

Watershed Outlet Monitoring Program

Willow Creek Station
Burnsville, MN

Quarterly Report
Preliminary Data
October – December 2007



Prepared By: Dakota County Soil and Water Conservation District

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 2007. 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 3.40 cubic feet per second (cfs) or 2.20 million gallons per day (mgd) (Table 1). Total precipitation was recorded as 4.04 inches, although the rain gauge was covered for the winter on November 1st. 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 2007

Period	Average Flow (cfs/mgd)	Precipitation (inches)	*Average Monthly Precipitation, 1997-2006 (inches)
OCTOBER	8.56/5.53	4.04	2.05
NOVEMBER	1.05/0.68	na	1.35
DECEMBER	0.52/0.34	na	0.74
TOTAL QUARTER	3.40/2.20	na	4.14

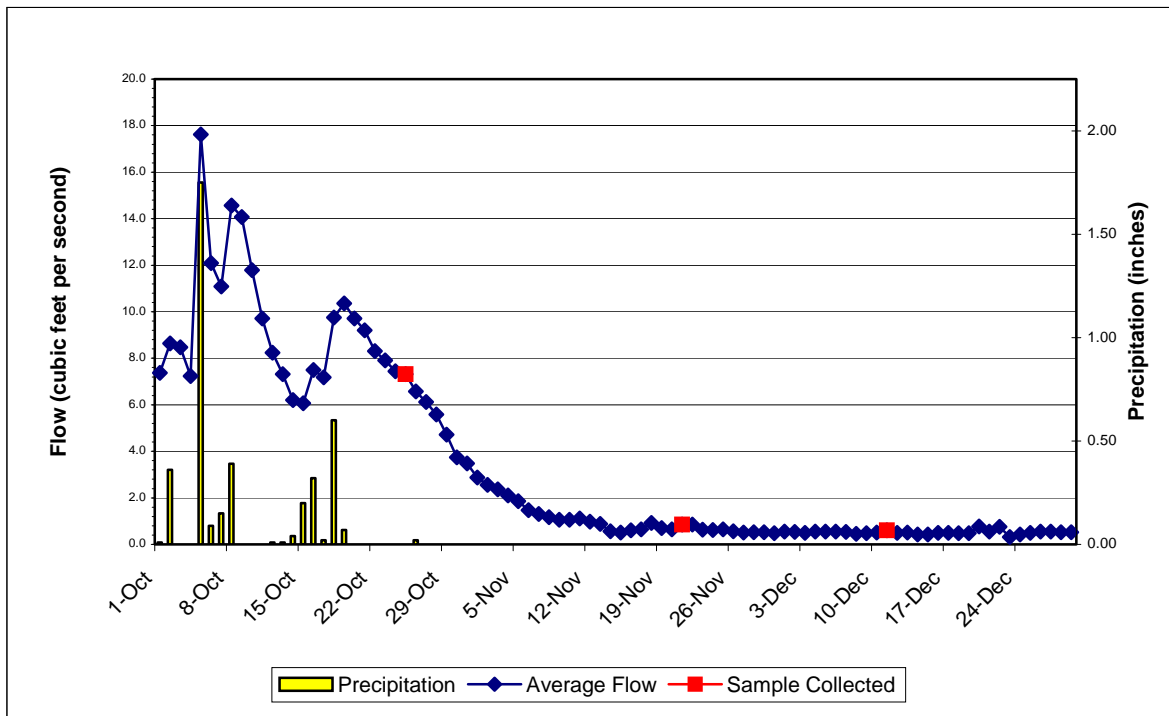


Figure 1. Flow and precipitation at Willow WOMP Station October-December, 2007

