2009 EAGLE CREEK TEMPERATURE STUDY

ANNUAL REPORT

Prepared for:

Lower Minnesota River Watershed District

By:

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This study was initiated by the Lower Minnesota River Watershed District (LMRWD) to evaluate the impact storm water runoff from Highway 101 has on temperatures of Eagle Creek, a DNR designated trout stream. Temperature loggers were placed upstream and downstream of Highway 101 by Bonestroo in June of 2006 (see Figure 1), and have been recording temperature since that time. Scott Soil and Water Conservation District (SWCD) is contracted with the LMRWD to collect and report the temperature data.

The loggers record temperature in 15-minute intervals. Because trout are sensitive to temperature, it is an important variable to monitor. The optimal temperature range for adult brown trout is approximately 12.4 – 17.6° Celsius (Bell, 2006). During 2009, water temperatures rarely exceeded the optimal range for trout (see Figure 2). However, during summer months there is a noticeable warming of water temperature downstream of highway 101 following some rain events (see Figure 3). This trend may in part be attributed to runoff caused by rain heating up after landing on and flowing across hot pavement. A second possible variable to consider is overflow from the pond located between Highway 101 and the railroad tracks, which discharges into Eagle Creek from the west (see Figure 4). The downstream temperature logger is located approximately 30 feet downstream of this input. This pond holds water which is likely warmed by a combination of solar energy and storm water inflow. Large amounts of warm water may be released during rain events as the pond fills and overflows.

Figure 1. Location of temperature loggers and Watershed Outlet Monitoring Program (WOMP) Station. The rainfall data in this report was collected at the WOMP station.

A study conducted on August 19, 2009, during a rain event (see Figure 5) shows numerous temperature monitoring locations on Eagle Creek upstream and downstream of the tributary, including the tributary itself. The temperature of Eagle Creek rises almost 2°C directly after the tributary discharges into Eagle Creek. The tributary water is almost 5°C higher than Eagle Creek. Temperature spikes appear to be due less from direct Highway 101 runoff, but rather more significantly, a combination of the warm ponded water, runoff from Highway 101, and an increase of water volume leaving the tributary. The temperature of the pond may not actually increase during storm events, but rather the volume of water discharging into Eagle Creek is perhaps the stronger influence on temperature rise. This greatly exceeds the small increase in temperature that typically occurs during dry periods that could be attributed to atmospheric warming of the stream. Even though the temperature exceeds the optimal range for trout by only a few degrees and for only a short period, these temperature increases could be stressful to fish. Placing a temperature logger in the tributary would be informative for future monitoring analysis.

Road construction is planned for Highway 101, from May 2010 – June 2011, including the stretch of road that crosses Eagle Creek. Some runoff will be reduced to Eagle Creek and instead diverted to a storm water holding pond. By continuing monitoring efforts, the opportunity exists to determine how much influence the roadway has on stream temperature before, during and after construction is complete and runoff is minimized.

Water temperature is an important factor influencing the health of trout streams. Overall, water quality of Eagle Creek appears good. Trout are making a comeback (Peterson, 2008), water temperatures rarely exceed optimal range, and most of the riparian area is in a natural state. However, the state water quality standard for Class 2A waters maintain there shall be “no material increase” in temperature. Future monitoring will help track whether the planned road construction will reduce the volume of water discharging to Eagle Creek, therefore reducing temperature spikes after rain events.

