

# Lower Clear Creek Water Quality Monitoring CC-40 and CC-59 Update

CLEAR CREEK CONSULTANTS, INC.



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# Background

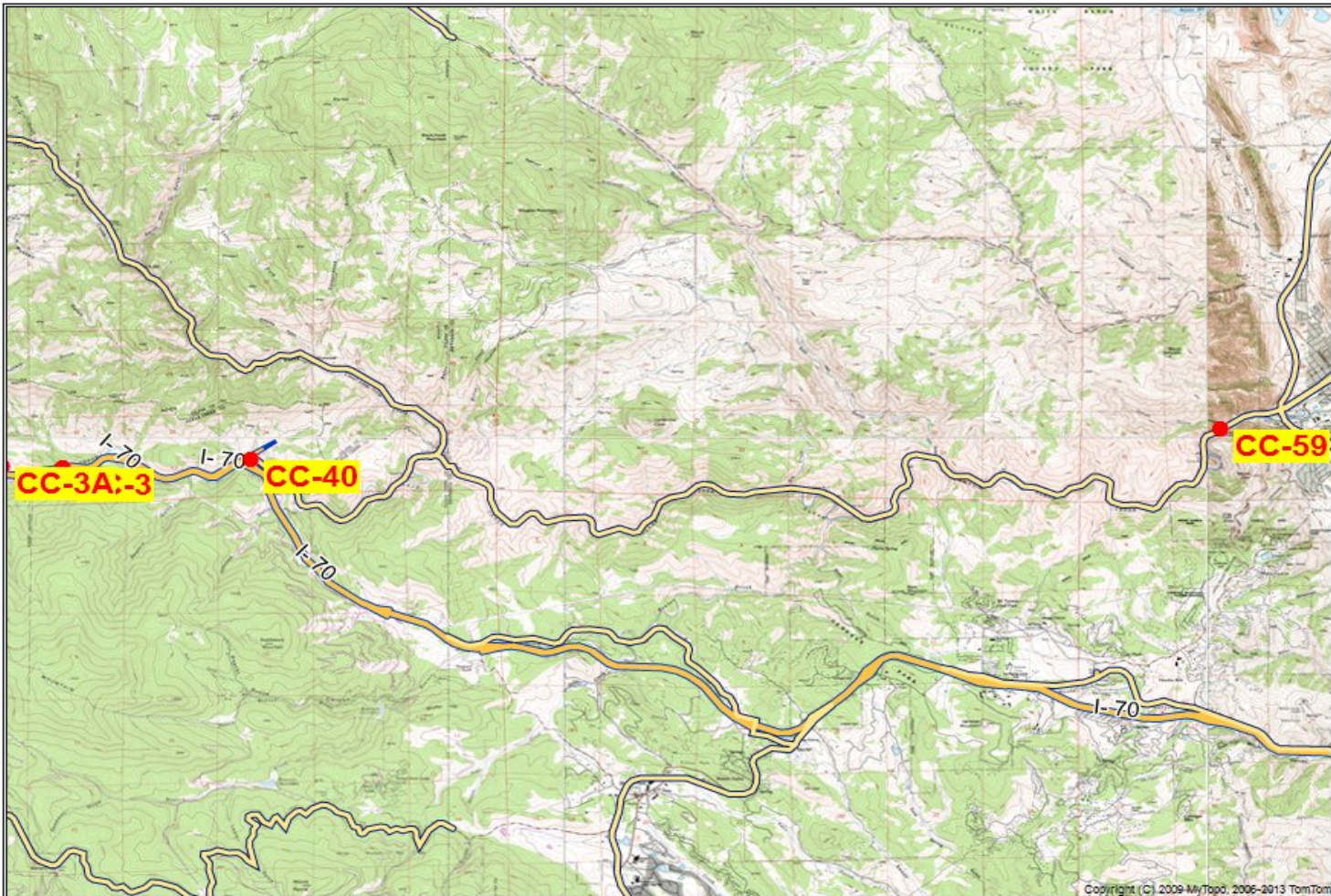
## CC-40 (Kermitts)

- CC-40 stream flow gaging station operated since 1995
- Highway runoff-event water quality sampling years 2000-2005 and 2009-2015
- Continuous recording conductivity/temperature started 2004 and seasonal turbidity started 2008
- Funding cooperators: UCCWA; CCWF; CDOT

## CC-59 (Golden)

- CC-59 started in 2005 at former USGS gage upstream Church Ditch/Golden Intake
- Continuous recording of conductivity/temperature and seasonal stream stage, turbidity, pH, precip.
- Funding cooperator: City of Golden

# Lower Clear Creek CC-40 and CC-59



# Objectives

- Quantify and evaluate long-term trends for TSS, nutrient, and trace metal concentrations and loads
- Utilize continuous recording in-stream turbidity, conductivity/temperature probes for more comprehensive analysis of water quality conditions
- Develop robust correlations between in-stream parameters, turbidity-TSS-nutrients and conductivity-chloride to reduce monitoring costs
- Characterize water quality during storm events and other “upset” conditions
- Track chloride trends related to highway runoff



