Watershed Pollutant Load Monitoring Network

Data for Determining Spatial and Temporal Differences in Water Quality, Pollutant Sources, and Delivery Dynamics

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MINNESOTA DNR

CLEAN WATER LAND & LEGACY AMENDMENT

Objectives of Today's Talk

- **Background**
  - Program Design
- **Pollutant Load Data**
  - Spatial and Temporal Variability
  - Pollutant Load Reduction Targeting
  - Pollutant Delivery Dynamics
    - Sources
    - Source Contributions

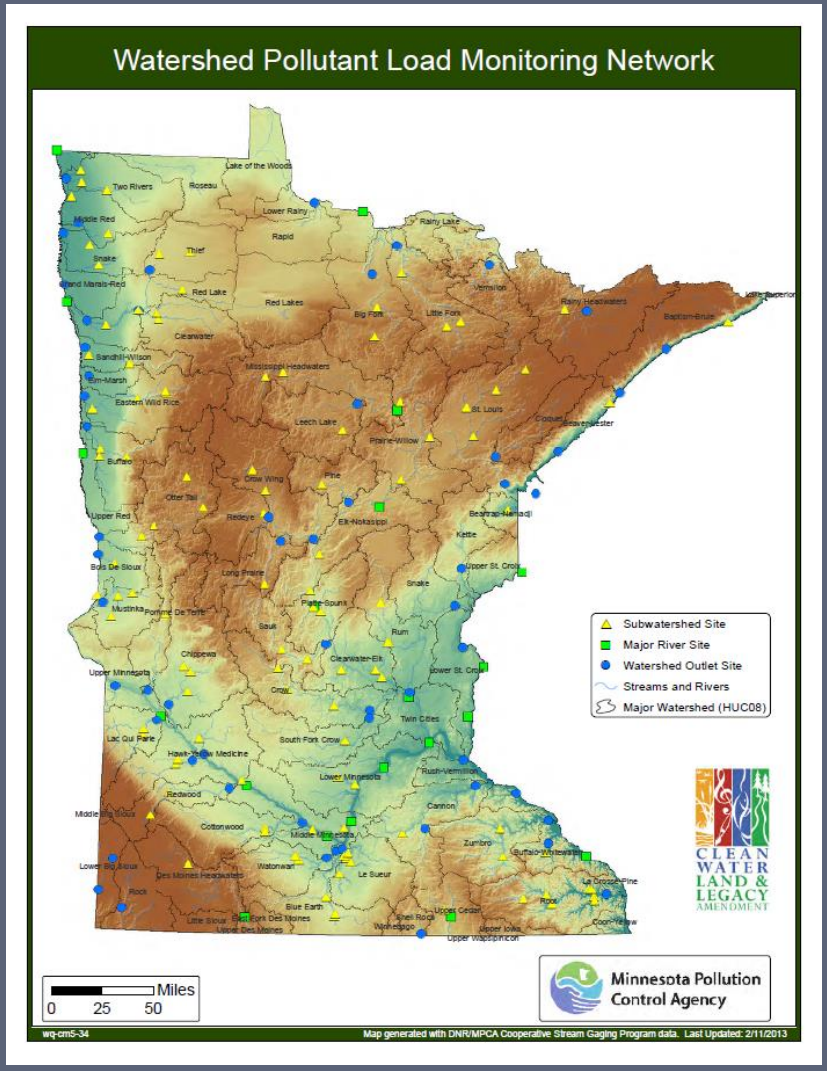
The Watershed Pollutant Load Monitoring Network (WPLMN) is a statewide monitoring network designed to obtain long-term spatial and temporal pollutant load information from Minnesota's rivers and streams and track water quality trends

Program Goals

CLEAN WATER LAND & LEGACY AMENDMENT

Monitoring Sites

Watershed Pollutant Load Monitoring Network – Program Design



- 20 Basin
- 56 Major Watershed Outlets
- 126 Subwatershed

Data

Watershed Pollutant Load Monitoring Network – Program Design

DISCHARGE DATA

- USGS and MDNR

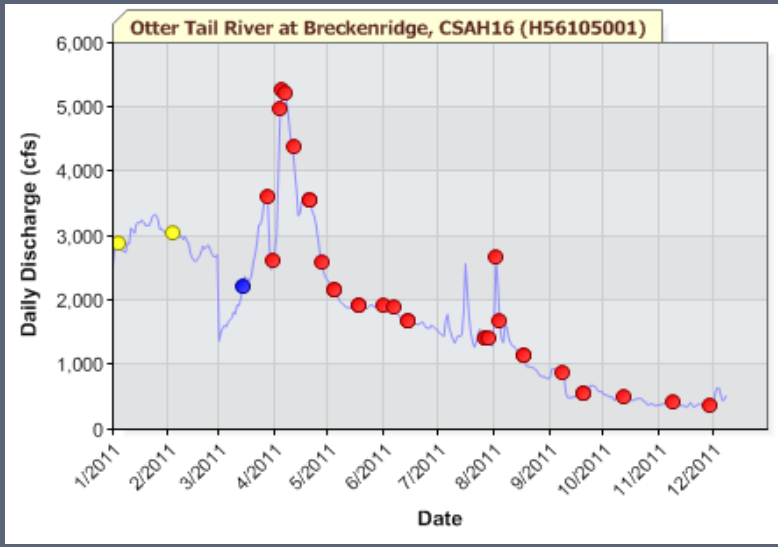
WATER QUALITY DATA

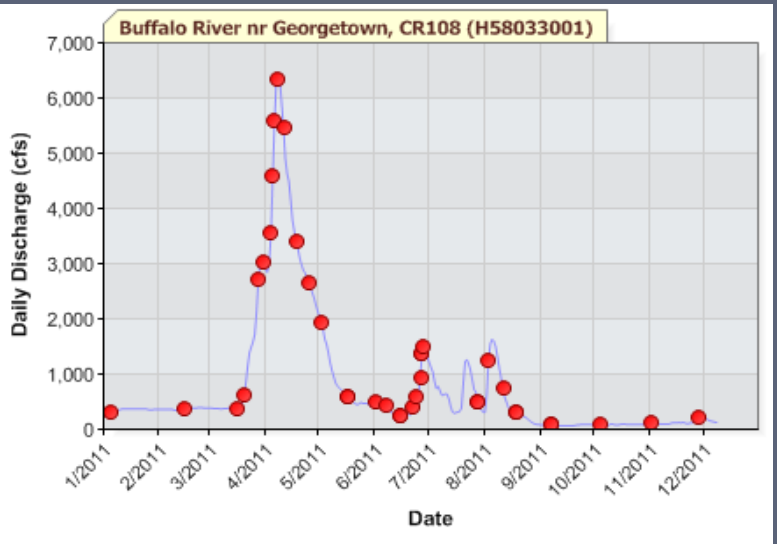
- WPLMN Staff
- Colleges/Universities
- LUG's

Water Quality Sampling Frequency

Watershed Pollutant Load Monitoring Network – Program Design

- Basin and Watershed Sites
  - 35 samples/year
  - Annual Loads
- Subwatershed Sites
  - 25 samples/year
  - Seasonal Loads

