



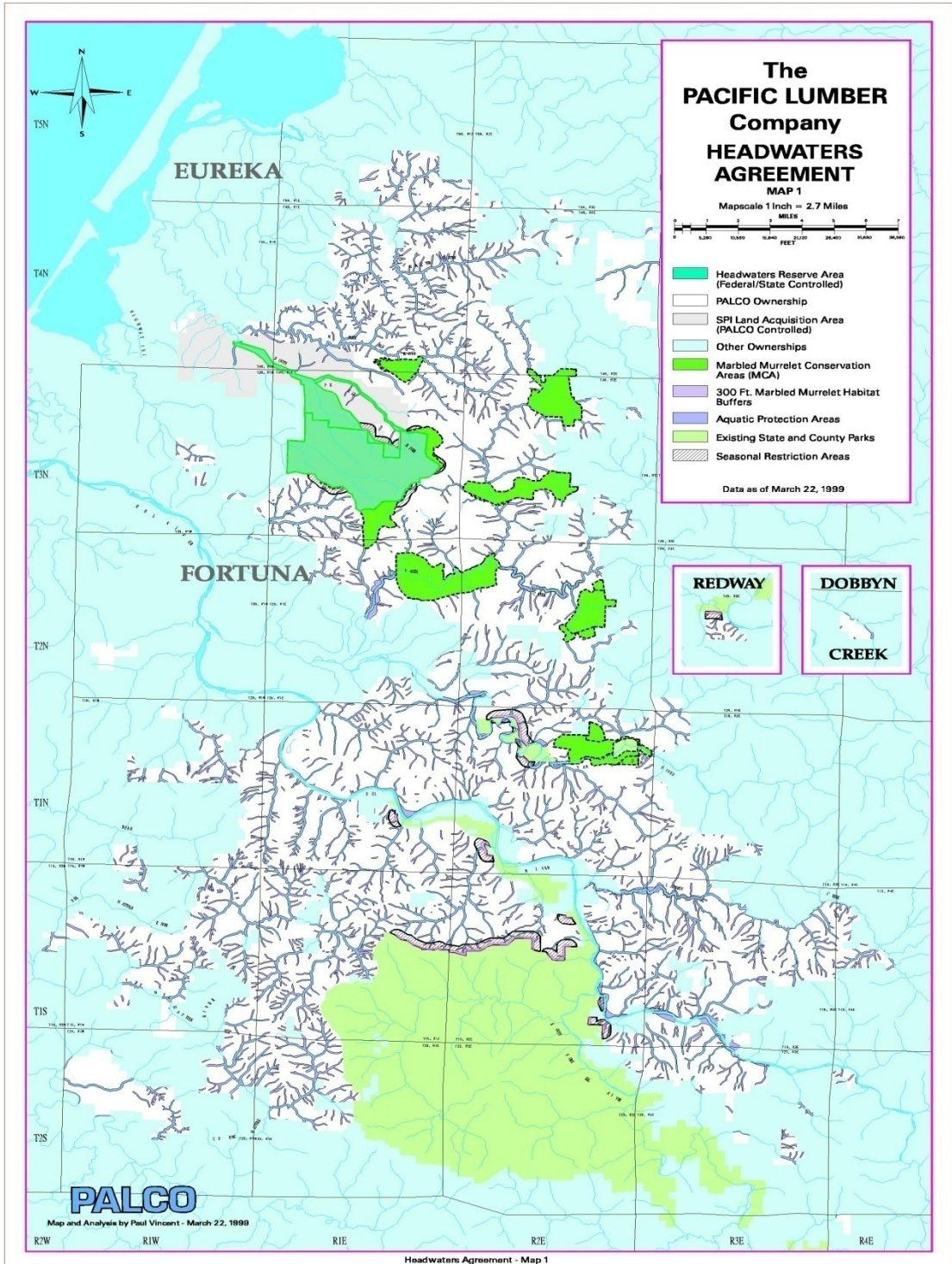
Humboldt Redwood  
COMPANY, LLC

# **HRC Road Upgrade and Decommissioning**

**About the program, and  
Does it help water quality?**

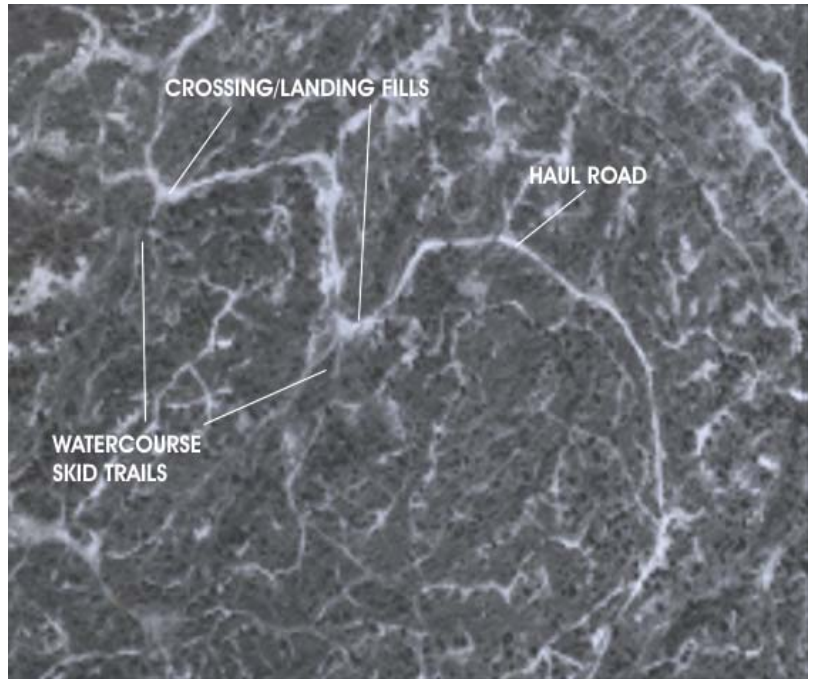
Restoration Workshop  
May, 2011

# 200,000 Acres— More than 2200 miles of road

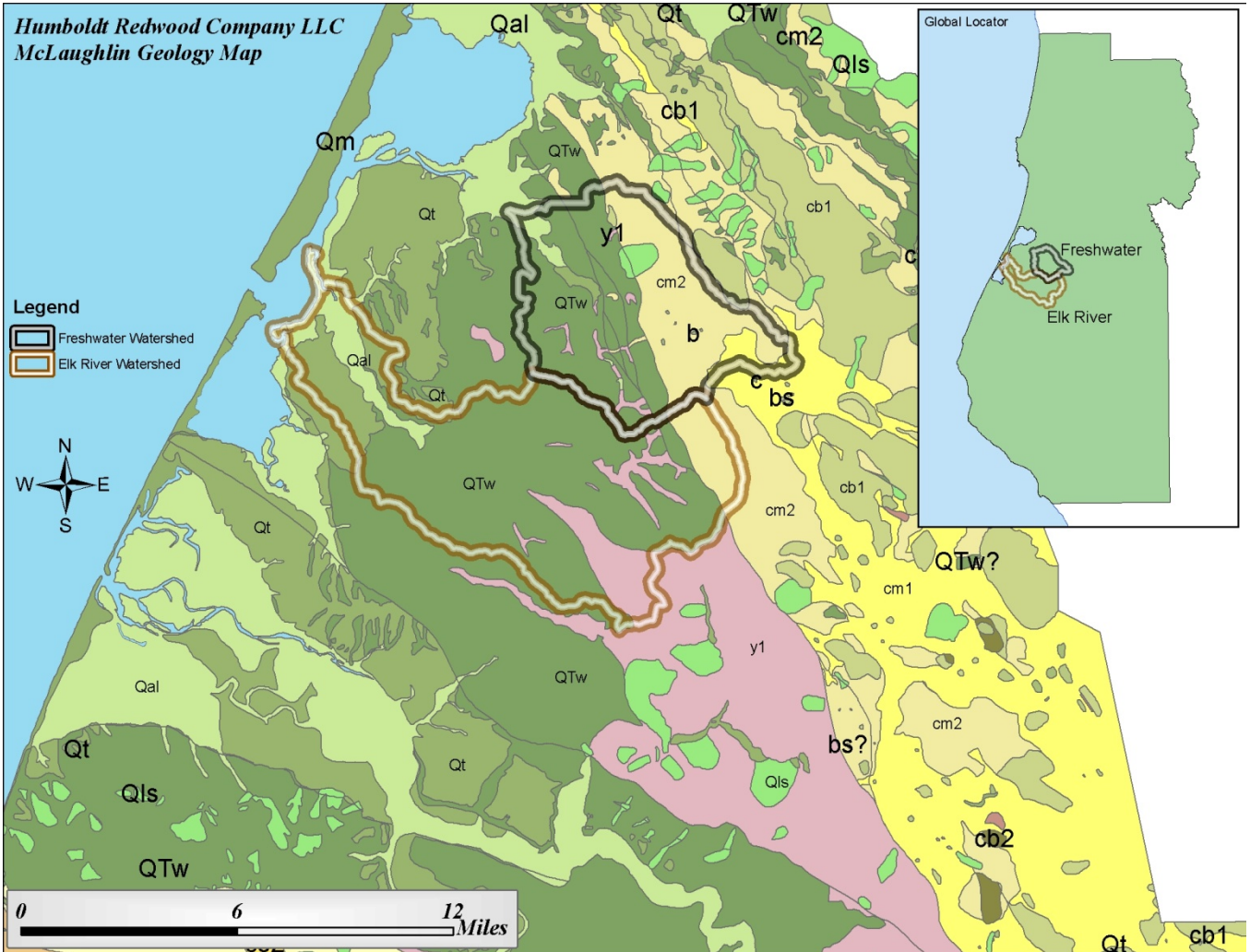


# The Problem

- HRC has an extensive road system
- Built over 60 year period to various standards
- Must bring them all up to modern “Storm proofed” standard

