

Table 1.CN. Cannon River Monitoring Station Information



Station Address: 14951 264th Street Path, Welch, MN 55089
County: Goodhue
Major Basin: Mississippi River Basin
Watershed: Cannon River
Drainage Area: 1,340 square miles

Station Operator: Dakota County Soil and Water Conservation District

Metropolitan Council Environmental Services Contact Information:

Contact Person: Leigh Harrod
Address: 2400 Childs Road
St Paul, MN 55106
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Watershed District or Watershed Management Organization:

North Cannon River Watershed Management Organization

Station Overview: MCES, with funding provided by the Minnesota Legislature via a grant from the Minnesota Pollution Control Agency (MPCA), has supported water quality monitoring of the Cannon River since 1999. The monitoring station is located near Welch, Minnesota, 11.9 miles upstream from the river confluence with the Mississippi River.

The Cannon River flows from headwater lakes (Tetonka and Sakatah) in LeSueur County through the following counties: LeSueur, Steele, Waseca, Rice, Dakota and Goodhue. Agriculture is the predominant land use in all of these counties. The Straight River is a major tributary of the Cannon River, with the confluence located in Rice County near Faribault, Minnesota.

MCES partners with the Dakota County Soil and Water Conservation District to operate the monitoring station. MCES also partners with the USGS to maintain the rating curve at this location. The USGS has been monitoring river flow at this location, station number 05355200, since 1909. The USGS has also intermittently collected water quality samples at this location since 1966. A rain gauge is present at this location for measurement of precipitation.

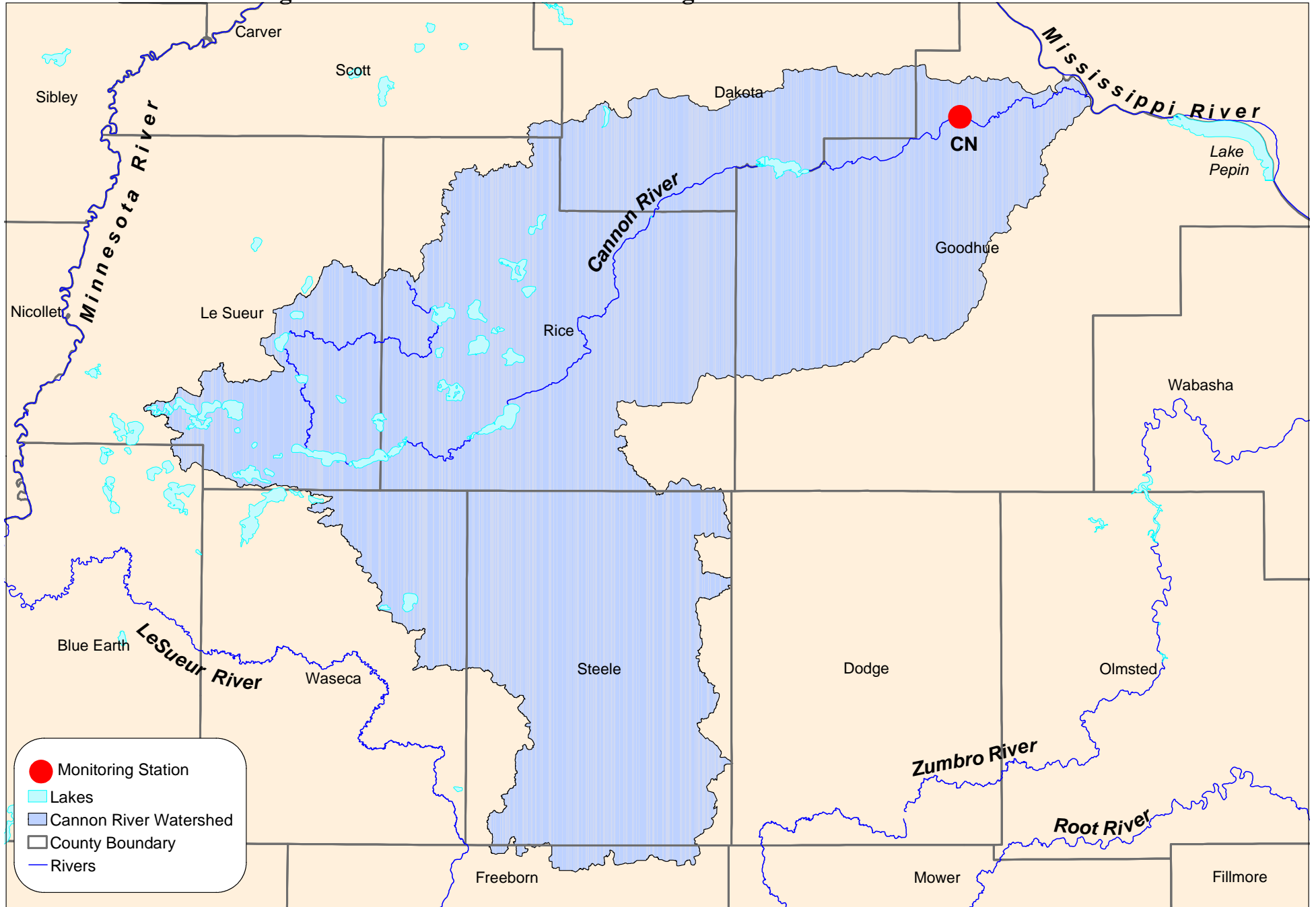
2003 Monitoring Year: Daily average flows were estimated prior to the ice out date, which occurred on approximately March 11, 2003. Snowmelt runoff in the watershed began in early March 2003, but the annual spring snowmelt event in mid-March was somewhat subdued, largely due to the lack of significant snow pack accumulation during the winter of 2002-2003. The peak daily average flow of 5,230 cfs occurred on May 13, 2003, following a 1.95-inch rain event on May 11. The Cannon River floods over its banks at a stage of 10.5 feet at this location, but this threshold was not exceeded during the 2003 monitoring year.

