

**Table 1.WI. Willow Creek Monitoring Station Information**



**Station Address:** 2900 West State Highway 13, Burnsville, MN  
**County:** Dakota  
**Major Basin:** Minnesota River Basin  
**Watershed:** Lower Minnesota  
**Drainage Area:** 10.25 square miles

**Station Operator:** Black Dog Watershed Management Commission /  
Barr Engineering, Inc.

**Metropolitan Council Environmental Services Contact Information:**

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

Black Dog Watershed Management Commission

**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 Willow Creek since 1999. The monitoring station is located in Burnsville, Minnesota, 1.0 mile upstream from the creek confluence with the Minnesota

River. Willow Creek originates above the bluff of the Minnesota River Valley. The creek flows from Lee and Keller Lakes into Crystal Lake and from there it flows through Twin and Early Lakes into Sunset Pond. From the dam at the outlet of Sunset Pond, the creek descends down the bluff into the Lower Minnesota Watershed. Below the bluff, Willow Creek is diverted into an underground box culvert that discharges on the south bank of the Minnesota River underneath the Burnsville Landfill.

MCES partners with the Black Dog Watershed Management Commission to operate the monitoring station through the commission's consulting engineering company, Barr Engineering, Inc. The rating curve at this location is based upon a Manning's equation developed by Barr Engineering. Because the stream is situated in an underground box culvert, direct in-stream measurements to refine the Manning's equation within the confines of the box culvert are generally not feasible.

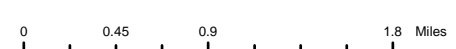
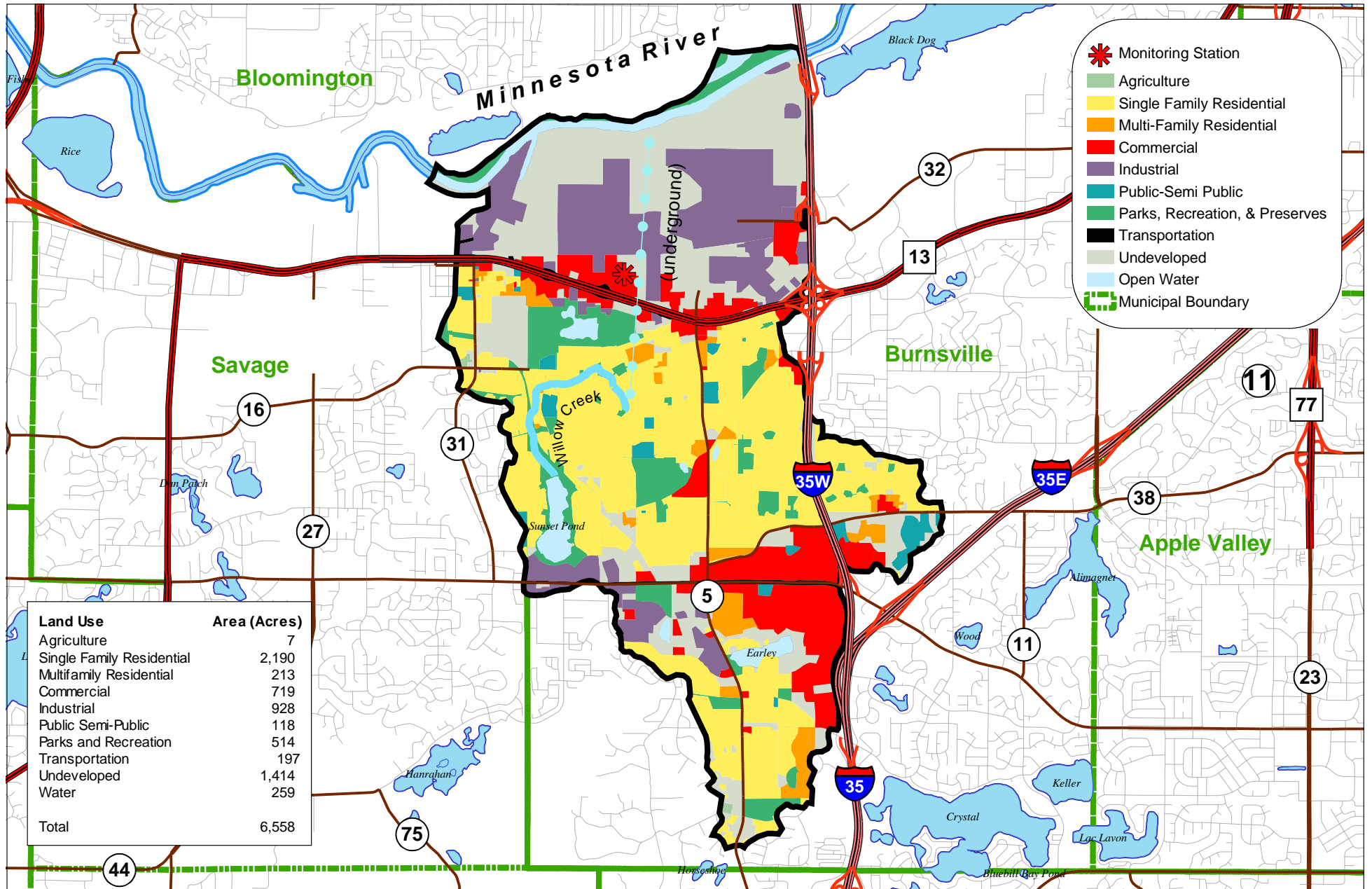
**2001 Monitoring Year:** Snowmelt began in late March 2001. Daily average flows are measurable all year at this station because the underground box culvert prevents Willow Creek from freezing. However, daily average flows were estimated during the April 17-June 5, 2001 period. On April 17, floodwaters from the Minnesota River completely inundated the box culvert, destroying the ultrasonic sensor that monitors water stage. The sensor was replaced on June 5, 2001. The peak daily average flow of 46 cfs, with a stage of 0.98 feet, occurred on June 16, 2001, when a large rain event of high intensity and long duration occurred throughout the Twin Cities Metropolitan Area.