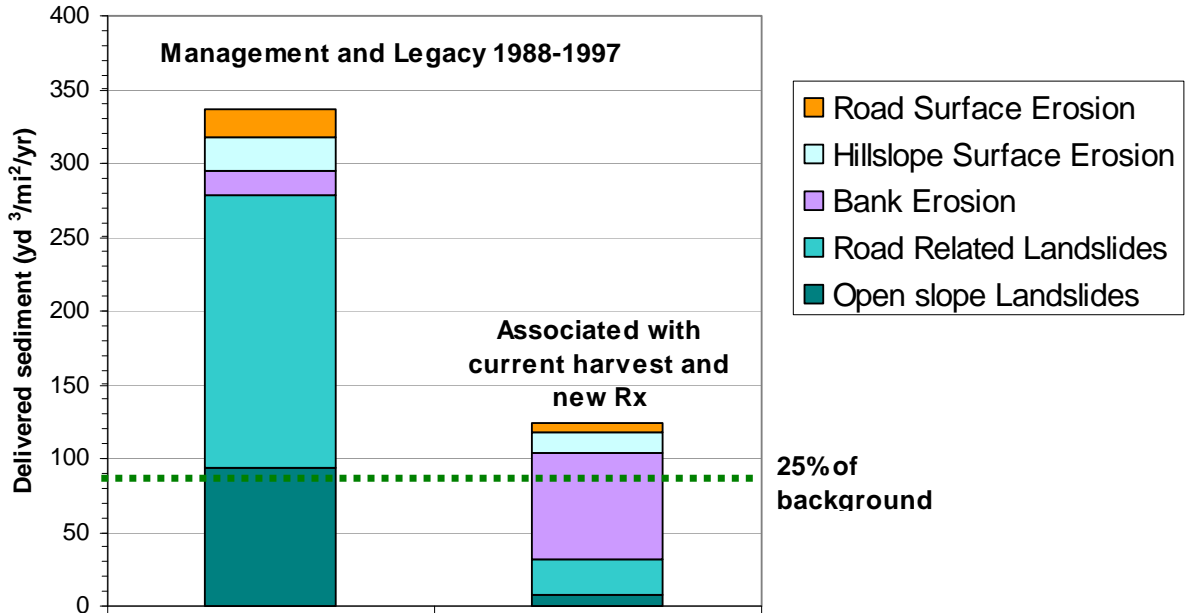


# Geology



# Ecologic Goal

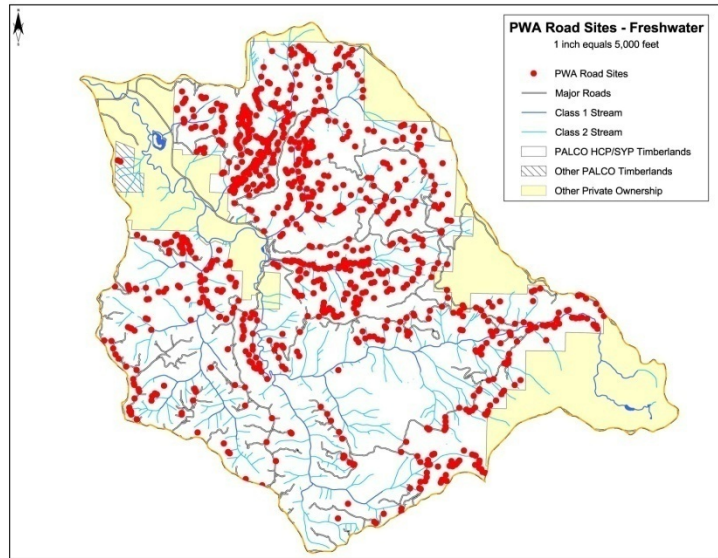
## Management-Related Sediment Elk River



Prevent	<ul style="list-style-type: none"> <li>➤ LS Avoidance on unstable terrain</li> <li>➤ Repair roads</li> </ul>
Minimize	<ul style="list-style-type: none"> <li>➤ Best management practices</li> <li>➤ Site specific Rx</li> </ul>
Restore	<ul style="list-style-type: none"> <li>➤ Road restoration and decommissioning</li> <li>➤ Legacy site cleanup</li> </ul>

# Elements of the Roads Program

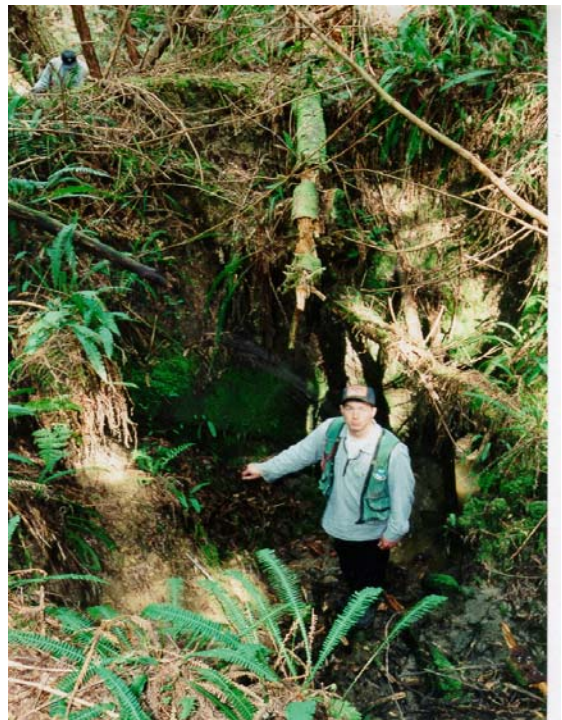
- Inventory
- Construction standards
- Schedule
- Do the work
- Audit to standards
- Wet weather inspections
- Annual road maintenance inspections



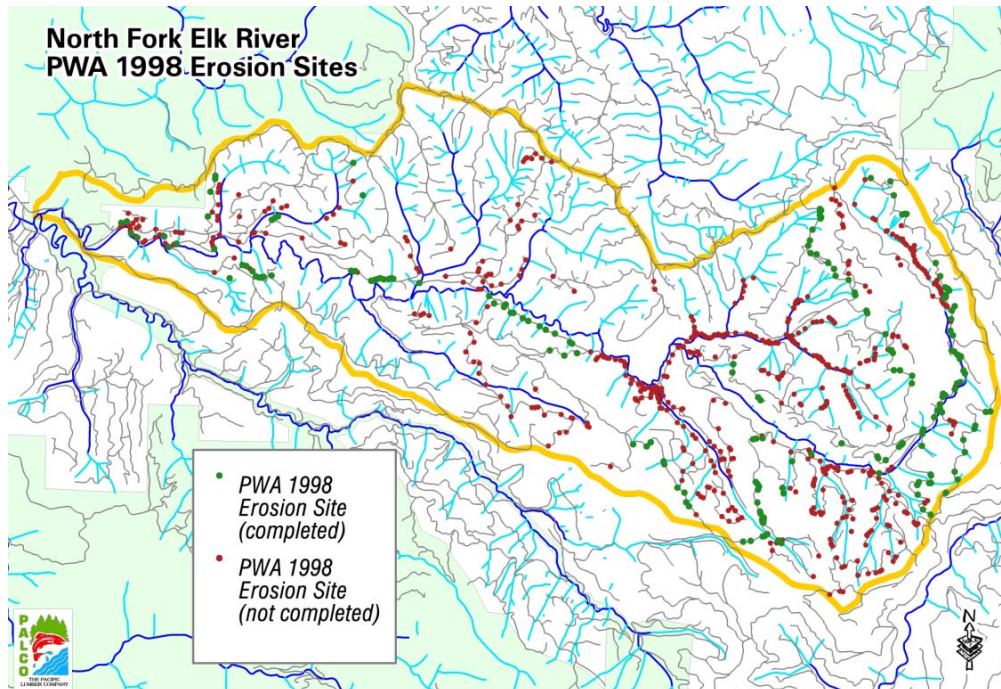
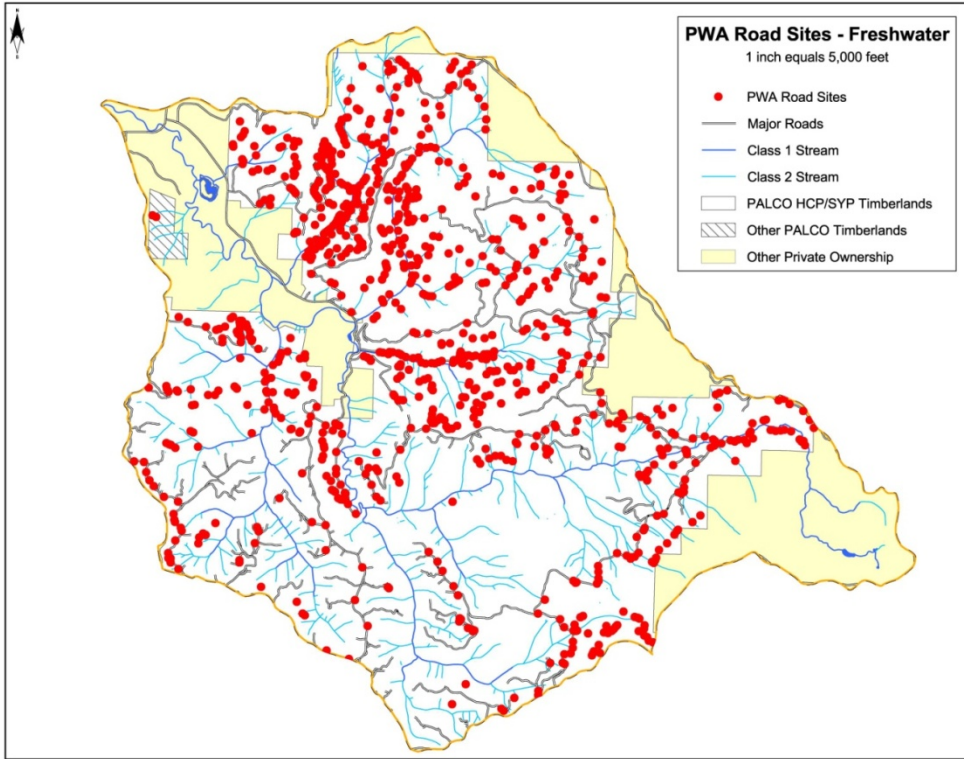
# All weather, dry weather, and abandoned roads are the major focus