The spring snowmelt event in mid-March generated the highest total suspended solids (TSS) concentration (304 mg/l) and the highest total phosphorus (TP) concentration (0.91 mg/l) measured at this station in 2003.

Fourteen samples were collected for water chemistry analysis during 2003, including 1 composite sample and 13 grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow (“non-event”) grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The sampling scheme for 2003 did not meet the goals of the MCES monitoring work plan. The scarcity of composite samples can be attributed to a combination of factors, including a very mild spring snowmelt event; equipment failure due to power supply problems; and the onset of drought conditions during the last half of 2003. In addition, no baseflow grab samples were obtained during the February-May period. Necessary adjustments to the sampling scheme will be made prior to the 2004 monitoring year.

For additional stream monitoring information and monitoring methods regarding this site, see www.metrocouncil.org/environment/RiversLakes.

Figure 1.CN. Cannon River Monitoring Station Location and Watershed



0 2 4 8 Miles



Figure 2.CN. Cannon River 2003 Hydrograph, Precipitation and Sampling Information

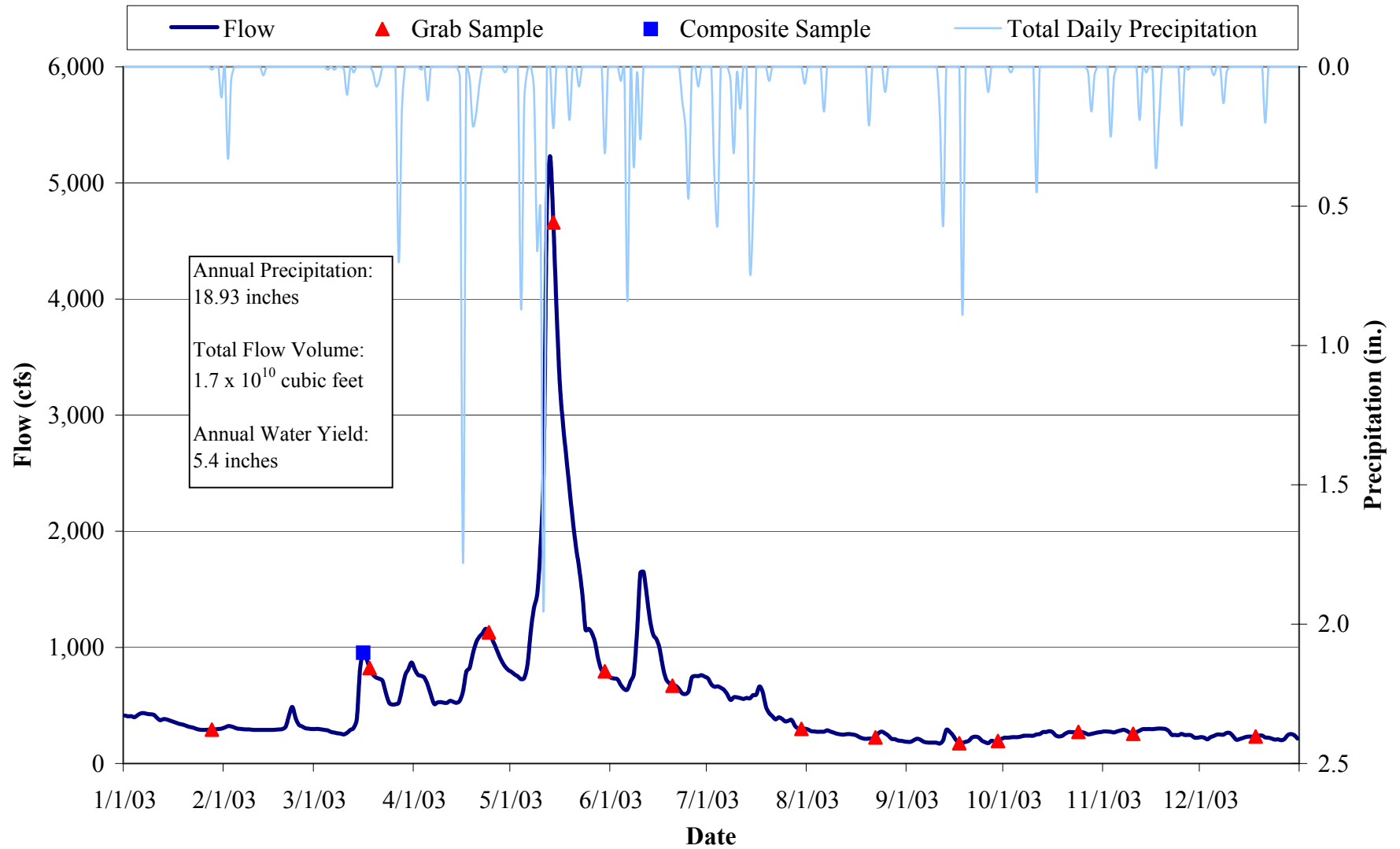


Table 2.CN. Cannon River 2003 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	12	34	37	20	44	27	42	9
Hardness, mg/L	12	283	289	230	326	257	307	31
Cadmium, ug/L	2	0.1	na	<0.1	0.1	na	na	na
Chromium, ug/L	2	0.4	na	0.4	0.4	na	na	na
Copper, ug/L	2	2.8	na	2.5	3.2	na	na	na
Lead, ug/L	2	0.1	na	0.1	0.1	na	na	na
Nickel, ug/L	2	3.7	na	3.5	3.9	na	na	na
Zinc, ug/L	2	4.9	na	4.3	5.5	na	na	na
Total Kjeldahl Nitrogen, mg/L	11	0.99	0.58	0.29	3.80	0.48	1.08	1.00
Total Nitrate Nitrogen, mg/L	12	4.22	3.76	2.10	9.17	3.09	4.62	1.95
Total Phosphorus, mg/L	11	0.22	0.14	0.08	0.92	0.12	0.20	0.24
Total Dissolved Phosphorus, mg/L	11	0.14	0.10	0.03	0.42	0.10	0.13	0.10
Total Suspended Solids, mg/L	12	42	6	1	304	3	30	86
Volatile Suspended Solids, mg/L	12	7	3	1	42	2	6	12
Turbidity, NTU	12	8	2	1	44	2	6	13

na: Data are insufficient to calculate these statistics.

