

Watershed Outlet Monitoring Program

Willow Creek Station Burnsville, MN

Quarterly Report *Preliminary Data* October – December 2008



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Prepared For: Lower Minnesota River Watershed District
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Introduction

The Willow Creek WOMP site, located in Burnsville behind the Menards on Hwy. 13, has been in operation since 1999. The Willow Creek watershed drains more than 5,000 acres of various types of land uses including residential, vacant/agricultural, and commercial properties (Appendix A). This report summarizes the results of flow, precipitation, and water quality for the 4th quarter of 2008. This data is preliminary and is subject to change until the Metropolitan Council submits the final report for this period.

Flow and Precipitation

Average flow in Willow Creek was 1.05 cubic feet per second (cfs) or 0.68 million gallons per day (mgd) (Table 1). Total precipitation was recorded as 2.90 inches, although the rain gauge was covered for the winter on November 10th, 2008. A graph describing annual flow and precipitation results is also provided (Figure 2).

Table 1. Average flow and total precipitation at Willow Creek WOMP Station October – December 2008

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1998-2007 (inches)
OCTOBER	1.57/1.01	1.68	2.21
NOVEMBER	1.02/0.66	1.22	1.29
DECEMBER	0.56/0.36	na	0.86
TOTAL QUARTER	1.05/0.68	na	1.46

*Average monthly precipitation data obtained from the National Weather Service station located near the Willow WOMP site.

