

Table 1.EA. Eagle Creek Monitoring Station Information



Station Address: 8451 West 126th Street, Savage, MN 55378
County: Scott
Major Basin: Minnesota River Basin
Watershed: Sub-watershed of the Lower Minnesota River Watershed
Drainage Area: 3.4 square miles

Station Operator: Lower Minnesota River Watershed District /
Scott County Soil and Water Conservation District

Metropolitan Council Environmental Services Contact Information:

Contact Person: Leigh Harrod, P.G.
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Watershed District or Watershed Management Organization:

Lower Minnesota Watershed District

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 Eagle Creek since 1999. The monitoring station is located in Savage, Minnesota, 0.8 mile upstream from the creek confluence with the Minnesota River. Eagle Creek is designated as a Class 2A trout stream by the Minnesota Department of Natural Resources (MDNR). The stream headwaters is Boiling Springs, an artesian spring located approximately one mile upstream from the monitoring station.

The bedrock source of Boiling Springs is the Prairie Du Chien aquifer. Since the flow in Eagle Creek is largely attributable to continuous discharge from this limestone formation, the term “water yield” (flow volume / watershed area / time) does not apply well for this small subwatershed. Very little of the discharge in Eagle Creek is attributable to runoff generated within the sub-watershed area itself.

During the winter months, the temperature of the groundwater discharge is significantly warmer than atmospheric temperatures. Therefore, unlike many small streams in the Minnesota River Basin, Eagle Creek remains open and ice-free during the winter.

MCES partners with the Lower Minnesota River Watershed District to operate the monitoring station. MCES maintains the rating curve at this location by building upon a rating table developed by the MDNR in 2000. High flow events, although extremely rare, can cause the creek to breach a flow control structure. A Mannings equation estimate for high flows was developed in 2003 and incorporated into the rating curve.

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

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

Twenty-one samples were collected for water chemistry analysis during 2003, including 8 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). In 2003, baseflow conditions were well characterized by monthly grab samples. However, several runoff events during the late March to mid-April period were not characterized by composite samples. A limited number of composite samples were obtained during the last half of 2003 due to drought conditions.

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

Figure 1.EA. Eagle Creek Monitoring Station Location and Watershed Characteristics

