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

Metropolitan Council Environmental Services Contact Information:

Contact Person: Leigh Harrod, P.G.
Address: 2400 Childs Road
St Paul, MN 55106
Phone: 651-602-8085
E-mail: leigh.harrod@metc.state.mn.us

Watershed District or Watershed Management Organization:
Lower Minnesota River 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 a Minnesota Department of Natural Resources (MDNR) designated trout stream. The stream headwater is Boiling Springs, an artesian spring located approximately one mile upstream from the monitoring station. The bedrock

source of the spring 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 flow 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 most small streams in the Minnesota River Basin, Eagle Creek does not freeze or form ice during the winter.

MCES maintains the rating curve at this location by building upon a rating table developed by the MDNR in 2000. A rain gauge is present at this location for measurement of precipitation.

2002 Monitoring Year: Stage in Eagle Creek rose steadily over the course of the year, influenced in large part by an increase in discharge from the Prairie Du Chien aquifer at Boiling Springs. The peak daily average flow of 22 cfs, with a stage of 1.62 feet, occurred on September 6, 2002.

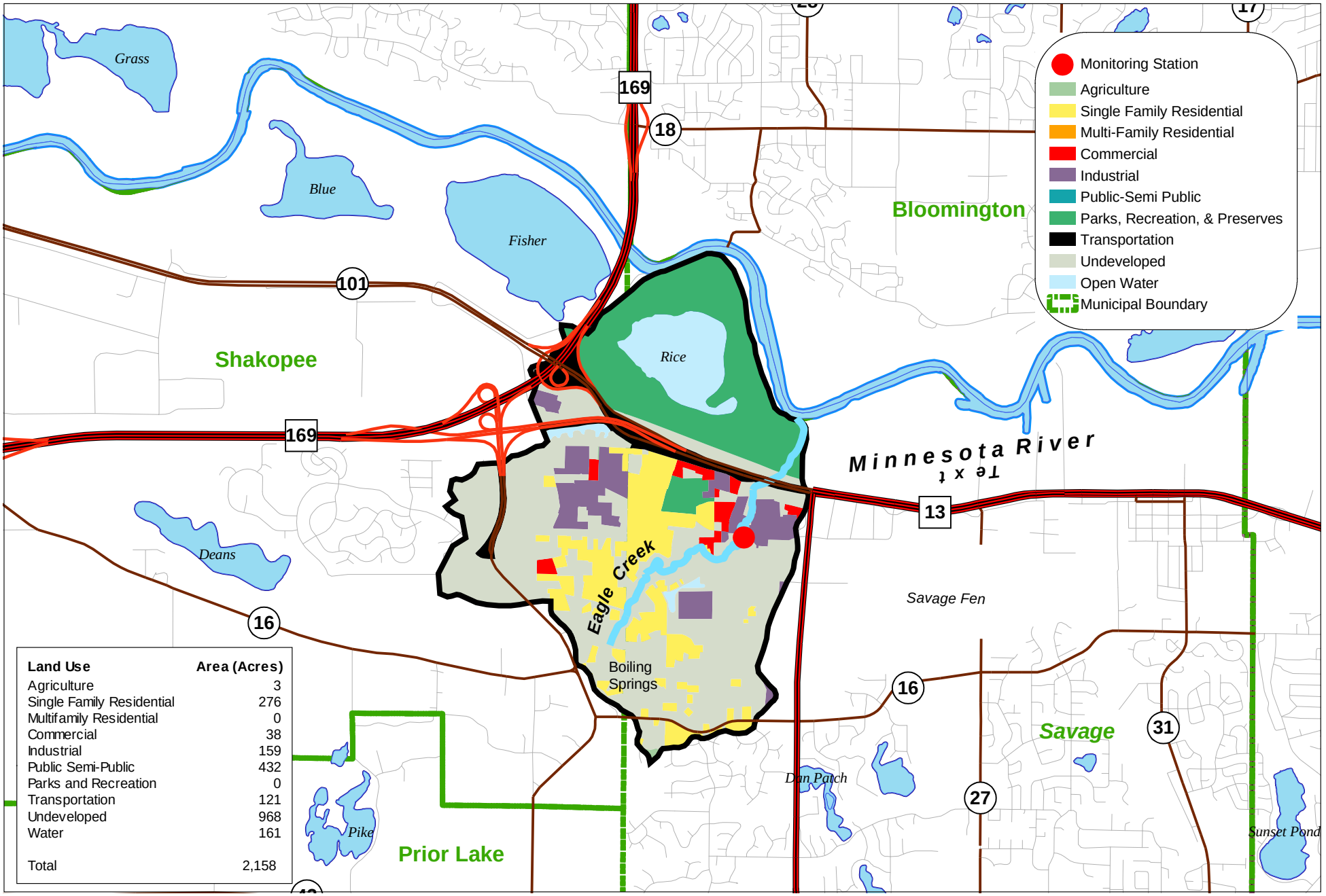
Precipitation was recorded on 103 days at this location in 2002. The highest daily rainfall total was 2.24 inches on August 3, 2002. Runoff event-based composite sampling began in early April 2002 and continued through early September.