**Humboldt Crossing**



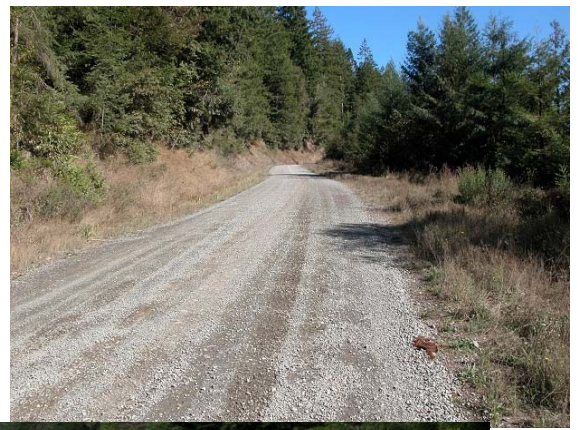
# Over 1000 sites per watershed





# Design standards

- Hydrologically disconnect
- “Harden” roads at stream crossings
- Restore natural gradient
- Ensure passage of flow and fish



## *E.2 Standards and Considerations for Road and Landing Design*

E.2.1 Standards for road classification	E-1
E.2.2 Considerations in laying out roads and landings	E-2
E.2.3 Standards for laying out roads and landings	E-3
E.2.4 Standards for road prism	E-3
E.2.5 Standards for road and landing surfaces	E-6
E.2.6 Standards for road and landing surface drainage	E-7
E.2.7 Standards for hydrological design	E-8
E.2.8 Considerations for choosing watercourse crossing type	E-9
E.2.9 Standards for temporary watercourse crossings	E-10
E.2.10 Considerations for fords	E-11
E.2.11 Standards for fords	E-11
E.2.12 Standards for vented fords	E-12
E.2.13 Standards for watercourse culverts	E-13
E.2.14 Standards for ditch-relief culverts	E-14
E.2.15 Considerations for bridges	E-14
E.2.16 Standards for bridges	E-15
E.2.17 Standards for fill material for landings	E-15
E.2.18 Standards for spoil piles, borrow areas, or soil disposal	E-15
E.2.19 Standards for rock piles	E-16

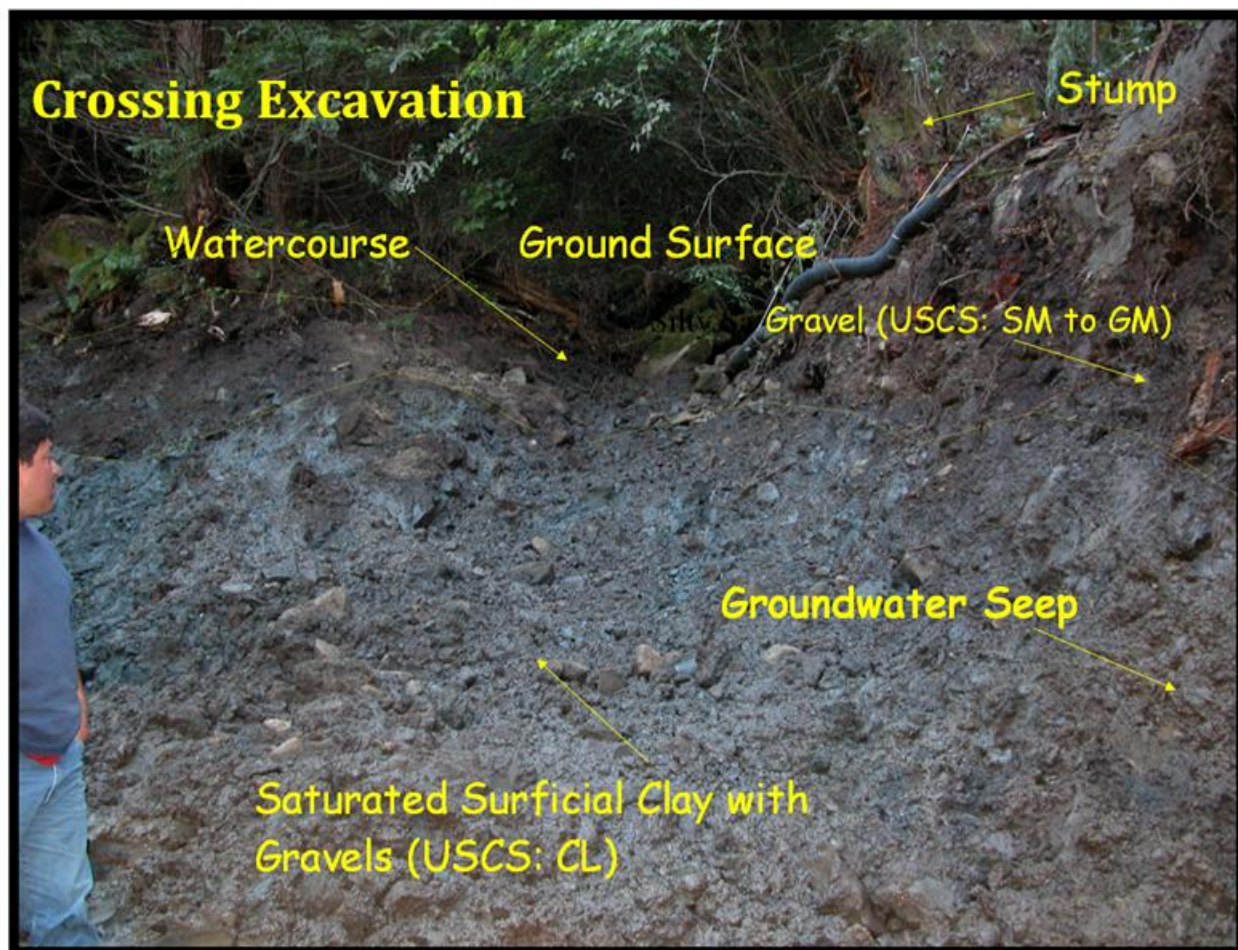
# Construction from the bottom up



# Minimize delivery of sediment to streams



# Have to react to conditions at each site



# Decommissioning and Abandoning







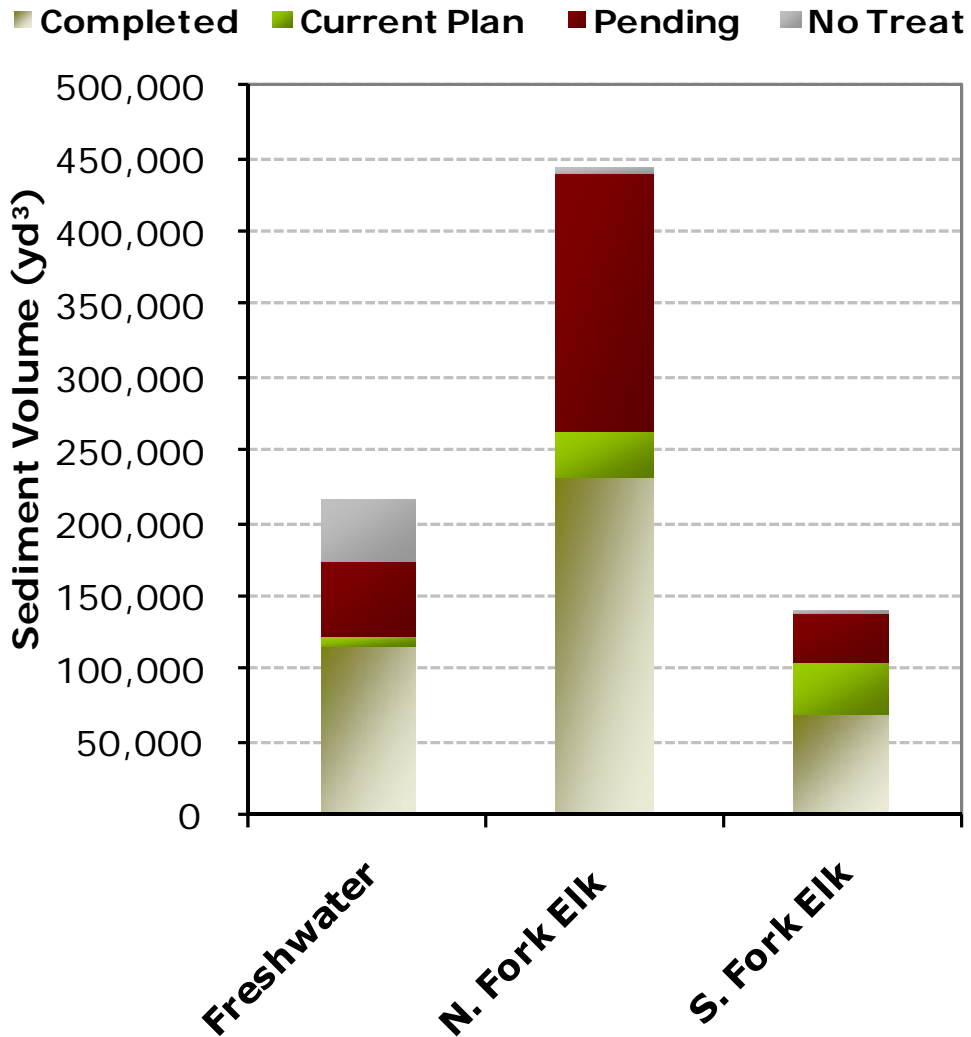
# Wild Cat “Blue Goo”