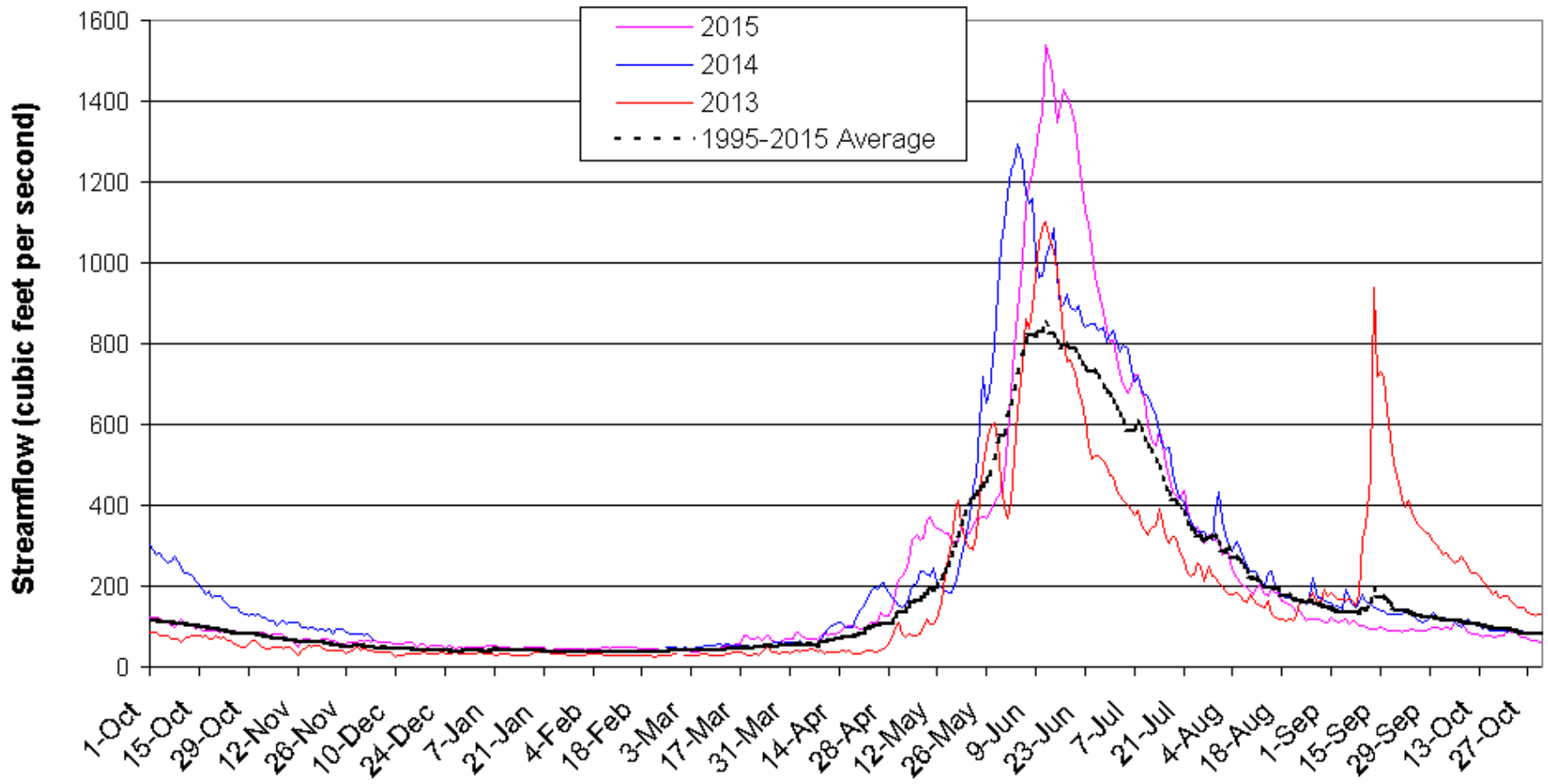
# Clear Creek CC-40 Monitoring Station



# Clear Creek CC-40 Streamflow

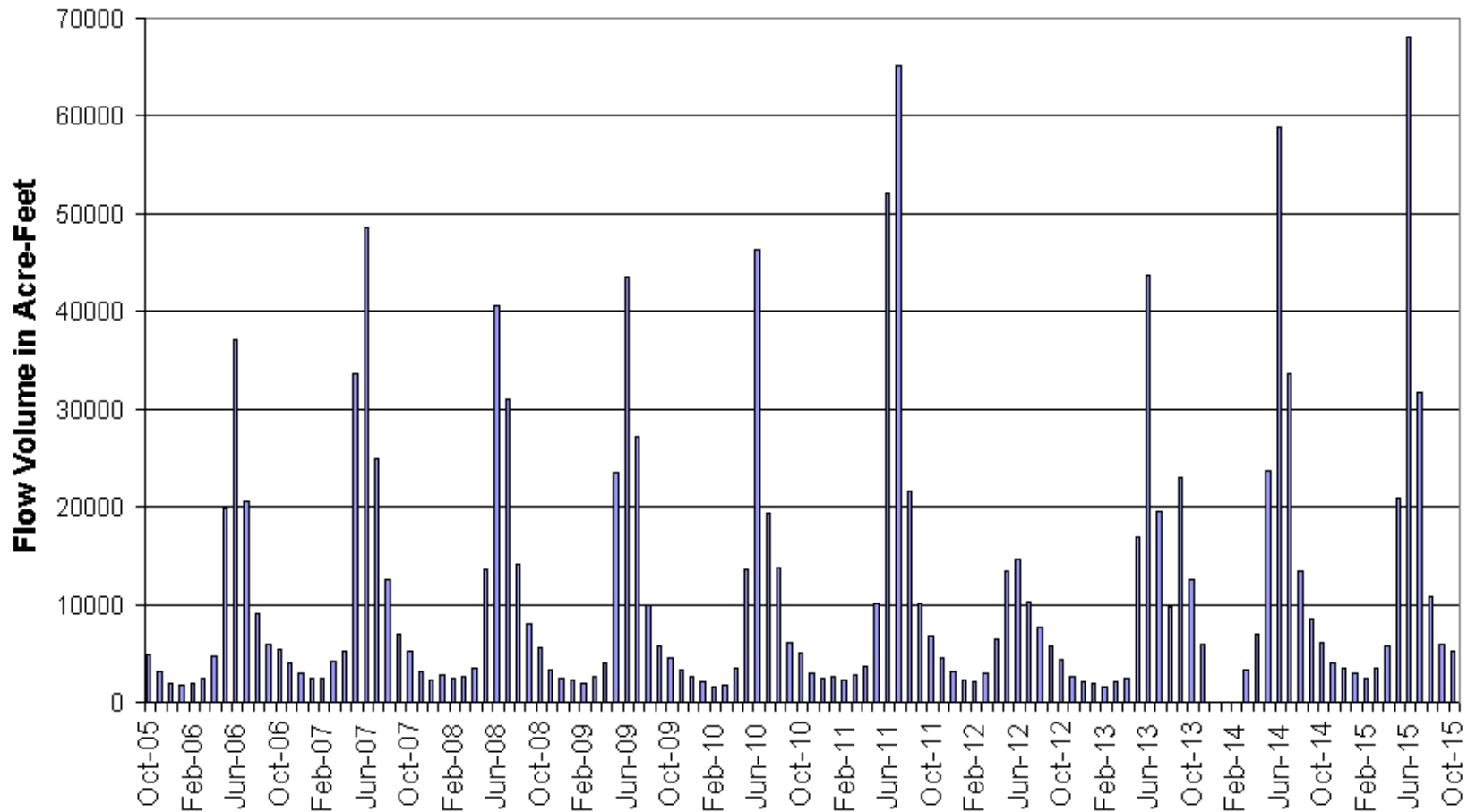
Clear Creek Mean Daily Streamflow by Water Year  
above Johnson Gulch near Kermitts (CC-40)