N: Sample Count

25%, 75%: 25th and 75th Percentiles

STD: Standard Deviation

Table 3.CN. Cannon River 2003 Annual Loading Information* for Suspended Solids and Nutrients

Variable	Annual Load (tons)	Annual Yield (lbs/acre)	Annual Normalized Yield (lbs/acre/in of water)	Flow Weighted Mean Concentration (mg/L)
Total Suspended Solids	47,725	111	21	91
Total Phosphorus	166	0.39	0.07	0.31
Total Dissolved Phosphorus	74	0.17	0.03	0.14
Total Nitrate Nitrogen	2763	6.44	1.19	5.24

* 2003 Annual Loading Information is provisional and may be subject to minor revisions.

Figure 3.CN. Cannon River 2003 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

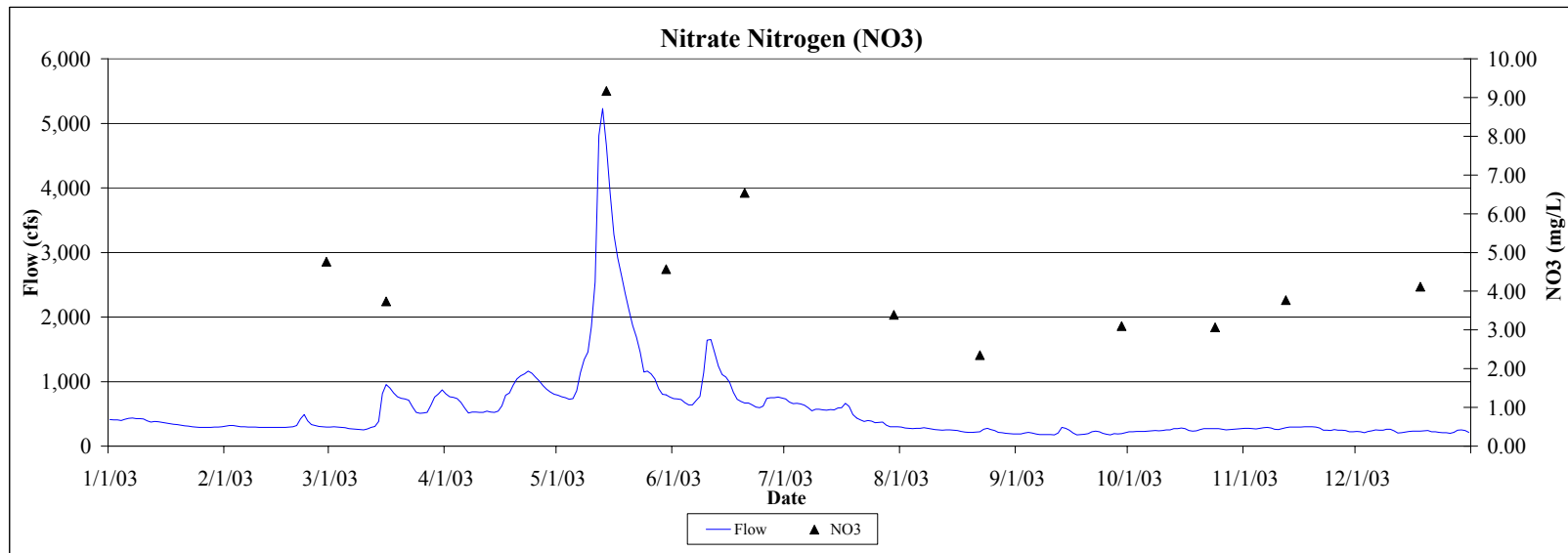
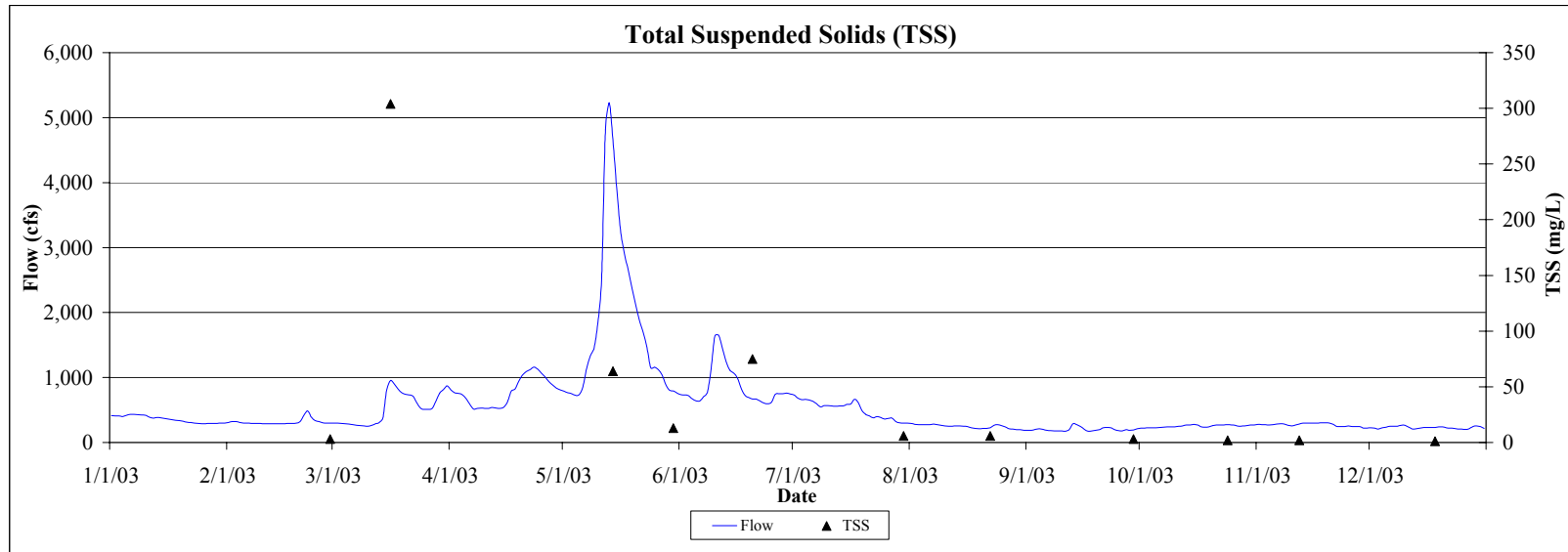


Figure 4.CN. Cannon River 2003 Hydrograph with Total and Dissolved Phosphorus Concentrations

