

Table 1.VA. Valley Creek Monitoring Station Information



Station Address: 15800 Putnam Boulevard South, Afton, MN
County: Washington
Major Basin: St. Croix River Basin
Watershed: Valley Creek
Drainage Area: 62 square miles

Station Operator: St. Croix Watershed Research Station

Metropolitan Council Environmental Services Contact Information:

Contact Person: Leigh Harrod, P.G.
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Watershed District or Watershed Management Organization:
Valley Branch 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 Valley Creek since 1999. The monitoring station is located in Afton, Minnesota, 1.0 mile upstream from the creek confluence with the St. Croix River. While the entire Valley Creek Watershed area is 62 square miles, a storm sewer system diverts runoff from the northern portion of the watershed directly to the St. Croix River. The actual area contributing drainage to Valley Creek is 17.3 square miles. Situated in a

groundwater discharge zone, Valley Creek has a disproportionately high water yield relative to its watershed area. The creek flows perennially and does not freeze during the winter. Valley Creek is a Minnesota Department of Natural Resources (MDNR) designated trout stream. Land use in the Valley Creek Watershed is largely a mix of agriculture and rural residential development, although large tracts have been set aside in land trusts and restored to prairie. Much of the riparian corridor is re-developing into floodplain forest following cessation of agriculture in the stream valley 30-40 years ago.

MCES partners with the Valley Branch Watershed District and the St. Croix Watershed Research Station (SCWRS) to conduct monitoring at this station. The SCWRS, an affiliate of the Science Museum of Minnesota, conducts continuous monitoring, maintains the rating curve, and collects all water quality samples on behalf of the watershed district. The SCWRS has also been conducting continuous monitoring and collecting water quality samples at two upstream Valley Creek locations since 1998. A dense canopy cover precludes the collection of precipitation data at the MCES station. However, precipitation data are recorded at the two SCWRS stations upstream.

2003 Monitoring Year: Snowmelt began during the second week of March 2003. The peak daily average flow of 64.5 cfs, with a stage of 1.59 feet, occurred on March 15, 2003, in response to the spring thaw. The creek stage at the station dropped suddenly during the October 2-10, 2003 period. This drop was confirmed by a similar decrease in flow on the North Branch of Valley Creek during the same time period. The exact cause is unknown, but it seems likely that either water was being diverted from the North Branch, or flow was partially dammed somewhere upstream of the station. The latter seems more likely, as flow increased rapidly to a higher-than-baseflow rate after the low-flow period, as though a dam were suddenly breached. A new rating curve was established on October 16, 2003. The former rating curve was applied through July 18, 2003, and the new rating curve was applied on and after July 19.

Precipitation during the first six months of 2003 appeared to be normal, but the last half of 2003 was characterized by a lower than normal rainfall pattern, particularly during the fourth quarter of the year. Rain was recorded on 84 days at a nearby gauge, with rain events greater than 1 inch occurring on only 5 days. The largest rain event (3.67 inches) occurred on June 25, 2003. Runoff event-based composite sampling began in mid-March 2003 and continued through mid-October.

Twenty samples were collected for water chemistry analysis during 2003, including 8 composite samples and 12 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. Due to the drought period and fewer runoff events during the last half of 2003, a reduced number of composite samples was obtained.

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

Figure 1.VA. Valley Creek Monitoring Station Location and Watershed Characteristics