Drainage Area = 267 square miles



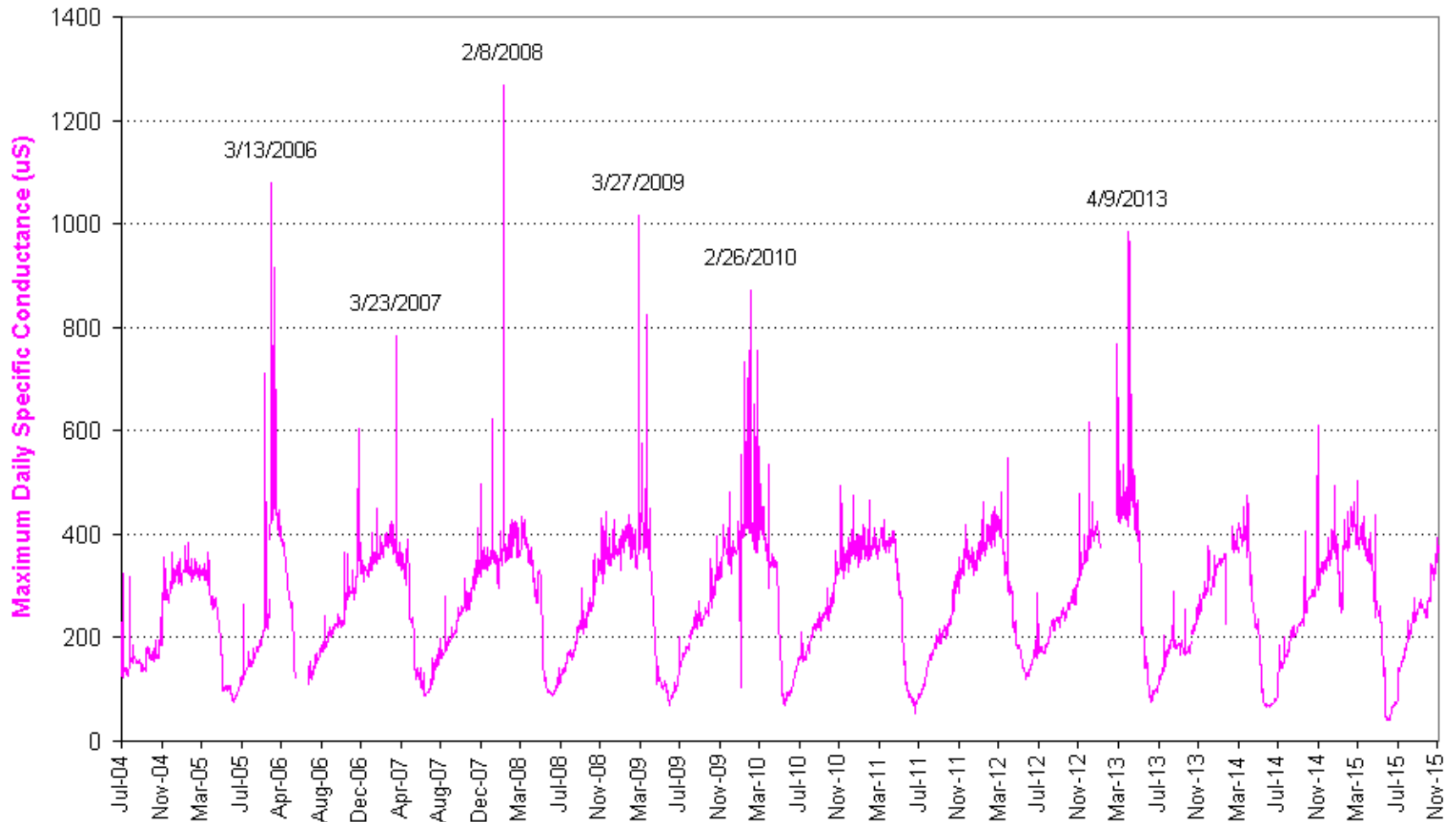
# Clear Creek CC-40 Flow Volume

Clear Creek above Johnson Gulch near Kermitts (Station CC-40)  
Monthly Flow Volume: 2006-2015