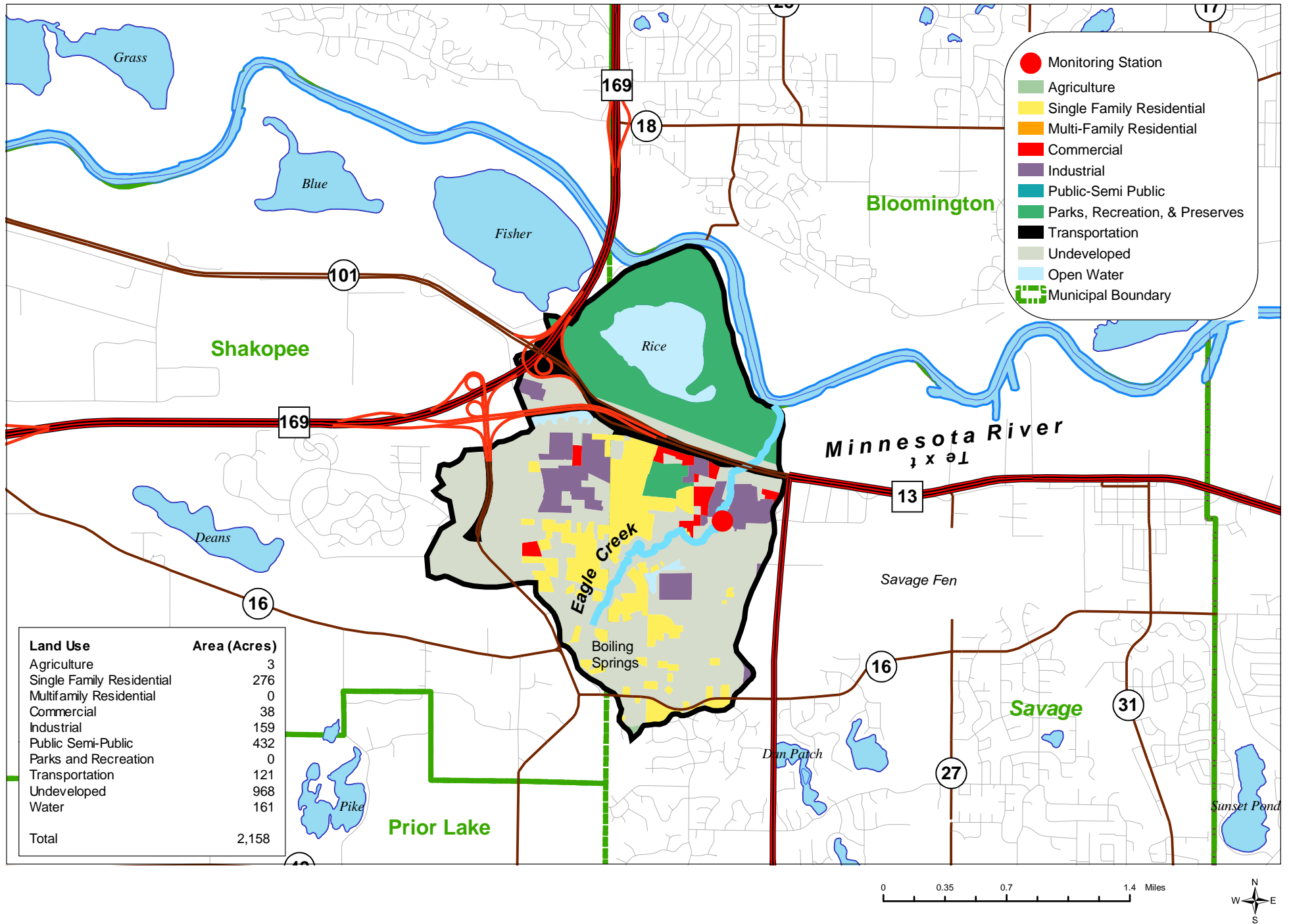


Figure 2.EA. Eagle Creek 2003 Hydrograph, Precipitation and Sampling Information

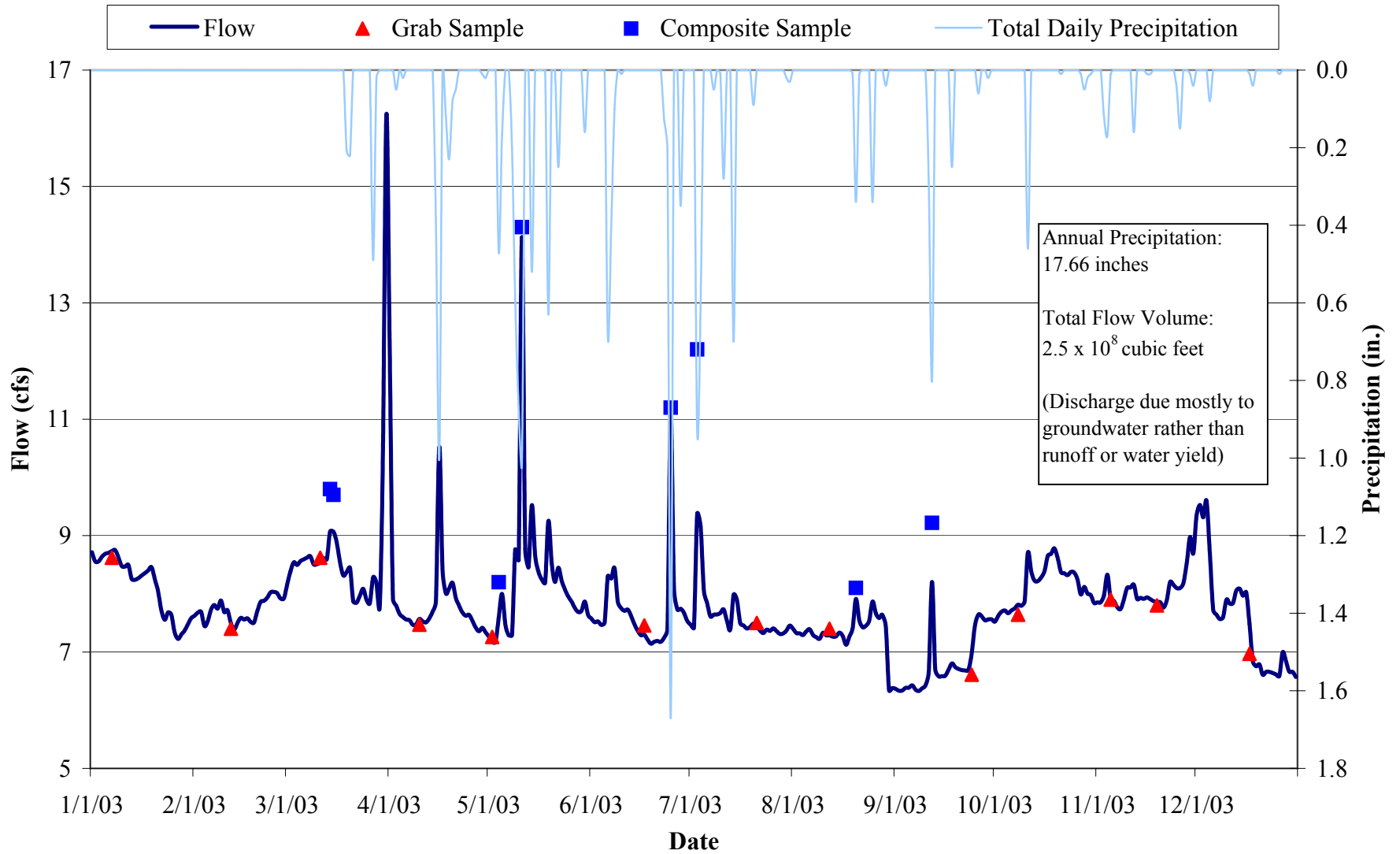


Table 2.EA. Eagle Creek 2003 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	22	18	18	15	21	17	19	2
Hardness, mg/L	22	270	273	226	292	261	286	18
Cadmium, ug/L	7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
Chromium, ug/L	7	0.4	0.2	0.2	1.1	0.2	0.5	0.3
Copper, ug/L	7	1.5	1.7	0.7	2.3	0.9	2.0	0.7
Lead, ug/L	7	0.4	0.2	0.1	1.5	0.1	0.6	0.5
Nickel, ug/L	7	3.0	2.5	2.1	5.6	2.3	3.2	1.2
Zinc, ug/L	7	4.1	3.4	2.4	9.1	2.7	4.4	2.3
Total Kjeldahl Nitrogen, mg/L	22	0.31	0.28	0.06	0.74	0.17	0.42	0.18
Total Nitrate Nitrogen, mg/L	22	0.26	0.17	0.05	0.75	0.10	0.35	0.21
Total Phosphorus, mg/L	22	0.08	0.06	0.01	0.35	0.04	0.08	0.08
Total Dissolved Phosphorus, mg/L	19	0.02	0.01	0.01	0.06	0.01	0.02	0.01
Total Suspended Solids, mg/L	20	19	8	2	92	5	31	22
Volatile Suspended Solids, mg/L	20	6	3	1	29	2	7	7
Turbidity, NTU	20	6	4	3	28	3	7	6

N: Sample Count

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

STD: Standard Deviation

Table 3.EA. Eagle Creek 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	95	87	3	12
Total Phosphorus	0.36	0.33	0.01	0.05
Total Dissolved Phosphorus	0.13	0.12	<0.01	0.02
Total Nitrate Nitrogen	1.74	1.60	0.05	0.23

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

Figure 3.EA. Eagle Creek 2003 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