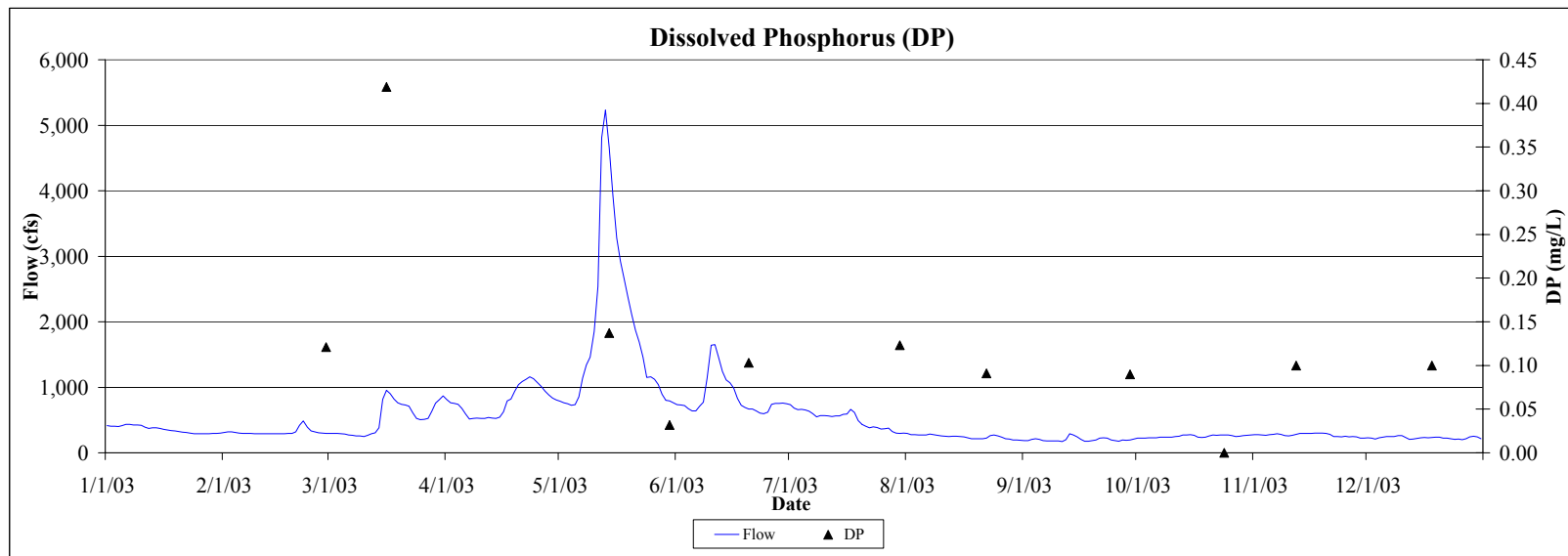
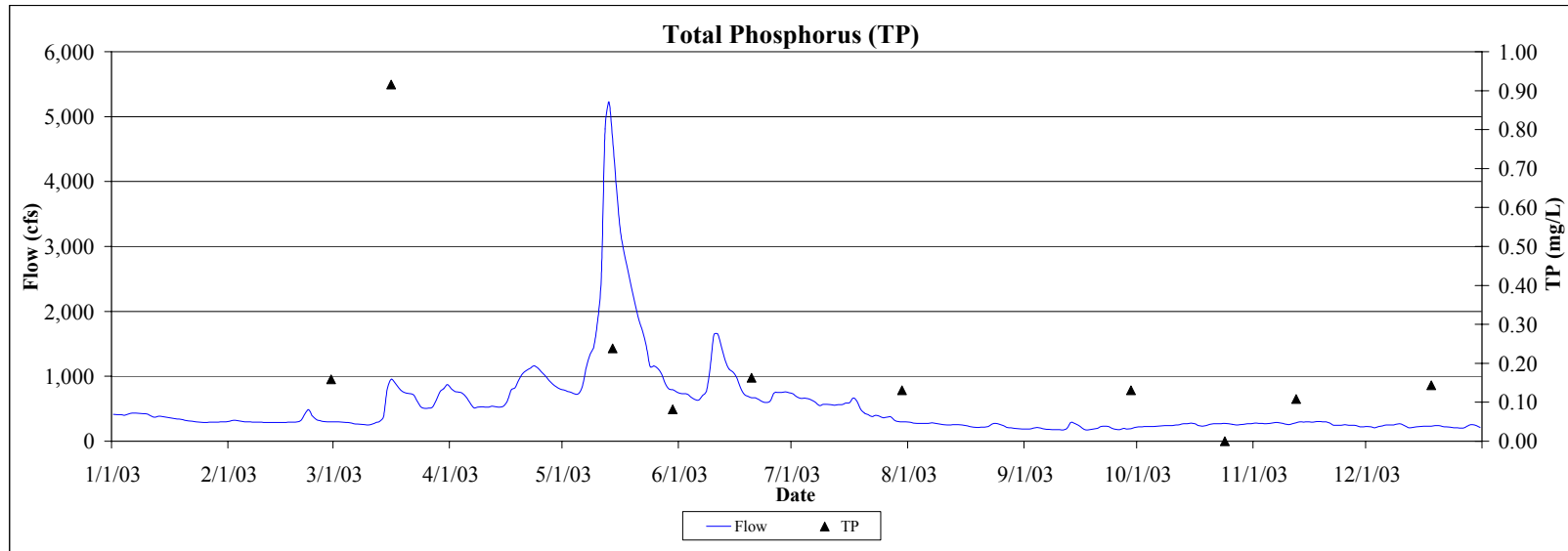