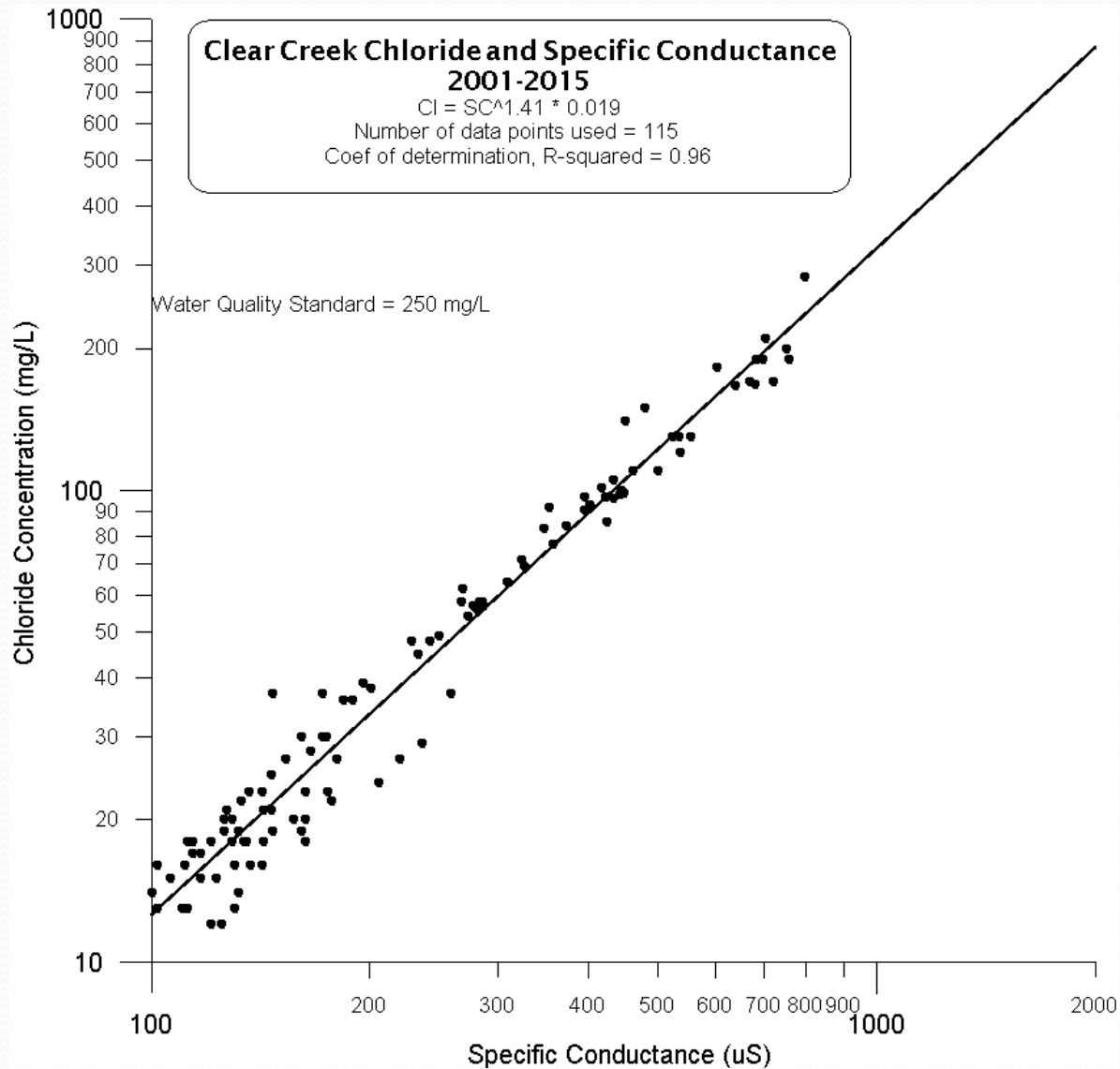
# Clear Creek CC-40 Maximum Conductivity

Clear Creek at Kermitts (CC-4) Maximum Specific Conductance  
July 2004 to November 2015

