

Root River Turbidity TMDL

Overview

The Clean Water Act, Section 303(d), requires that states publish a list of waters that do not meet water quality standards and do not support their designated uses every two years. These waters are then considered "impaired," and a Total Maximum Daily Load (TMDL) must be developed. The TMDL provides a calculation of the maximum amount of a pollutant that can enter a water body and still allow it to meet water quality standards. It's the sum of the individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources and natural background, a margin of safety (MOS), and a reserve capacity (RC).

$$TMDL = \text{sumWLAs} + \text{sumLAs} + \text{MOS} + \text{RC}$$

The Minnesota Pollution Control Agency (MPCA) is responsible for listing impaired waters in Minnesota. There are eleven reaches monitored for this project, all of which are impaired for turbidity and the affected use is aquatic life. The first impaired reach for this TMDL was listed in 1994, with additional reaches listed in 2004 (2), 2006 (4), and 2008 (4). The target start date for this TMDL was 2009, and the target completion date is 2013.

The eleven turbidity impairments for the Root River as well as the monitoring locations are spread out across the watershed (see map to right). There are two turbidity impairments on the North Branch, six in the South Branch watershed, one on the South Fork, one on Money Creek (tributary to the Main Branch), and one at the mouth of the Main Branch. Monitoring locations were established across the watershed to monitor these impairments. Besides impairments, existing monitoring data/equipment and site access were considered when determining the sites for this study.