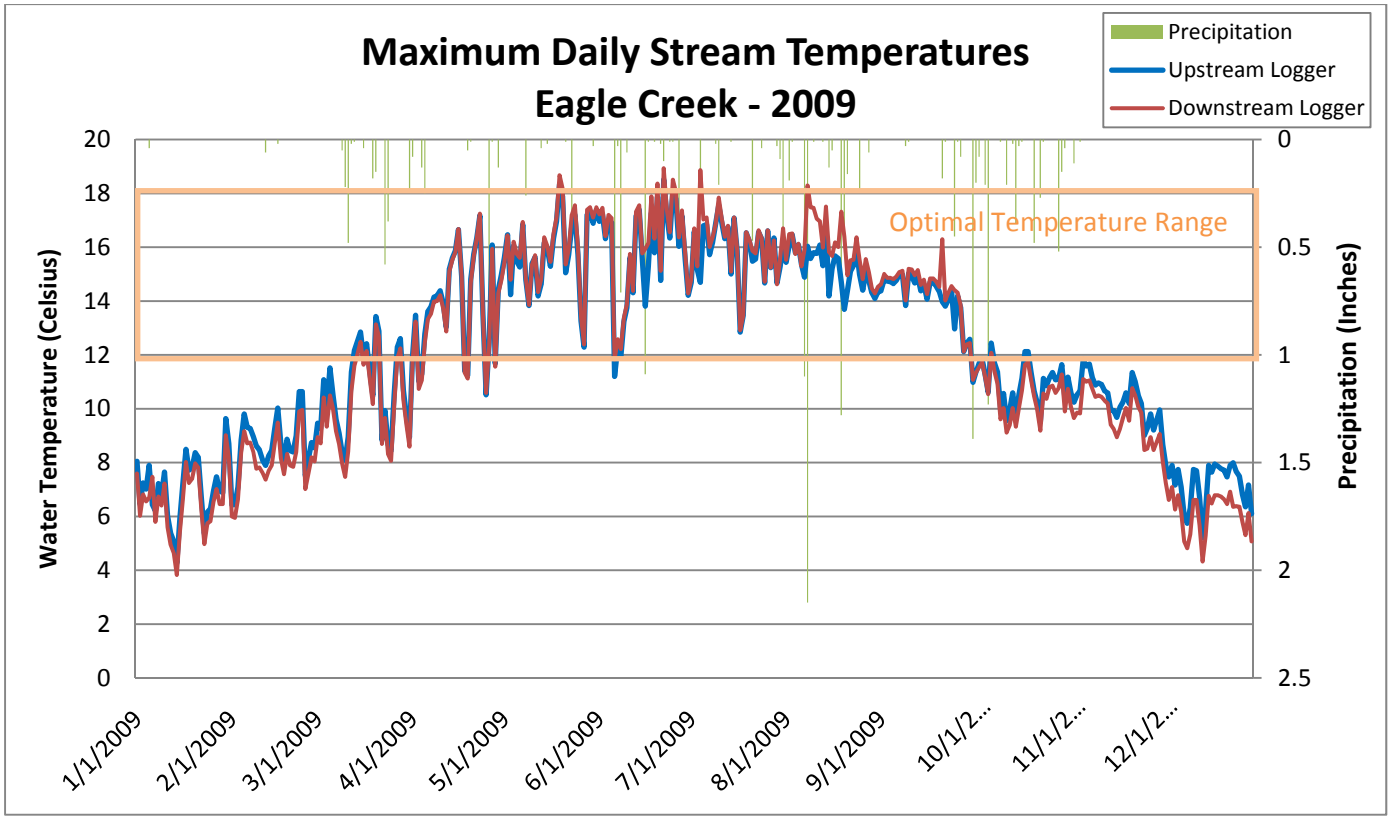

Figure 2. Maximum Daily Stream Temperatures in Eagle Creek. Temperature results recorded upstream and downstream of Highway 101, precipitation, and an overlay with optimal temperature range for brown trout.