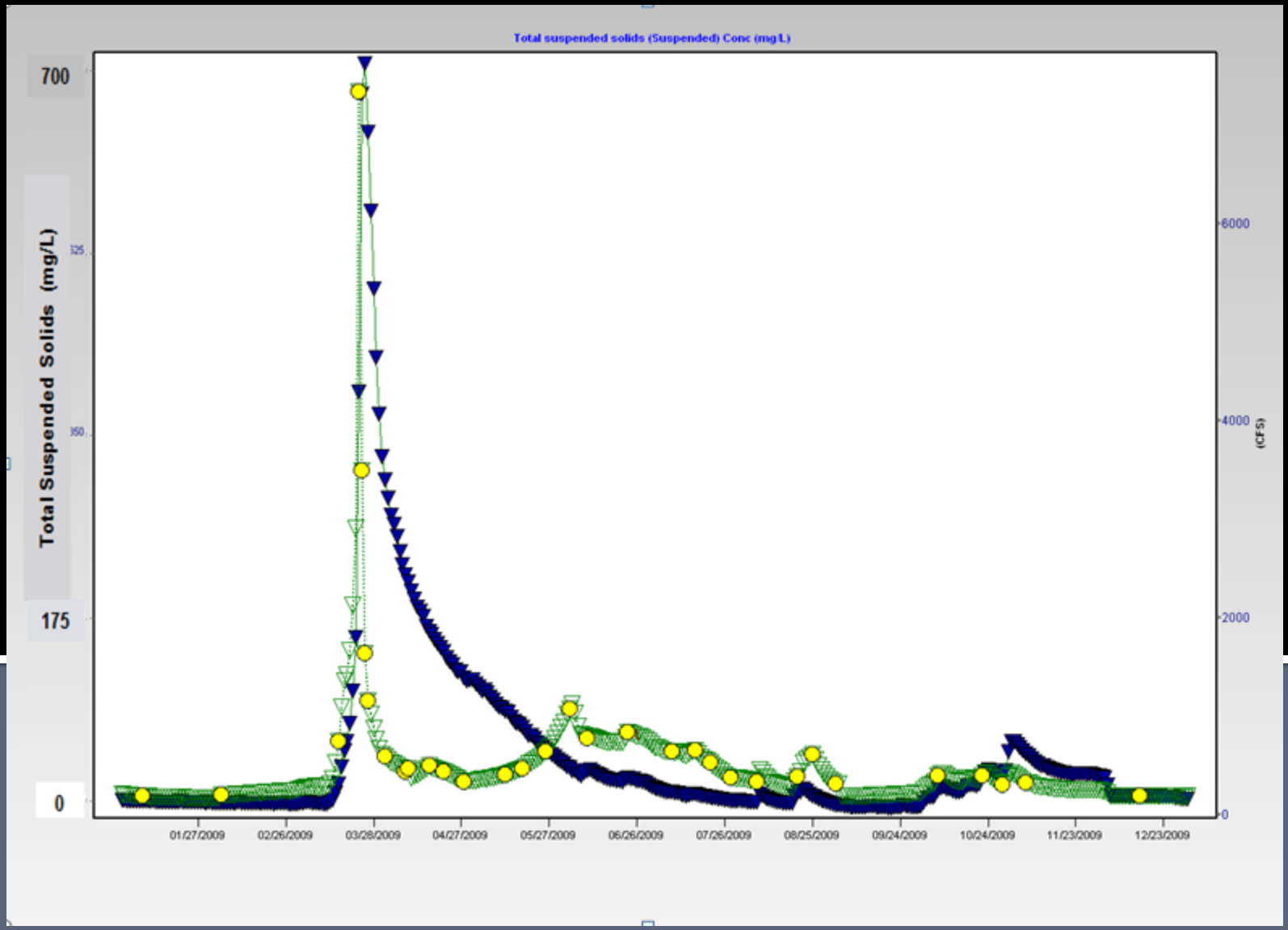




Pollutant Load Calculations

FLUX32 Pollutant Load Software

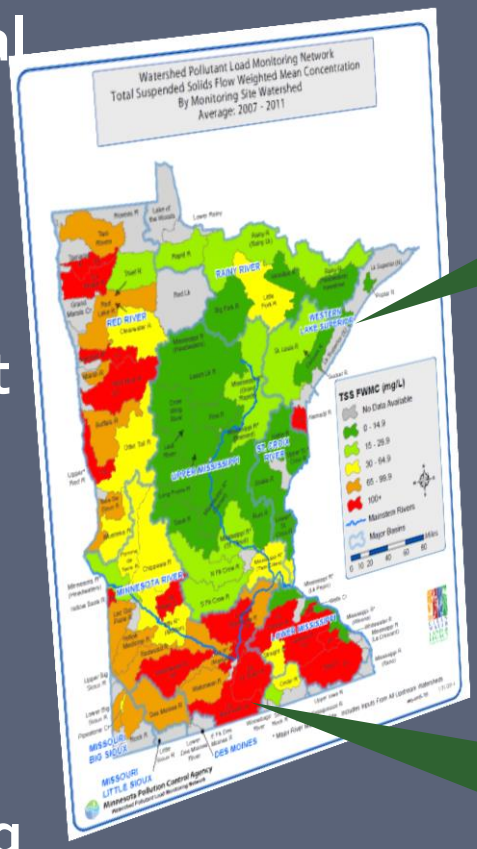
Watershed Pollutant Load Monitoring Network - Program Design



Data Uses

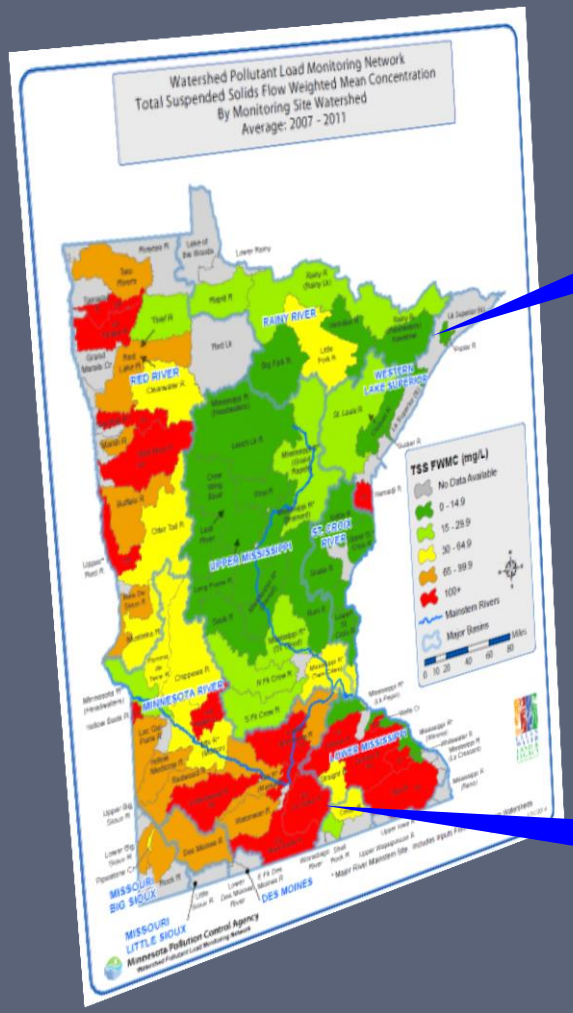
Watershed Pollutant Load Monitoring Network – Program Design

- Spatial and temporal differences in WQ
- Targeting - load reductions
- Determine pollutant sources and source contributions
- Track WQ Trends
- Watershed studies and reports
- Watershed Modeling