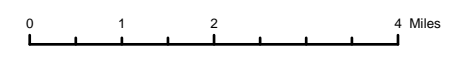
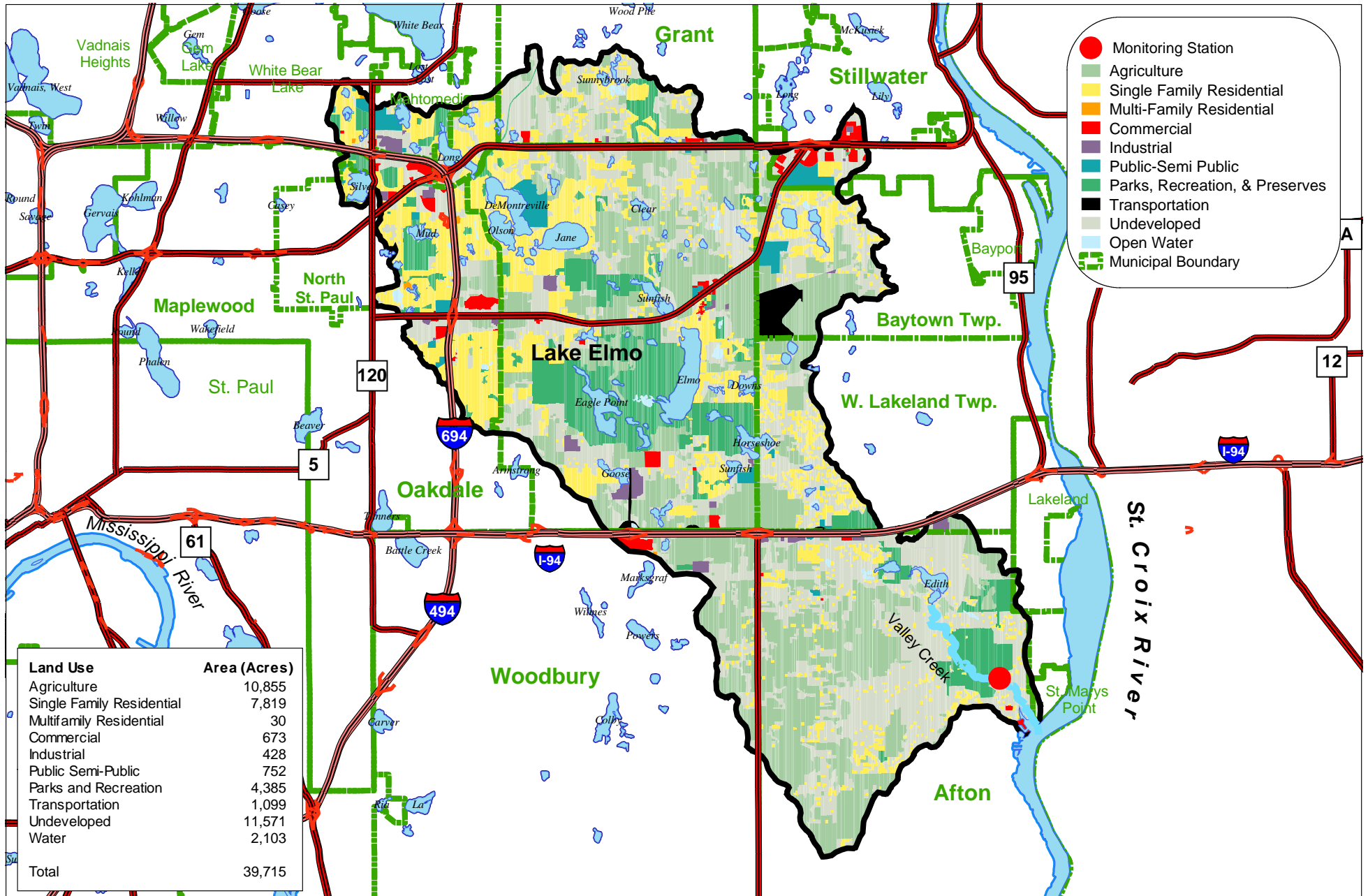


Figure 2.VA. Valley Creek 2003 Hydrograph, Precipitation and Sampling Information

