	35.56	682
Dissolved Oxygen	mg/L	12	10-16	11	11	13	13	14	1.67	13
Turbidity	NTU	12	1-12	1.3	2.1	3.4	4.5	8.2	3.23	4.1
Ammonia-N	mg/L	12	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1
Fecal Bacteria	count 100 ml.	12	<10-1200	<10	<10	123	945	7050	3846.27	1901
NO2+NO3-N	mg/L	12	8.4-11.0	8.7	8.8	9.0	9.6	10.9	0.87	9.3
Chloride	mg/L	12	17.0-20.0	17.0	17.8	18.0	18.0	19.8	1.00	18.1

Site SN2
Annual

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	0-19	1	2	10	15	19	7.19	9
Conductivity	umhos/cm	12	590-676	602	606	625	655	673	29.55	631
Dissolved Oxygen	mg/L	12	10-14	10	11	13	13	14	1.51	12
Turbidity	NTU	12	1.8-11	2.2	2.8	3.5	5.6	8.3	2.88	4.6
Ammonia-N	mg/L	12	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	12	<10-2800	<10	<10	80	348	2287	998.21	538
NO2+NO3-N	mg/L	12	2.7-3.7	2.7	2.9	3.2	3.4	3.5	0.35	3.2
Chloride	mg/L	12	7.0-10.0	7.6	8.0	8.8	9.0	9.5	0.85	8.6

Site SNT
Annual

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	1-19	2	4	11	15	19	6.74	10
Conductivity	umhos/cm	12	556-643	586	589	608	632	637	26.02	608
Dissolved Oxygen	mg/L	12	9-13	9	11	12	13	13	1.51	11
Turbidity	NTU	12	2.3-18	2.4	2.5	2.9	4.3	10.3	4.76	4.9
Ammonia-N	mg/L	12	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	12	<10-31000	<10	<10	39	1380	16620	9819.91	4492
NO2+NO3-N	mg/L	12	3.2-4.2	3.4	3.4	3.5	3.9	4.2	0.34	3.7
Chloride	mg/L	12	8.0-12.0	9.0	9.0	9.8	10.0	10.9	1.03	9.8

Summary of water-quality data on an annual and quarterly basis; Water Year 1998.

Site SN1
Annual

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	52	0-20	2	4	10	16	18	6.32	10
Conductivity	umhos/cm	52	383-681	573	590	608	627	638	45.81	604
Dissolved Oxygen	mg/L	52	9-18	10	11	13	14	15	2.06	13
Turbidity	NTU	51	1.9->100	2.5	3.0	3.7	6.0	9.5	16.56	8.0
NO2+NO3-N	mg/L	52	1.8-5.2	2.4	2.6	2.7	3.1	3.6	0.60	2.9
Ammonia-N	mg/L	52	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Organic-N	mg/L	52	<0.1-5.0	<0.1	<0.1	0.2	0.3	0.3	0.70	0.3
Fecal Bacteria	count 100 ml.	52	<10-46,000	<10	10	55	340	1,352	6470.36	1395
Total P	mg/L	52	<0.1-1.9	<0.1	<0.1	<0.1	<0.1	0.1	0.26	0.1
BOD	mg/L	52	<1-10	<1	<1	<1	1	2	1.38	1
Triazine Herbicides	ug/L	52	<0.10-0.25	<0.10	<0.10	<0.10	<0.10	0.14	0.05	<0.10
Chloride	mg/L	52	5.0-22.0	7.0	8.0	8.0	9.0	10.0	2.37	8.7
Discharge	cfs	365	6.5-200	8.8	11	17	21	29	16.04	19.2
Susp. Sed. Conc.	mg/L	365	4-4180	10	14	23	37	63.7	276.03	64
Susp. Sed. Load	tons/day	365	0.12-3310	0.264	0.39	0.89	2	4.67	191.42	20

Site SN1
Oct-Nov-Dec

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	1-16	2	3	4	6	9	3.93	5
Conductivity	umhos/cm	13	550-667	588	623	635	638	645	31.21	627
Dissolved Oxygen	mg/L	13	11-15	11	13	14	14	15	1.50	13
Turbidity	NTU	13	2.3-7.0	2.7	2.9	3.5	4.8	5.7	1.39	3.9
NO2+NO3-N	mg/L	13	1.8-3.5	2.2	2.3	2.6	2.7	2.8	0.40	2.5
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.2	<0.1	<0.1	0.1	0.1	0.2	0.06	0.1
Fecal Bacteria	count 100 ml.	13	<10-1,400	<10	20	29	36	55	381.49	131
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	2	0.56	<1
Triazine Herbicides	ug/L	13	<0.10-<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	<0.10
Chloride	mg/L	13	7.0-9.0	7.1	7.5	8.0	8.0	8.9	0.64	7.9
Discharge	cfs	92	6.5-30	8.62	9.775	11	12	13	2.80	11.2
Susp. Sed. Conc.	mg/L	92	4-116	7	10	12	17	24	12.64	15.1
Susp. Sed. Load	tons/day	92	0.12-10	0.19	0.2575	0.34	0.4825	0.61	1.03	0.5