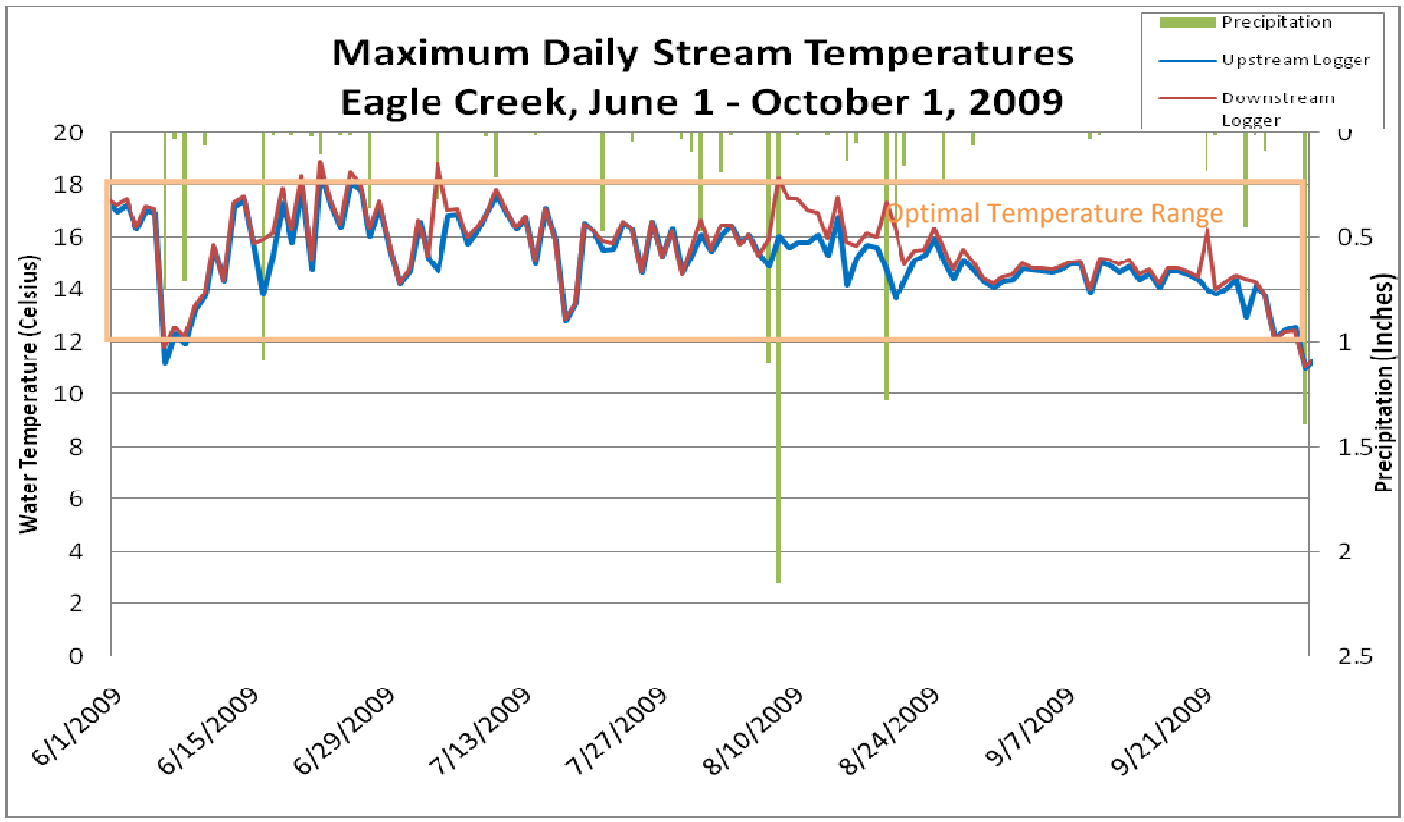

Figure 3. Maximum Daily Stream Temperatures between June 1 and October 1, 2009. This graph represents the temperature deviations following some rain events, precipitation, and an overlay with optimal temperature range for brown trout.