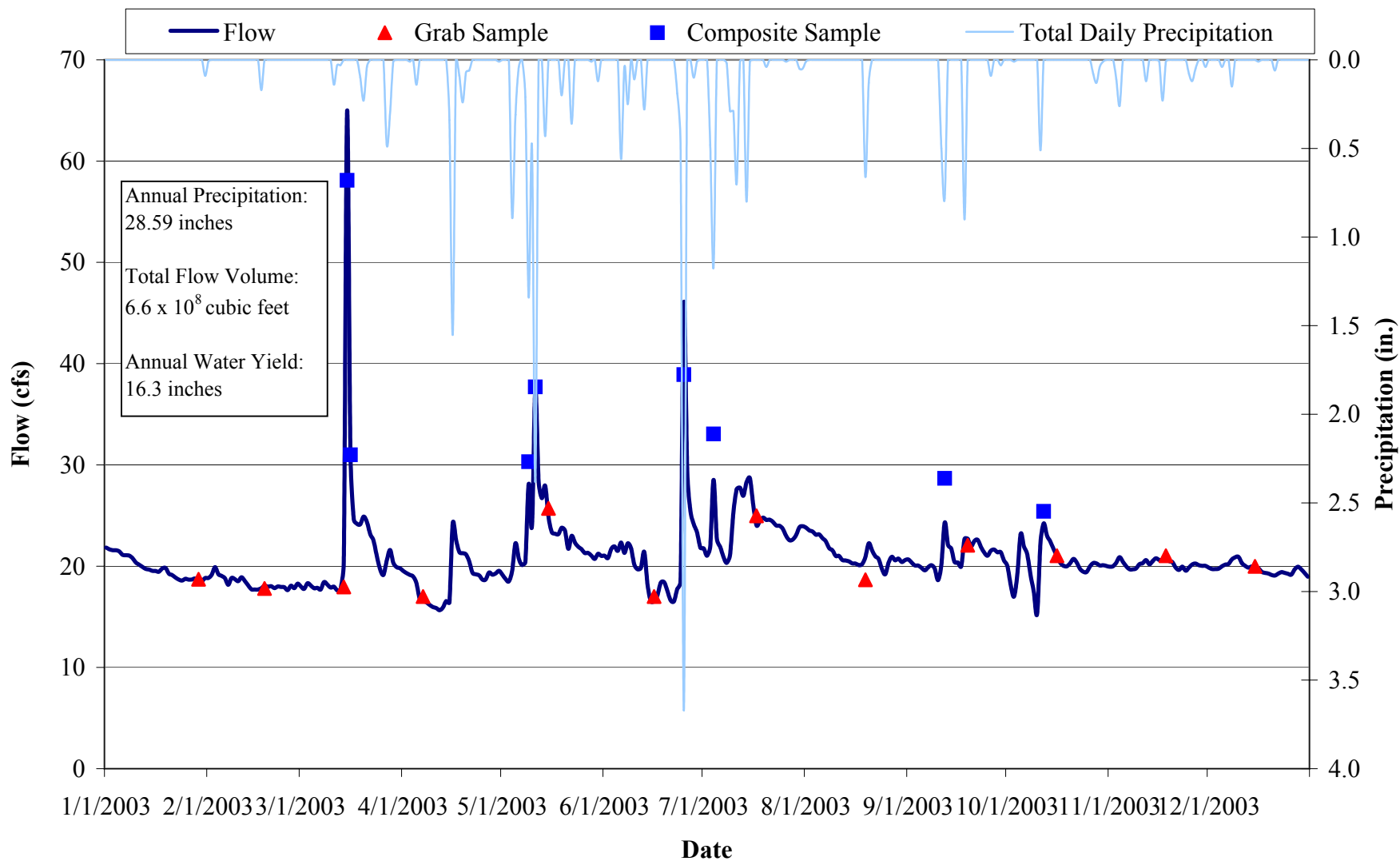


Table 2.VA. Valley Creek 2003 Water Chemistry Information

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	19	19	19	16	28	19	20	3
Hardness, mg/L	20	230	235	142	270	216	250	32
Cadmium, ug/L	5	0.1	0.04	0.04	0.1	0.04	0.06	0.03
Chromium, ug/L	5	2.9	1.0	0.7	8.3	0.8	3.7	3.3
Copper, ug/L	5	4.8	1.2	0.8	16.2	0.9	4.9	6.6
Lead, ug/L	5	2.2	0.3	0.1	6.5	0.2	3.9	2.9
Nickel, ug/L	5	3.1	1.8	1.1	7.5	1.2	3.8	2.7
Zinc, ug/L	5	13.0	7.0	2.4	36.0	3.9	15.7	13.9
Total Kjeldahl Nitrogen, mg/L	19	0.67	0.27	0.03	5.40	0.21	0.55	1.19
Total Nitrate Nitrogen, mg/L	20	3.76	3.64	2.71	4.94	3.50	4.24	0.63
Total Phosphorus, mg/L	18	0.13	0.06	0.02	0.95	0.03	0.09	0.22
Total Dissolved Phosphorus, mg/L	18	0.06	0.02	0.01	0.58	0.02	0.04	0.14
Total Suspended Solids, mg/L	20	50	12	4	448	6	31	104
Volatile Suspended Solids, mg/L	20	10	3	1	74	2	6	17
Turbidity, NTU	20	7	3	1	38	2	4	11

N: Sample Count

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

STD: Standard Deviation

Table 3.VA. Valley 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	345	62	4	17
Total Phosphorus	1.3	0.24	0.01	0.07
Total Dissolved Phosphorus	0.5	0.09	0.01	0.02
Total Nitrate Nitrogen	81	15	0.9	3.98

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

Figure 3.VA. Valley Creek 2003 Hydrograph with Total Suspended Solids and Nitrate Nitrogen Concentrations