Site SN1
Jan-Feb-Mar

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile				----------------------		
Parameters										
Temperature	degree C	13	0-9	1	2	4	6	7	2.55	4
Conductivity	umhos/cm	13	383-681	555	590	611	628	639	71.46	596
Dissolved Oxygen	mg/L	13	11-18	12	13	15	15	17	2.03	14
Turbidity	NTU	13	2->100	2.5	2.6	3.4	5.2	6.2	28.14	11.5
NO2+NO3-N	mg/L	13	2.5-4.1	2.5	2.5	2.9	3.2	3.4	0.48	3.0
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Organic-N	mg/L	13	<0.1-5.0	<0.1	0.1	0.1	0.2	0.2	1.36	0.5
Fecal Bacteria	count 100 ml.	13	<10-9,300	<10	<10	<10	10	178	2572.58	740
Total P	mg/L	13	<0.1-1.9	<0.1	<0.1	<0.1	<0.1	<0.1	0.51	0.2
BOD	mg/L	13	<1-3	<1	<1	1	1	2	0.72	1
Triazine Herbicides	ug/L	13	<0.10-<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.00	<0.10
Chloride	mg/L	13	7.0-22.0	8.0	8.0	8.5	9.0	13.9	4.13	9.9
Discharge	cfs	90	6.8-200	7.96	8.8	11	16.75	22.1	23.22	16
Susp. Sed. Conc.	mg/L	90	5-4180	13	16.25	22	29.75	40.2	459.13	84.7
Susp. Sed. Load	tons/day	90	0.10-3310	0.318	0.3925	0.625	1.1	2.14	358.20	46.7

Site SN1
Apr-May-June

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile				----------------------		
Parameters										
Temperature	degree C	13	10-18	10	12	15	16	17	2.78	14
Conductivity	umhos/cm	13	537-622	576	585	591	599	617	21.40	591
Dissolved Oxygen	mg/L	13	10-14	10	10	12	12	13	1.39	12
Turbidity	NTU	12	2.7-11.0	2.9	3.1	3.5	5.9	9.2	2.80	4.9
NO2+NO3-N	mg/L	13	2.4-4.3	2.5	2.7	2.9	3.6	3.9	0.62	3.2
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.3	<0.1	0.1	0.2	0.3	0.3	0.11	0.2
Fecal Bacteria	count 100 ml.	13	<10-920	12	50	110	630	766	342.31	286
Total P	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.02	<0.1
BOD	mg/L	13	<1-2	<1	<1	<1	1	1	0.44	<1
Triazine Herbicides	ug/L	13	<0.10- 0.25	<0.10	<0.10	<0.10	0.16	0.22	0.08	0.10
Chloride	mg/L	13	5.0-12.0	6.4	8.0	9.0	10.0	10.0	1.81	8.7
Discharge	cfs	91	16-113	18	19	23	30	38	16.25	27.8
Susp. Sed. Conc.	mg/L	91	15-1820	22	29	43	58	125	299.08	115.9
Susp. Sed. Load	tons/day	91	0.70-1130	1	1.5	2.5	4.9	13	140.52	30