The 2002 total suspended solids (TSS) load carried by Eagle Creek (153 tons) was substantially higher than the 2001 TSS load (38 tons). While part of the increased TSS load may be related to non-point runoff or overland flow during a wet summer, a portion of the increase may also be a function of the energy associated with the upwelling action at Boiling Springs. Boiling Spring's artesian discharge is characterized by intermittent pressure surges and upwelling rather than by a steady drainage flow that occurs at a constant rate. The upwelling action constantly re-suspends unconsolidated sediments in a pond at the mouth of the spring. Under low energy conditions, much of the re-suspended material is re-deposited within the pond itself. However, with a large increase in aquifer recharge and yield, as occurred in 2002, the increased energy associated with stronger upwelling could transport more sediment out of the pond and into the main channel of Eagle Creek.

Twenty-one samples were collected for water quality analysis during 2002, including 10 composite samples and 11 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). Except for the omission of a baseflow grab sample in March 2002, the 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.

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



Land Use	Area (Acres)
Agriculture	3
Single Family Residential	276
Multifamily Residential	0
Commercial	38
Industrial	159
Public Semi-Public	432
Parks and Recreation	0
Transportation	121
Undeveloped	968
Water	161
Total	2,158

Figure 2.EA. Eagle Creek 2002 Hydrograph, Precipitation and Sampling Information

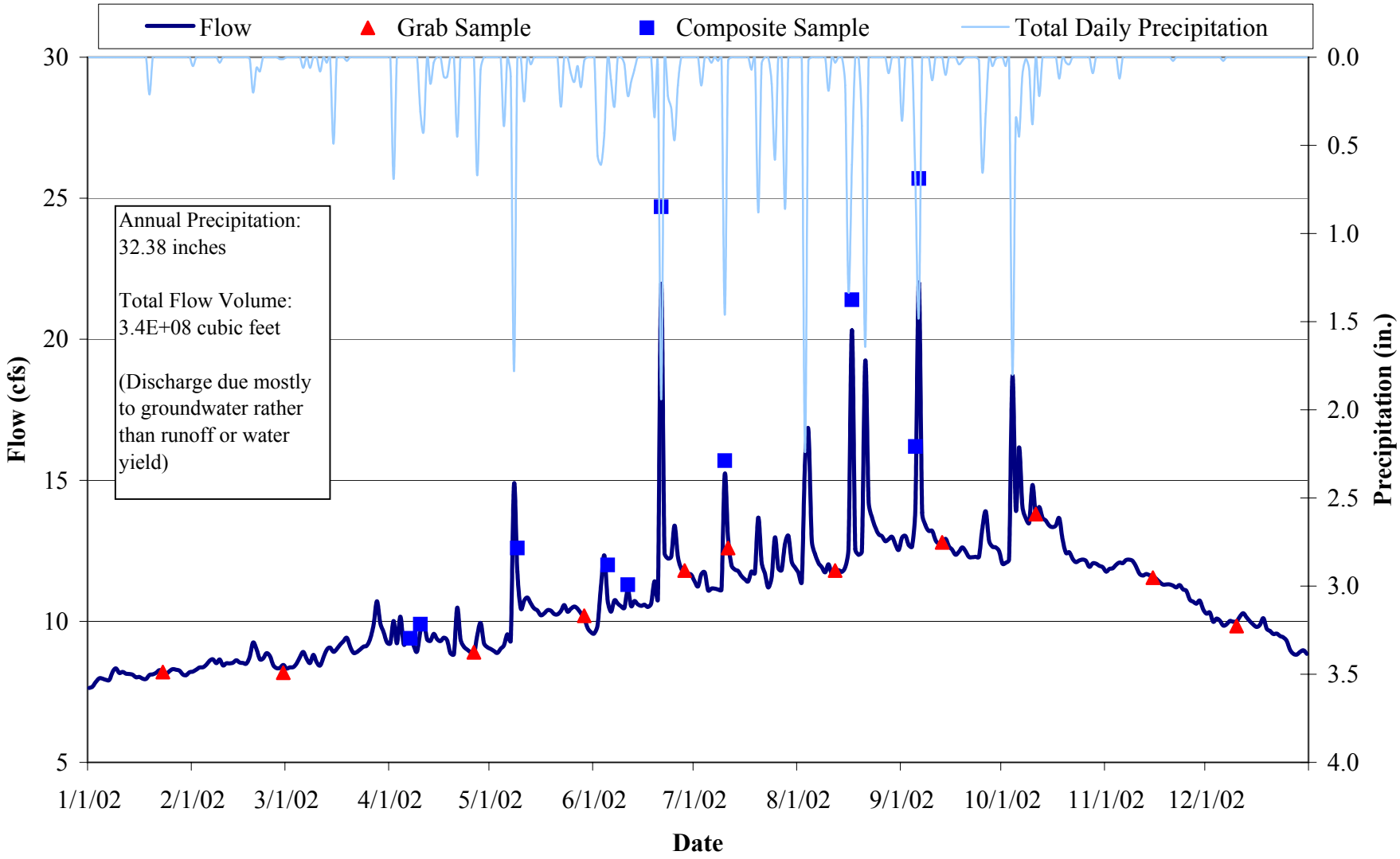


Table 2.EA. Eagle Creek 2002 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	21	17	17	13	19	16	18	2
Hardness, mg/L	21	260	274	200	296	226	290	35
Cadmium, ug/L	8	0.1	0.1	<0.1	0.1	<0.1	0.1	<0.1
Chromium, ug/L	8	0.4	0.5	0.2	0.7	0.3	0.5	0.2
Copper, ug/L	8	1.6	1.4	1.1	2.9	1.3	1.7	0.6
Lead, ug/L	8	0.6	0.5	0.1	1.8	0.5	0.5	0.5
Nickel, ug/L	8	3.2	3.0	2.7	4.7	2.8	3.2	0.7
Zinc, ug/L	8	7.2	6.4	3.0	17.7	3.5	8.1	4.9
Total Kjeldahl Nitrogen, mg/L	21	0.26	0.20	0.03	0.99	0.16	0.34	0.20
Total Nitrate Nitrogen, mg/L	21	0.21	0.14	0.05	0.66	0.09	0.21	0.19
Total Phosphorus, mg/L	21	0.07	0.05	0.01	0.40	0.04	0.09	0.08
Total Dissolved Phosphorus, mg/L	18	0.02	0.02	0.01	0.05	0.01	0.03	0.01
Total Suspended Solids, mg/L	21	15	9	2	95	4	15	21
Volatile Suspended Solids, mg/L	21	5	3	2	21	2	5	4
Turbidity, NTU	20	6	4	2	28	3	5	6