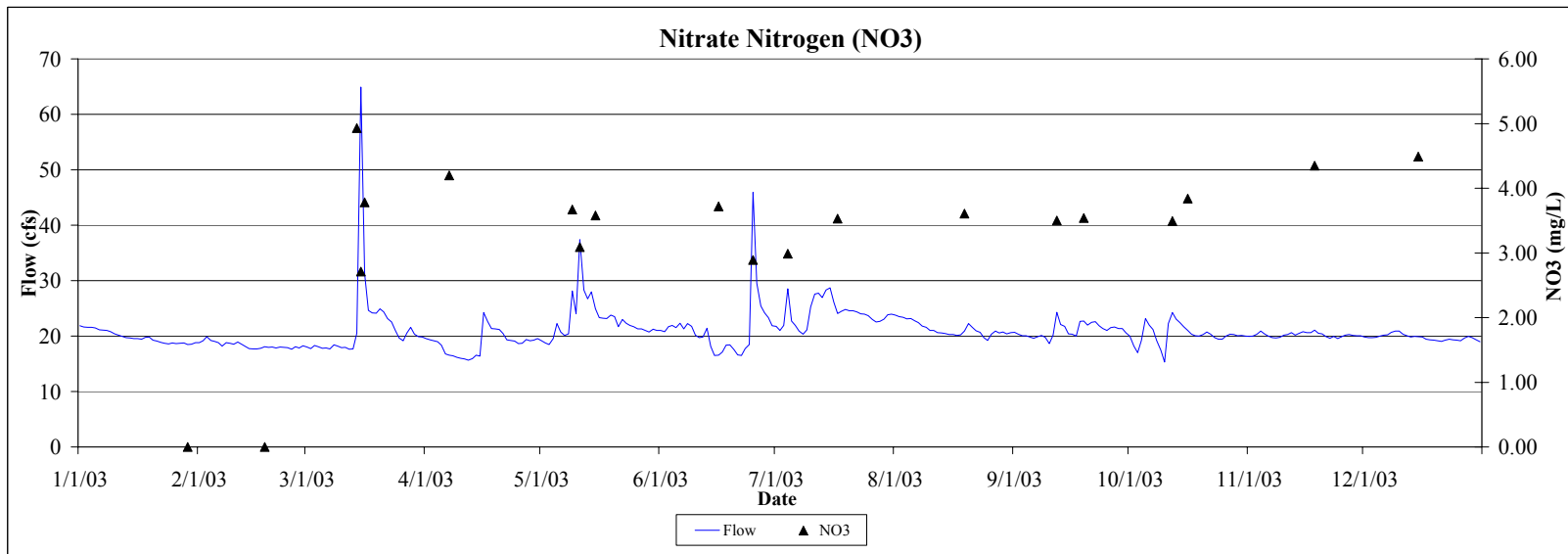
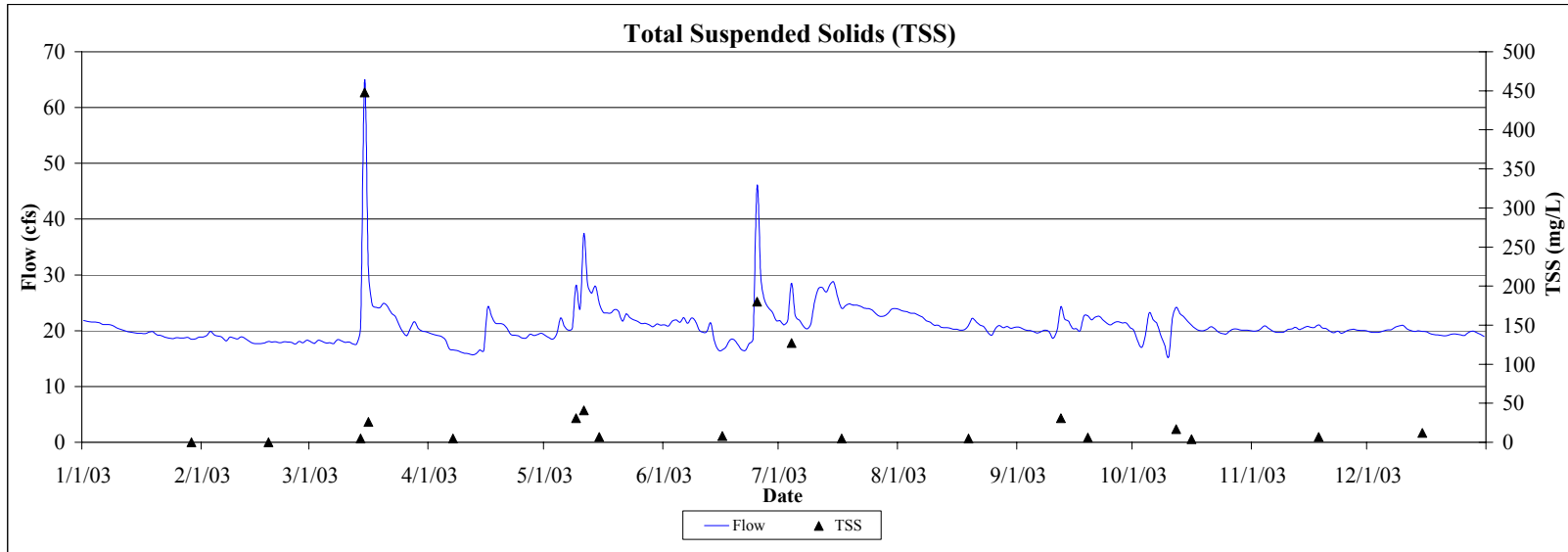


Figure 4 VA. Valley Creek 2003 Hydrograph with Total and Dissolved Phosphorus Concentrations