Site SN1
July-Aug-Sept

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile				----------------------		
Parameters										
Temperature	degree C	13	14-20	16	16	17	18	19	1.55	17
Conductivity	umhos/cm	13	552-621	576	597	606	617	620	20.59	602
Dissolved Oxygen	mg/L	13	9-13	9	10	11	12	13	1.42	11
Turbidity	NTU	13	1.9-65.0	2.9	5.3	5.9	8.6	21.2	16.91	11.8
NO2+NO3-N	mg/L	13	2.3-5.2	2.6	2.7	2.7	2.9	3.1	0.71	2.9
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Organic-N	mg/L	13	<0.1-1.2	<0.1	0.2	0.3	0.3	0.9	0.35	0.4
Fecal Bacteria	count 100 ml.	13	100-46,000	122	190	430	2,200	3,840	12553.75	4,422
Total P	mg/L	13	<0.1-0.4	<0.1	<0.1	<0.1	0.1	0.3	0.13	0.1
BOD	mg/L	13	<1-10	<1	<1	<1	<1	2	2.62	1
Triazine Herbicides	ug/L	13	<0.10-0.18	<0.10	<0.10	<0.10	0.12	0.14	0.05	<0.10
Chloride	mg/L	13	7.0-10.0	7.1	8.0	8.0	9.0	9.0	0.86	8.2
Discharge	cfs	92	14-79	16	17	19	24.25	28.9	8.80	21.9
Susp. Sed. Conc.	mg/L	92	5-459	10.1	16.5	24	40.5	70.6	62.65	41.4
Susp. Sed. Load	tons/day	92	0.20-59	0.342	0.66	1.1	2.725	4.66	9.30	3.6

Site BR1
Annual

	Units	Number	Range	Percentile					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	52	1-19	4	5	11	16	17	5.43	11
Conductivity	umhos/cm	52	438-721	563	600	620	632	639	40.45	611
Dissolved Oxygen	mg/L	52	9-18	11	12	14	15	16	2.22	13
Turbidity	NTU	52	1.2->100	1.6	2.2	3.0	4.1	8.1	14.69	6.1
NO2+NO3-N	mg/L	52	2.9-9.1	5.0	5.2	5.6	6.7	7.4	1.12	6.0
Ammonia-N	mg/L	52	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Organic-N	mg/L	52	<0.1-3.5	<0.1	<0.1	0.1	0.3	0.4	0.51	0.3
Fecal Bacteria	count 100 ml.	52	<10-130,000	<10	<10	32	320	2,450	19456.06	4,423
Total P	mg/L	52	<0.1-1.2	<0.1	<0.1	<0.1	<0.1	0.2	0.17	0.1
BOD	mg/L	52	<1-4	<1	<1	<1	1	2	0.81	<1
Triazine Herbicides	ug/L	52	<0.10-0.84	0.10	0.12	0.14	0.18	0.24	0.13	0.17
Chloride	mg/L	52	9.0-27.0	10.0	11.0	12.0	13.0	14.0	2.57	12.3
Discharge	cfs	365	8.5-189	11	13	17	23	31	16.36	20.9
Susp. Sed. Conc.	mg/L	365	2-1300	5	8	15	25	35	84.59	28.8
Susp. Sed. Load	tons/day	365	0.08-773	0.19	0.29	0.69	1.4	2.64	47.68	6.2

Site BR1
Oct-Nov-Dec

	Units	Number	Range	Percentile					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	13	4-14	4	5	5	7	9	2.79	6
Conductivity	umhos/cm	13	560-639	591	620	628	632	638	23.65	619
Dissolved Oxygen	mg/L	13	11-16	11	14	15	15	15	1.80	14
Turbidity	NTU	13	1.4-4.3	1.5	1.7	2.2	3.0	3.0	0.82	2.3
NO2+NO3-N	mg/L	13	4.4-5.6	4.6	5.0	5.1	5.3	5.6	0.37	5.1
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	0.1	0.1	0.03	<0.1
Fecal Bacteria	count 100 ml.	13	<10-4,300	<10	10	10	10	26	1189.57	341
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
BOD	mg/L	13	<1-1	<1	<1	<1	<1	<1	0.19	<1
Triazine Herbicides	ug/L	13	<0.10-0.18	<0.10	0.12	0.14	0.15	0.17	0.04	0.13
Chloride	mg/L	13	10.0-12.0	10.0	11.0	11.0	11.0	12.0	0.71	11.0
Discharge	cfs	92	8.5-25	11	12	13.5	14	15	2.08	13.2
Susp. Sed. Conc.	mg/L	92	2-36	4	6	10	14.25	23	7.08	11.4
Susp. Sed. Load	tons/day	92	0.08-2	0.151	0.2175	0.315	0.485	0.79	0.30	0.4

