

**Table 1.BU. Blue Earth River Monitoring Station Information**



**Station Address:** County Road 9 near the Rapidan Dam, Rapidan, MN 56079  
**County:** Blue Earth  
**Major Basin:** Minnesota River Basin  
**Watershed:** Blue Earth River  
**Drainage Area:** 1,550 square miles

**Station Operators:** Metropolitan Council Environmental Services  
Minnesota Department of Agriculture (MDA)

**Metropolitan Council Environmental Services Contact Information:**

**Contact Person:** Heather Offerman  
**Address:** Water Resources Center  
Minnesota State University, Mankato  
184 Trafton Science Center South  
Mankato, MN 56001  
**Phone:** 507-344-0145  
**E-mail:** [heather.offerman@metc.state.mn.us](mailto:heather.offerman@metc.state.mn.us)

**Station Overview:** MCES, with funding provided by the Minnesota Legislature via a grant from the Minnesota Pollution Control Agency (MPCA), has conducted water quality monitoring of the Blue Earth River since 1999. The monitoring station is located near Rapidan, Minnesota, 12 miles upstream from the river confluence with the Minnesota River. This location presents a unique challenge for monitoring because the station is situated just downstream from the Rapidan Dam, an operating hydroelectric dam. The Blue Earth River originates in Iowa and flows north-northeast through a region of gently rolling ground moraines. The Watonwan River, a major tributary, joins the

Blue Earth River just upstream from the reservoir created by the Rapidan Dam. As such, the Blue Earth River station monitors any impacts of the Watonwan River on Blue Earth River flow and water quality.

MCES and MDA cooperatively operate this monitoring station, but partner with the USGS, which maintains the rating curve at this location. USGS has been monitoring river flow at this location, station number 05320000, since 1909. USGS has also intermittently collected water quality samples at this station, in 1960-1967, 1969, and 2000. A rain gauge at this monitoring station collects rainfall data during the April-December period.