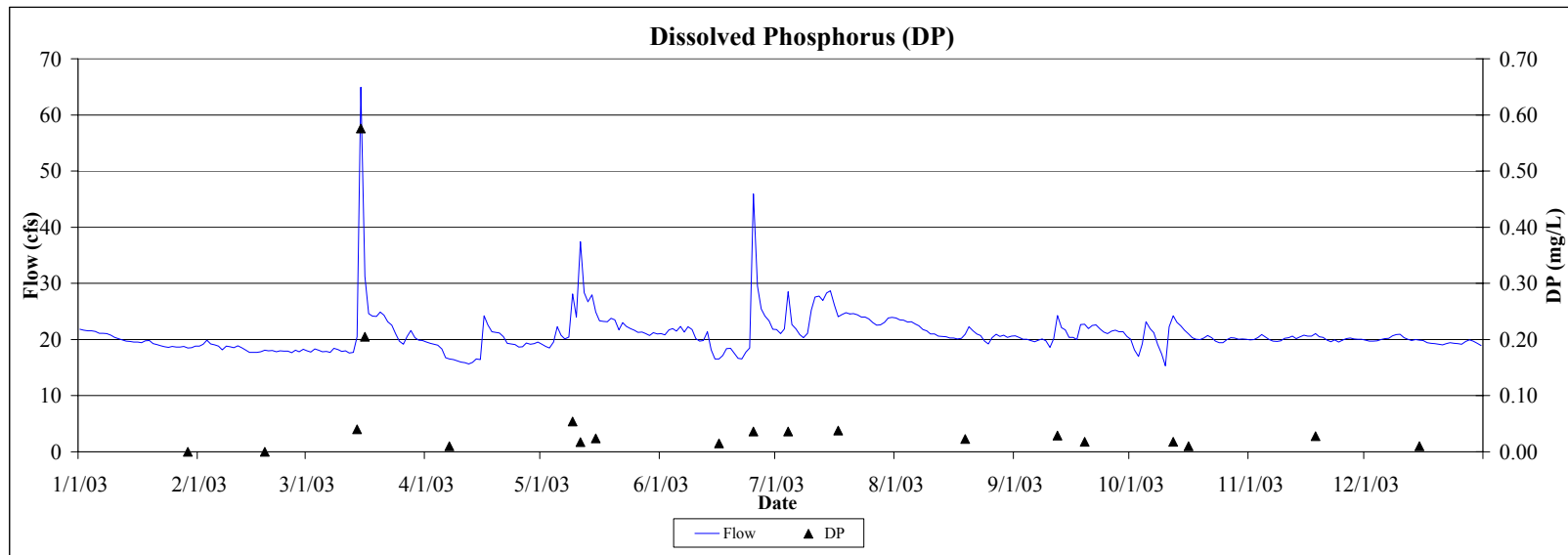
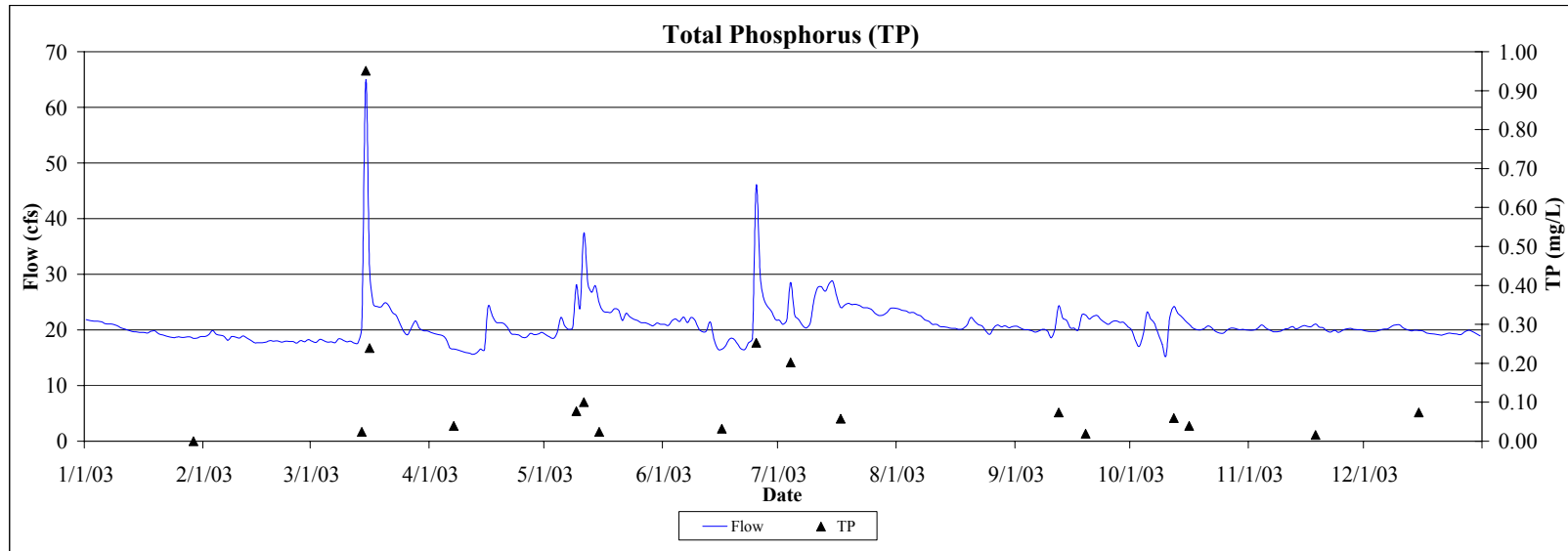