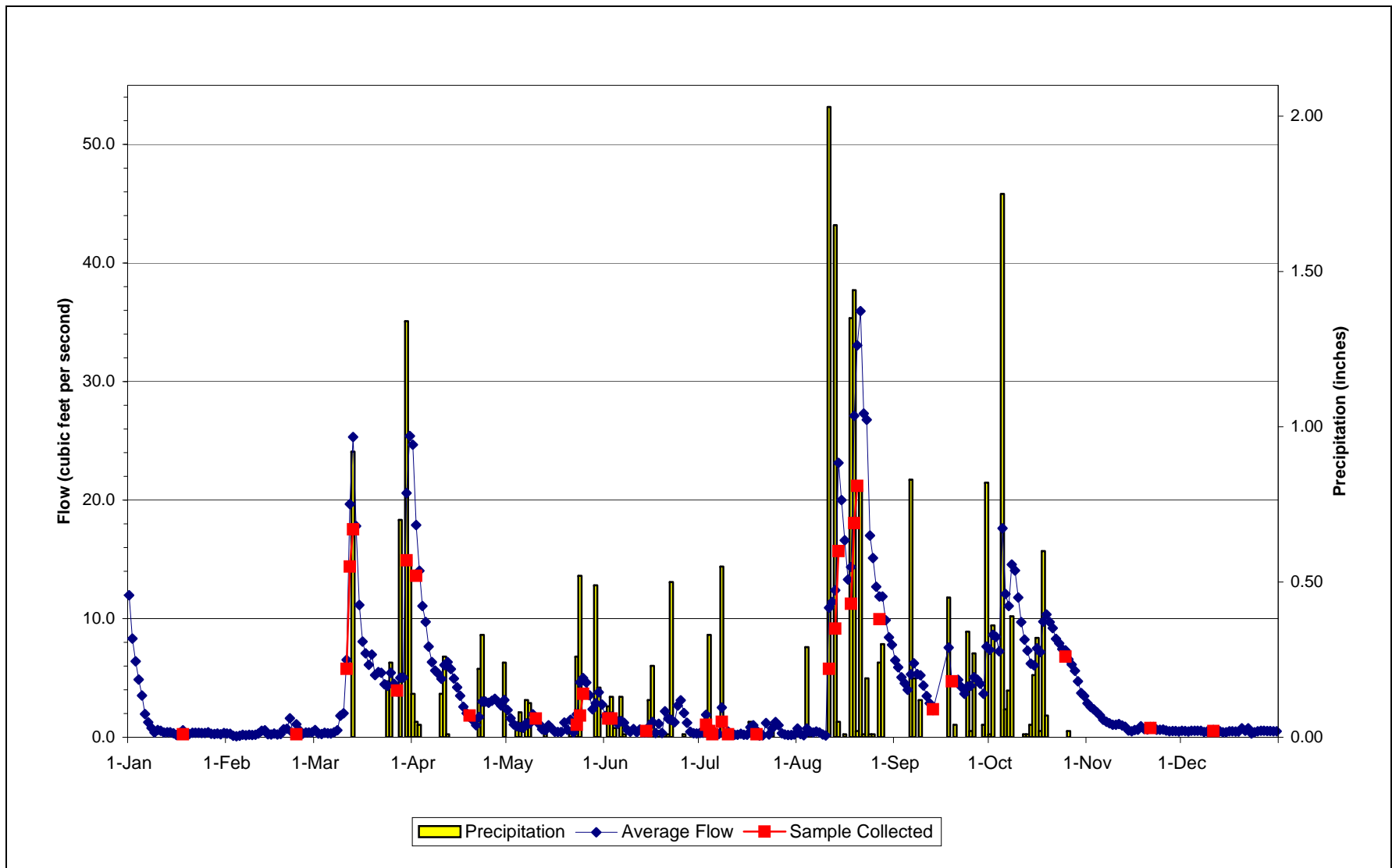


Figure 2. Flow January – December 2007 and Precipitation March 13 – November 1, 2007

Water Quality

Throughout 2007, the long established Willow Creek WOMP monitoring schedule was followed and samples were collected during runoff events and base flows, giving us a good representation of water quality conditions. It should be mentioned that the equipment used to measure stage failed in mid-September. Metropolitan Council staff promptly replaced the faulty equipment within four days of the equipment failure.

During the fourth quarter of 2007, three base flow grab samples (10/25/07, 11/21/07 and 12/11/07) were collected at the Willow WOMP Station. Overall, water quality was excellent with most parameters below/near the state standard or the minimally impacted stream ecoregion mean, with the exception of conductivity and nitrates/nitrites.