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

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

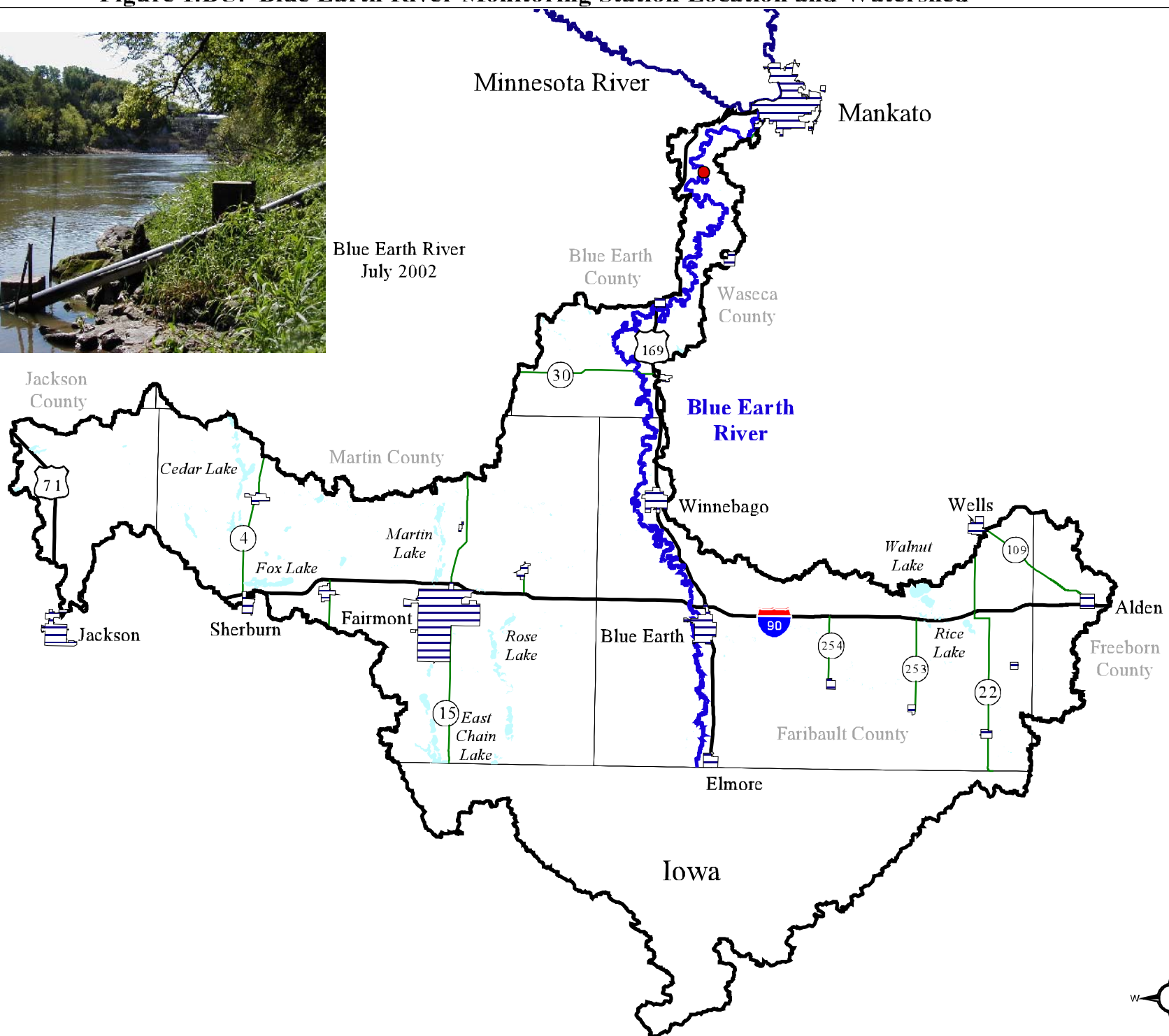
Twenty-six samples were collected for water quality analysis during 2003, including 13 composite samples and 13 grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow (“non-event”) grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open-water season (March-November). The 2003 sampling scheme met the goals of the MCES monitoring work plan.

**For additional stream monitoring information and monitoring methods regarding this site, see [www.metrocouncil.org/environment/RiversLakes](http://www.metrocouncil.org/environment/RiversLakes).**