Table 4.VA. Valley Creek: Comparison of 2001-2003 Hydrology and Water Chemistry

	2001*	2002*	2003
Hydrology			
Total Precipitation (inches)	33.22	40.16	28.59
Water Yield (inches)	15.3	16.5	16.3
Total Volume (cubic feet)	6.2 x 10 ⁸	6.6 x 10 ⁸	6.2 x 10 ⁸
Annual Load (tons)			
Total Suspended Solids	228	302	345
Total Phosphorus	1.21	1.36	1.35
Total Dissolved Phosphorus	0.45	0.50	0.51
Total Nitrate Nitrogen	76.7	82.7	81.5
Annual Yield (lbs/acre)**			
Total Suspended Solids	41	55	62
Total Phosphorus	0.22	0.25	0.24
Total Dissolved Phosphorus	0.08	0.09	0.09
Total Nitrate Nitrogen	13.9	14.9	14.6
Annual Normalized Yield (lbs/acre/inch of water)**			
Total Suspended Solids	3	3	4
Total Phosphorus	0.01	0.02	0.01
Total Dissolved Phosphorus	< 0.01	< 0.01	< 0.01
Total Nitrate Nitrogen	0.91	0.90	0.90
Flow-Weighted Mean Concentration (mg/L)			
Total Suspended Solids	12	15	17
Total Phosphorus	0.06	0.07	0.07
Total Dissolved Phosphorus	0.02	0.02	0.02
Total Nitrate Nitrogen	3.99	3.99	3.98

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

** Annual yields and normalized yields are based upon Valley Creek's actual contributing drainage area of 17.3 square miles.

Table 5.VA. Valley Creek 2003 Macroinvertebrate Monitoring Results and Metrics

Monitoring Date 10/7/2003

Class	Order	Family	Common Name	Organism Count
Arthropoda	Amphipoda		Scuds	245
Arthropoda	Isopoda		Sowbugs	10
Gastropoda			Snails	4
Hirudinea			Leeches	1
Insecta	Coleoptera	Elmidae	Riffle Beetles	44
Insecta	Diptera	Chironomidae	Midges	345
Insecta	Diptera	Simuliidae	Black Flies	6
Insecta	Ephemeroptera	Baetidae	Small Minnow Mayflies	40
Insecta	Ephemeroptera	Heptageniidae	Flatheaded Mayflies	2
Insecta	Ephemeroptera	Potamanthidae	Hackelgills	1
Insecta	Ephemeroptera	Caenidae	Small Squaregills	15
Insecta	Trichoptera	Philopotamidae	Fingernet Caddisflies	2
Insecta	Trichoptera	Hydropsychidae	Common Netspinners	18
Insecta	Trichoptera	Phryganeidae	Giant Case Makers	1

Macroinvertebrate Taxa Metrics

Total Taxa	14
EPT Taxa	7
% EPT Taxa	50
Diptera Taxa	2
% Diptera Taxa	14
Mean Tolerance Value	5.5

Macroinvertebrate Organism Metrics

Total Individuals	734
EPT Individuals	79
% EPT Individuals	11
Diptera Individuals	351
% Diptera Individuals	48
Chironomidae Individuals	345
% Chironomidae Individuals	47

Water Quality

Degree of Organic Pollution

Family-Level Biotic Index	5.8	Fair	Fairly Significant Organic Pollution
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