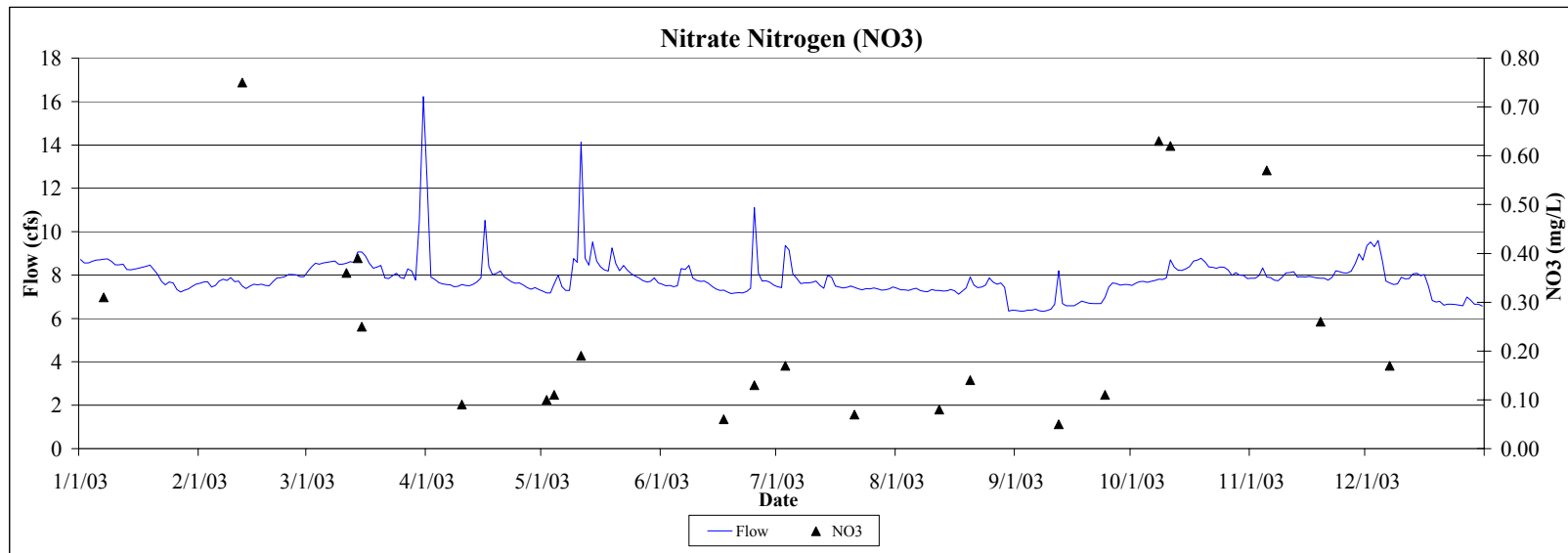
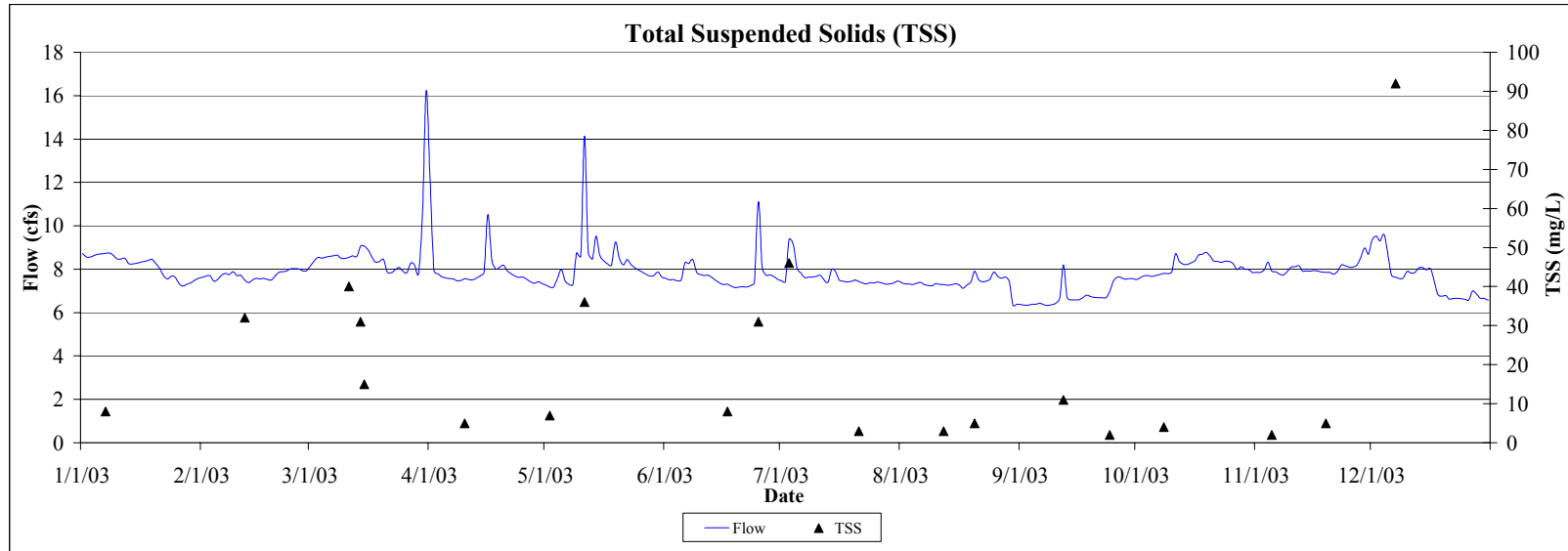