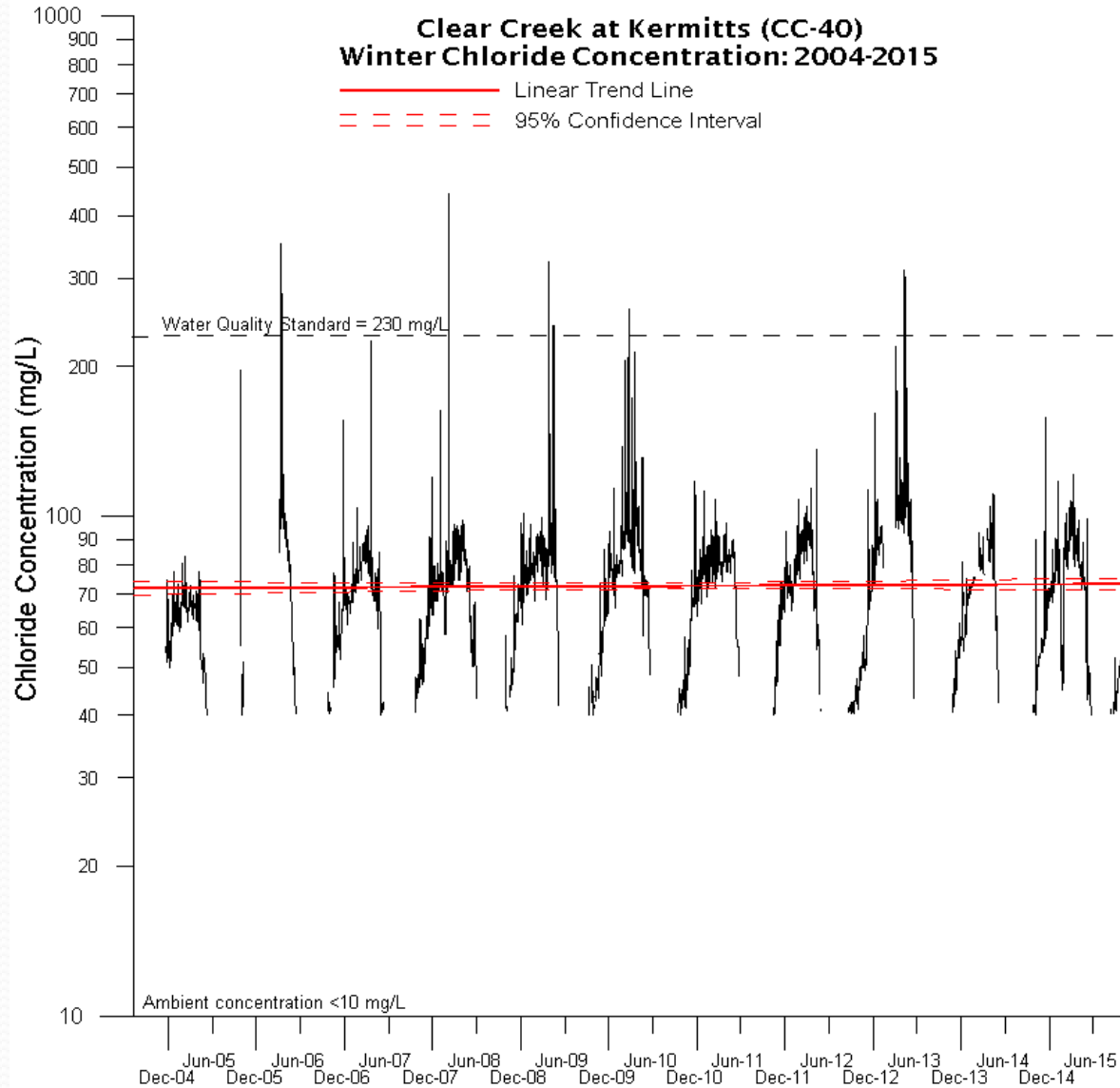




# Clear Creek Specific Conductance and Chloride

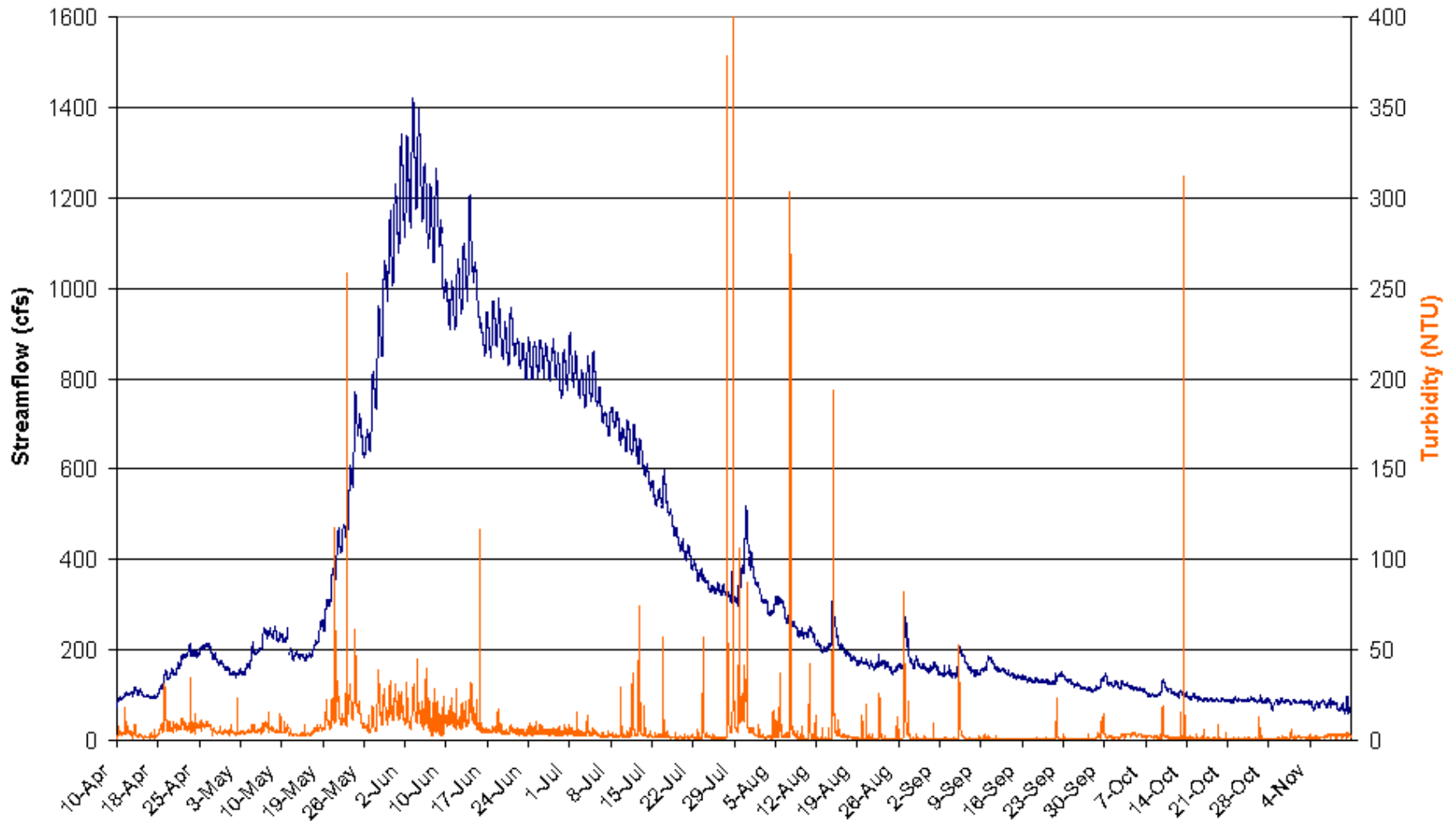


# Clear Creek CC-40 Chloride Trend

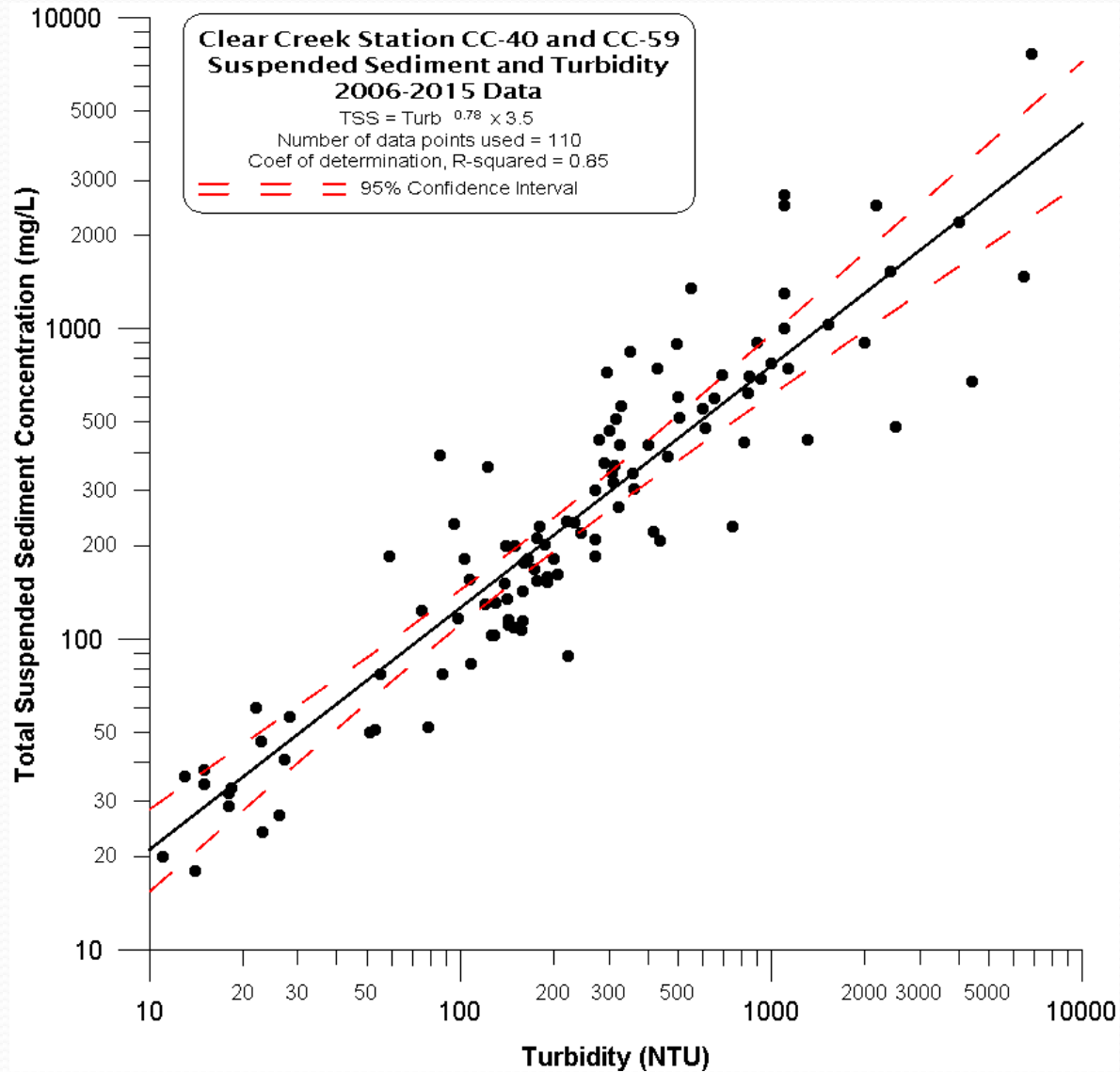