# Inventoried Sites

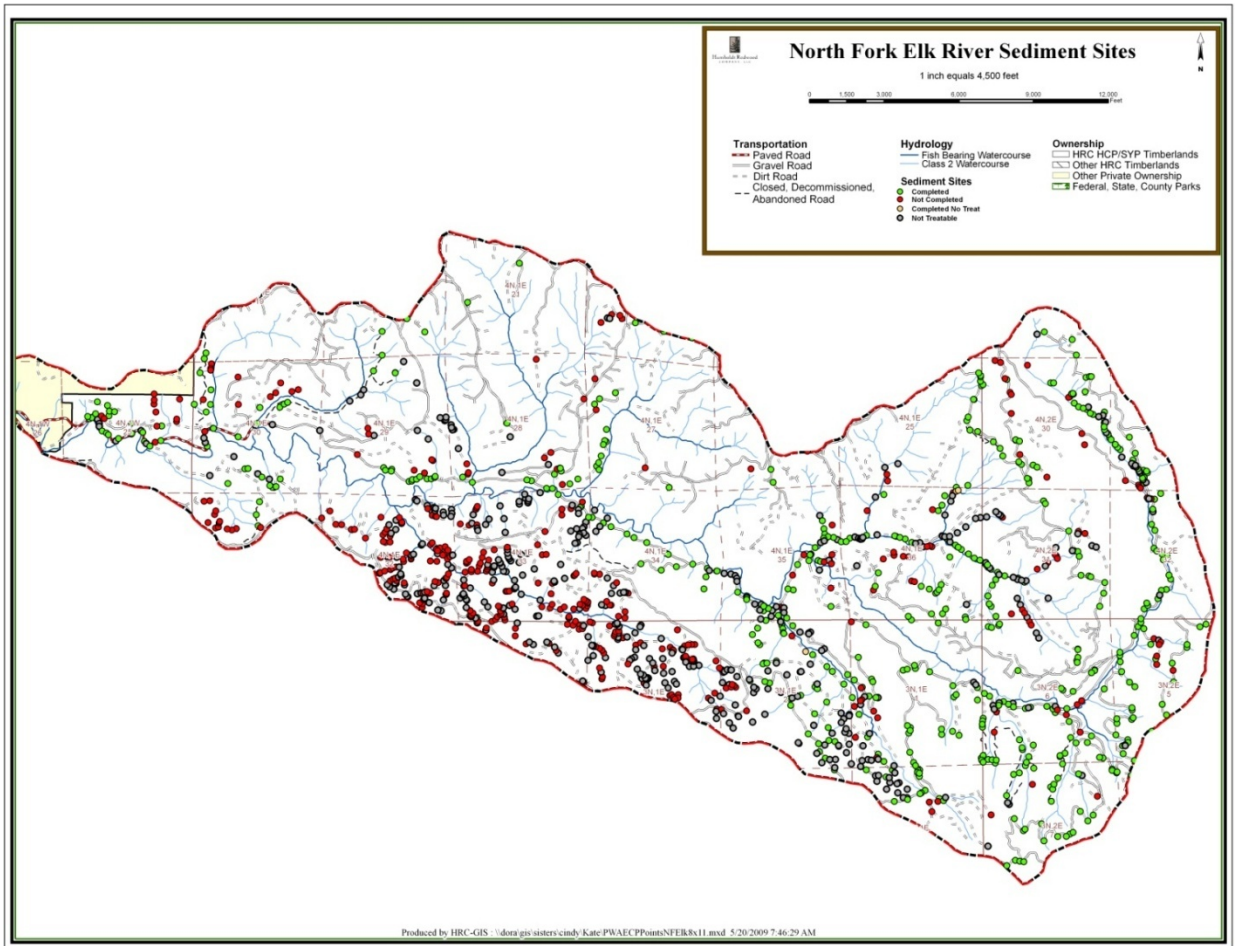
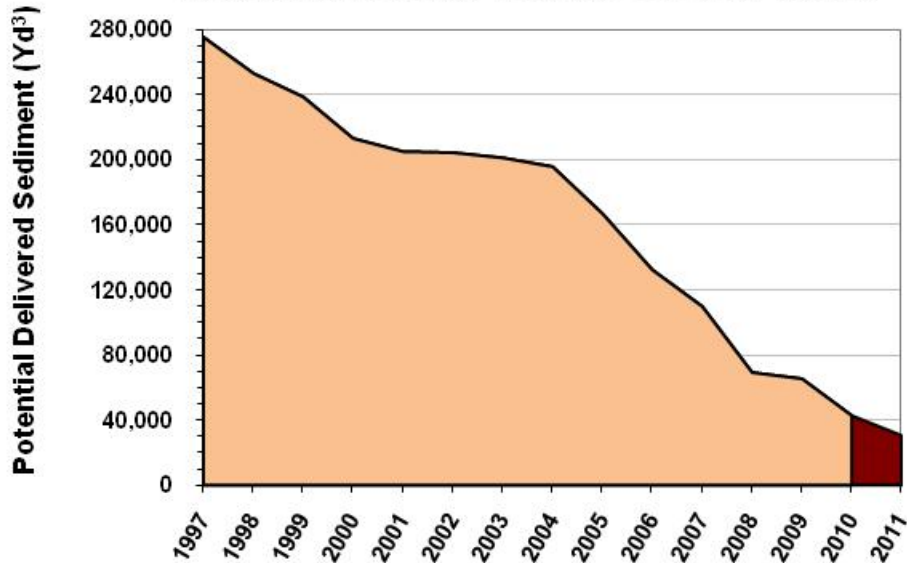
## Road Sediment Site Progress