Willow Creek typically exhibits very high, flashy flows during rain events, and very low flows at other times. On June 16, 2001, more than 2 inches of rain fell within a 9-hour period, with an intensity of 0.44 inch during one 15-minute period. During that rain event, the flow in Willow Creek exceeded 156 cfs with a corresponding stage of 2.37 feet.

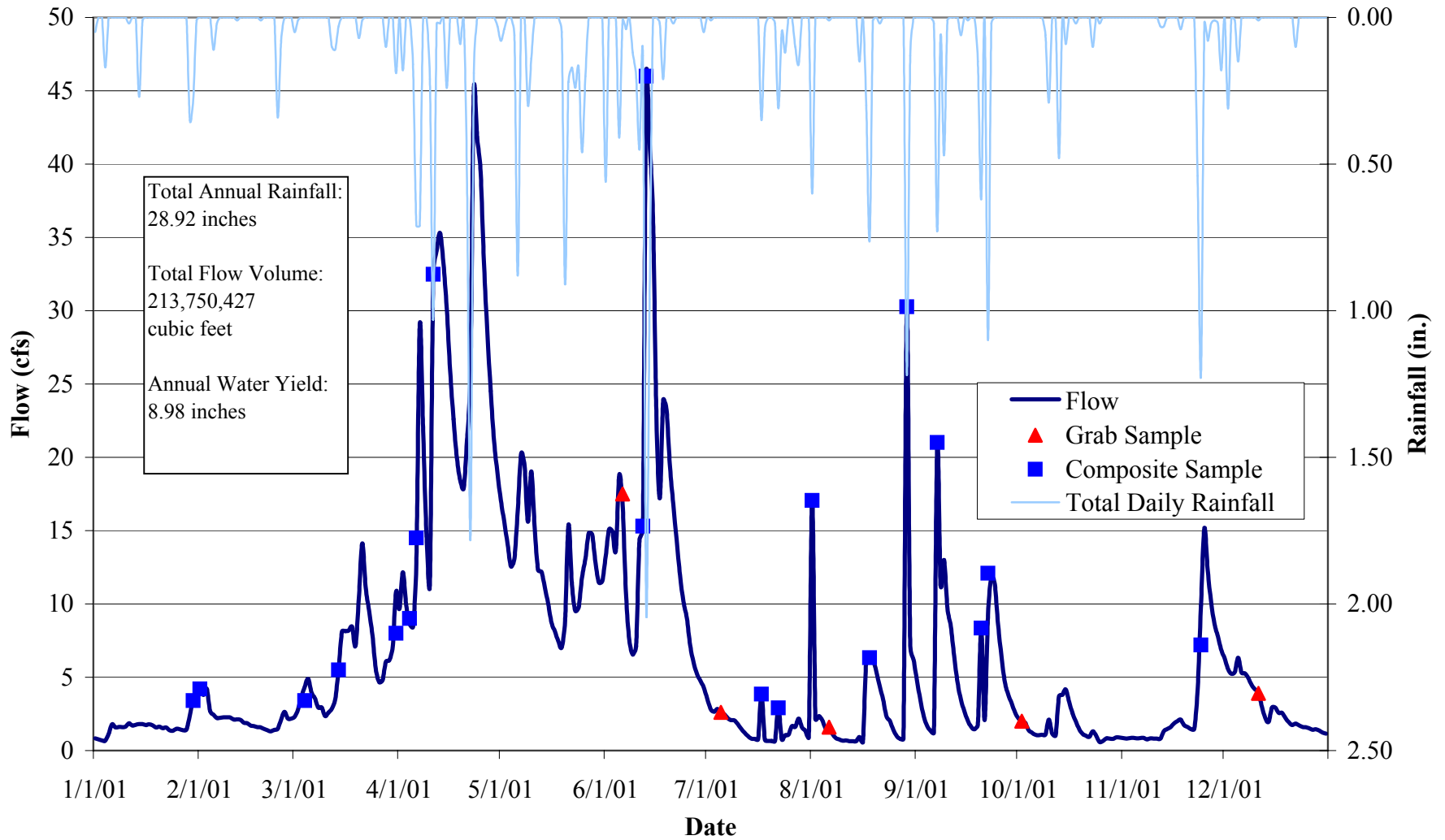
Twenty-five samples were collected for water quality analysis during 2001, including 22 composite samples and three grab samples. The MCES annual water quality monitoring plan includes 12 monthly baseflow ("non-event") grab samples and approximately 10 to 15 flow-weighted composite samples collected during all runoff events in the open water season (March-November). The 2001 sampling scheme met the goals of the MCES monitoring work plan, exception for the collection of monthly base flow grab samples. During base flow periods, the stage typically drops below the elevation of the intake for the automatic sampler. Thus a grab sample cannot be obtained from the box culvert during these low-flow conditions.