Spatial Differences in Water Quality

Watershed Pollutant Load Monitoring Network – data Uses

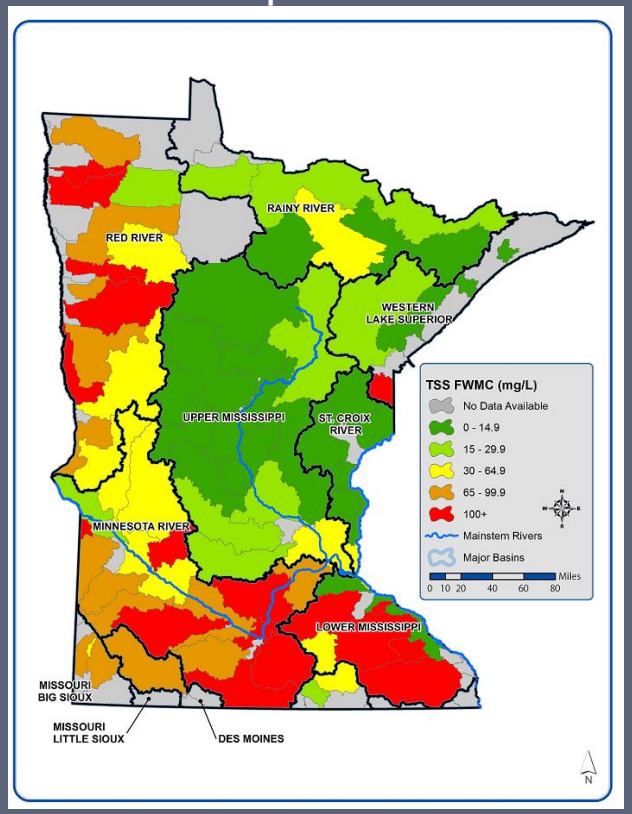


Spatial Differences in Water Quality

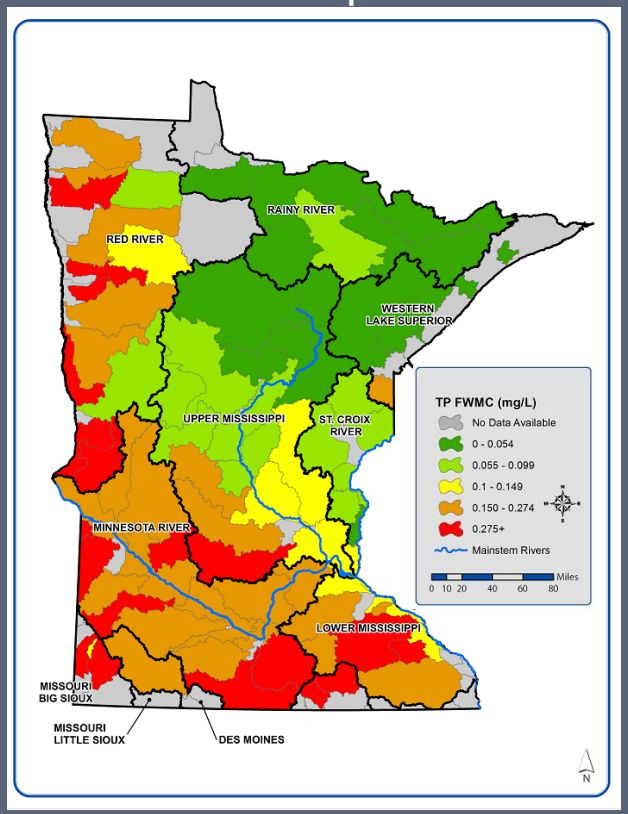
Watershed Pollutant Load Monitoring Network – data Uses

Average Flow Weighted Mean Concentrations (2007-11)

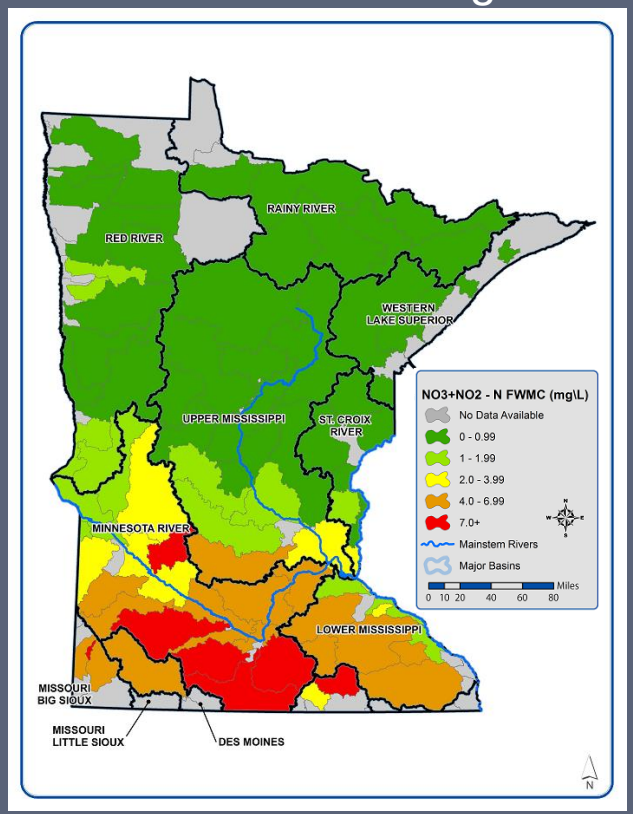
Total Suspended Solids



Total Phosphorus



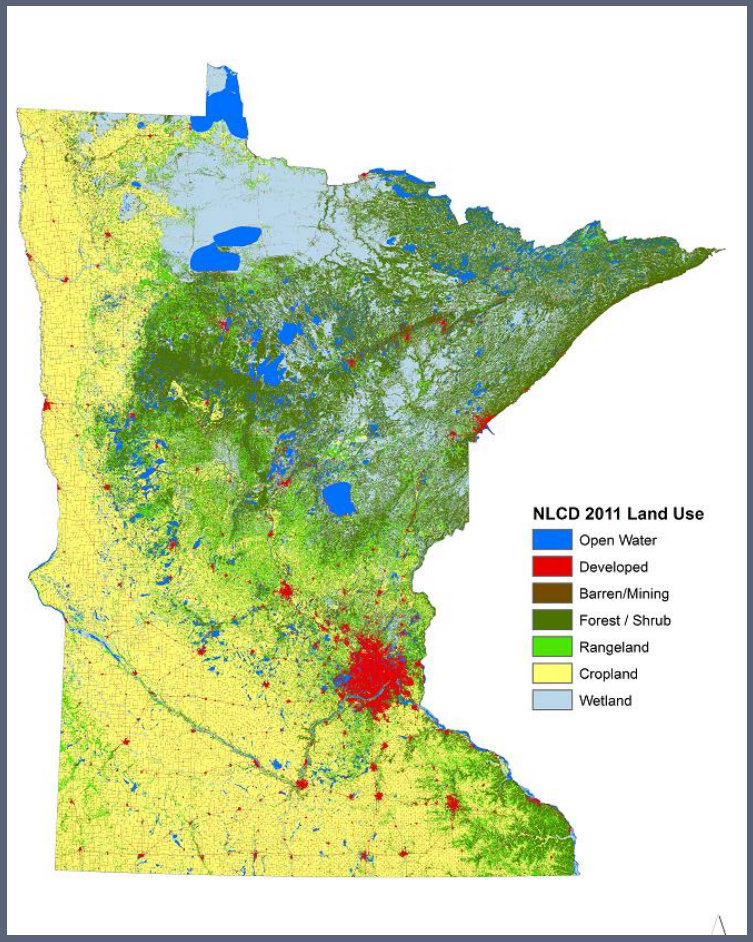
Nitrate+Nitrite Nitrogen



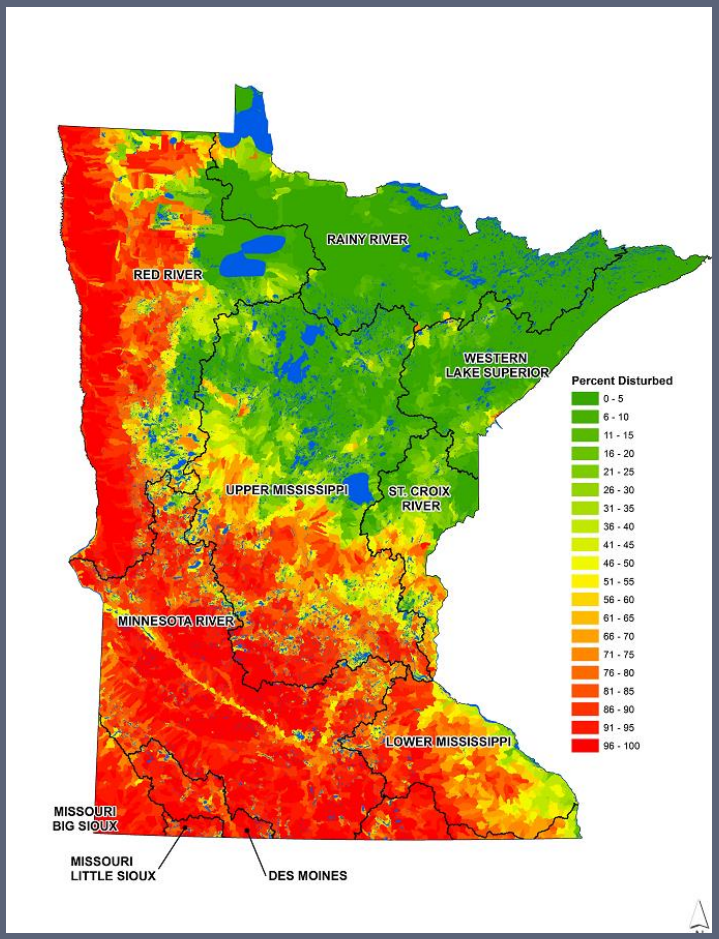
Understanding Spatial Differences in Water Quality