# Clear Creek CC-40 Flow and Turbidity

Clear Creek at Kermitts (CC-40)  
Stream Flow and Turbidity: 2014



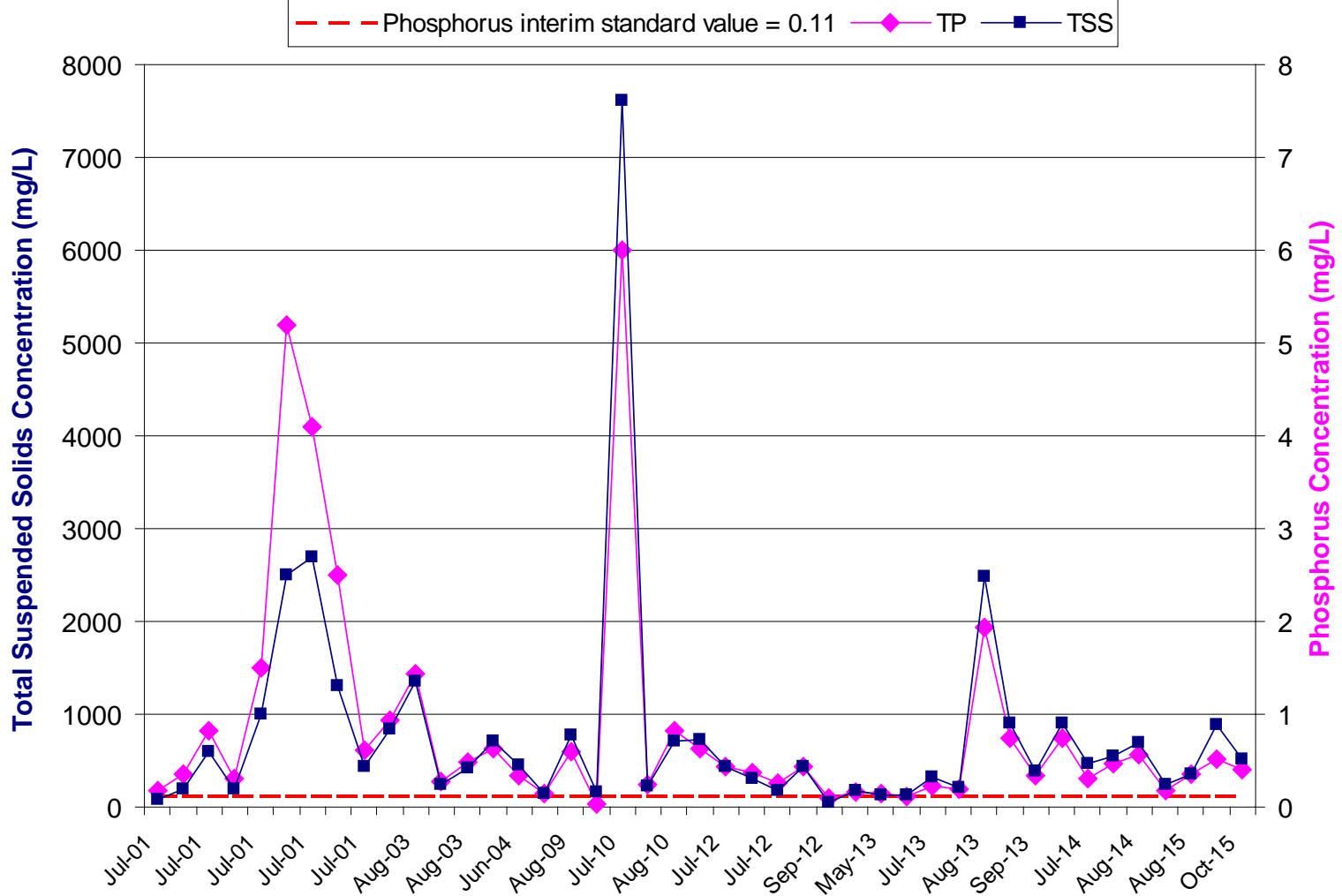