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 others. Conductivity in streams and rivers is affected by the geology of the area through which the water flows. Streams that run through granite bedrock will have lower conductivity, and those that flow 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/>).

As suggested in the 2006 4th Quarter Willow Creek Monitoring Report, Dakota County Soil and Water Conservation District (SWCD) staff identified soil types common to the Willow Creek Watershed in an attempt to describe the source of the 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 the clay soils may account for much of the elevated conductivity results.

Nitrate/nitrite concentrations over the 4th quarter of 2007 were also higher than the minimally impacted stream ecoregion mean. Although somewhat elevated at 0.39 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. Common sources of nitrates/nitrites include lawn fertilizer, failing septic systems, and industrial runoff.

In 2006, elevated fecal coliform concentrations were often reported at the Willow Creek WOMP station. Dakota County SWCD staff agreed to monitor waterfowl populations that may be inhabiting the wetland system immediately upstream from the Willow Creek monitoring station. Staff routinely surveyed this wetland following sample collections. On many occasions large populations (50+) of geese and ducks were observed in these wetlands. In addition, local residents have confirmed that a large nuisance population of geese live on or near these waterways. Therefore, we assume that a likely source of the elevated bacteria concentrations may be waterfowl living in the area. Moderately elevated fecal coliform results are relatively common in other urban streams within Dakota County.

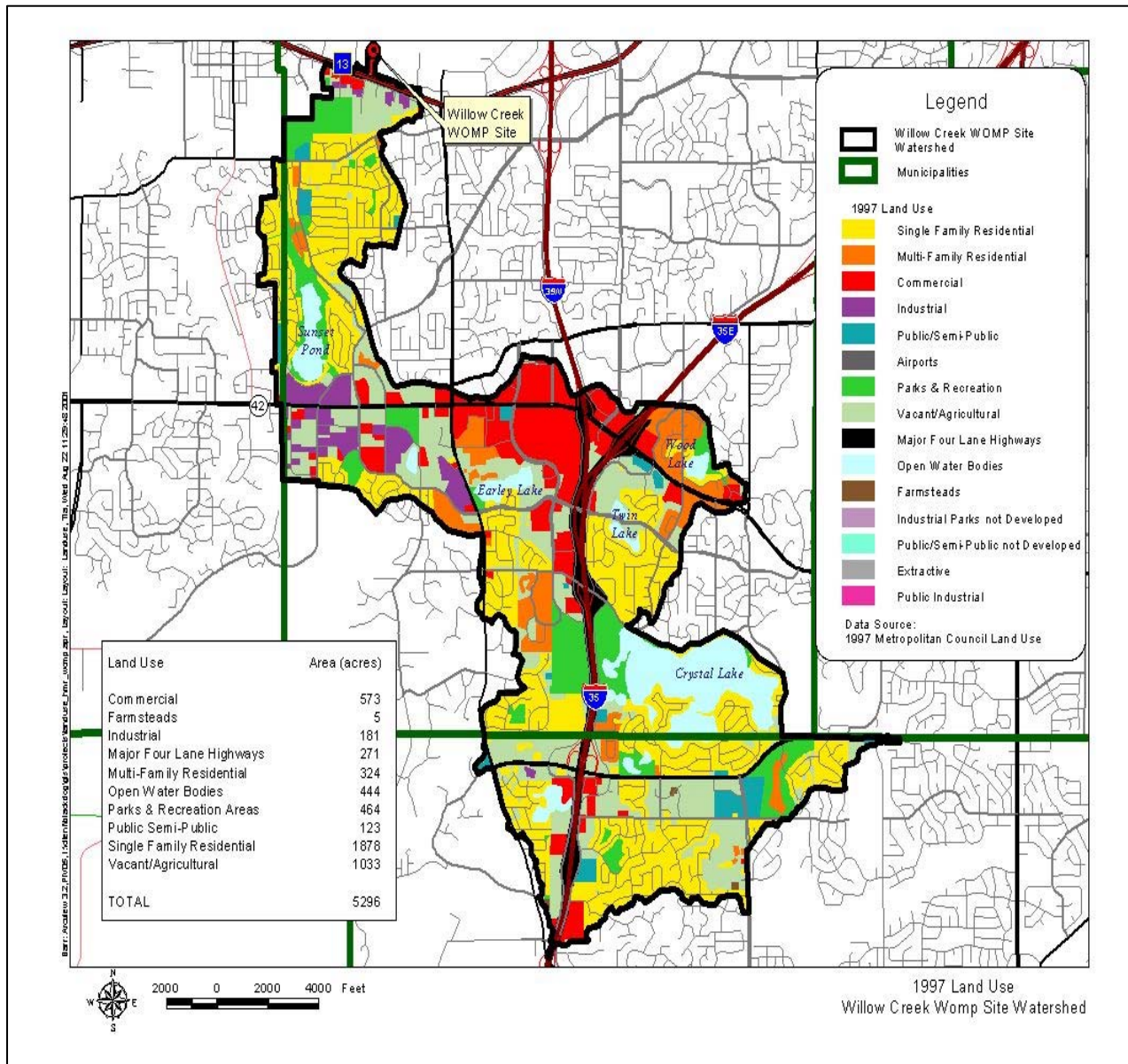
Table 2. Average concentrations at Willow Creek WOMP Station October – December 2007. 1st–3rd quarter results are included (shaded grey) for comparison purposes.