Watershed Pollutant Load Monitoring Network – data Uses

Land Use



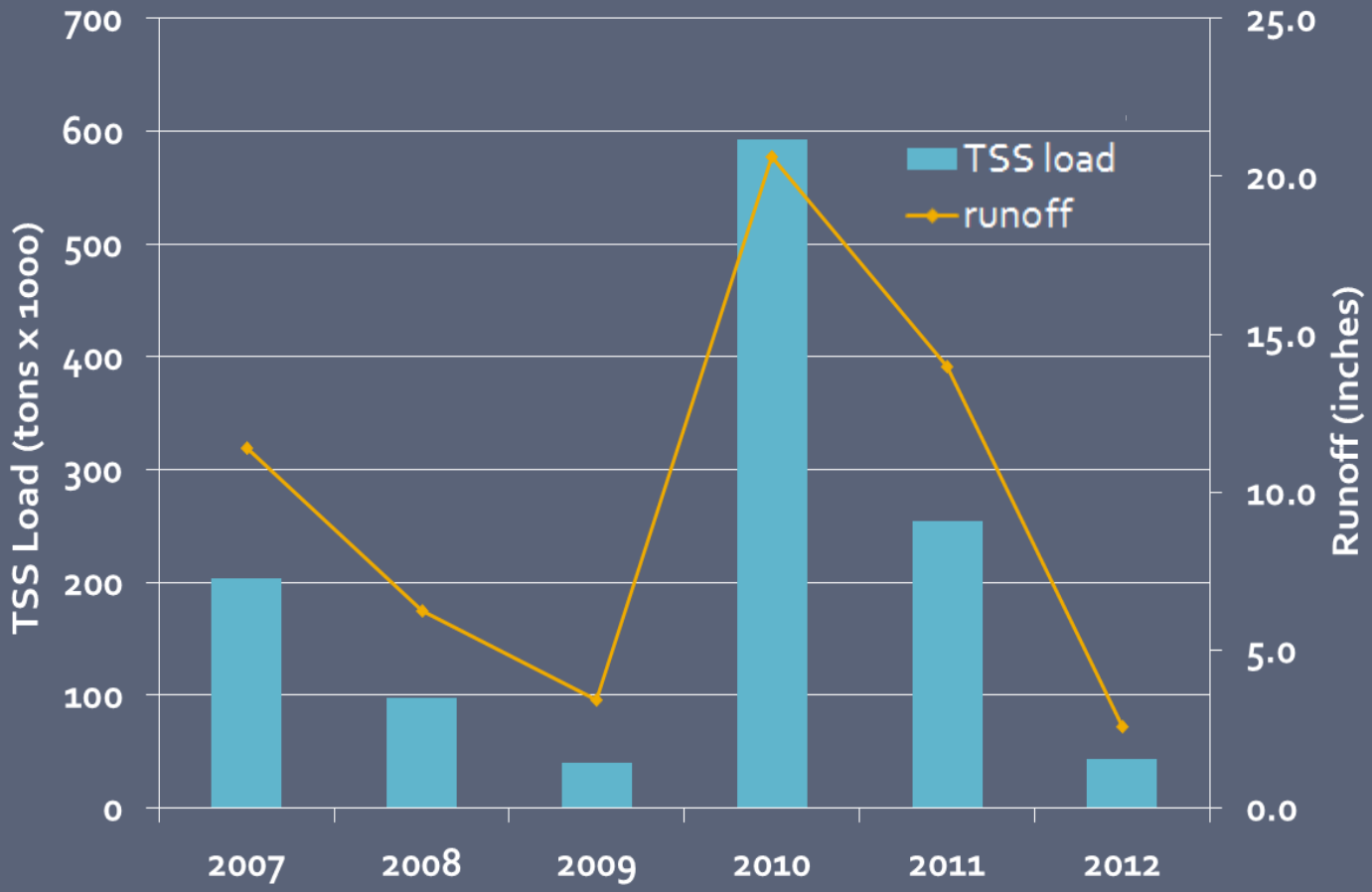
Percent Land Disturbance

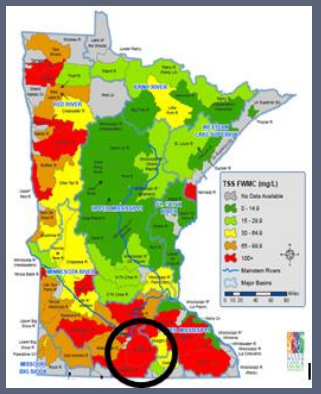


Temporal Differences in Water Quality

Watershed Pollutant Load Monitoring Network – data Uses

Le Sueur River annual total suspend solids loads and runoff

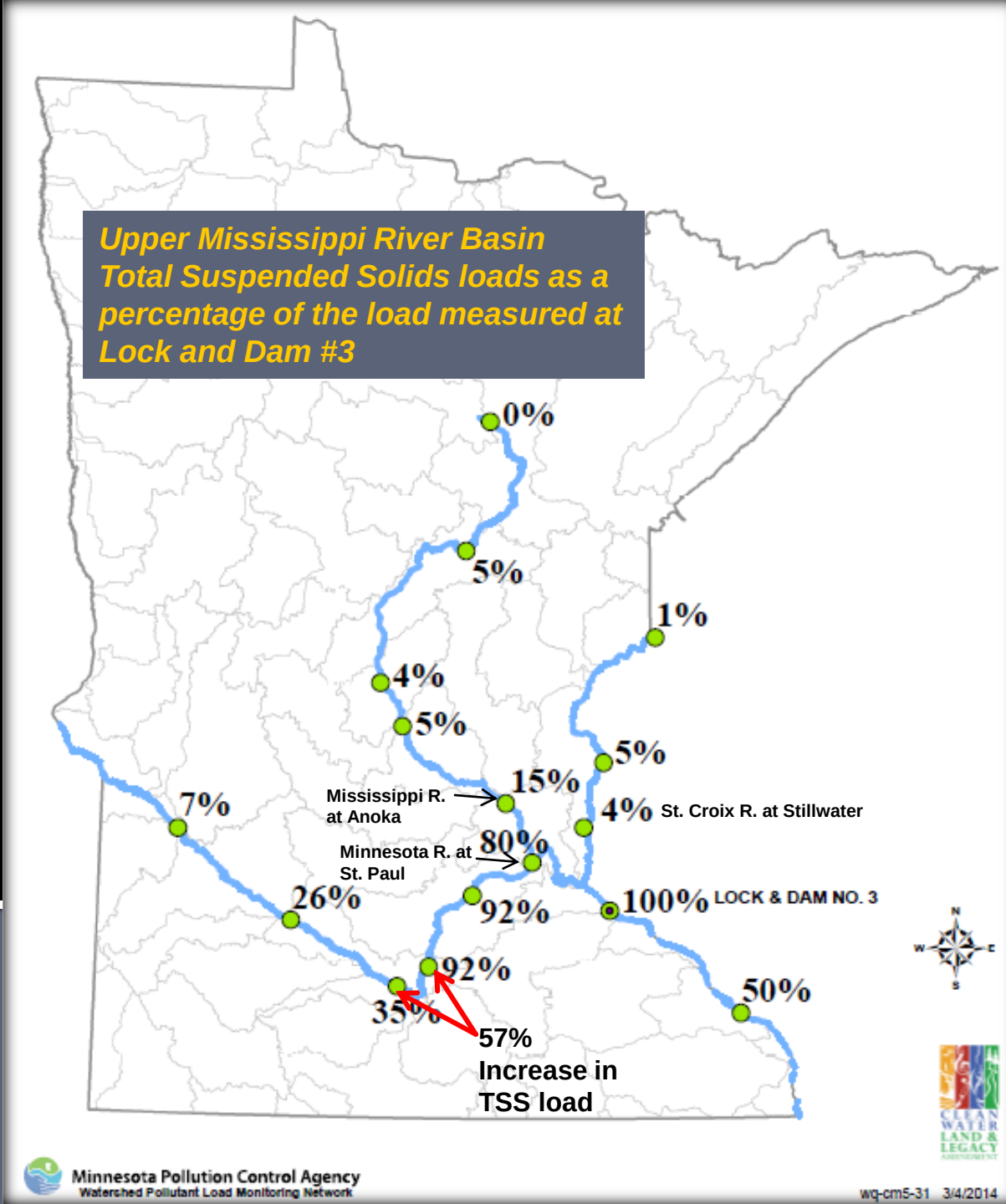




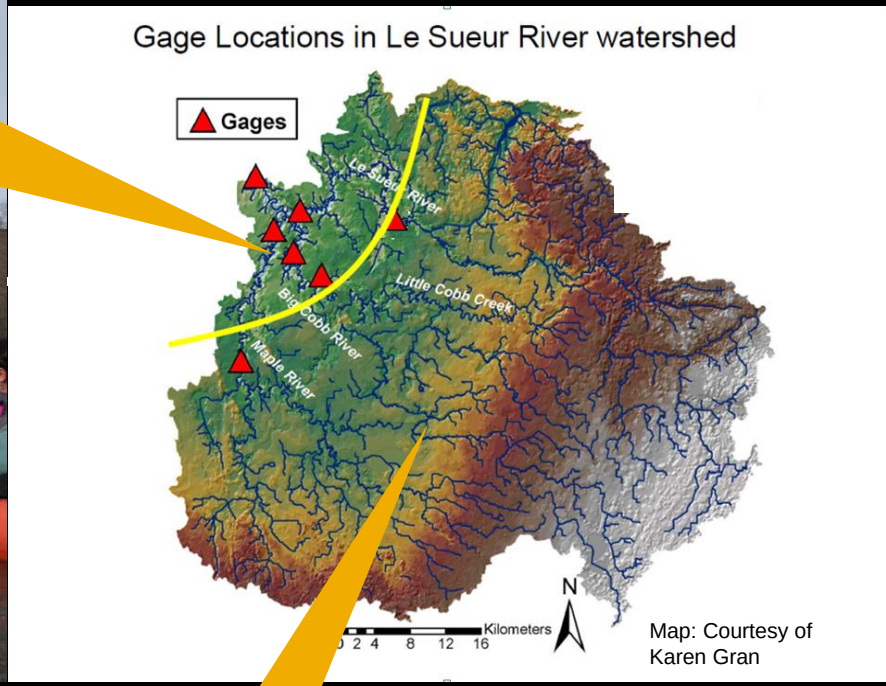
Pollutant Load Targeting:

Accelerated Infilling of Lake Pepin

(IS and TS)