Site BR1
Jan-Feb-Mar

	Units	Number	Range	Percentile					std. dev.	Mean
				10th	25th	50th	75th	90th		
Parameters										
Temperature	degree C	13	1-9	3	4	5	6	8	2.18	5
Conductivity	umhos/cm	13	438-721	539	608	620	630	651	66.62	607
Dissolved Oxygen	mg/L	13	11-18	11	12	16	16	17	2.43	15
Turbidity	NTU	13	1.2->100	1.5	1.9	2.6	4.0	7.8	28.33	10.9
NO2+NO3-N	mg/L	13	5.3-6.4	5.3	5.4	5.5	5.9	6.0	0.34	5.7
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Organic-N	mg/L	13	<0.1-3.5	<0.1	<0.1	<0.1	0.1	0.6	0.95	0.4
Fecal Bacteria	count 100 ml.	13	<10-31,000	<10	<10	<10	10	52	8594.75	2,395
Total P	mg/L	13	<0.1-1.2	<0.1	<0.1	<0.1	<0.1	0.3	0.32	0.2
BOD	mg/L	13	<1-4	<1	<1	1	2	4	1.26	1
Triazine Herbicides	ug/L	13	<0.10-0.16	0.10	0.12	0.13	0.14	0.15	0.03	0.13
Chloride	mg/L	13	9.0-27.0	10.0	11.0	12.0	13.0	14.0	4.51	12.8
Discharge	cfs	90	9.0-189	11	11.25	12.5	16	20.1	19.61	16.6
Susp. Sed. Conc.	mg/L	90	3-1300	4	5	7	12	18.1	148.09	29.8
Susp. Sed. Load	tons/day	90	0.10-773	0.149	0.19	0.275	0.43	0.815	92.04	13.6

Site BR1
Apr-May-June

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	10-17	11	12	15	17	17	2.54	14
Conductivity	umhos/cm	13	540-639	567	595	609	617	636	28.03	603
Dissolved Oxygen	mg/L	13	10-17	10	11	13	14	15	2.08	13
Turbidity	NTU	13	1.7-16.5	2.3	2.4	3.3	5.0	9.0	4.09	4.9
NO2+NO3-N	mg/L	13	5.0-9.1	5.2	5.6	6.0	8.1	8.3	1.41	6.7
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Organic-N	mg/L	13	<0.1-0.5	0.1	0.2	0.3	0.3	0.4	0.13	0.3
Fecal Bacteria	count 100 ml.	13	<10-2,500	<10	36	82	540	720	687.57	371
Total P	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.06	<0.1
BOD	mg/L	13	<1-2	<1	<1	1	1	1	0.43	<1
Triazine Herbicides	ug/L	13	<0.10-0.84	<0.10	0.11	0.12	0.18	0.55	0.24	0.23
Chloride	mg/L	13	10.0-15.0	11.2	12.0	13.0	14.0	14.0	1.38	12.7
Discharge	cfs	91	14-132	15	17	19	26	44	19.40	25.7
Susp. Sed. Conc.	mg/L	91	6-466	10	18.5	24	34.5	69	77.80	46.7
Susp. Sed. Load	tons/day	91	0.30-192	0.43	0.82	1.1	2	7.4	25.69	7.9

Site BR1
July-Aug-Sept

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	13-19	15	16	17	17	18	1.51	17
Conductivity	umhos/cm	13	528-644	585	610	625	635	639	31.57	615
Dissolved Oxygen	mg/L	13	9-14	9	11	12	13	14	1.61	12
Turbidity	NTU	13	2.1-29.0	2.3	2.9	3.8	4.4	11.3	7.39	6.2
NO2+NO3-N	mg/L	13	2.9-7.4	5.3	6.4	6.8	7.0	7.2	1.20	6.4
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Organic-N	mg/L	13	<0.1-1.3	0.1	0.1	0.2	0.3	0.4	0.32	0.3
Fecal Bacteria	count 100 ml.	13	73-130,000	110	140	350	2,000	40,260	37160.30	14,584
Total P	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	0.1	0.2	0.13	0.1
BOD	mg/L	13	<1-3	<1	<1	<1	1	2	0.77	<1
Triazine Herbicides	ug/L	13	0.14-0.25	0.16	0.18	0.21	0.24	0.24	0.04	0.21
Chloride	mg/L	13	10.0-16.0	11.0	12.0	13.0	13.0	14.8	1.64	12.8
Discharge	cfs	92	19-125	20.1	22	25	28	34	12.84	28
Susp. Sed. Conc.	mg/L	92	8-143	12	18	24	26	41.9	22.45	27.3
Susp. Sed. Load	tons/day	92	0.50-60	0.711	1.2	1.55	2	3.45	7.44	3