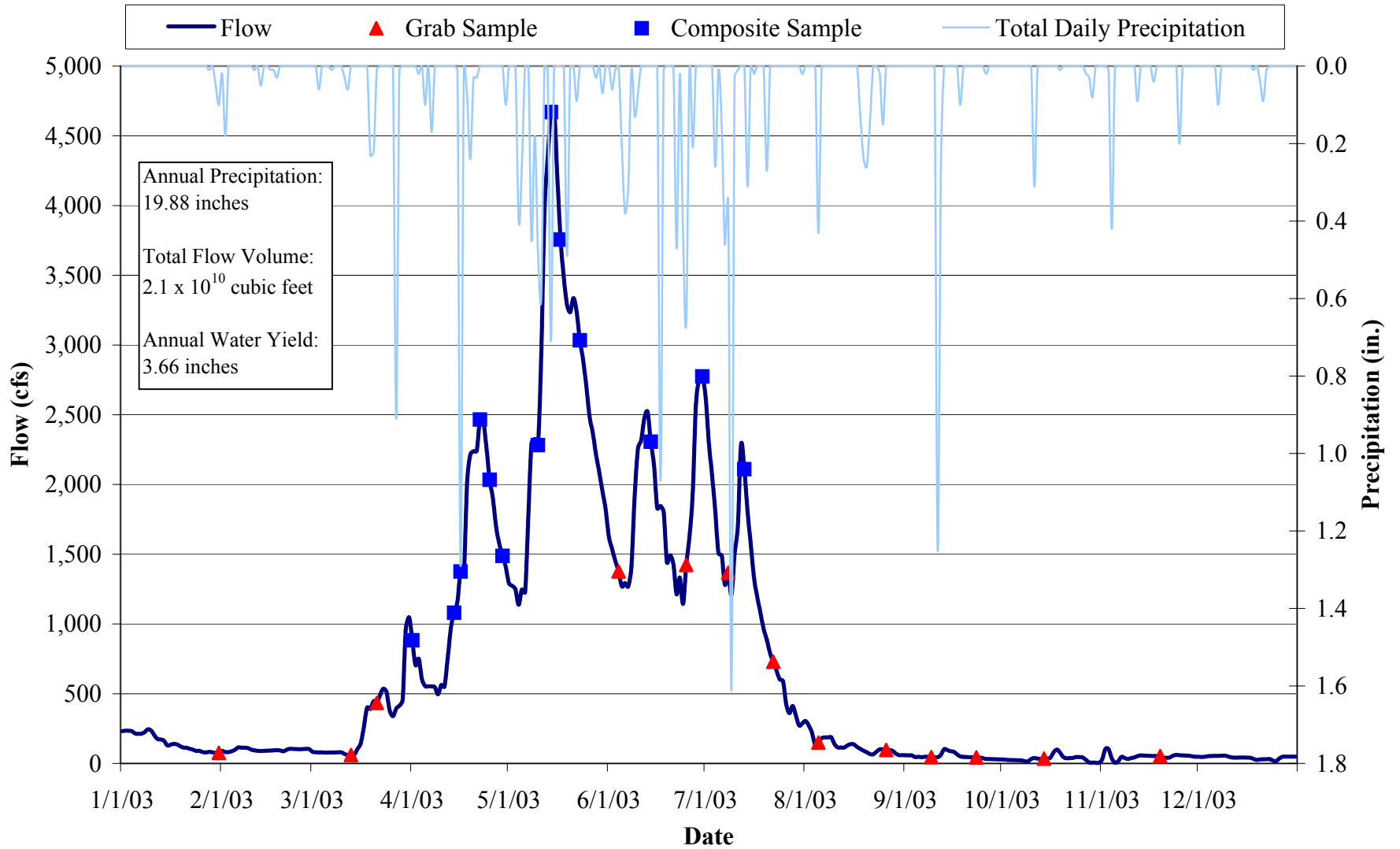
Figure 1.B.U. Blue Earth River Monitoring Station Location and Watershed



Blue Earth River  
July 2002



**Figure 2.BU. Blue Earth River 2003 Hydrograph, Precipitation and Sampling Information**



**Table 2.BU. Blue Earth River 2003 Water Chemistry Information**

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	25	34	28	22	65	27	40	11
Hardness, mg/L	7	324	314	248	436	250	404	75
Cadmium, ug/L	8	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Chromium, ug/L	8	0.8	0.6	0.1	1.8	0.3	1.1	0.6
Copper, ug/L	8	2.9	3.1	1.7	3.4	2.6	3.4	0.6
Lead, ug/L	8	0.7	0.9	<0.1	1.3	0.1	1.2	0.5
Nickel, ug/L	8	4.8	4.7	4.1	5.8	4.4	5.2	0.6
Zinc, ug/L	8	3.6	3.9	1.6	6.5	1.8	5.0	1.8
Nitrogen, Total Kjeldahl, mg/L	27	1.13	1.10	0.54	2.00	0.90	1.30	0.31
Nitrogen, Total Nitrate, mg/L	27	9.11	11.40	0.24	15.70	1.74	13.90	5.67
Phosphorus, Total, mg/L	27	0.19	0.16	0.10	0.55	0.13	0.21	0.09
Phosphorus, Total Dissolved, mg/L	27	0.05	0.05	0.01	0.13	0.02	0.08	0.03
Solids, Total Suspended, mg/L	27	86	61	1	488	40	101	96
Solids, Volatile Suspended, mg/L	27	13	12	1	44	8	16	9
Turbidity, NTU	26	24	21	3	110	12	25	22
Transparency Tube, cm	22	23	18	5	60	12	24	17