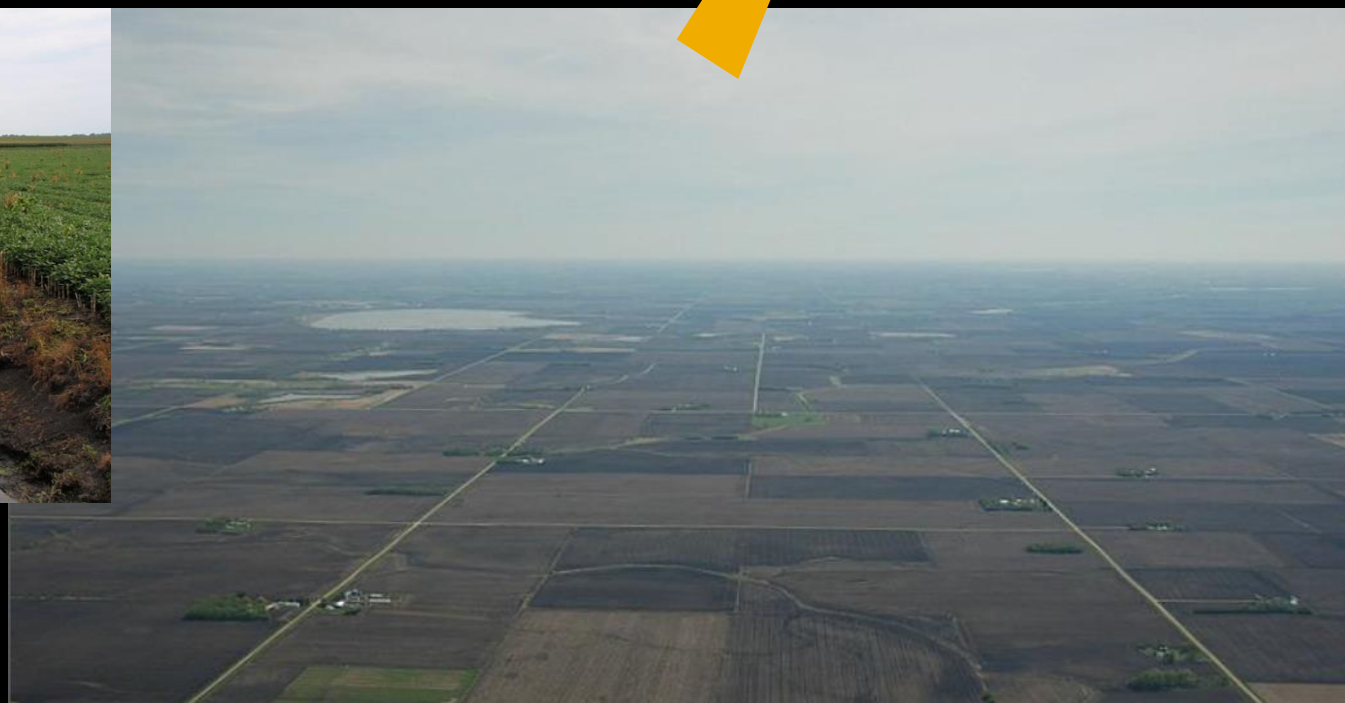


Lower Le Sueur



Map: Courtesy of Karen Gran

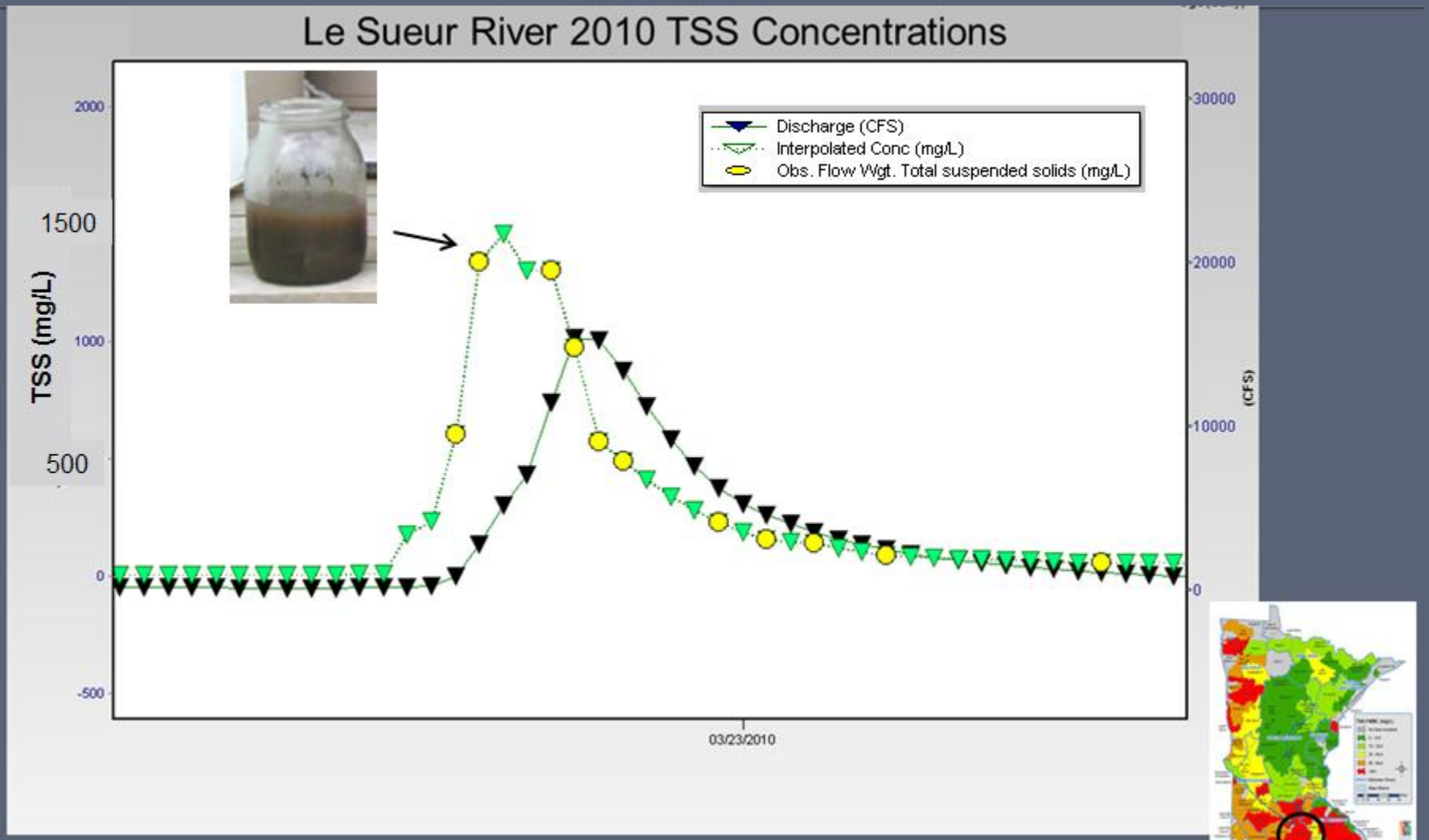
Upper Le Sueur



Upper LS Watershed Sediment Sources

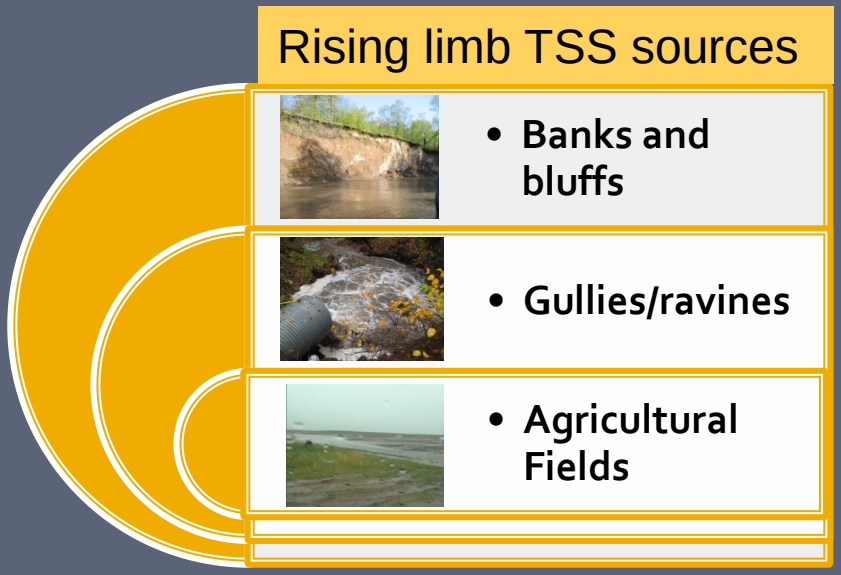
Lower LS watershed sediment sources

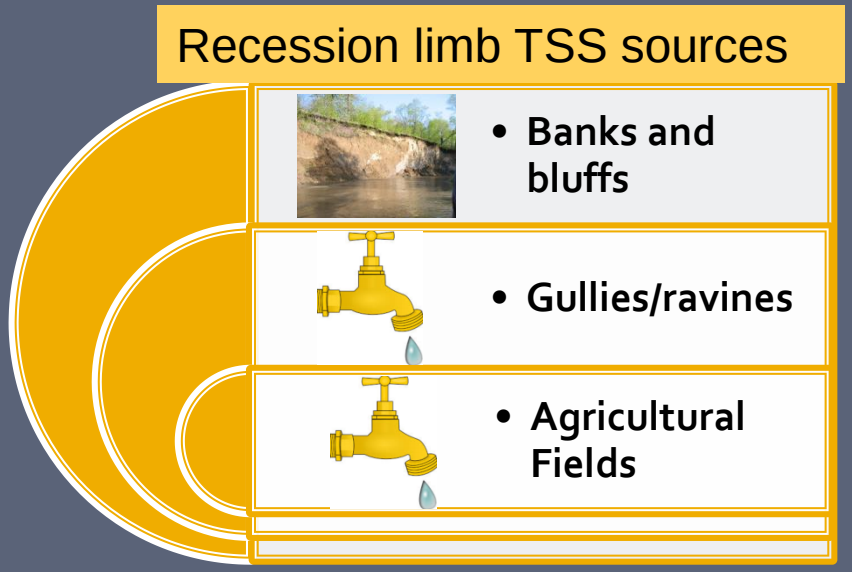
Separating TSS sources: concentration dynamics



Concentration dynamics: What's going on?

- **Hypothesis:**
  - More TSS sources contribute during rising limb flows than recession limb flows
  - As overland and tile flow to ravines cease, TSS concentrations drop