Site NCC
Annual

	Units	Number	Range	---------------------- Percentile ---------------------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	52	0-19	2	4	10	16	17	6.44	10
Conductivity	umhos/cm	52	263-732	560	582	606	633	643	67.19	598
Dissolved Oxygen	mg/L	52	9-18	10	11	12	14	16	2.30	13
Turbidity	NTU	52	1.4->100	1.8	2.1	2.9	4.1	7.6	14.63	6.0
Ammonia-N	mg/L	52	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	52	<10-21,000	<10	<10	20	135	299	2934.32	562
NO2+NO3-N	mg/L	52	1.5-7.6	2.0	2.1	3.0	3.7	5.9	1.52	3.3
Chloride	mg/L	52	5.0-17.0	6.0	7.0	8.0	8.5	9.0	1.80	7.9

Site NCC
Oct-Nov-Dec

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-16	2	2	4	6	8	4.13	5
Conductivity	umhos/cm	13	540-667	580	631	636	643	652	34.42	627
Dissolved Oxygen	mg/L	13	11-16	11	13	15	16	16	1.86	14
Turbidity	NTU	13	1.4-5.6	1.7	1.8	2.0	3.0	3.5	1.14	2.6
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-200	<10	<10	<10	10	108	60.92	32
NO2+NO3-N	mg/L	13	1.5-2.2	2.0	2.0	2.1	2.1	2.2	0.18	2.0
Chloride	mg/L	13	6.0-8.5	6.0	6.0	7.0	8.0	8.0	0.91	7.1

Site NCC
Jan-Feb-Mar

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	1-9	1	2	3	5	7	2.53	4
Conductivity	umhos/cm	13	263-732	532	590	620	635	674	111.95	597
Dissolved Oxygen	mg/L	13	11-18	11	12	14	16	17	2.41	14
Turbidity	NTU	13	1.4->100	1.9	2.0	2.7	3.8	11.6	28.27	11.5
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	<10-3,600	<10	<10	<10	30	54	994.32	291
NO2+NO3-N	mg/L	13	2.0-5.8	2.1	2.1	2.5	4.4	5.2	1.38	3.2
Chloride	mg/L	13	5.0-12.0	6.0	7.0	7.5	8.5	9.0	1.76	7.7

Site NCC
Apr-May-June

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	10-17	10	12	15	16	17	2.47	14
Conductivity	umhos/cm	13	556-610	561	570	582	595	604	17.05	581
Dissolved Oxygen	mg/L	13	10-12	10	10	11	11	12	0.76	11
Turbidity	NTU	13	1.6-8.8	2.2	2.7	3.6	5.2	7.9	2.25	4.2
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-680	<10	10	40	82	270	190.55	108
NO2+NO3-N	mg/L	13	3.2-7.6	3.3	3.5	4.5	6.5	6.8	1.63	5.0
Chloride	mg/L	13	6.0-11.0	7.0	8.0	8.0	9.0	9.4	1.25	8.3

Site NCC
July-Aug-Sept

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	13-19	15	16	17	18	19	1.66	17
Conductivity	umhos/cm	13	383-618	584	592	603	608	616	61.91	586
Dissolved Oxygen	mg/L	13	9-12	9	10	11	12	12	1.12	11
Turbidity	NTU	13	1.4-30.0	2.3	2.5	3.5	5.1	7.3	7.47	5.8
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.19	<0.1
Fecal Bacteria	count 100 ml.	13	20-21,000	51	110	190	290	604	5766.54	1,816
NO2+NO3-N	mg/L	13	2.2-4.0	2.3	2.5	3.1	3.4	3.7	0.57	3.0
Chloride	mg/L	13	7.0-17.0	7.0	7.0	8.0	8.0	9.0	2.63	8.5

Site SNWF
Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	52	0-20	2	5	11	16	18	6.12	10
Conductivity	umhos/cm	52	319-742	585	622	639	656	667	54.00	630
Dissolved Oxygen	mg/L	52	9-16	10	10	11	14	15	1.97	12
Turbidity	NTU	52	1.5->100	1.9	2.2	2.9	3.8	5.6	14.35	5.6
Ammonia-N	mg/L	52	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	52	18-18,000	41	80	245	713	2,120	2963.00	1,162
NO2+NO3-N	mg/L	52	2.9-4.3	3.1	3.2	3.4	3.6	3.8	0.30	3.4
Chloride	mg/L	52	4.0-15.0	8.0	8.9	9.0	10.0	10.0	1.54	9.3

Site SNWF
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	13	1-15	2	3	5	7	9	3.69	6
Conductivity	umhos/cm	13	570-670	588	657	662	667	668	34.46	647
Dissolved Oxygen	mg/L	13	10-15	11	13	14	14	15	1.49	13
Turbidity	NTU	13	1.5-4.5	1.7	1.9	2.5	3.0	4.2	0.97	2.6
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	55-1,200	71	80	100	210	470	318.56	228
NO2+NO3-N	mg/L	13	3.2-3.7	3.2	3.3	3.4	3.6	3.6	0.16	3.4
Chloride	mg/L	13	8.0-15.0	8.6	9.0	9.5	10.0	10.0	1.70	9.8