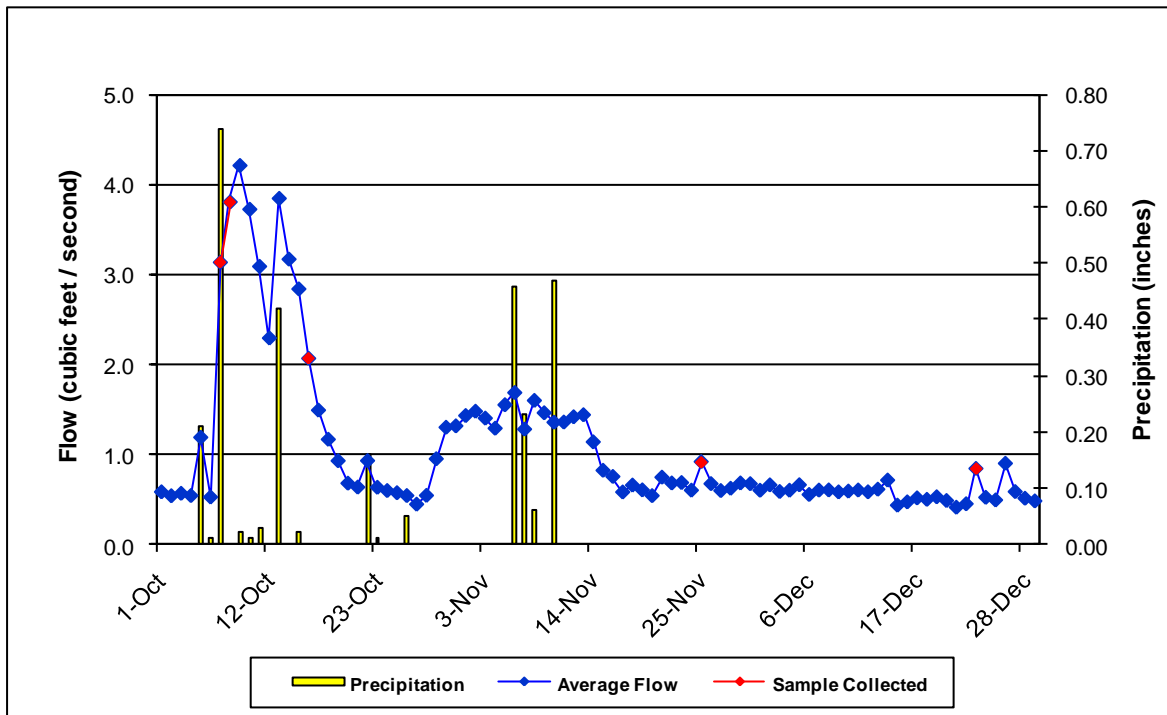


Figure 1. Flow and precipitation at Willow WOMP Station October-December, 2008

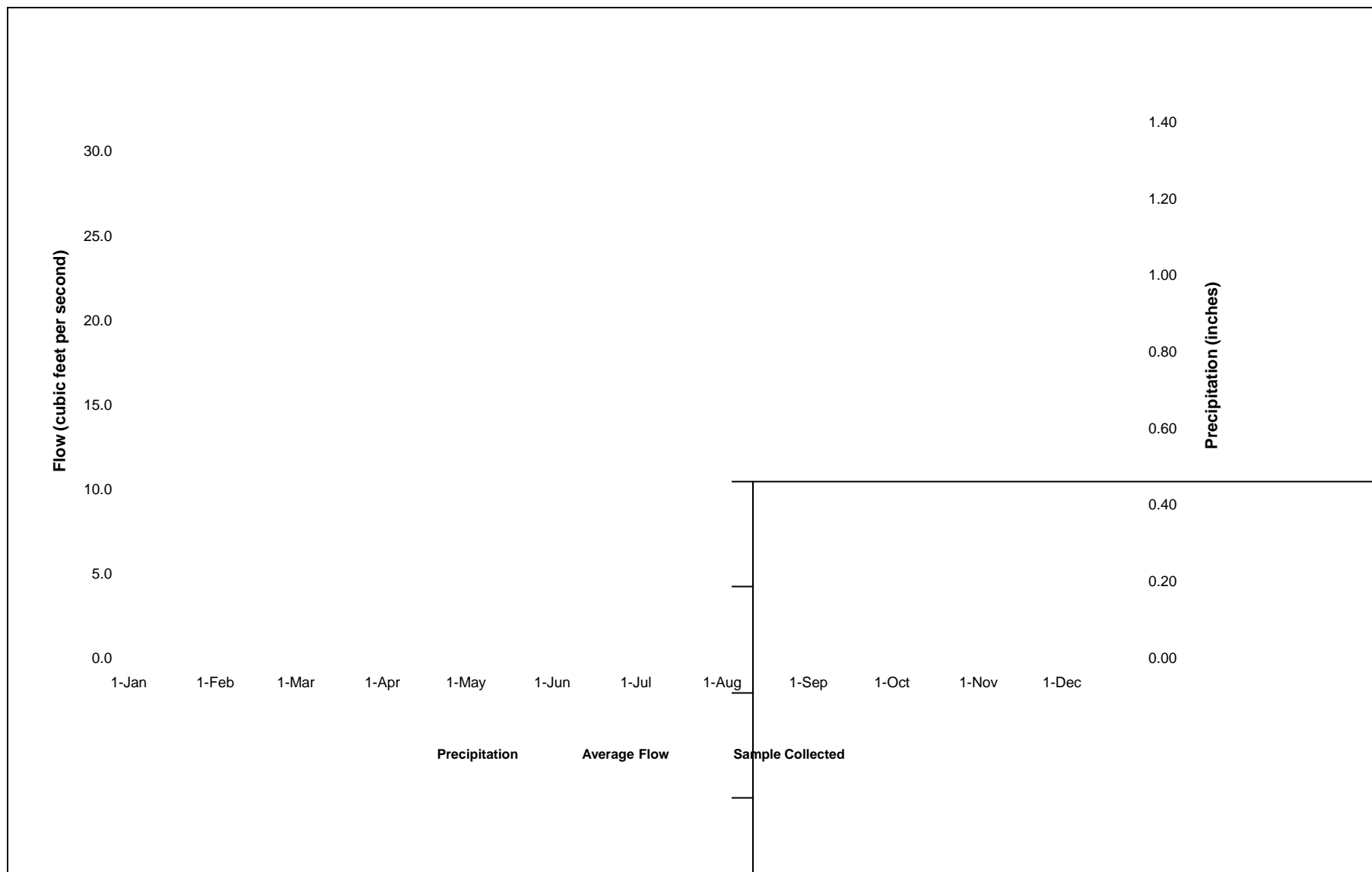


Figure 2. 2008 Flow (January – December 2008) and Precipitation (March 14th – November 10th) Results

Water Quality

Summary:

During the fourth quarter of 2008, one precipitation based event composite sample (10/7/08-10/8/08) and three base flow grab samples (10/16/08, 11/25/08 and 12/23/08) were collected at the Willow Creek WOMP station. Overall, water quality in Willow Creek should be considered good, with most parameters below state standards or minimally impacted stream eco-region means, with the exception of conductivity results, *E. coli* bacteria concentrations, and nitrate/nitrite levels.

Conductivity Results:

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, sulfate, sodium, calcium and other solids. Conductivity in streams and rivers is affected by the geology of the area through which the water flows. Streams that run through limestone and clay soils will have higher conductivity values. High conductance readings can also come from industrial pollution or urban runoff. Extended dry periods, low flow conditions, and warmer water temperatures may also contribute to higher specific conductance readings (Source: <http://www.epa.gov/volunteer/stream/>).