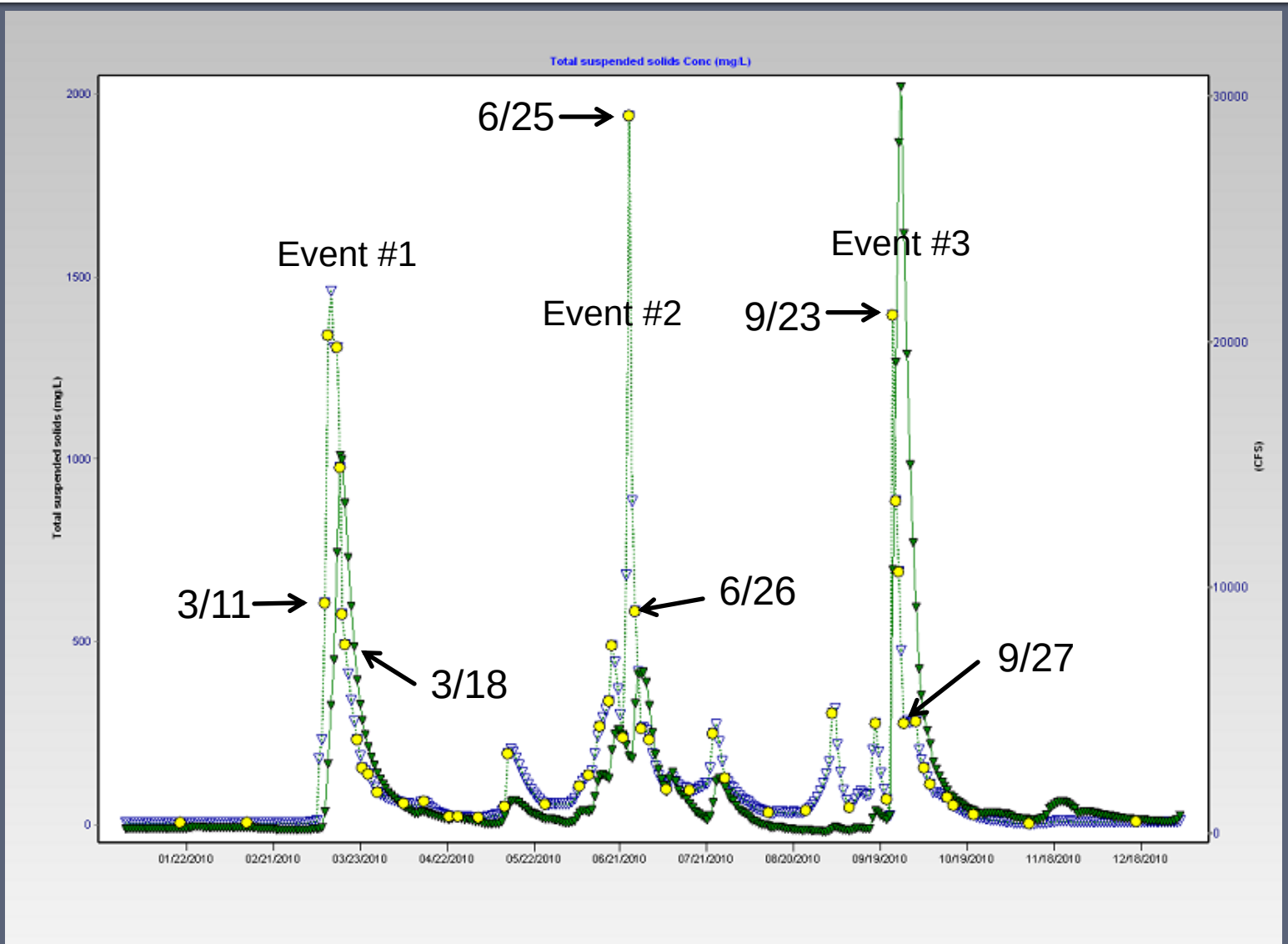


Gulley Erosion:

How long does tile flow contribute to gulley/ravine erosion and does this correlate with elevated TSS concentrations measured in the Le Sueur River?

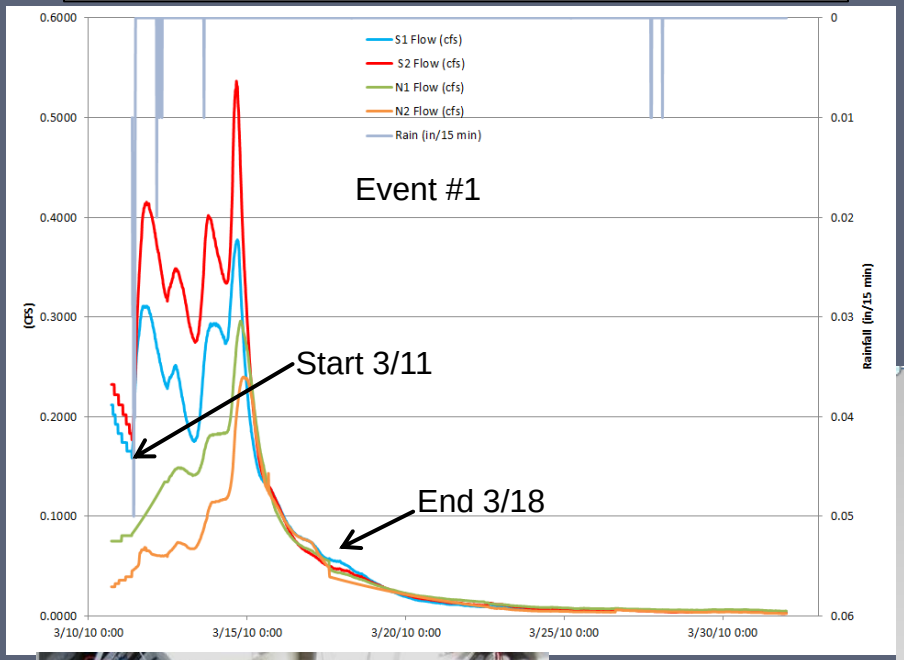
- MDA tile monitoring site H90 (Highway 90)

2010 Le Sueur Outlet: Time range of elevated TSS concentrations for 2010 runoff events

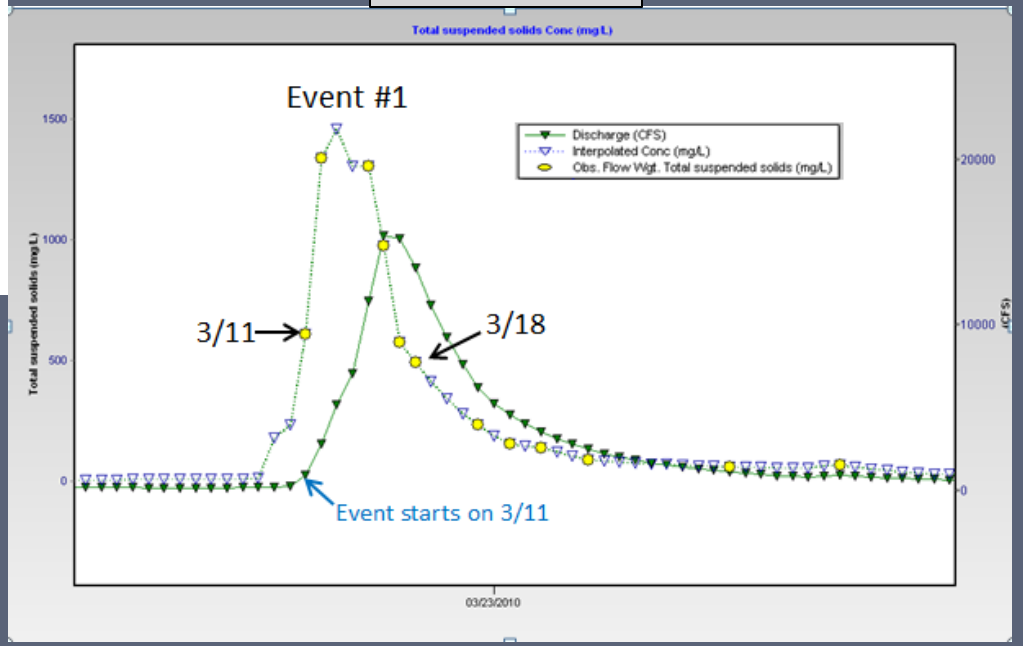


Time range of elevated TSS concentrations: Le Sueur Outlet & H90 Tile monitoring site Event #1