N: Sample Count

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

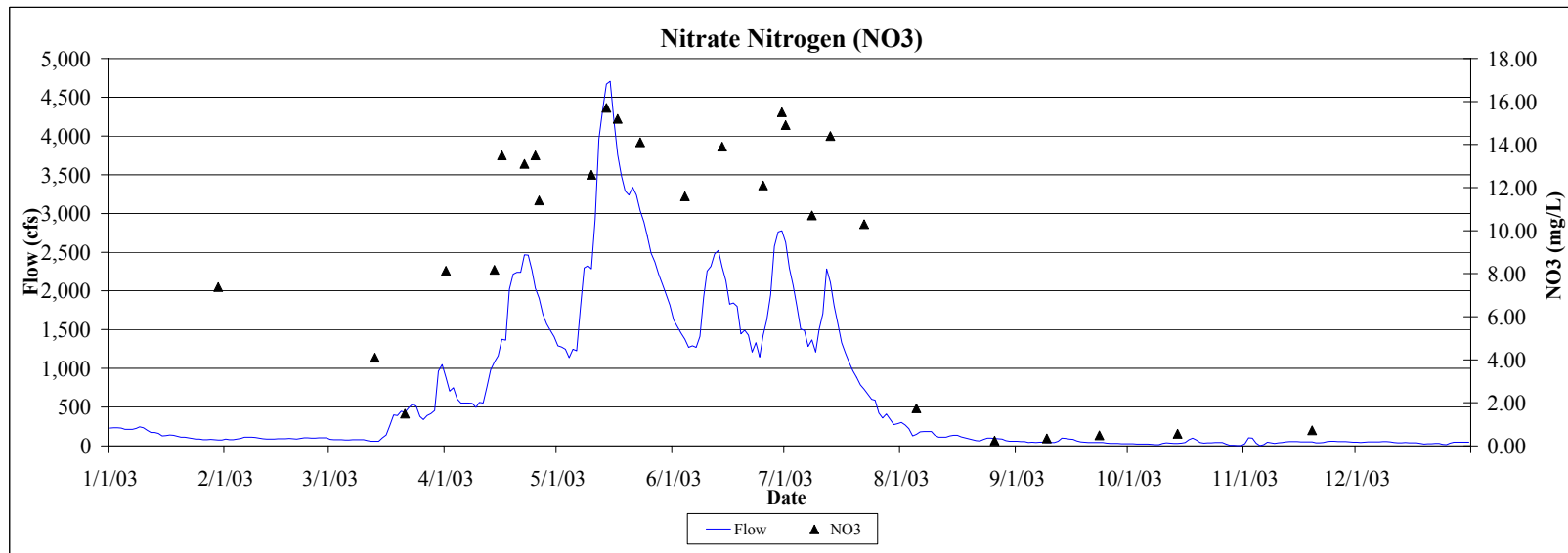
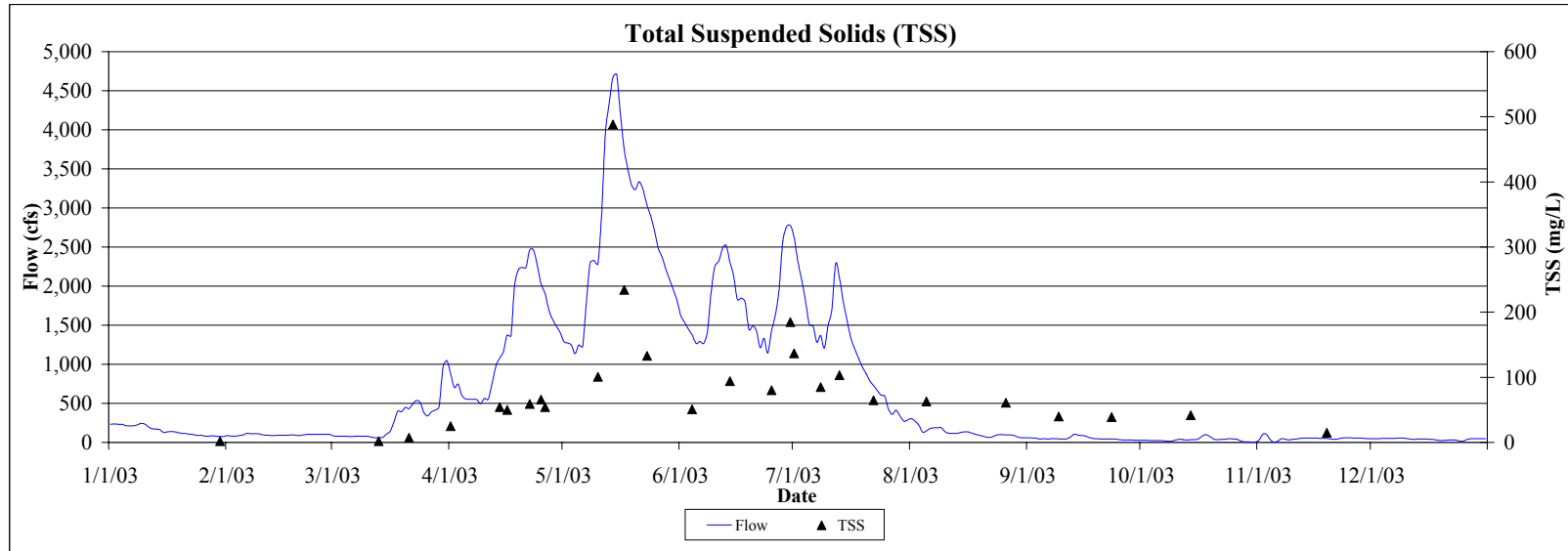
STD: Standard Deviation