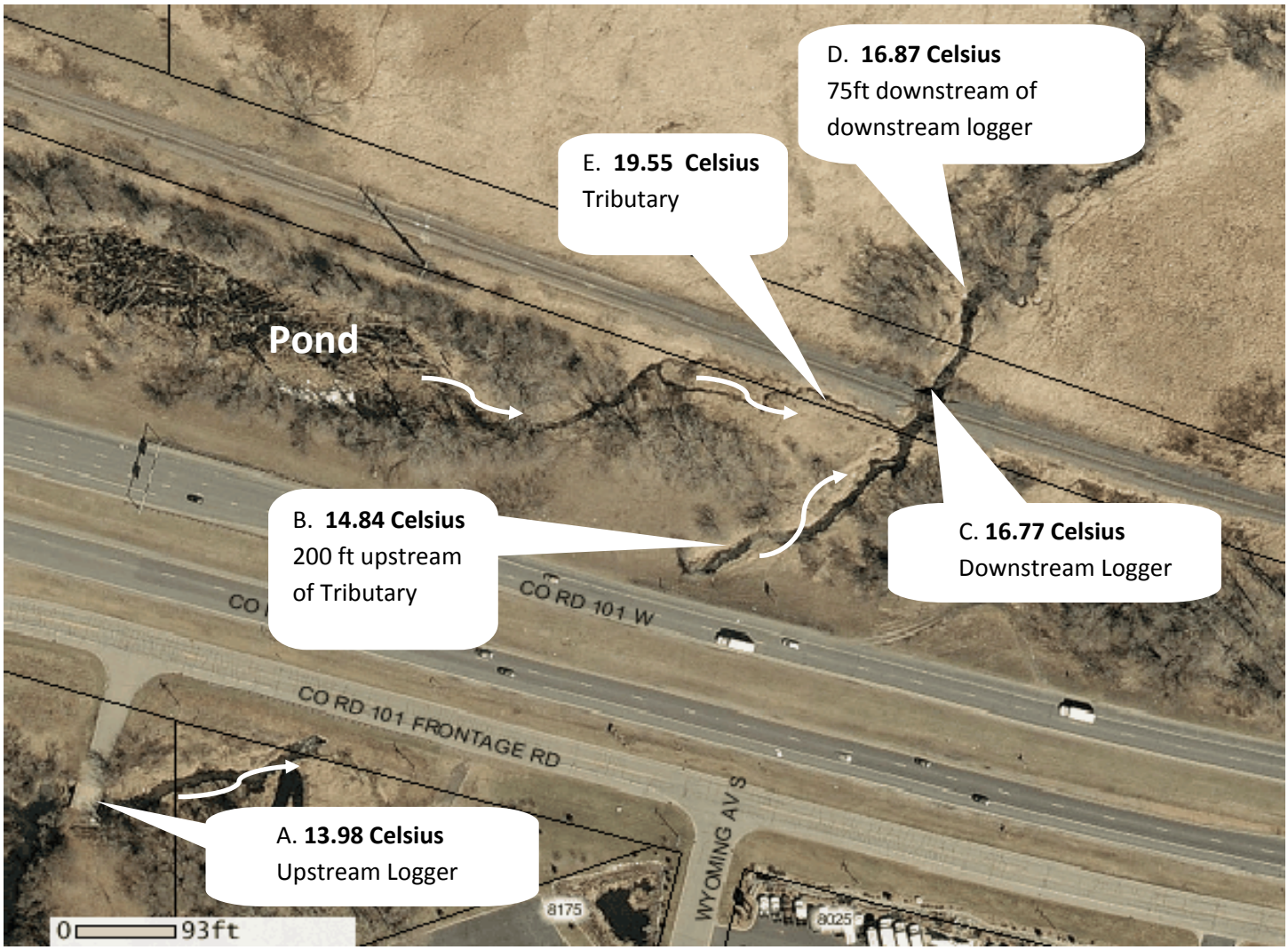

Figure 4. Synoptic Monitoring on Eagle Creek. White arrows indicate flow direction. Callouts indicate temperature values taken at approximately 4:00pm on August 19, 2009 during a rain event. Notice temperature increase between (B) and (C). Tributary (E), which comes from the pond, is contributing warmer water than the direct contribution from Highway 101 (estimated that 5–10 cfs water coming from tributary during time of measurement).

Works Cited:

Bell J.M., 2006. The Assessment of Thermal Impacts on Habitat Selection, Growth, Reproduction, and Mortality in Brown Trout (*Salm trutta* L): A Review of the Literature. Prepared for the Vermillion River EPA Grant #WS 97512701-0 and the Vermillion River Joint Powers Board. Applied Ecological Services, Inc.

Peterson, David. (2008, October 1). "Without a doubt: More trout in Eagle Creek." *Star Tribune*. 2008. Star Tribune. 21 May 2009 [http://www.startribune.com/local/south/29842934.html?elr=KArksi8cyaiUo8cyaiUiD3aPc:_Yyc:aUU].