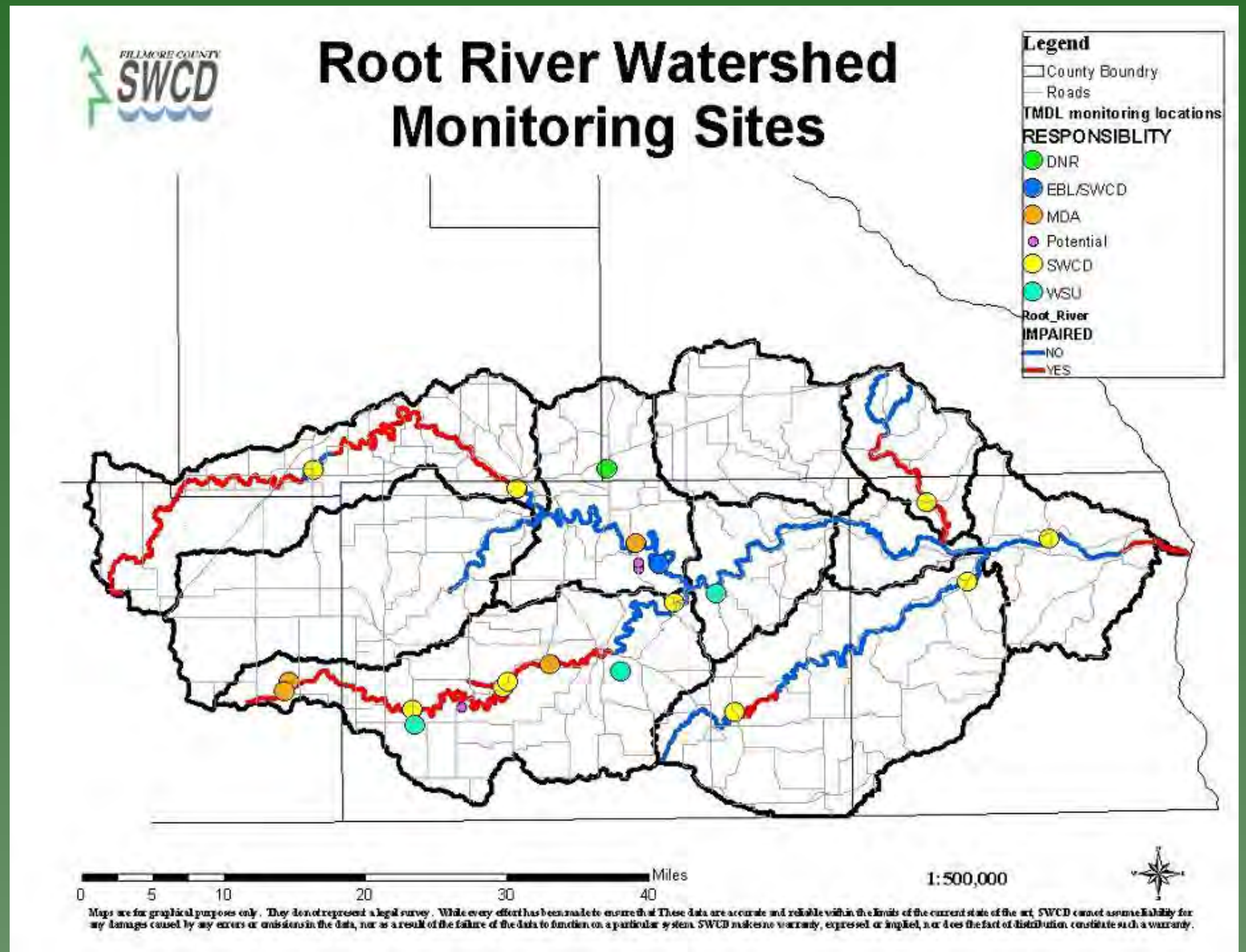


Figure 1: Root River Watershed Turbidity Impairments and Monitoring Sites

Turbidity

Turbidity is a measure of water clarity and also an indicator of water quality. Turbidity is caused by suspended and dissolved matter including silt, clay, organic matter, and algae. Sediment is the dominant source of turbidity in the Root River Watershed. Sediment makes its way through the watershed in many ways including erosion from agricultural fields, bluffs, ravines, in-stream erosion, and via karst features. The state standard for turbidity in Minnesota is 25 nephelometric turbidity units (NTUs) for class 2B waters (cool and warm water fisheries), and 10 NTUs for class 1B and 2A waters (drinking water and cold water fisheries). Elevated turbidity levels are detrimental to water quality and habitat. Negative impacts can include reduced light penetration and plant growth, reduced invertebrate and fish habitat, reduced forage, killing or reducing the growth rate of fish, reducing the aesthetics of our lakes and streams, and increasing our water treatment costs.



Figure 2: Transparency Tube



Figure 3: Sediment entering the stream after a rain event

Current Status

The 3rd and final monitoring season for the Root River Turbidity TMDL wrapped up in 2010. A majority of the monitoring equipment has been removed, except for select sites that will be continued for long term monitoring purposes. The final report is due to the U.S. Environmental Protection Agency (EPA) by June 30th, 2011. Up until then the Fillmore SWCD and MPCA will be compiling, processing, and analyzing 3 years of data and incorporating the results into the report. One of the end products will be a Load Duration Curve (LDC) for each impaired reach, which essentially "sets" the TMDL and establishes the percent reductions needed in order to meet the water quality standard. The LDC's in addition to any supplemental data (e.g. sediment fingerprinting, load estimates) will help guide the implementation process. An implementation plan will eventually be developed (not sure on the timeline at this point) to address the impairments and necessary reductions.

Sediment Fingerprinting, a technique used to identify sediment sources, was performed in 2010 as part of this project. A total of 82 water samples were collected across 5 sites in the Root River Watershed, and are currently being analyzed. Beryllium-10 and Lead-210 isotope concentrations are used to determine sediment sources. This method will allow us to determine what percentage of the sediment is coming from crop fields versus how much is coming from bluffs, ravines, floodplains, and in-stream channel erosion.

Total Suspended Solids (TSS), Nitrate + Nitrite, and Total Phosphorus (TP) data collected over the duration of the project can be seen in the graphs below. These values are based on yearly averages at each monitoring site and have not been flow weighted. **All data displayed is preliminary.**