**Table 3.BU. Blue Earth River 2003 Annual Loading Information\* for Suspended Solids and Nutrients**

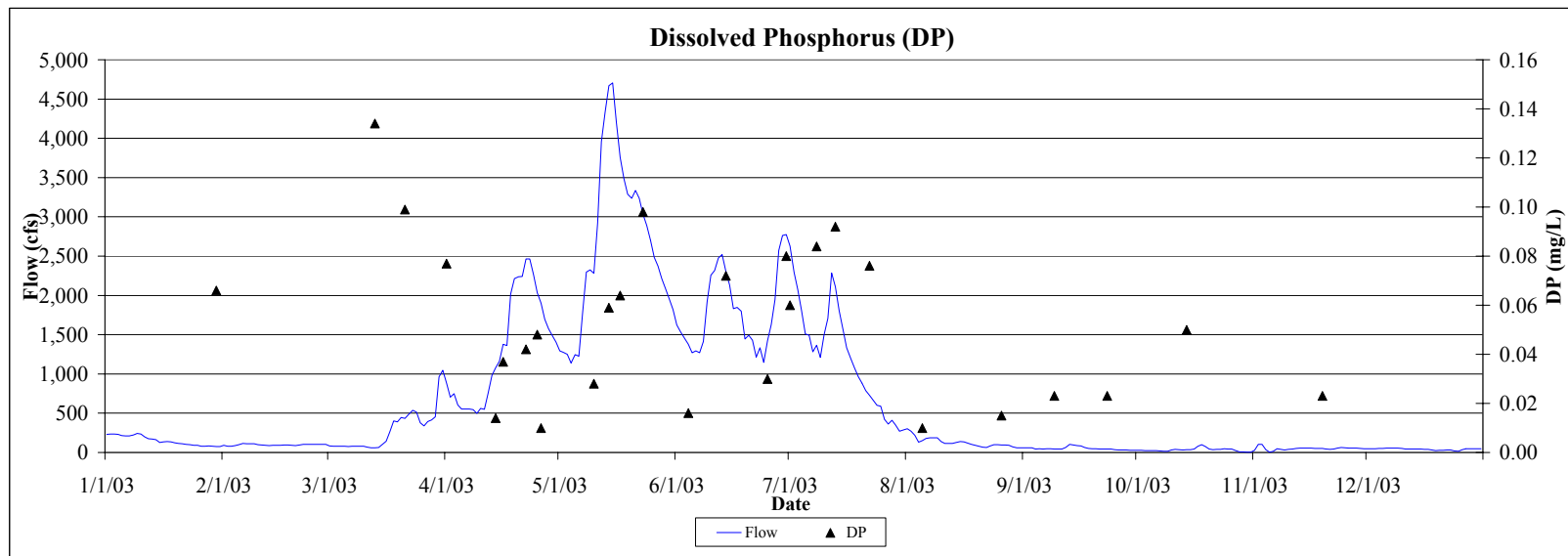
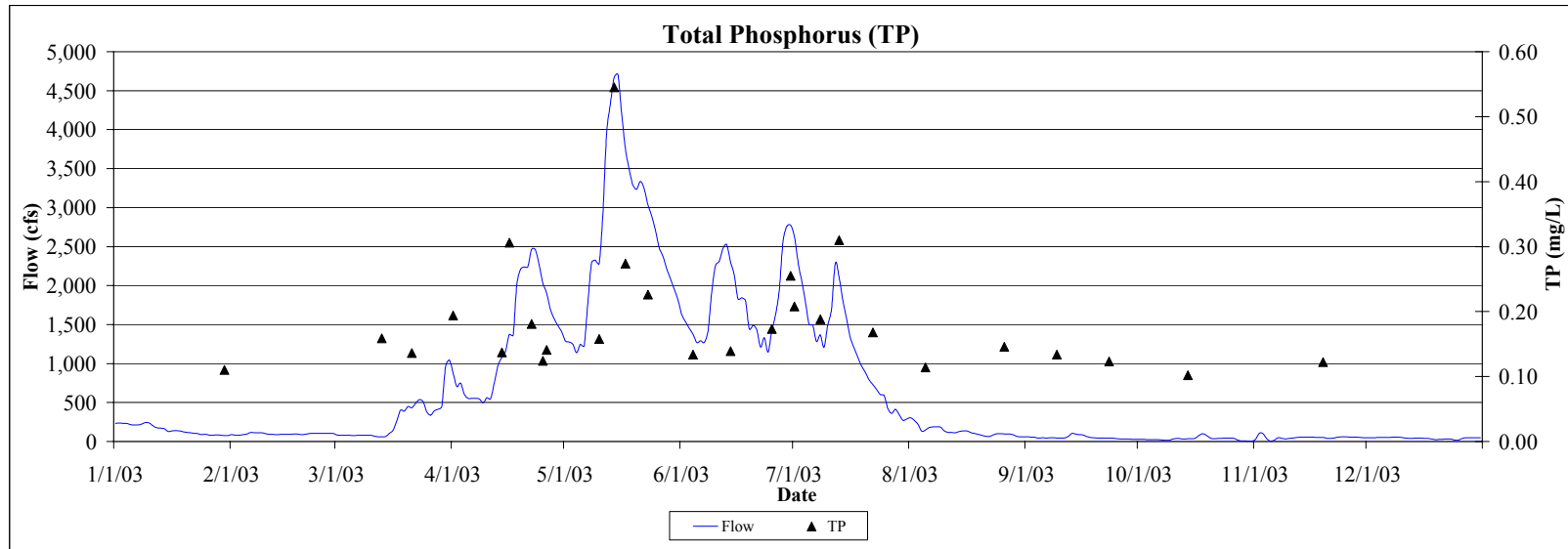
Variable	Annual Load (tons)	Annual Yield (lbs/acre)	Annual Normalized Yield (lbs/acre/in of water)	Flow Weighted Mean Concentration (mg/L)
Solids, Total Suspended	74,500	96	26	115
Phosphorus, Total	138	0.18	0.05	0.21
Phosphorus, Total Dissolved	36.5	0.05	0.01	0.06
Nitrogen, Total Nitrate+Total Nitrite	7,520	9.67	2.64	11.6