**720,000 cubic yards—  
1 million tons**

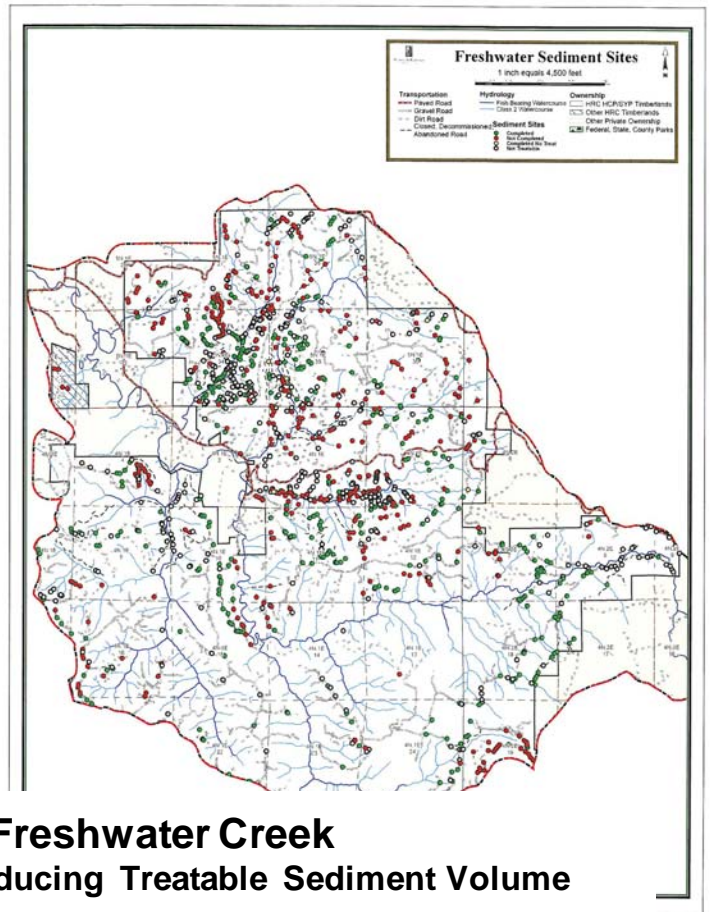
# Progress to Date

**N. Fork Elk River**  
**Progress in Reducing Treatable Sediment Volume**

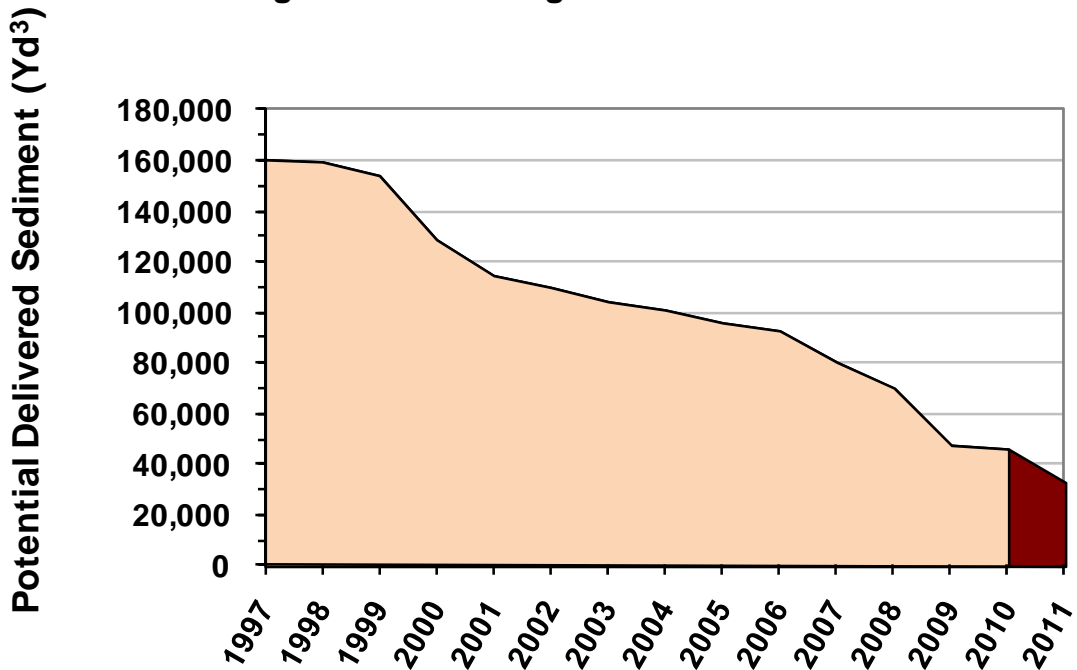


# Progress to Date

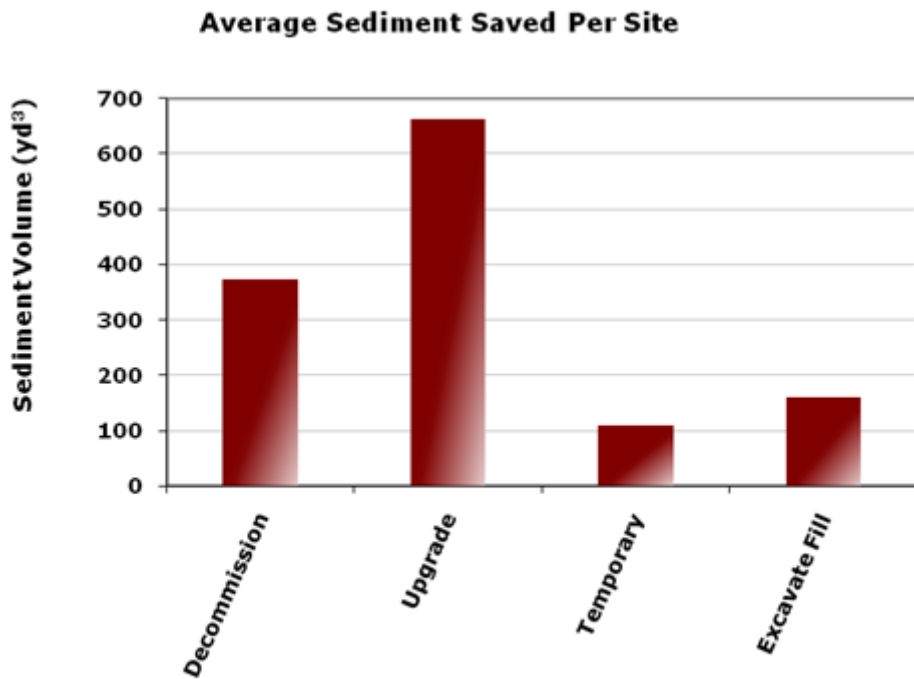
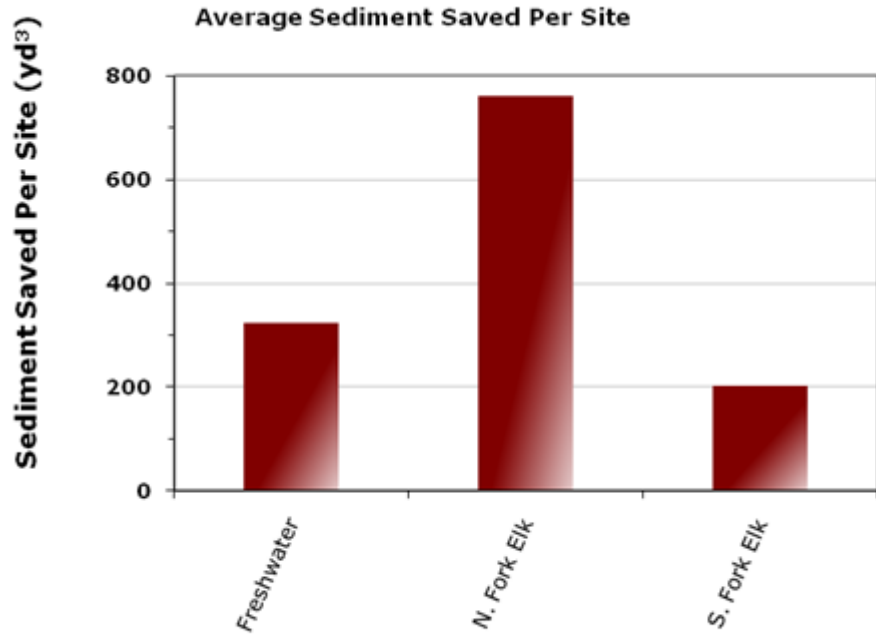
## Freshwater



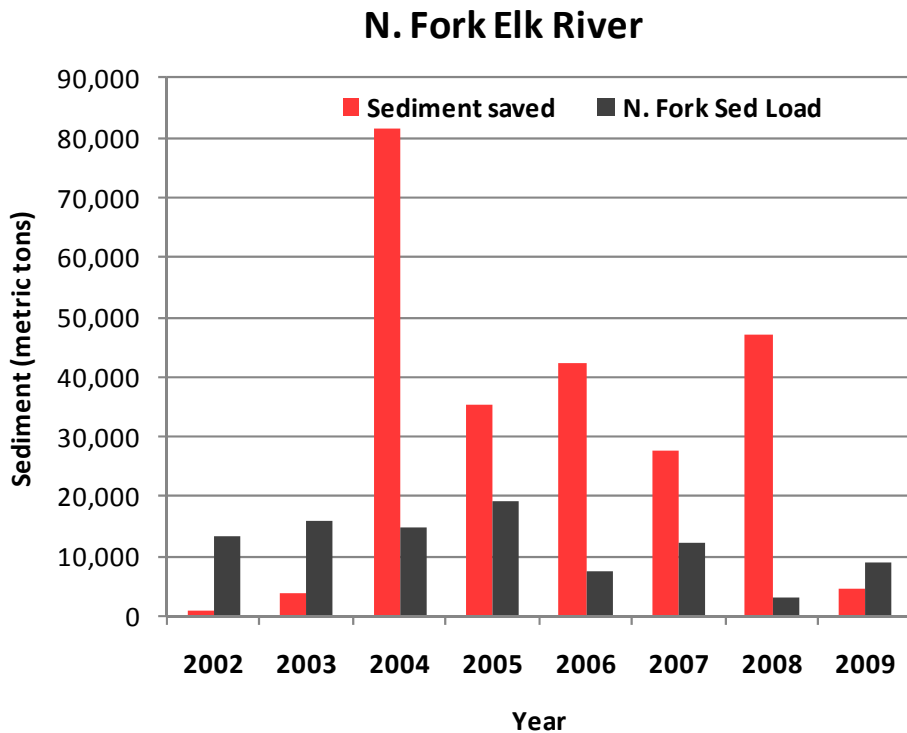
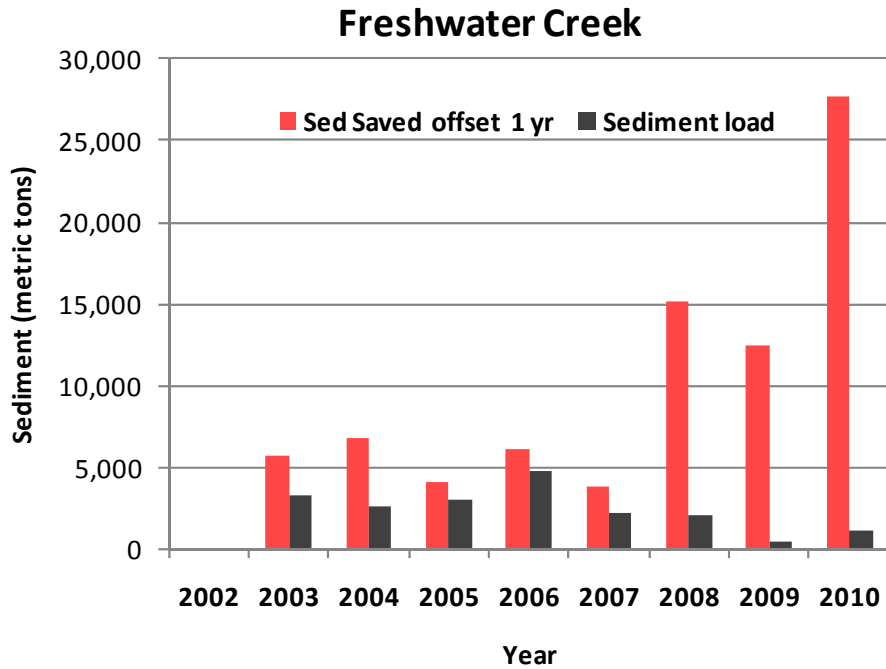
**Freshwater Creek**  
Progress in Reducing Treatable Sediment Volume