Dakota County Soil and Water Conservation District (SWCD) staff have identified soil types common to the Willow Creek Watershed, in an attempt to explain the source of continually elevated conductivity results. According to the U.S. Department of Agriculture, Soil Survey of Dakota County (1980), soils in this watershed consist primarily of sand, silts, and clays. The high mineral content of these clay soils likely accounts for much of the elevated conductivity results reported throughout all 2008 monitoring data (Table 2).

Bacteria Results:

Bacteria concentrations in fresh water resources continues to be an area of research that is poorly understood. Some research has suggested that the sediment of lakes, rivers, and streams can function as a bacterial reservoir, continually releasing bacteria into the water column. Under low flow conditions, sediment release of bacteria may cause elevated bacteria results in water quality samples.

The 4th quarter *E. coli* results (Table 2) indicate elevated bacteria concentrations in Willow Creek. SWCD staff did not observe any waterfowl in upstream wetlands while collecting samples in the 4th quarter of 2008, so waterfowl may not be the source elevated results, as suggested in other quarterly reports. Due to very low flow conditions observed in this quarter, the sediment of Willow Creek, acting as a bacterial reservoir, may be a source of bacteria in these samples. Elevated bacteria concentrations, especially under low flow conditions similar to what was observed in the 4th quarter of 2008, are common in other watersheds elsewhere in Dakota County. SWCD staff will continue to monitor waterfowl populations in upstream wetlands to assist in identifying potential sources of elevated *E. coli* results.

Nitrate/Nitrite Results:

Nitrate/nitrite concentrations in the 4th quarter of 2008 were slightly higher than the minimally impacted stream eco-region mean (0.16 mg/L). Although somewhat elevated at 0.22 mg/L, nitrate/nitrite results of less than 1.0 mg/L are generally considered low. Slightly higher concentrations are to be expected in urbanized areas like the Willow Creek Watershed (Appendix A). Common sources of nitrates/nitrites include lawn fertilizer, failing septic systems, and industrial runoff.

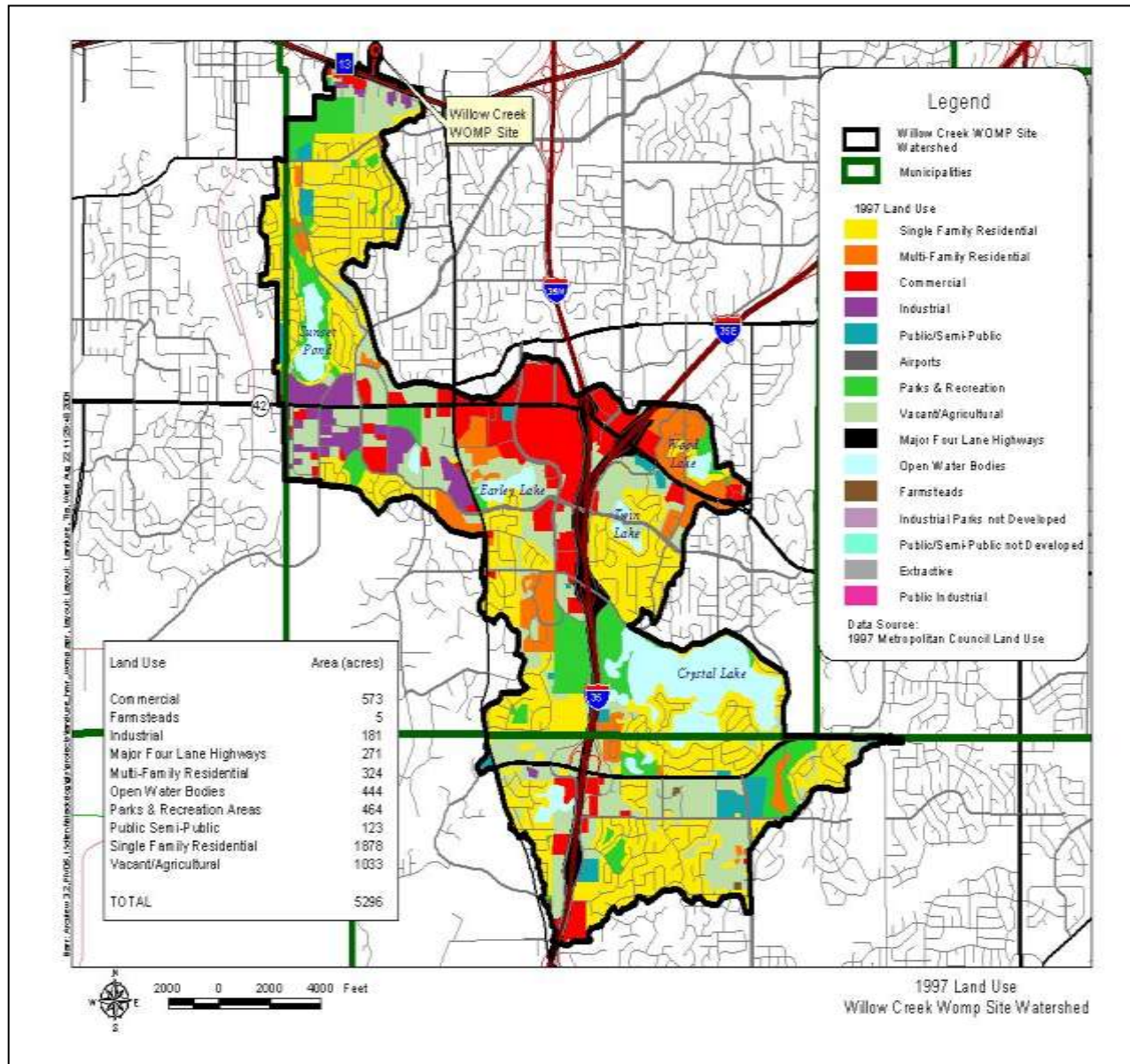
Table 2. Average concentrations at Willow Creek WOMP Station October – December 2008. 1st –3rd quarter results are included (shaded grey) for comparison purposes (results exceeding minimally impacted stream eco-region means or state standards are listed in red font).