Site SNWF
Jan-Feb-Mar

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	13	0-9	1	2	5	6	8	2.82	4
Conductivity	umhos/cm	13	319-742	630	635	645	655	672	97.50	629
Dissolved Oxygen	mg/L	13	11-16	12	13	13	15	16	1.56	14
Turbidity	NTU	13	1.7->100	2.0	2.2	2.8	3.8	7.3	28.25	11.1
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	13	18-4,300	20	30	50	130	998	1191.78	477
NO2+NO3-N	mg/L	13	3.5-4.3	3.5	3.6	3.6	3.9	4.0	0.24	3.7
Chloride	mg/L	13	4.0-12.0	9.0	10.0	10.0	10.0	11.0	1.89	9.7

Site SNWF
Apr-May-June

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				Percentile						
Parameters										
Temperature	degree C	13	10-18	11	12	15	16	17	2.54	15
Conductivity	umhos/cm	13	554-647	575	596	609	632	636	27.40	610
Dissolved Oxygen	mg/L	13	9-11	10	10	10	11	11	0.63	10
Turbidity	NTU	13	2.1-16.0	2.3	2.6	2.9	4.4	7.7	3.84	4.5
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	70-11,000	106	260	410	680	1,190	2940.92	1,275
NO2+NO3-N	mg/L	13	2.9-4.1	3.0	3.1	3.2	3.5	3.6	0.33	3.3
Chloride	mg/L	13	6.0-12.0	7.2	8.0	9.0	10.0	10.0	1.54	8.9

Site SNWF
July-Aug-Sept

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile ----------------------						
Parameters										
Temperature	degree C	13	14-20	15	16	17	18	19	1.63	17
Conductivity	umhos/cm	13	606-650	615	625	638	641	648	13.44	634
Dissolved Oxygen	mg/L	13	10-11	10	10	10	10	11	0.38	10
Turbidity	NTU	13	1.9-17.0	2.2	2.4	3.2	3.8	4.1	3.94	4.1
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	220-18,000	354	470	790	2,200	4,700	4819.20	2,666
NO2+NO3-N	mg/L	13	2.9-3.5	3.1	3.2	3.2	3.4	3.4	0.16	3.3
Chloride	mg/L	13	8.0-10.0	8.0	8.0	9.0	9.0	9.0	0.60	8.8

Site SN3
Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std	Mean
				---------------------- Percentile ----------------------						
Parameters										
Temperature	degree C	52	0-21	2	4	11	18	19	7.13	11
Conductivity	umhos/cm	52	334-798	596	630	650	673	690	59.12	644
Dissolved Oxygen	mg/L	52	9-17	10	10	11	14	15	2.24	12
Turbidity	NTU	52	1.2->100	1.6	2.0	2.7	3.8	5.4	14.25	5.1
Ammonia-N	mg/L	52	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.06	<0.1
Fecal Bacteria	count 100 ml.	52	<10-15,000	<10	30	250	728	1,190	2466.01	914
NO2+NO3-N	mg/L	52	2.7-6.4	3.9	4.2	4.7	5.3	5.5	0.67	4.7
Chloride	mg/L	52	6.0-21.0	10.0	11.0	12.0	12.3	13.0	2.00	11.8

Site SN3
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile ----------------------						
Parameters										
Temperature	degree C	13	0-15	2	2	4	6	9	3.90	5
Conductivity	umhos/cm	13	600-715	616	671	683	685	690	33.28	670
Dissolved Oxygen	mg/L	13	10-16	11	13	15	15	15	1.95	14
Turbidity	NTU	13	1.3-7.8	1.4	1.7	2.1	2.7	4.4	1.79	2.7
Ammonia-N	mg/L	13	<0.1-0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	<0.1
Fecal Bacteria	count 100 ml.	13	27-710	30	30	60	200	482	218.02	169
NO2+NO3-N	mg/L	13	4.0-5.7	4.4	4.8	5.0	5.3	5.4	0.47	5.0
Chloride	mg/L	13	11.0-14.0	11.0	12.0	12.0	12.0	12.8	0.82	12.0