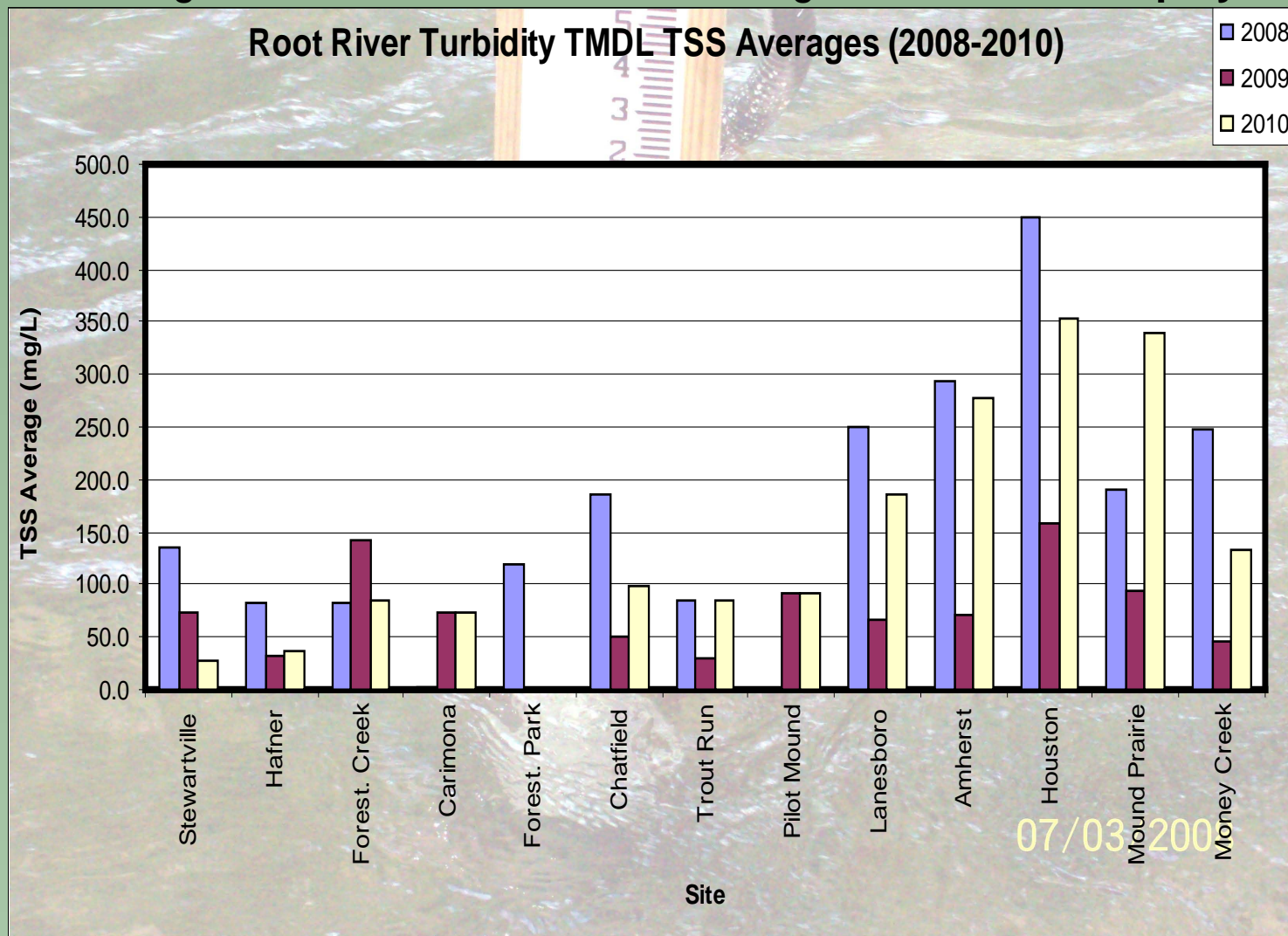


Figure 4: 2008-2010 TSS Averages

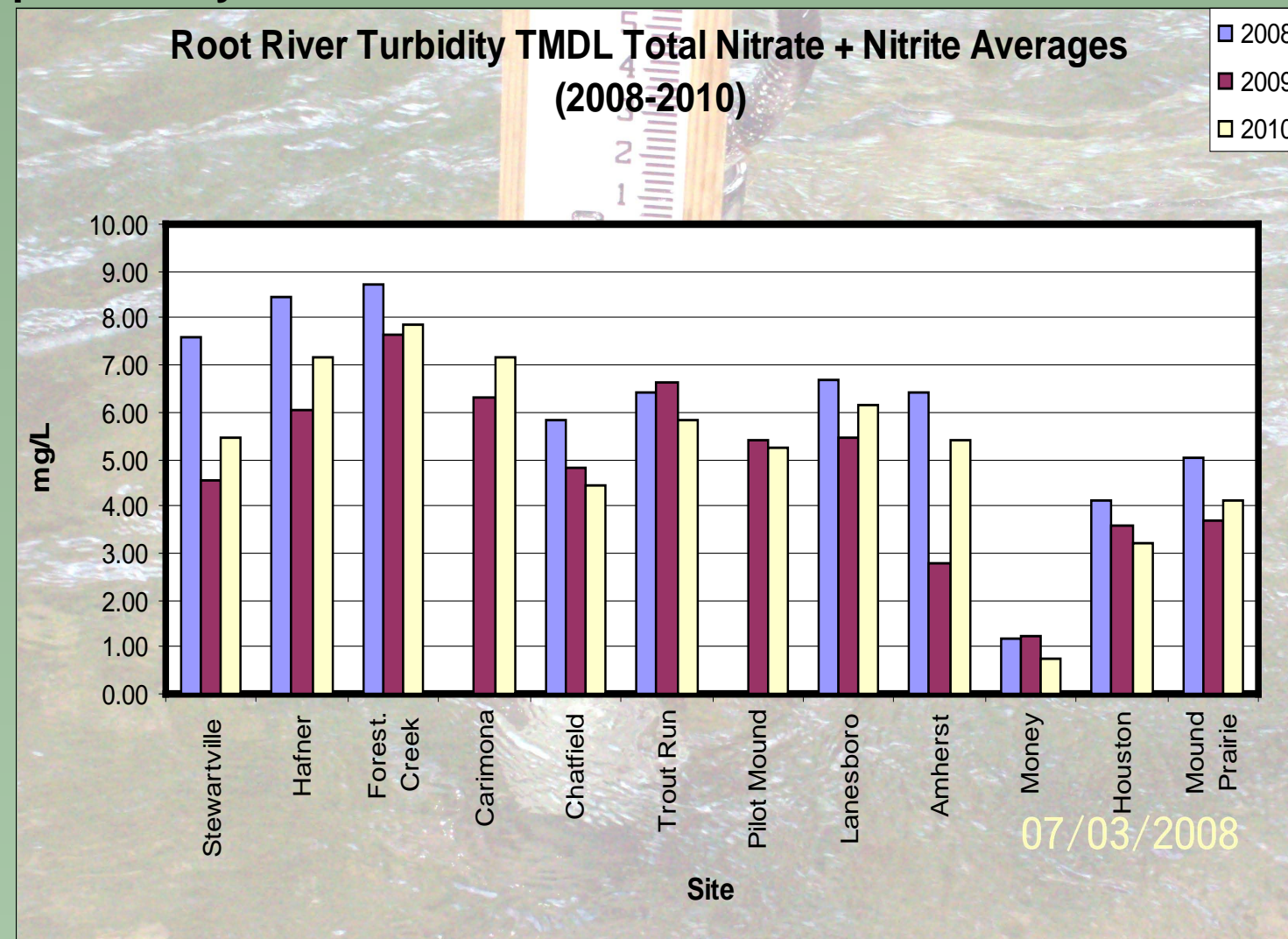


Figure 5: 2008-2010 Nitrate + Nitrite Averages

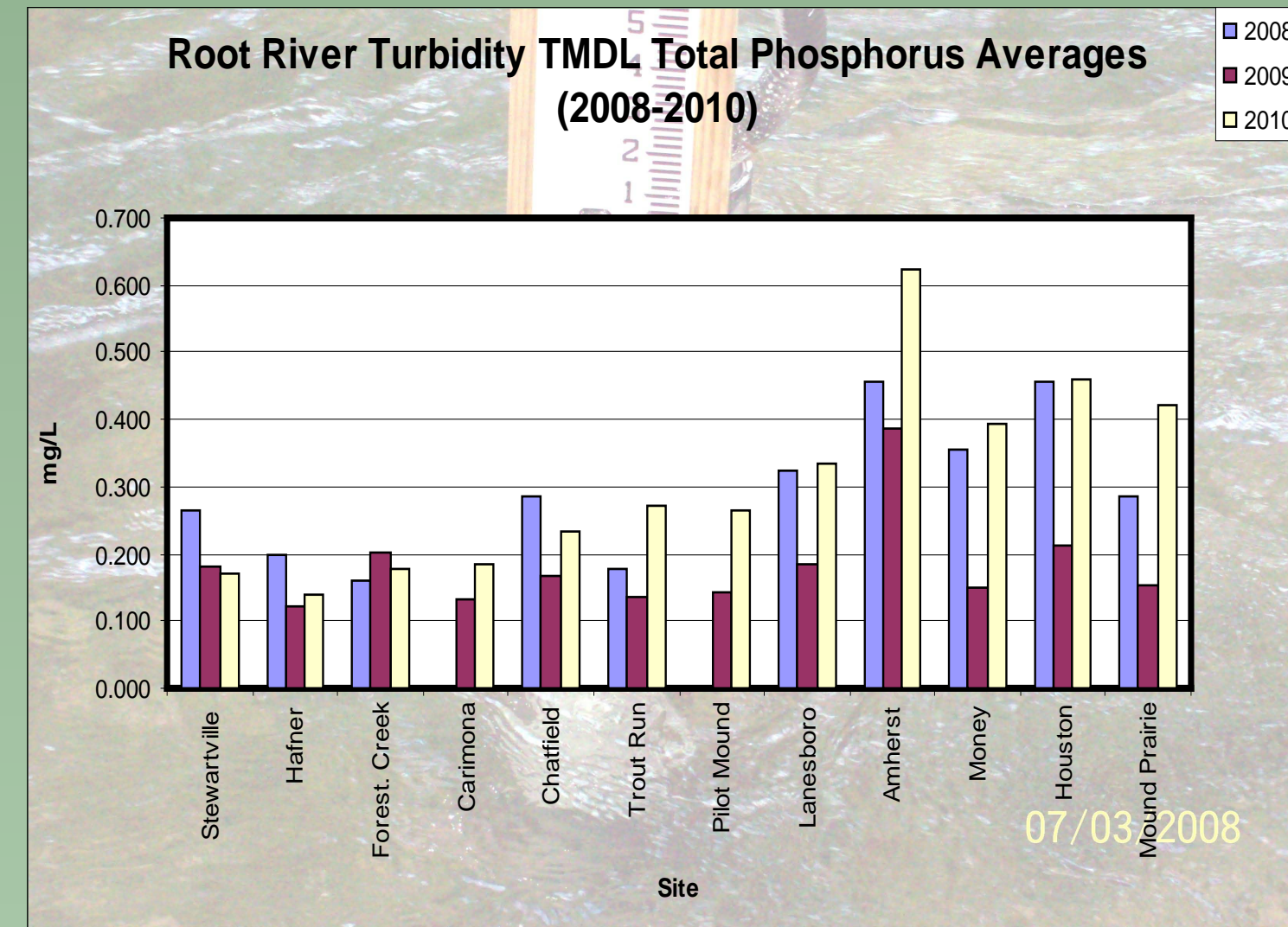


Figure 6: 2008-2010 Total Phosphorus Averages

"Civic Engagement" is Big Component of Upcoming Root Project

"Civic Engagement" (engaging the public/stakeholders) is a key element of The Root River Comprehensive Strategy, an upcoming project in the Root River watershed. This project activity will operate at two levels: the Root River watershed as a whole, and a targeted effort within the upper South Fork Root River watershed.

For the Root River watershed as a whole, this project activity will promote the following four objectives:

1. Early involvement of stakeholders in the project
2. Early and frequent public information and outreach
3. Citizen leadership development
4. Inclusion of citizens in developing and implementing the comprehensive Root River watershed management strategy.

The targeted approach in the upper South Fork Root River watershed will involve residents in developing their own civic engagement plan. This plan will produce elements of a sub-watershed management strategy, and serve as a model of what can be accomplished through a more intensive civic engagement process.

This project is scheduled to start in 2011.



Figure 7: Monitoring Equipment



Figure 8: Grab Sampling



Figure 9: DTS-12 Turbidity Probe



Figure 10: Flow Measurements



Figure 11: North Branch of the Root River

Joe Magee
Fillmore SWCD – Water Plan /
TMDL Coordinator
507 – 765 – 3878 x 109
joe.magee@fillmoreswcd.org



Shaina Keseley
MPCA – Watershed Project Manager
507 – 206 – 2622
Shaina.keseley@state.mn.us