# Sediment saved per site



# How much sediment removal is this?



# Erosion After Site Construction

## Explanation of Method

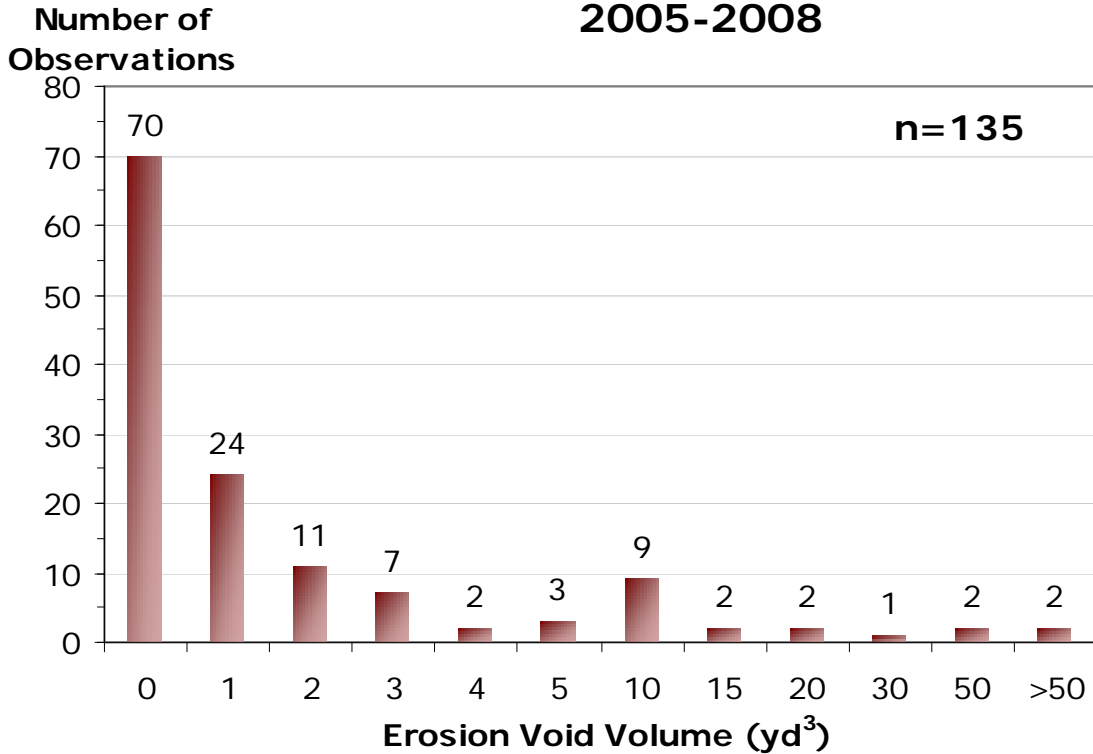


4.90 Yd<sup>3</sup>



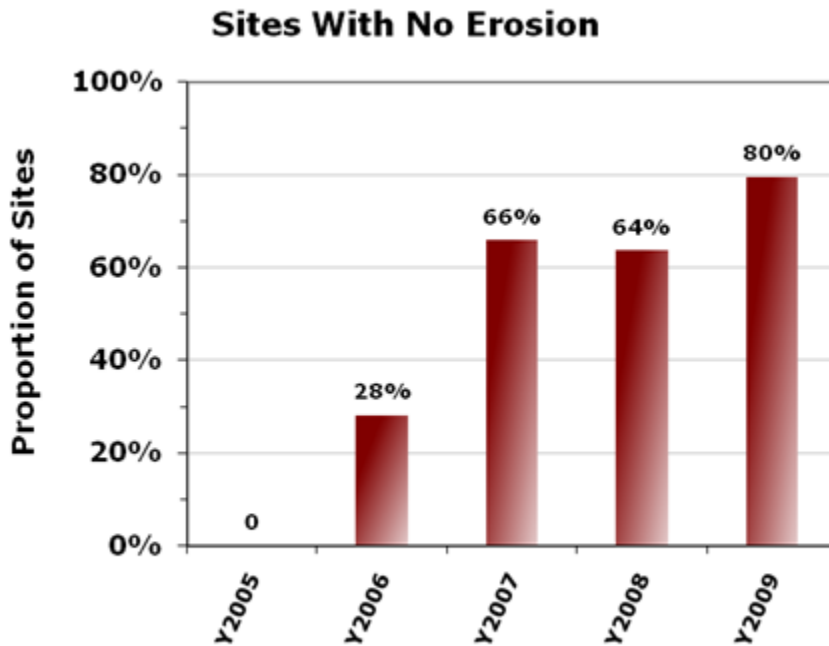
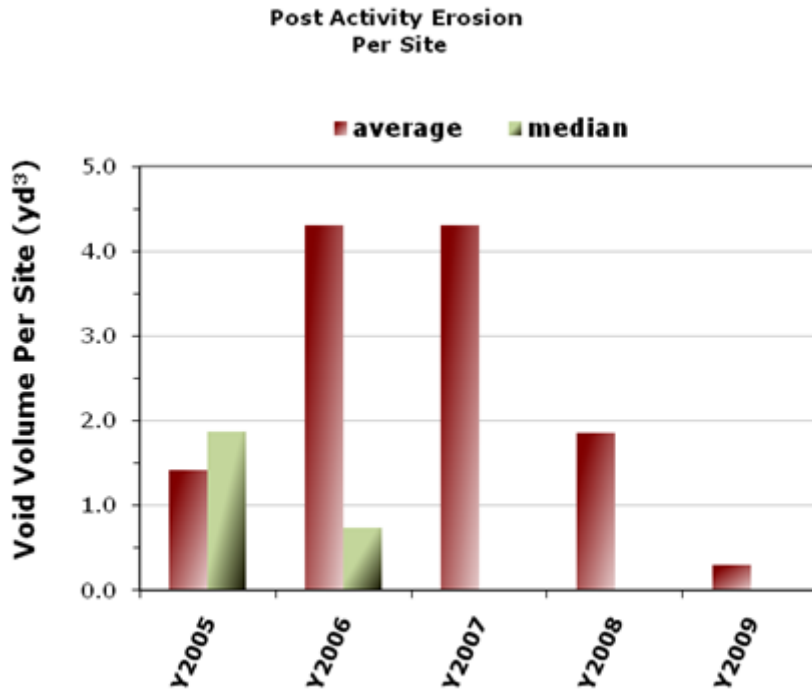
# Erosion After Site Construction

## Post Activity Erosion Volume Per Site 2005-2008



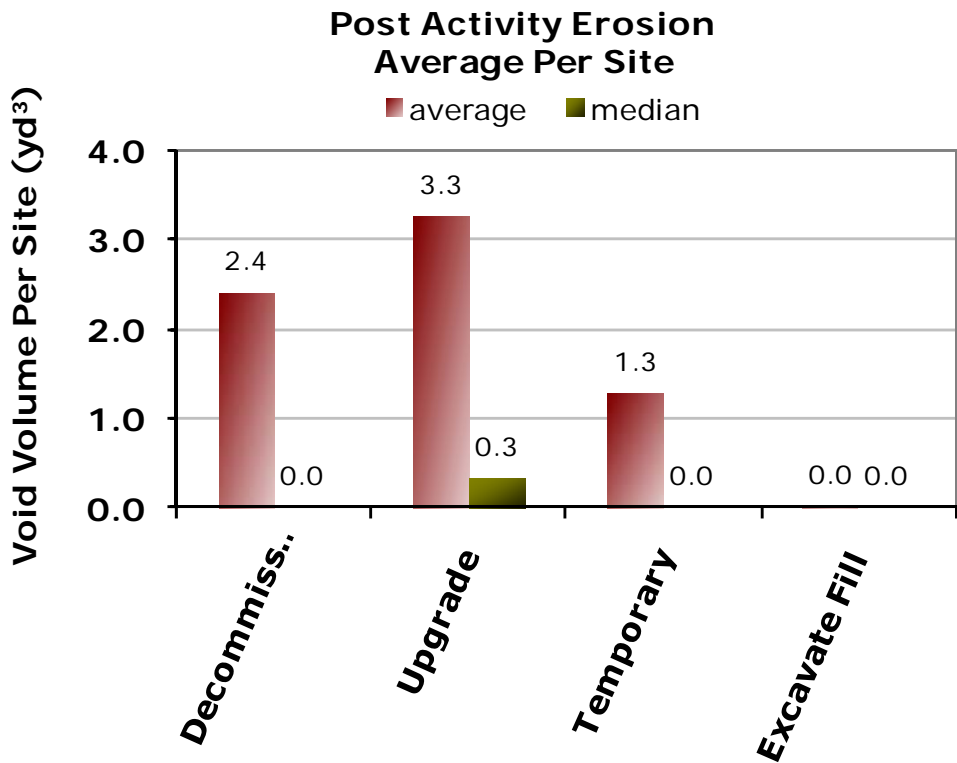
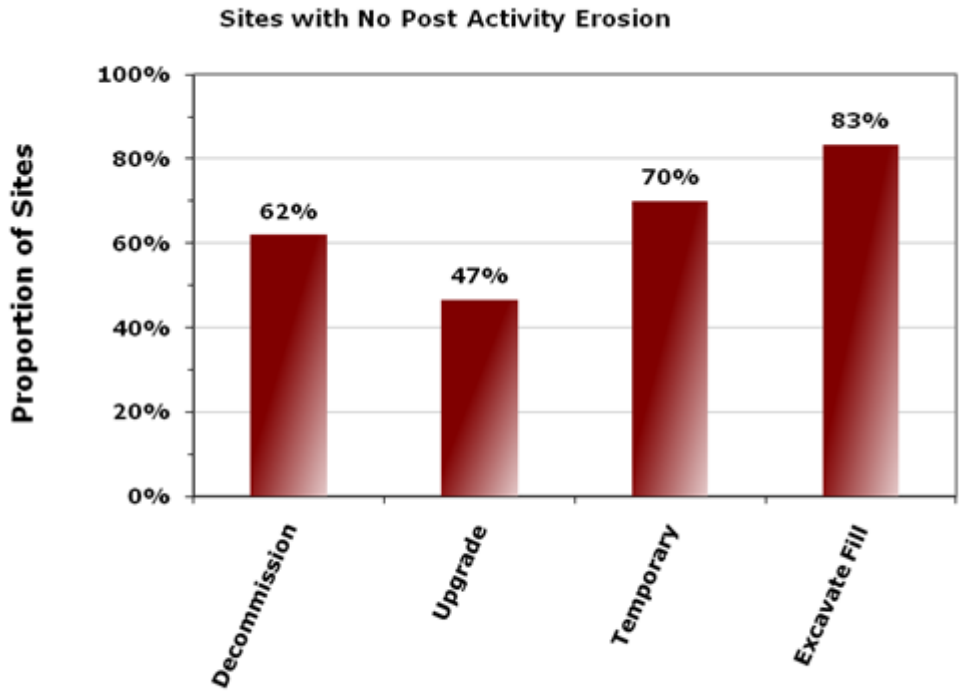
	Yds Saved	Yds Eroded	
Erosion Study	70,074	441.0	
		0.6%	----- proportion of saved later eroded
Study observed		24%	sites
		33%	saved sediment