Figure 4.EA. Eagle Creek 2003 Hydrograph with Total and Dissolved Phosphorus Concentrations

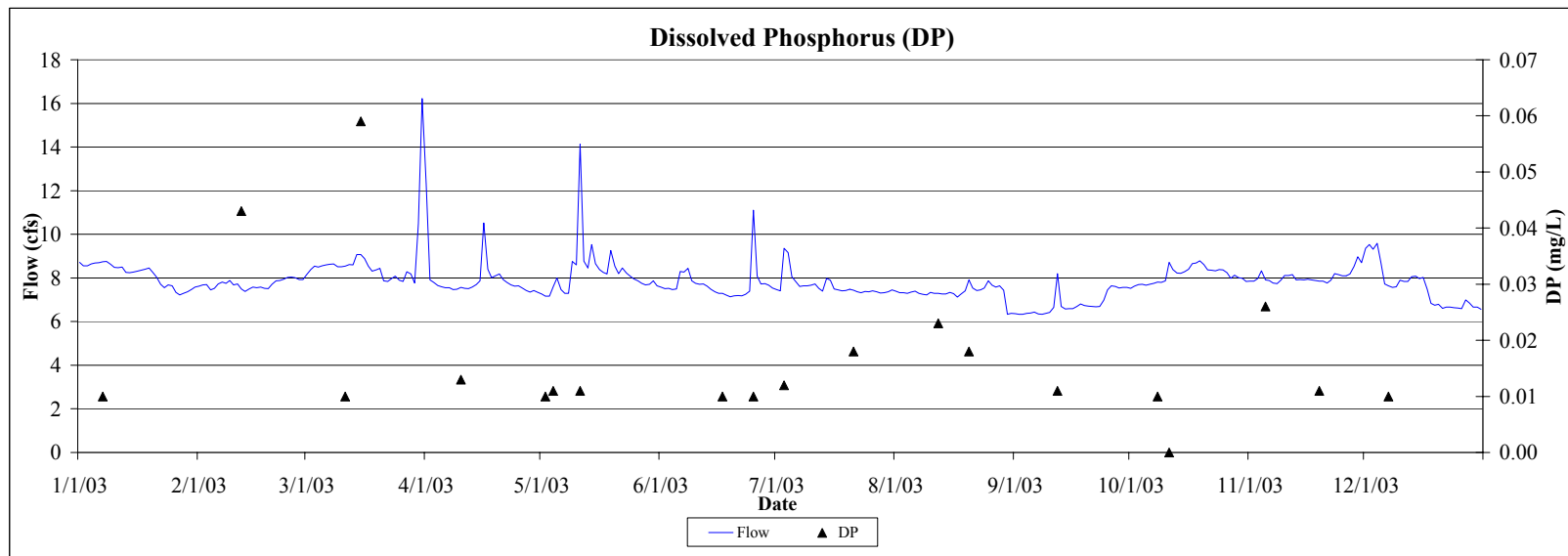
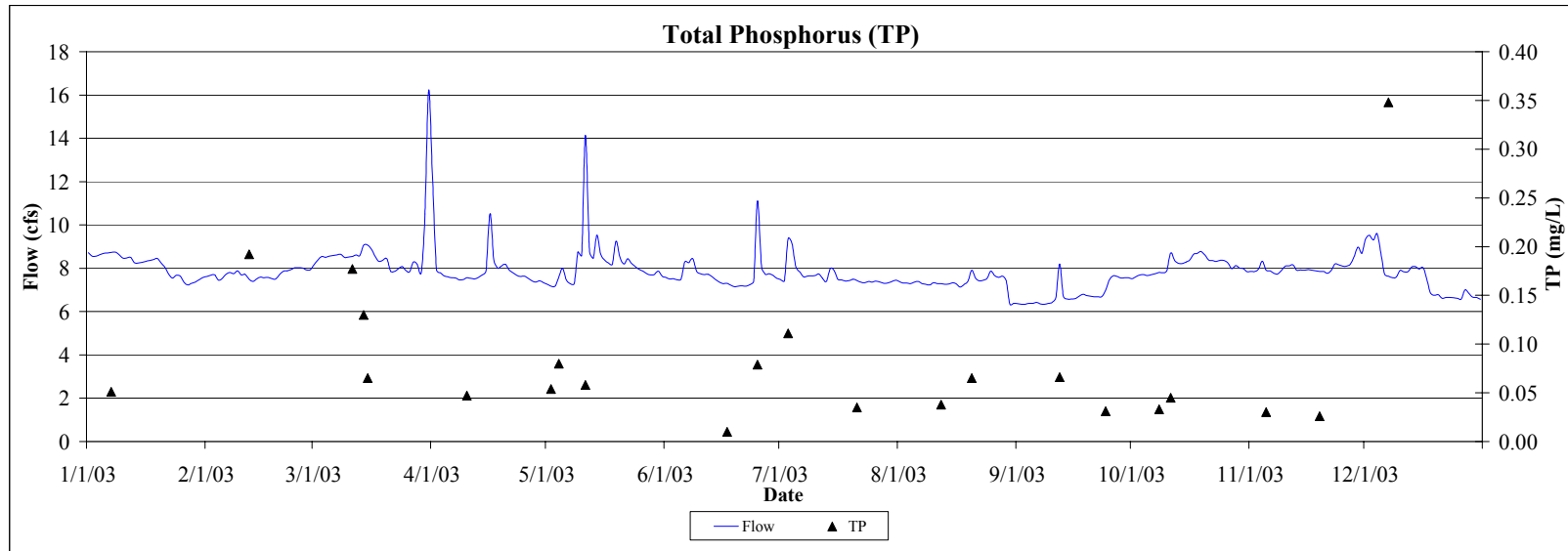