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

**Figure 3.BU. Blue Earth River 2003 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations**



**Figure 4.BU. Blue Earth River 2003 Hydrograph with Total and Dissolved Phosphorus Concentrations**



**Table 4.BU. Blue Earth River: Comparison of 2001-2003 Hydrology and Water Chemistry**

	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>Hydrology</b>			
<b>Total Precipitation (inches)</b>	26.13	21.94	19.88
<b>Water Yield (inches)</b>	12.4	3.6	3.7
<b>Total Volume (cubic feet)</b>	$7.0 \times 10^{10}$	$2.0 \times 10^{10}$	$2.1 \times 10^{10}$
<b>Annual Load (tons)</b>			
<b>Total Suspended Solids</b>	449,000	49,600	74,500
<b>Total Phosphorus</b>	1,000	133	138
<b>Total Dissolved Phosphorus</b>	395	53.3	36.5
<b>Total Nitrate + Nitrite Nitrogen</b>	20,300	5,300	7,520
<b>Annual Yield (lbs/acre)</b>			
<b>Total Suspended Solids</b>	577	64	96
<b>Total Phosphorus</b>	1.29	0.17	0.18
<b>Total Dissolved Phosphorus</b>	0.51	0.07	0.05
<b>Total Nitrate + Nitrite Nitrogen</b>	26.1	6.82	9.67
<b>Annual Normalized Yield (lbs/acre/inch of water)</b>			
<b>Total Suspended Solids</b>	47	18	26
<b>Total Phosphorus</b>	0.10	0.05	0.05
<b>Total Dissolved Phosphorus</b>	0.04	0.02	0.01
<b>Total Nitrate + Nitrite Nitrogen</b>	2.11	1.91	2.64
<b>Flow-Weighted Mean Concentration (mg/L)</b>			
<b>Total Suspended Solids</b>	206	79	115
<b>Total Phosphorus</b>	0.46	0.21	0.21
<b>Total Dissolved Phosphorus</b>	0.18	0.08	0.06
<b>Total Nitrate + Nitrite Nitrogen</b>	9.48	8.42	11.6

**Table 5.BU. Blue Earth River 2003 Macroinvertebrate Monitoring Results and Metrics**

**Monitoring Date 10/14/2003**

<b>Class</b>	<b>Order</b>	<b>Family</b>	<b>Common Name</b>	<b>Organism Count</b>
Hirudinea			Leeches	2
Insecta	Coleoptera	Elmidae	Riffle Beetles	2
Insecta	Diptera	Chironomidae	Midges	65
Insecta	Diptera	Simuliidae	Black Flies	740
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	88
Insecta	Ephemeroptera	Caenidae	Small Squaregills	5
Insecta	Ephemeroptera	Heptageniidae	Flatheaded Mayflies	5
Insecta	Hemiptera	Corixidae	Water Boatman	17
Insecta	Lepidoptera	Pyralidae	Aquatic Moths	1
Insecta	Plecoptera	Perlidae	Comon Stoneflies	1
Insecta	Plecoptera		Stoneflies	55
Insecta	Trichoptera	Hydropsychidae	Common Netspinners	620
Pelecypoda			Clams and Mussels	26

**Macroinvertebrate Taxa Metrics**

Total Taxa	13
EPT Taxa	6
% EPT Taxa	46
Diptera Taxa	2
% Diptera Taxa	15
Mean Tolerance Value	5.3

**Macroinvertebrate Organism Metrics**

Total Individuals	1627
EPT Individuals	774
% EPT Individuals	48
Diptera Individuals	805
% Diptera Individuals	49
Chironomidae Individuals	65
% Chironomidae Individuals	4

**Water Quality**

**Degree of Organic Pollution**

<b>Family-Level Biotic Index</b>	5.1	Good	Some Organic Pollution
----------------------------------	-----	------	------------------------