# Clear Creek Turbidity and TSS



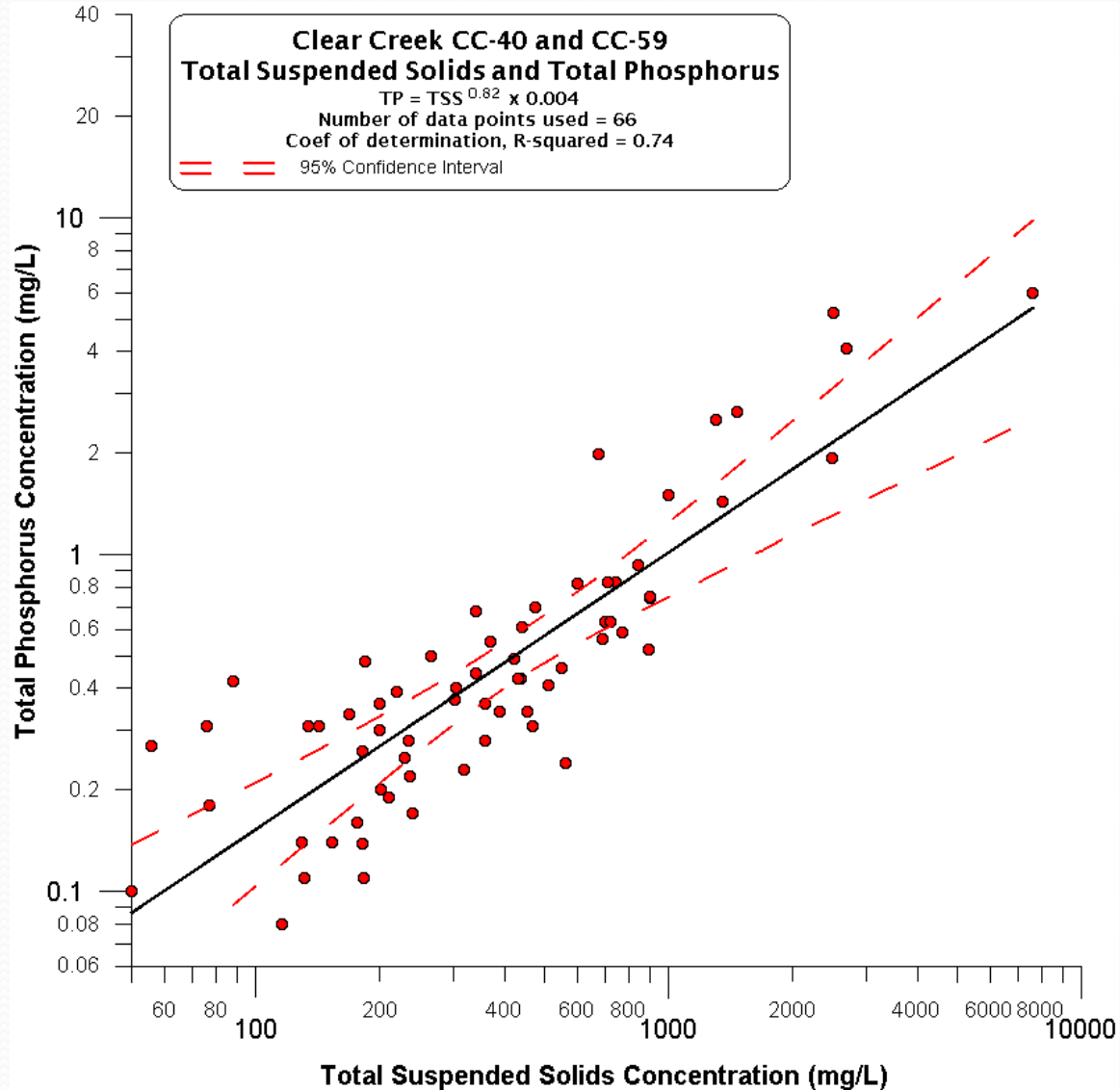


# Clear Creek CC-40 Storm Event TP and TSS

Clear Creek Station CC-40 Storm Event Data  
Suspended Solids >50 and Total Phosphorus: 2001-2015