Parameter	1 st Quarter 2008 Mean Concentration	2 nd Quarter 2008 Mean Concentration	3 rd Quarter 2008 Mean Concentration	4 th Quarter 2008 Mean Concentration	Notes – 4th Quarter Results
Alkalinity	228 mg/L CaCO ₃	83.4 mg/L CaCO ₃	208.8 mg/L CaCO ₃	188.2 mg/L CaCO ₃	Typical for freshwater; higher during lower flow
Biological Oxygen Demand (BOD5)	3.50 mg/L	1.84 mg/L	1.0 mg/L	1.0 mg/L	Below eco-region mean
Cadmium	0.50 ug/L	0.50 ug/L	0.50 ug/L	0.50 ug/L	In compliance with state standard
Chloride	235 mg/L	201 mg/L	132 mg/L	101 mg/L	In compliance with state standard
Chlorophyll-a	11.9 ug/L	11.7 ug/L	2.8 ug/L	3.8 ug/L	Low level
Chromium	1.2 ug/L	3.6 ug/L	3.3 ug/L	3.0 ug/L	In compliance with state standard
Conductivity	1315 mMHOs	832 mMHOs	1072 mMHOs	853 mMHOs	Above eco-region mean, higher during low flow
Copper	4.8 ug/L	2.6 ug/L	1.8 ug/L	1.6 ug/L	In compliance with state standard
Escherichia coli Bacteria (geometric mean)	53.5 MPN/100mL	20.6 MPN/100mL	88.7 MPN/100mL	401.0 MPN/100mL	Exceeds state standard
Hardness	307 mg/L CaCO ₃	144 mg/L CaCO ₃	350 mg/L CaCO ₃	308 mg/L CaCO ₃	Considered hard water; very hard during low flow
Lead	3.65 ug/L	0.40 ug/L	0.10 ug/L	0.10 ug/L	In compliance with state standard
Nickel	5.9 ug/L	1.7 ug/L	6.2 ug/L	5.5 ug/L	In compliance with state standard
Nitrogen Ammonia	345 ug/L	76 ug/L	28 ug/L	24 ug/L	In compliance with state standard
Nitrate + Nitrite	0.42 mg/L	0.28 mg/L	0.39 mg/L	0.22 mg/L	Above eco-region mean
Phosphorus, Total	0.146 mg/L	0.065 mg/L	0.045 mg/L	0.056 mg/L	Below eco-region mean
Suspended Solids	7.0 mg/L	13.3	9.8 mg/L	2.25 mg/L	Below eco-region mean
Turbidity	9.5 NTRU	6.6 NTRU	4.8 NTRU	5 NTRU	In compliance with state standard
Zinc	7.5 ug/L	4.1 ug/L	2.6 ug/L	2.3 ug/L	In compliance with state standard

mg/L = milligrams per liter or parts per million (ppm)
 ug/L = micrograms per liter or parts per billion (ppb)
 mMHO = micromhos or microseimens

MPN = most probable number
 NTRU = nephelometric turbidity ratio units

Appendix A



Watershed and land use information provided by Metropolitan Council Environmental Services.