# Average Post Activity Erosion By Year



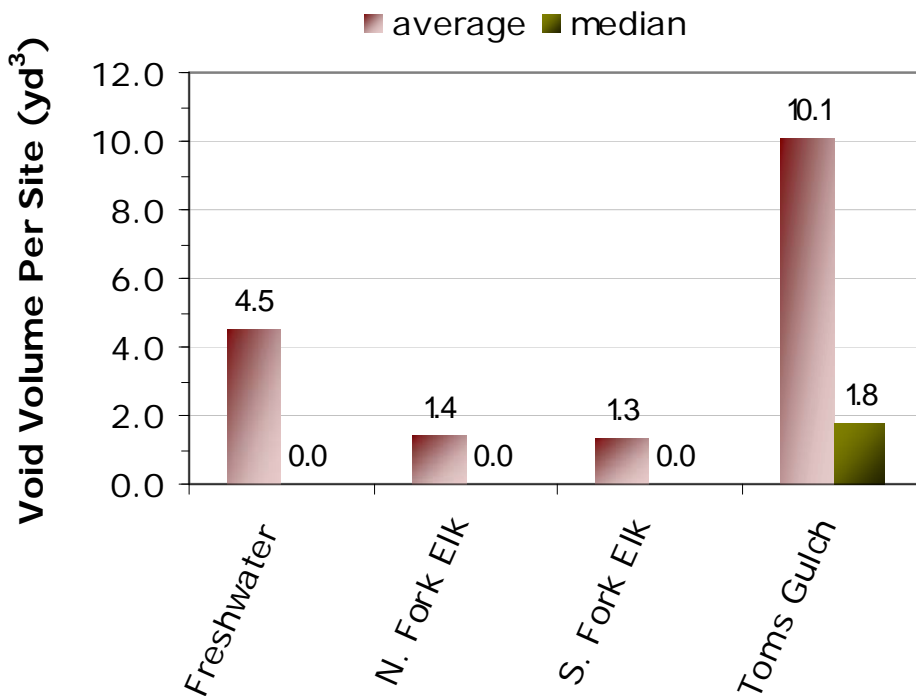


# Average Erosion by Project Type

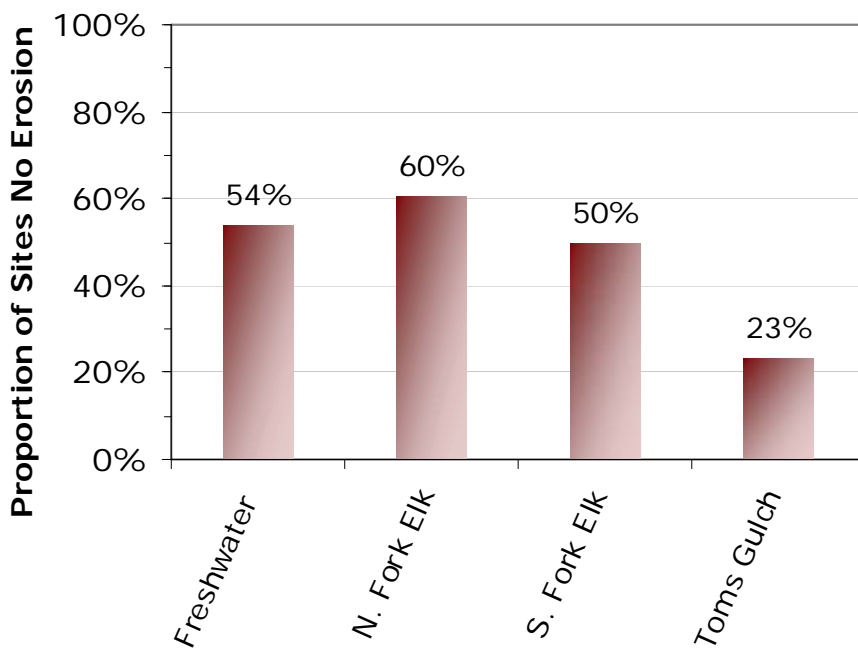


# Average Erosion by Watershed

## Post Activity Erosion Average Per Site

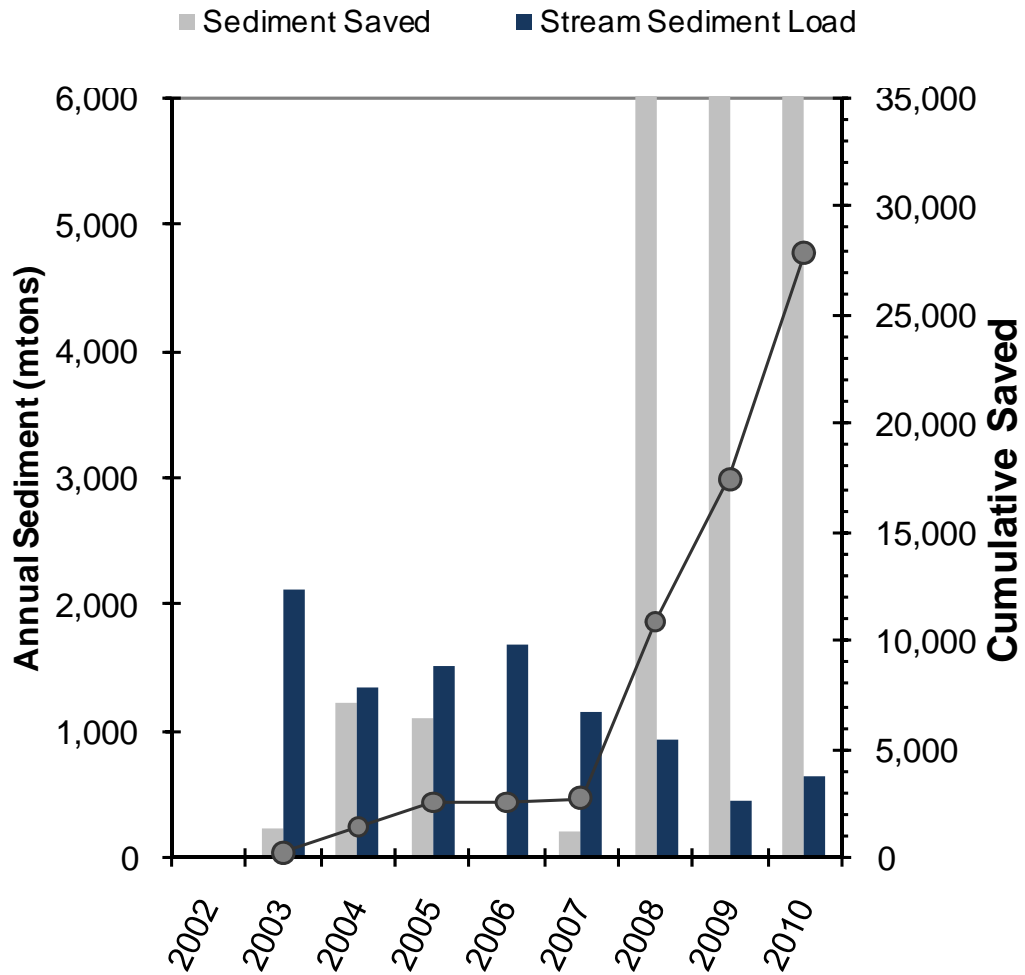


## Sites with No Post Activity Erosion



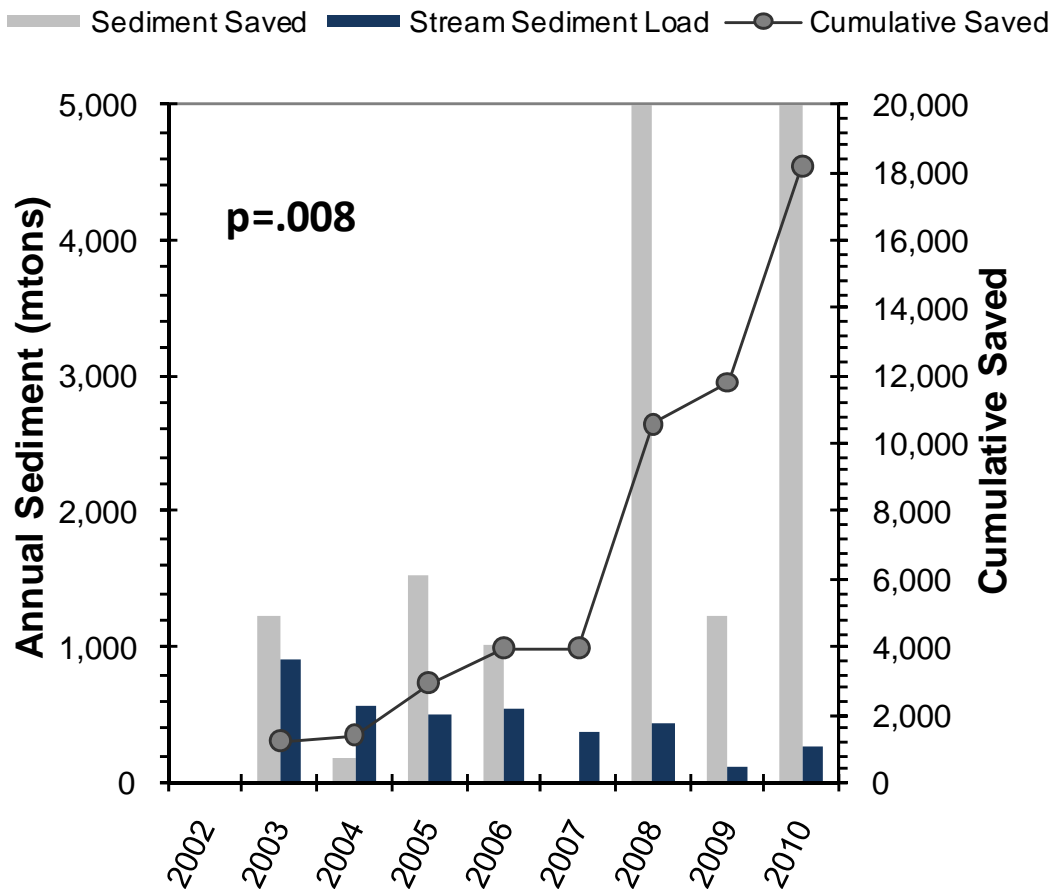
# Effect on Water Quality— Cloney Gulch

## Cloney Gulch During Stream Monitoring Period



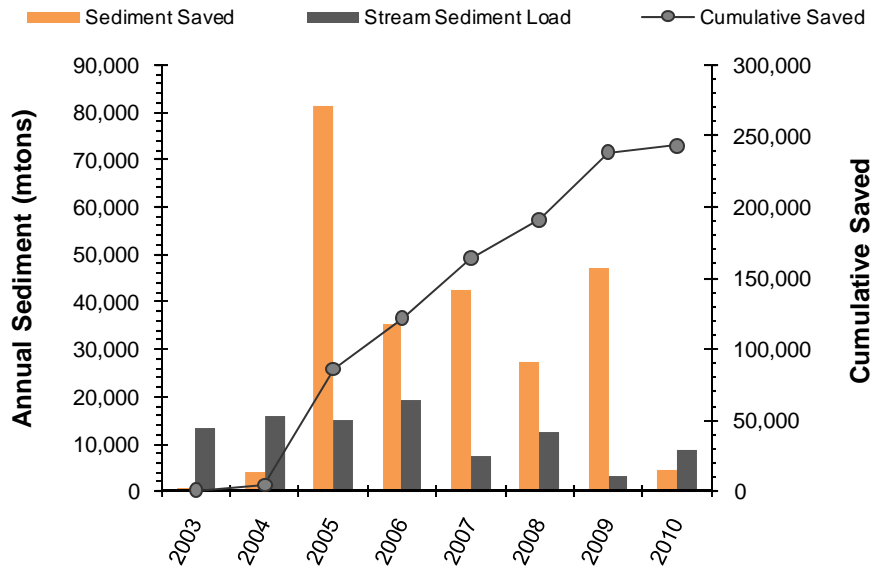
# Effect on Water Quality -- McCready Gulch