N: Sample Count

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

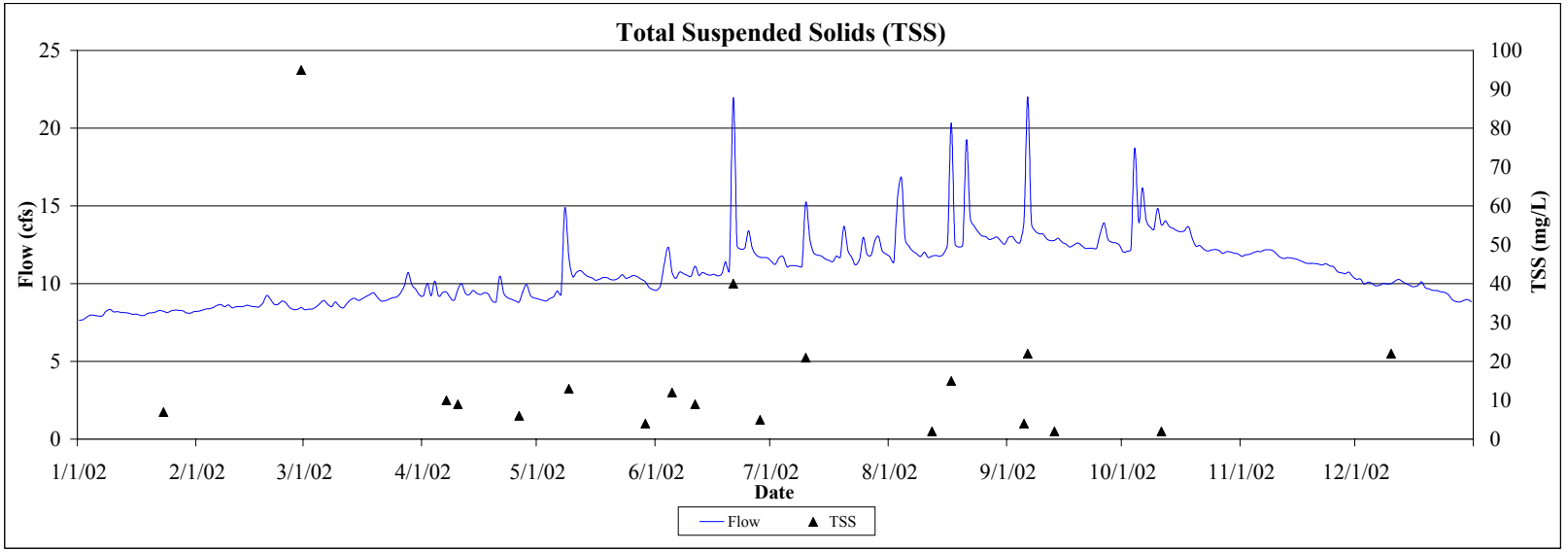
STD: Standard Deviation

Table 3.EA. Eagle Creek 2002 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	153	141	3	14
Total Phosphorus	0.78	0.72	0.02	0.07
Total Dissolved Phosphorus	0.26	0.24	<0.01	0.02
Total Nitrate Nitrogen	2.12	1.97	0.05	0.20

* 2002 Annual Loading Information is provisional and may be subject to minor revisions.

Figure 3.EA. Eagle Creek 2002 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations



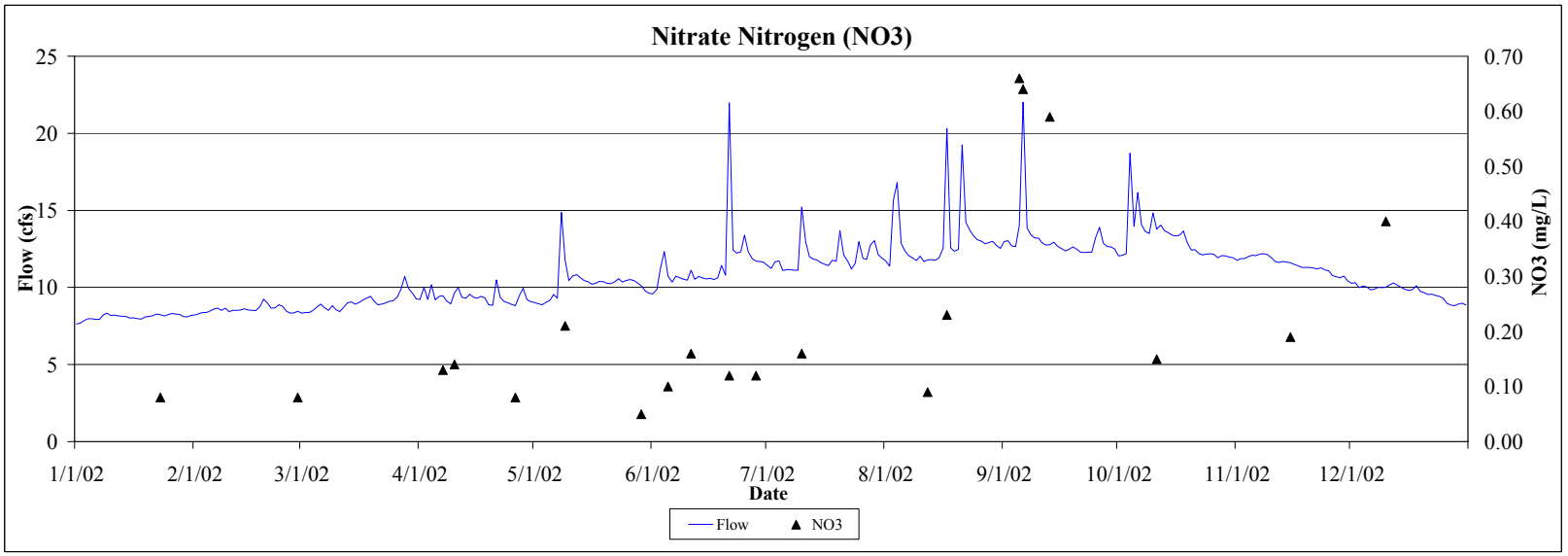
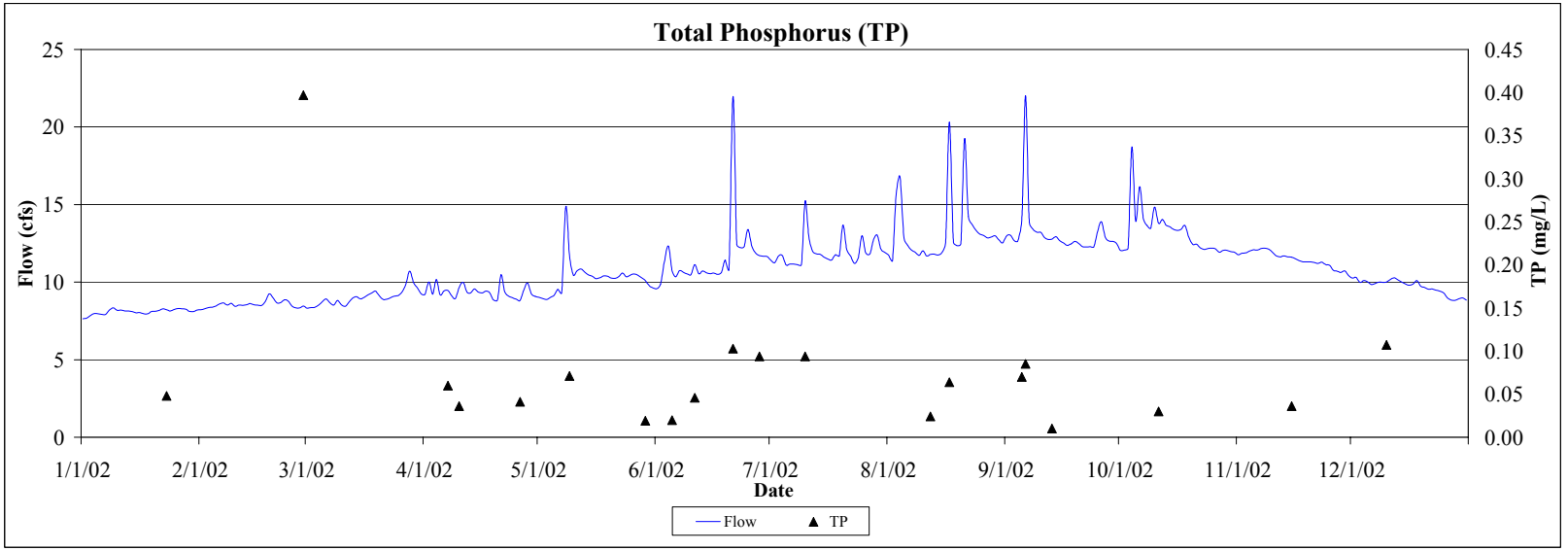


Figure 4.EA. Eagle Creek 2002 Hydrograph with Total and Dissolved Phosphorus Concentrations