Table 4.EA. Eagle Creek: Comparison of 2001-2003 Hydrology and Water Chemistry

	2001*	2002*	2003
Hydrology			
Total Precipitation (inches)	25.83	32.38	17.66
Water Yield (inches)	39.2	43.0	31.6
Total Volume (cubic feet)	3.1 x 10 ⁸	3.4 x 10 ⁸	2.5 x 10 ⁸
Annual Load (tons)			
Total Suspended Solids	121	123	95
Total Phosphorus	0.51	0.62	0.36
Total Dissolved Phosphorus	0.14	0.20	0.13
Total Nitrate Nitrogen	2.18	2.40	1.74
Annual Yield (lbs/acre)			
Total Suspended Solids	111	113	87
Total Phosphorus	0.47	0.57	0.33
Total Dissolved Phosphorus	0.13	0.18	0.12
Total Nitrate Nitrogen	2.00	2.21	1.60
Annual Normalized Yield (lbs/acre/inch of water)			
Total Suspended Solids	3	3	3
Total Phosphorus	0.01	0.01	0.01
Total Dissolved Phosphorus	<0.01	<0.01	<0.01
Total Nitrate Nitrogen	0.05	0.05	0.05
Flow-Weighted Mean Concentration (mg/L)			
Total Suspended Solids	12	12	12
Total Phosphorus	0.05	0.06	0.05
Total Dissolved Phosphorus	0.02	0.02	0.02
Total Nitrate Nitrogen	0.23	0.23	0.23

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

Table 5.EA. Eagle Creek 2003 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 10/8/2003

Class	Order	Family	Common Name	Organism Count
Arthropoda	Amphipoda		Scuds	15
Arthropoda	Isopoda		Sowbugs	2
Gastropoda			Snails	3
Insecta	Coleoptera	Elmidae	Riffle Beetles	1
Insecta	Diptera	Chironomidae	Midges	3
Insecta	Diptera	Simuliidae	Black Flies	5
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	200
Insecta	Trichoptera	Brachycentridae	Humpless Case Makers	185
Insecta	Trichoptera	Hydropsychidae	Common Netspinners	1
Insecta	Trichoptera	Limnephilidae	Northern Case Makers	5

Macroinvertebrate Taxa Metrics

Total Taxa	10
EPT Taxa	4
% EPT Taxa	40
Diptera Taxa	2
% Diptera Taxa	20
Mean Tolerance Value	5.0

Macroinvertebrate Organism Metrics

Total Individuals	420
EPT Individuals	391
% EPT Individuals	93
Diptera Individuals	8
% Diptera Individuals	2
Chironomidae Individuals	3
% Chironomidae Individuals	1

Water Quality

Degree of Organic Pollution

Family-Level Biotic Index	2.8	Excellent	No Apparent Organic Pollution
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