Parameter	1 st Quarter 2007 Mean Concentration	2 nd Quarter 2007 Mean Concentration	3 rd Quarter 2007 Mean Concentration	4 th Quarter 2007 Mean Concentration	Notes – 4th Quarter Results
Alkalinity	197 mg/L CaCO ₃	175 mg/L CaCO ₃	91 mg/L CaCO ₃	274 mg/L CaCO ₃	Typical for freshwater; higher during lower flow
Biological Oxygen Demand (BOD5)	1.5 mg/L	1.37 mg/L	2.93 mg/L	1.13 mg/L	Below ecoregion mean
Cadmium	0.04 ug/L	0.04 ug/L	0.29 ug/L	0.50 ug/L	In compliance with state standard
Chloride	158 mg/L	126 mg/L	47 mg/L	95 mg/L	In compliance with state standard
Chlorophyll-a	3.7 ug/L	4.2 ug/L	9.9 ug/L	5.3 ug/L	Low level
Chromium	3.3 ug/L	10.9 ug/L	4.5 ug/L	0.5 ug/L	In compliance with state standard
Conductivity	1057 mMHOs	937 mMHOs	454 mMHOs	1015 mMHOs	Above ecoregion mean, higher during low flow
Copper	2.75 ug/L	5.4 ug/L	7.6 ug/L	1.6 ug/L	In compliance with state standard
Fecal Coliform Bacteria (geometric mean)	45 CFU/100mL	240 CFU/100mL	81 CFU/100mL	15 CFU/100mL	In compliance with state standard
Hardness	321 mg/L CaCO ₃	258 mg/L CaCO ₃	129 mg/L CaCO ₃	416 mg/L CaCO ₃	Considered hard water; very hard during low flow
Lead	0.6 ug/L	1.8 ug/L	5.0 ug/L	0.1 ug/L	In compliance with state standard
Nickel	9.6 ug/L	6.6 ug/L	7.7 ug/L	9.3 ug/L	In compliance with state standard
Nitrogen Ammonia	107.5 ug/L	48.0 ug/L	168.6 ug/L	33.3 ug/L	In compliance with state standard
Nitrate + Nitrite	0.30 mg/L	2.21 mg/L	0.30 mg/L	0.39 mg/L	Above ecoregion mean
Phosphorus, Total	0.0938 mg/L	0.1136 mg/L	0.1718 mg/L	0.103 mg/L	Below ecoregion mean
Suspended Solids	11.75 mg/L	50.2 mg/L	104.1 mg/L	2.0 mg/L	Below ecoregion mean
Turbidity	6.75 NTU	22.6 NTU	20.8 NTU	2.0 NTU	In compliance with state standard
Zinc	7.7 ug/L	17.2 ug/L	56.0 ug/L	2.0 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

CFU = colony forming units
 NTU = nephelometric turbidity units

Appendix A



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