Site SN3
Jan-Feb-Mar

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------------------- Percentile ----------------------						
Parameters										
Temperature	degree C	13	0-9	1	2	4	5	9	3.03	4
Conductivity	umhos/cm	13	334-798	625	640	650	694	708	104.23	645
Dissolved Oxygen	mg/L	13	11-17	12	13	14	15	17	1.80	14
Turbidity	NTU	13	1.2->100	1.6	1.9	2.2	3.2	4.9	28.44	10.4
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	<10-15,000	<10	<10	<10	80	344	4145.27	1,208
NO2+NO3-N	mg/L	13	2.7-6.4	4.6	5.2	5.4	5.5	5.6	0.87	5.2
Chloride	mg/L	13	6.0-14.0	11.0	12.0	12.0	12.0	13.8	1.96	11.8

Site SN3
Apr-May-June

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	13	10-20	11	14	17	18	19	3.02	16
Conductivity	umhos/cm	13	575-655	577	578	608	633	648	29.26	612
Dissolved Oxygen	mg/L	13	10-12	10	10	10	11	11	0.66	11
Turbidity	NTU	13	1.7-12.0	2.4	2.5	3.0	3.9	5.2	2.63	3.9
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	<10-9,400	12	70	390	850	1,150	2518.98	1,116
NO2+NO3-N	mg/L	13	3.7-4.5	3.8	3.9	4.0	4.2	4.4	0.24	4.1
Chloride	mg/L	13	8.0-21.0	9.2	10.0	11.0	12.0	12.8	3.18	11.4

Site SN3
July-Aug-Sept

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	13	15-21	16	18	19	20	20	1.71	19
Conductivity	umhos/cm	13	630-664	634	646	651	658	659	10.51	649
Dissolved Oxygen	mg/L	13	9-12	9	10	11	11	11	0.88	10
Turbidity	NTU	13	1.3-6.4	1.8	2.6	3.1	4.6	5.8	1.59	3.5
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.01	<0.1
Fecal Bacteria	count 100 ml.	13	290-5,000	408	650	930	1,100	1,540	1209.05	1,165
NO2+NO3-N	mg/L	13	4.0-5.0	4.2	4.3	4.5	4.9	5.0	0.33	4.6
Chloride	mg/L	13	10.0-15.0	10.2	11.0	12.0	13.0	13.0	1.44	12.1

Site BR2
Annual

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	52	0-18	1	4	11	15	16	6.12	9
Conductivity	umhos/cm	51	434-760	626	655	691	717	733	51.86	681
Dissolved Oxygen	mg/L	52	9-17	11	11	13	15	16	2.14	13
Turbidity	NTU	52	1.6-72.0	2.1	2.7	3.6	5.1	9.0	10.15	6.1
Ammonia-N	mg/L	52	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	52	<10-140,000	10	39	150	675	2,150	20097.86	4,717
NO2+NO3-N	mg/L	52	4.0-13.0	8.5	9.1	9.6	10.0	11.0	1.40	9.6
Chloride	mg/L	52	8.0-20.0	14.1	16.0	17.0	18.0	18.0	2.20	16.6

Site BR2
Oct-Nov-Dec

	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
				---------- Percentile				----------		
Parameters										
Temperature	degree C	13	0-16	1	2	3	5	8	4.20	4
Conductivity	umhos/cm	13	630-760	660	713	725	734	740	36.54	715
Dissolved Oxygen	mg/L	13	10-16	11	13	15	15	16	1.96	14
Turbidity	NTU	13	2.4-9.0	2.9	4.2	4.5	5.2	6.4	1.69	4.8
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	10-140,000	14	30	73	300	396	38793.35	10,889
NO2+NO3-N	mg/L	13	7.8-11.0	8.7	9.4	9.4	9.7	9.9	0.73	9.4
Chloride	mg/L	13	16.0-18.0	16.2	17.0	18.0	18.0	18.0	0.78	17.5

Site BR2
Jan-Feb-Mar

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	0-9	0	1	4	6	7	2.80	4
Conductivity	umhos/cm	12	434-733	635	665	687	707	723	79.29	669
Dissolved Oxygen	mg/L	13	11-17	11	12	15	16	17	2.22	14
Turbidity	NTU	13	1.6-72.0	1.7	2.3	3.4	5.0	11.4	19.09	9.2
Ammonia-N	mg/L	13	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	13	<10-16,000	<10	<10	30	70	200	4424.95	1,274
NO2+NO3-N	mg/L	13	7.4-11.0	8.5	8.7	9.3	9.7	10.0	0.86	9.2
Chloride	mg/L	13	10.0-20.0	15.2	17.0	18.0	18.0	18.0	2.40	16.9