**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.WI. Willow Creek Monitoring Station Location and Watershed Characteristics**



**Figure 2.WI. Willow Creek 2001 Hydrograph with Rainfall and Sampling Information**



**Table 2.WI. Willow Creek 2001 Water Chemistry Information**

Variable	N	Mean	Median	Minimum	Maximum	25%	75%	STD
Chloride, mg/L	24	134	65	4	871	14	178	193
Hardness, mg/L	25	132	107	58	378	78	180	75
Cadmium, ug/L	24	0.2	0.1	0.1	1.1	0.1	0.2	0.2
Chromium, ug/L	24	3.5	2.4	0.5	13.9	1.5	4.5	3.1
Copper, ug/L	24	8.8	7.9	2.4	31.0	4.7	11.2	6.1
Lead, ug/L	24	4.5	2.3	0.5	19.8	0.5	7.0	5.0
Nickel, ug/L	24	4.2	3.4	1.6	12.9	2.5	5.3	2.5
Zinc, ug/L	24	35.0	17.0	3.0	193.0	6.0	56.0	42.0
Nitrogen, Total Kjeldahl, mg/L	24	1.40	1.30	0.30	4.60	0.70	1.70	0.90
Nitrogen, Total Nitrate, mg/L	25	0.52	0.55	0.14	1.04	0.27	0.69	0.26
Phosphorus, Total, mg/L	24	0.20	0.13	0.02	0.93	0.06	0.28	0.20
Phosphorus, Total Dissolved, mg/L	22	0.06	0.05	0.01	0.17	0.04	0.08	0.04
Solids, Total Suspended, mg/L	25	104	40	3	586	12	175	141
Solids, Volatile Suspended, mg/L	25	24	10	2	146	4	35	32
Turbidity, NTU	5	2	na	1	3	na	na	na

na: Data are insufficient to calculate these statistics.

**Table 3.WI. Willow Creek 2001 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	264	80	8	40
Phosphorus, Total	0.77	0.24	0.02	0.12
Phosphorus, Total Dissolved	0.33	0.10	0.01	0.05
Nitrogen, Total Nitrate	3.91	1.19	0.12	0.59

\* 2001 Annual Loading Information is provisional and may be subject to minor revisions.