Table 4.CN. Cannon River: Comparison of 2001-2003 Hydrology and Water Chemistry

	2001*	2002*	2003
Hydrology			
Total Precipitation (inches)	13.53	22.19	18.93
Water Yield (inches)	12.2	8.0	5.4
Total Volume (cubic feet)	3.8×10^{10}	2.5×10^{10}	1.7×10^{10}
Annual Load (tons)			
Total Suspended Solids	193,000	90,500	47,700
Total Phosphorus	486	289	166
Total Dissolved Phosphorus	194	114	73.5
Total Nitrate Nitrogen	6,860	3,620	2,760
Annual Yield (lbs/acre)			
Total Suspended Solids	450	211	111
Total Phosphorus	1.13	0.67	0.39
Total Dissolved Phosphorus	0.45	0.27	0.17
Total Nitrate Nitrogen	16.0	8.44	6.44
Annual Normalized Yield (lbs/acre/inch of water)			
Total Suspended Solids	37	26	21
Total Phosphorus	0.09	0.08	0.07
Total Dissolved Phosphorus	0.04	0.03	0.03
Total Nitrate Nitrogen	1.31	1.06	1.19
Flow-Weighted Mean Concentration (mg/L)			
Total Suspended Solids	162	116	91
Total Phosphorus	0.41	0.37	0.31
Total Dissolved Phosphorus	0.16	0.15	0.14
Total Nitrate Nitrogen	5.77	4.63	5.24

* Note: Annual loads, yields, normalized yields, and flow-weighted mean concentrations have been revised.

Table 5.CN. Cannon River 2003 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 10/17/2003

Class	Order	Family	Common Name	Organism Count
Arthropoda	Amphipoda		Scuds	1
Gastropoda			Snails	1
Insecta	Coleoptera	Elmidae	Riffle Beetles	16
Insecta	Diptera	Tipulidae	Crane Flies	4
Insecta	Diptera	Chironomidae	Midges	1650
Insecta	Diptera	Simuliidae	Black Flies	12
Insecta	Ephemeroptera	Baetiscidae	Armored Mayflies	1
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	53
Insecta	Ephemeroptera	Heptageniidae	Flatheaded Mayflies	4
Insecta	Ephemeroptera	Caenidae	Small Squaregills	1
Insecta	Hemiptera	Belostomatidae	Giant Water Bugs	1
Insecta	Plecoptera		Stoneflies	2
Insecta	Trichoptera	Hydropsychidae	Common Net-spinners	77
Pelecypoda			Clams and Mussels	2
Turbellaria	Tricladida	Planariidae	Planarians	7

Macroinvertebrate Taxa Metrics

Total Taxa	15
EPT Taxa	6
% EPT Taxa	40
Diptera Taxa	3
% Diptera Taxa	20
Mean Tolerance Value	5.1

Macroinvertebrate Organism Metrics

Total Individuals	1832
EPT Individuals	138
% EPT Individuals	8
Diptera Individuals	1666
% Diptera Individuals	91
Chironomidae Individuals	1650
% Chironomidae Individuals	90

Water Quality

Degree of Organic Pollution

Family-Level Biotic Index	5.8	Fair	Fairly Significant Organic Pollution
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