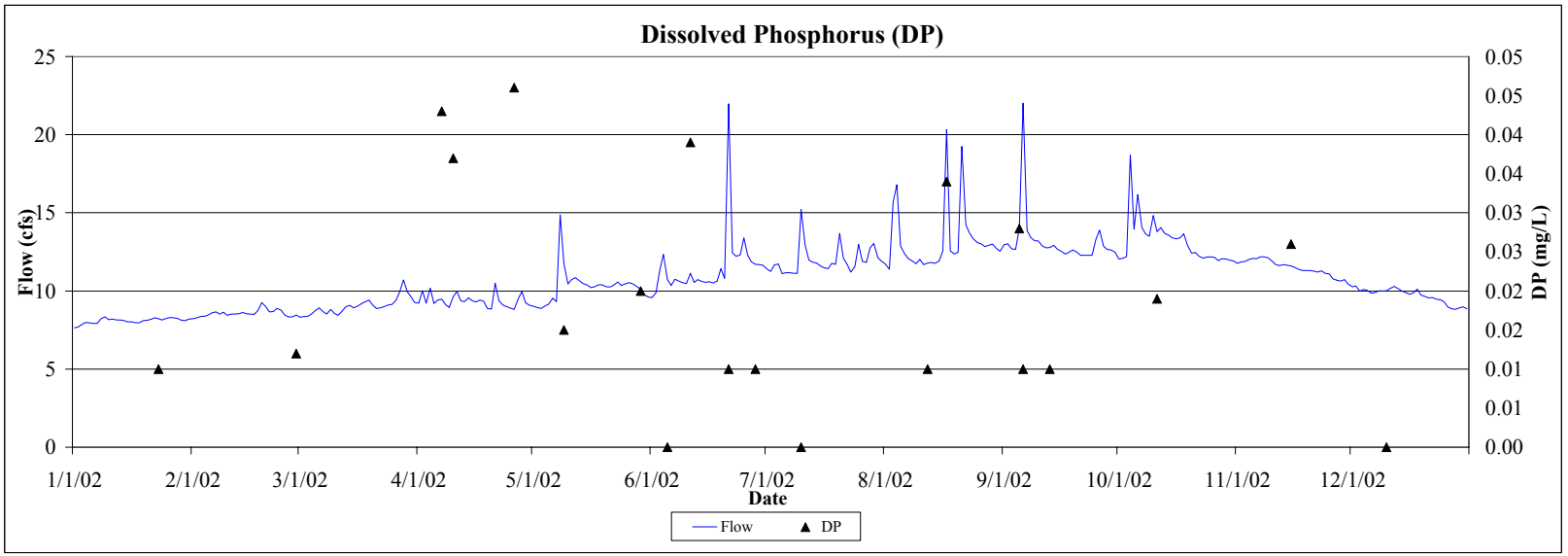


Table 4.EA. Eagle Creek: Comparison of 2001-2002 Hydrology and Water Chemistry

	2001	2002
Hydrology		
Total Precipitation (in)	25.83	32.38
Water Yield (in)	35.4	43.5
Total Volume (cf)	2.8E+08	3.4E+08
Annual Load (tons)		
Total Suspended Solids	38	153
Total Phosphorus	0.25	0.78
Total Dissolved Phosphorus	0.19	0.26
Total Nitrate Nitrogen	1.99	2.12
Annual Yield (lbs/acre)		
Total Suspended Solids	36	141
Total Phosphorus	0.23	0.72
Total Dissolved Phosphorus	0.18	0.24
Total Nitrate Nitrogen	1.85	1.97
Annual Normalized Yield (lbs/acre/in of water)		
Total Suspended Solids	1	3
Total Phosphorus	0.01	0.02
Total Dissolved Phosphorus	<0.01	<0.01
Total Nitrate Nitrogen	0.05	0.05
Flow-Weighted Mean Concentration (mg/L)		
Total Suspended Solids	4	14
Total Phosphorus	0.03	0.07
Total Dissolved Phosphorus	0.02	0.02
Total Nitrate Nitrogen	0.23	0.20

Table 5.EA. Eagle Creek 2002 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 6/20/2002

Class	Order	Family	Common Name	Life Stage	Organism Count
Crustacea	Amphipoda		Scuds	Adult	469
Crustacea	Isopoda		Sowbugs	Adult	16
Gastropoda			Snails	Adult	10
Hirudinea			Leeches	Adult	3
Insecta	Coleoptera	Curculionidae	Water Weevils	Adult	1
Insecta	Coleoptera	Dytiscidae	Predaceous Diving Beetles	Larvae	2
Insecta	Diptera	Athericidae	Watersnipe Flies	Larvae	1
Insecta	Diptera	Chironomidae	Midges	Larvae	17
Insecta	Diptera	Simuliidae	Black Flies	Larvae	26
Insecta	Diptera	Stratiomyidae	Aquatic Soldier Flies	Larvae	1
Insecta	Diptera		True Flies	Pupa	1
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	Larvae	126
Insecta	Plecoptera	Nemouridae	Nemourid Broadbacks	Larvae	1
Insecta	Trichoptera	Brachycentridae	Humpless Case Makers	Larvae	224
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatid Case Makers	Larvae	75
Insecta	Trichoptera	Limnephilidae	Northern Case Makers	Larvae	85

Macroinvertebrate Taxa Metrics

Total Taxa	15
EPT Taxa	5
% EPT Taxa	33
Diptera Taxa	4
% Diptera Taxa	27
Mean Tolerance Value	4.8

Macroinvertebrate Organism Metrics

Total Organisms	1058
EPT Individuals	511
% EPT Individuals	48
Diptera Individuals	46
% Diptera Individuals	4
Chironomidae Individuals	17
% Chironomidae Individuals	2

		Water Quality	Degree of Organic Pollution
Family-Level Biotic Index	4.2	Very Good	Possible slight organic pollution