MDA H90 subsurface agricultural tile monitoring site

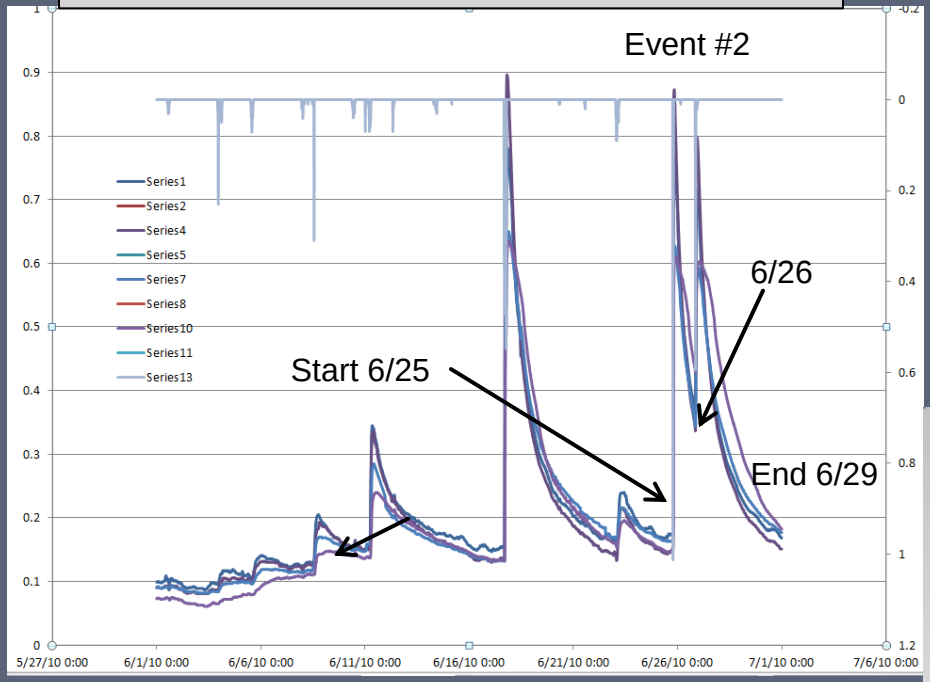


Le Sueur Outlet

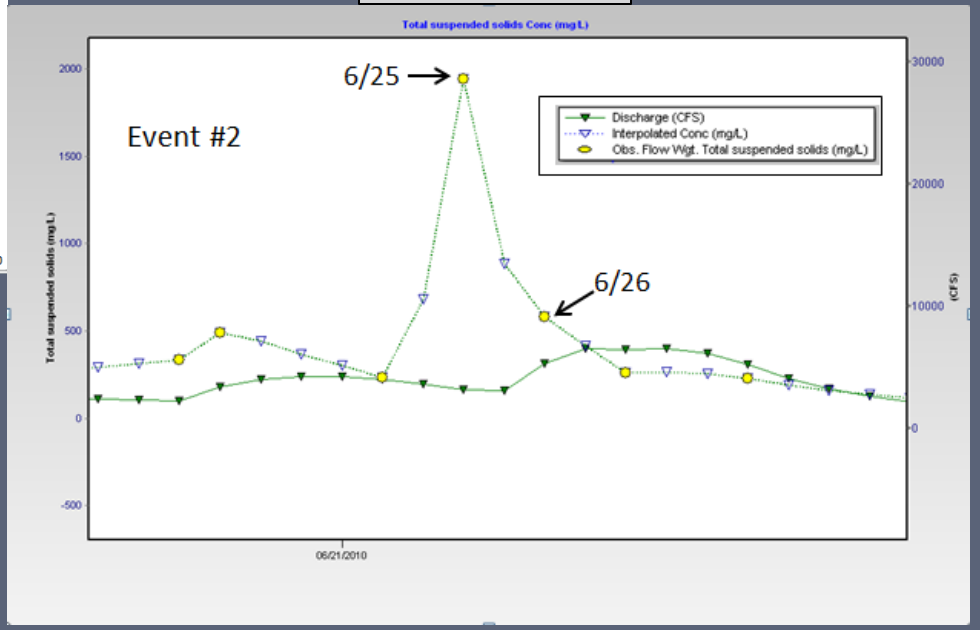


Time range of elevated TSS concentrations: Le Sueur Outlet & H90 Tile monitoring site Event #2

MDA H90 subsurface agricultural tile monitoring site

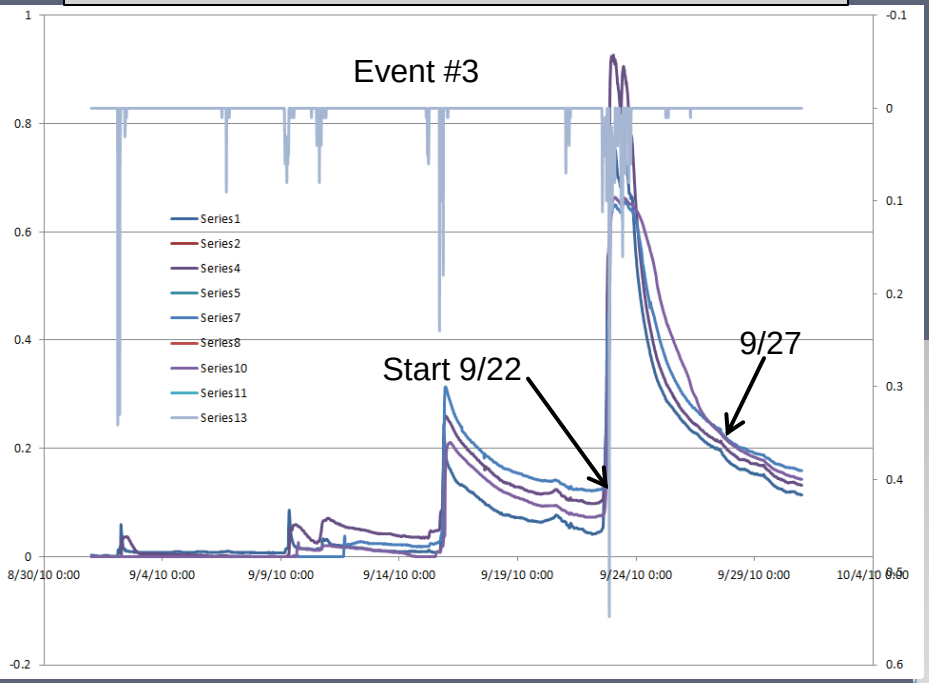


Le Sueur Outlet

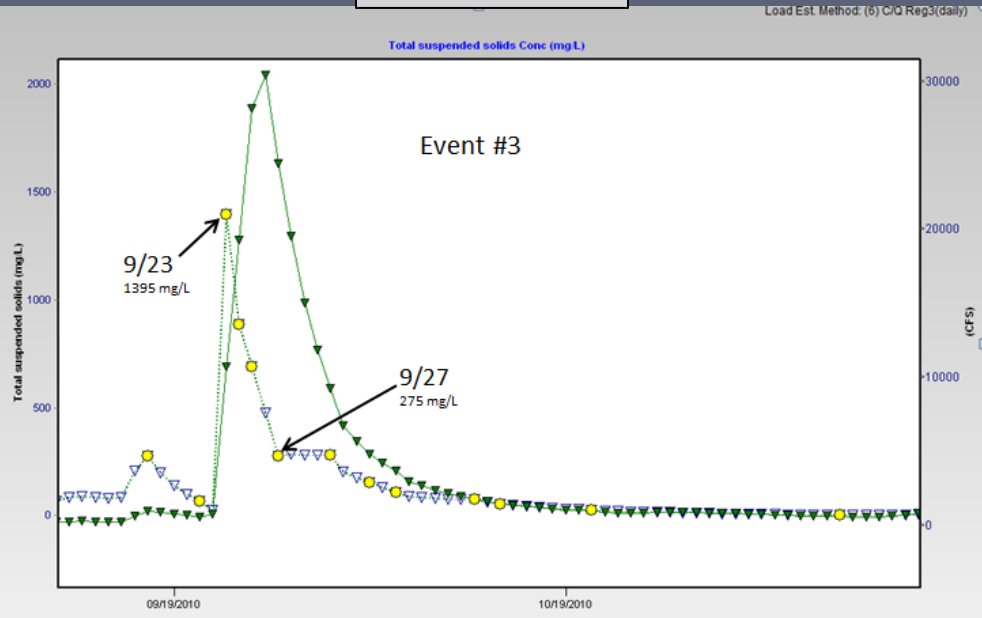


Time range of elevated TSS concentrations: Le Sueur Outlet & H90 Tile monitoring site Event #3

MDA H90 subsurface agricultural tile monitoring site



Le Sueur Outlet



Summary

- Multi-agency design
- Over 200 monitoring sites
  - Annual or seasonal pollutant loads
- Data Uses
  - Characterize spatial and temporal differences in water quality
  - Load reduction targeting
  - Pollutant source dynamics and contributions
  - Trends and impairment listing

Questions?