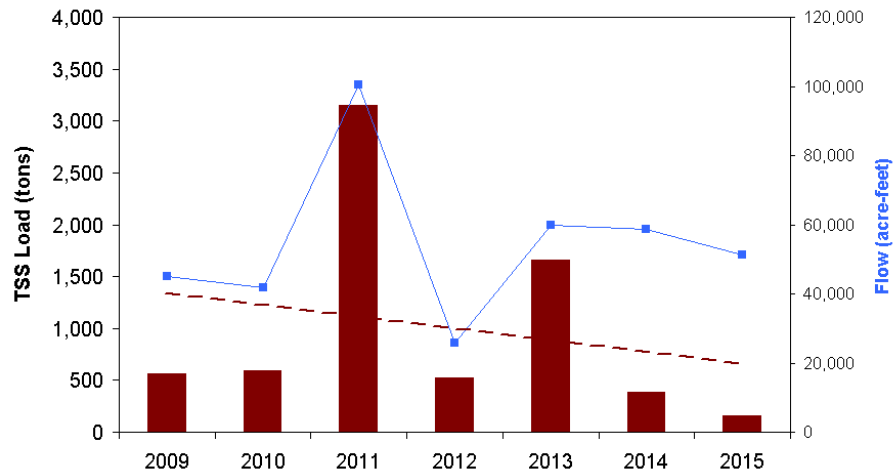


# Clear Creek CC-40/CC-59 Total Phosphorus and TSS

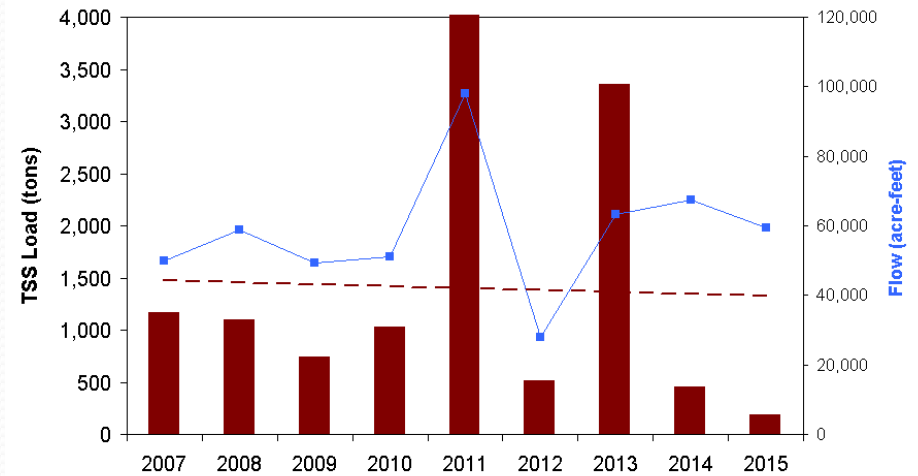


# Clear Creek Suspended Solids Load CC-40 and CC-59

Clear Creek Station CC-40  
July 1 to October 15 Total Suspended Solids Load

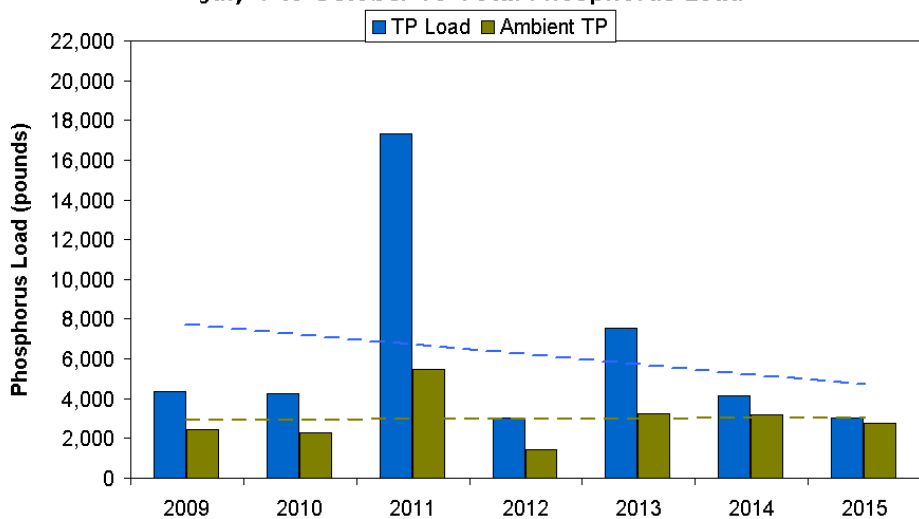


Clear Creek Station CC-59  
July 1 to October 15 Total Suspended Solids Load

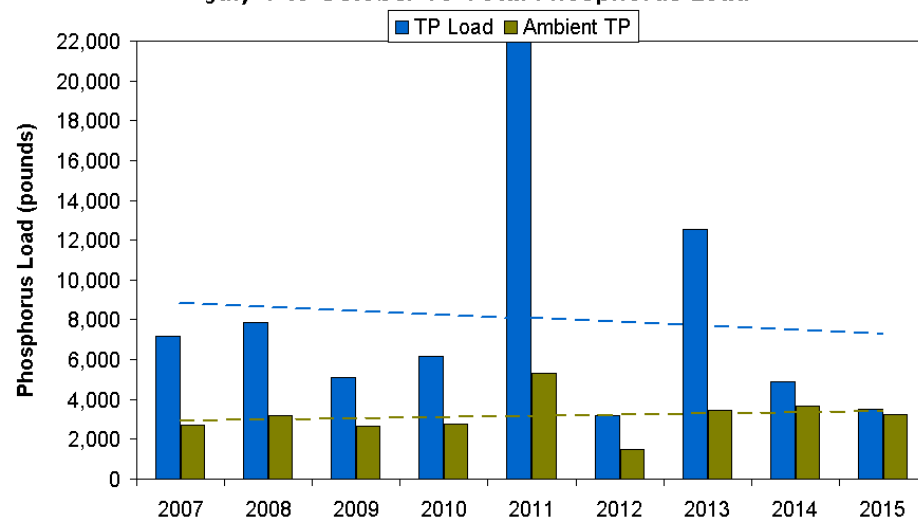


# Clear Creek Total Phosphorus Load CC-40 and CC-59

Clear Creek Station CC-40  
July 1 to October 15 Total Phosphorus Load



Clear Creek Station CC-59  
July 1 to October 15 Total Phosphorus Load





# Clear Creek Summary

- Flows have been near or above average since 2013
- Continuous recording in-stream water quality monitoring probes provide more comprehensive water quality characterization while reducing the need to collect samples
- Robust statistical correlations have been established between conductivity/chloride and turbidity/TSS/total phosphorus
- Maximum chloride concentrations show no increasing trend and remained below standards in winter 2014 and 2015
- Lower Clear Creek shows a decreasing trend in total suspended solids and phosphorus loads in recent years
- High TSS is correlated with high nutrient and total metal concentrations that can exceed standards each year
- Approximately 40-50% of total phosphorus load is ambient while 50-60% is attributable to nonpoint sediment load sources