Site BR2
Apr-May-June

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	11-17	11	12	14	15	17	2.23	14
Conductivity	umhos/cm	13	620-691	624	637	646	686	690	27.97	656
Dissolved Oxygen	mg/L	13	10-15	10	11	12	14	14	1.66	12
Turbidity	NTU	13	1.7-25.0	2.2	2.9	3.2	4.3	11.7	6.50	5.8
Ammonia-N	mg/L	13	<0.1-<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.00	<0.1
Fecal Bacteria	count 100 ml.	13	30-2,200	62	80	150	750	1,144	631.80	528
NO2+NO3-N	mg/L	13	4.0-13.0	8.7	8.9	9.8	12.0	12.0	2.30	9.9
Chloride	mg/L	13	14.0-19.0	14.2	16.0	17.0	18.0	18.0	1.63	16.8

Site BR2
July-Aug-Sept

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	13	12-18	14	15	16	16	17	1.51	16
Conductivity	umhos/cm	13	595-725	635	673	695	701	706	35.25	682
Dissolved Oxygen	mg/L	13	9-13	10	11	12	13	13	1.26	12
Turbidity	NTU	13	2.0-15.0	2.2	2.6	3.2	4.9	8.4	3.68	4.6
Ammonia-N	mg/L	13	<0.1-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1
Fecal Bacteria	count 100 ml.	13	170-31,000	200	280	750	1,700	21,800	10786.35	6,178
NO2+NO3-N	mg/L	13	7.3-11.0	8.5	9.6	10.0	11.0	11.0	1.15	10.0
Chloride	mg/L	13	8.0-19.0	12.2	15.0	16.0	17.0	18.0	2.96	15.3

Site BRSC
Annual

				Percentile						
	Units	Number	Range	10th	25th	50th	75th	90th	Std	Mean
Parameters										
Temperature	degree C	12	5-16	6	7	10	14	16	4.09	11
Conductivity	umhos/cm	12	471-765	660	691	704	729	738	75.17	691
Dissolved Oxygen	mg/L	12	10-16	10	12	13	14	15	1.91	13
Turbidity	NTU	12	1.0->100	1.7	2.0	2.3	3.3	12.1	29.54	11.7
Ammonia-N	mg/L	12	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1
Fecal Bacteria	count 100 ml.	12	<10-56,000	6	18	110	270	1,110	16110.41	4,853
NO2+NO3-N	mg/L	12	5.1-14.0	9.3	9.7	10.0	11.0	11.0	2.02	10.1
Chloride	mg/L	12	12.0-19.0	16.1	17.0	18.0	18.0	18.9	1.88	17.3

Site SN2

Annual

	Units	Number	Range	---------- Percentile ---------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	2-18	4	6	11	16	18	5.82	11
Conductivity	umhos/cm	12	301-673	590	627	632	656	659	99.76	610
Dissolved Oxygen	mg/L	12	10-15	11	11	12	14	14	1.68	12
Turbidity	NTU	12	1.4->100	1.6	2.2	2.5	3.1	7.5	29.53	11.4
Ammonia-N	mg/L	12	<0.1-0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.04	<0.1
Fecal Bacteria	count 100 ml.	12	<10-10,000	<10	<10	77	225	516	2853.98	952
NO2+NO3-N	mg/L	12	3.0-4.1	3.1	3.2	3.3	3.4	3.6	0.28	3.4
Chloride	mg/L	12	5.0-10.0	8.0	8.0	8.5	9.0	9.0	1.20	8.3

Site SNT

Annual

	Units	Number	Range	---------- Percentile ---------- 10th	25th	50th	75th	90th	std. dev.	Mean
Parameters										
Temperature	degree C	12	3-18	4	7	11	17	18	5.62	11
Conductivity	umhos/cm	12	354-697	580	618	635	646	654	86.10	612
Dissolved Oxygen	mg/L	12	9-13	9	10	11	12	13	1.60	11
Turbidity	NTU	12	1.5-87.0	1.8	2.3	2.8	4.1	6.5	24.27	10.1
Ammonia-N	mg/L	12	<0.1-0.4	<0.1	<0.1	<0.1	<0.1	0.3	0.12	0.1
Fecal Bacteria	count 100 ml.	12	<10-21,000	<10	16	135	248	1,287	6010.10	1,955
NO2+NO3-N	mg/L	12	2.6-4.9	3.2	3.8	4.0	4.3	4.7	0.63	4.0
Chloride	mg/L	12	4.0-13.0	9.1	9.9	10.0	11.3	12.0	2.24	10.0

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