## McCready Gulch During Stream Monitoring Period

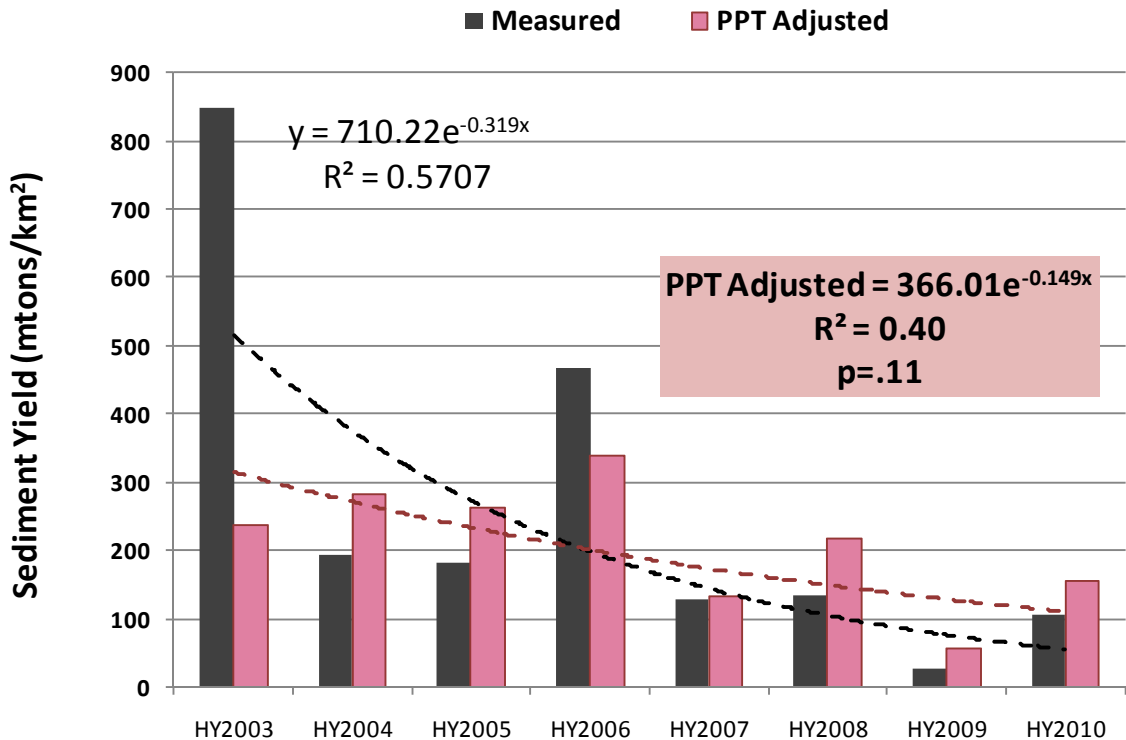


# Effect on Water Quality -- N. Fork Elk River

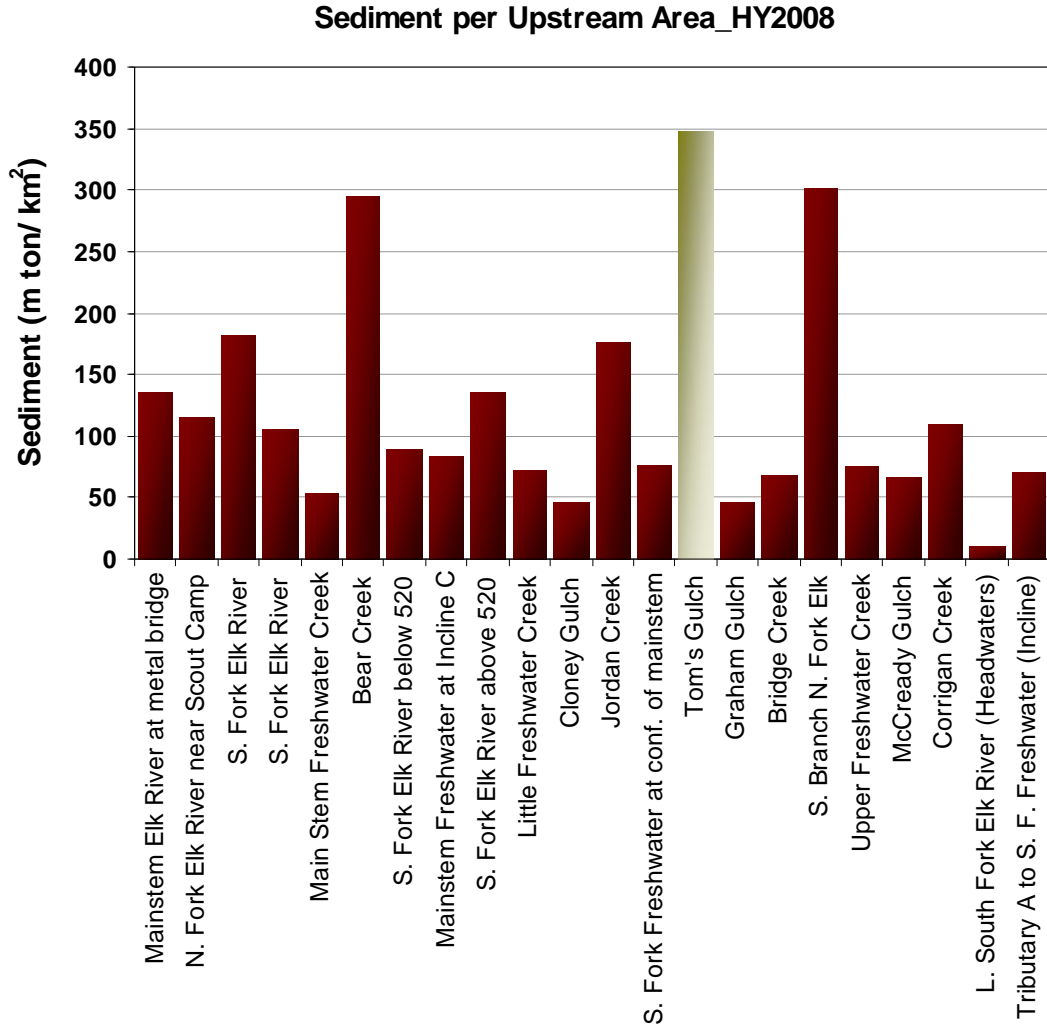
**Total N. Fork Watershed  
During Stream Monitoring Period**



**N. Fork Elk River Sediment Yield**

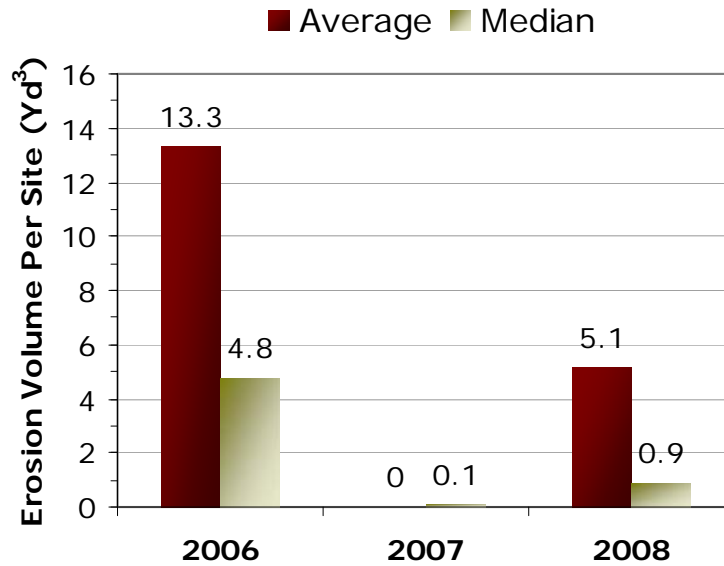


# Comparison of Sediment Yield at HRC Water Quality Trend Sites

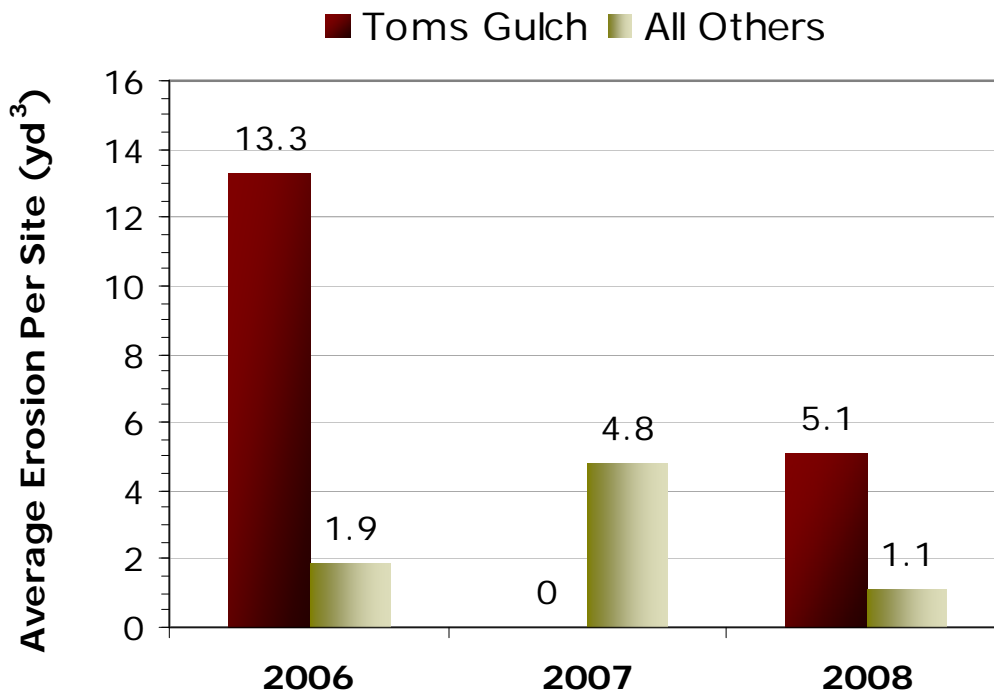


# Toms Gulch has been more of a problem generally

Toms Gulch

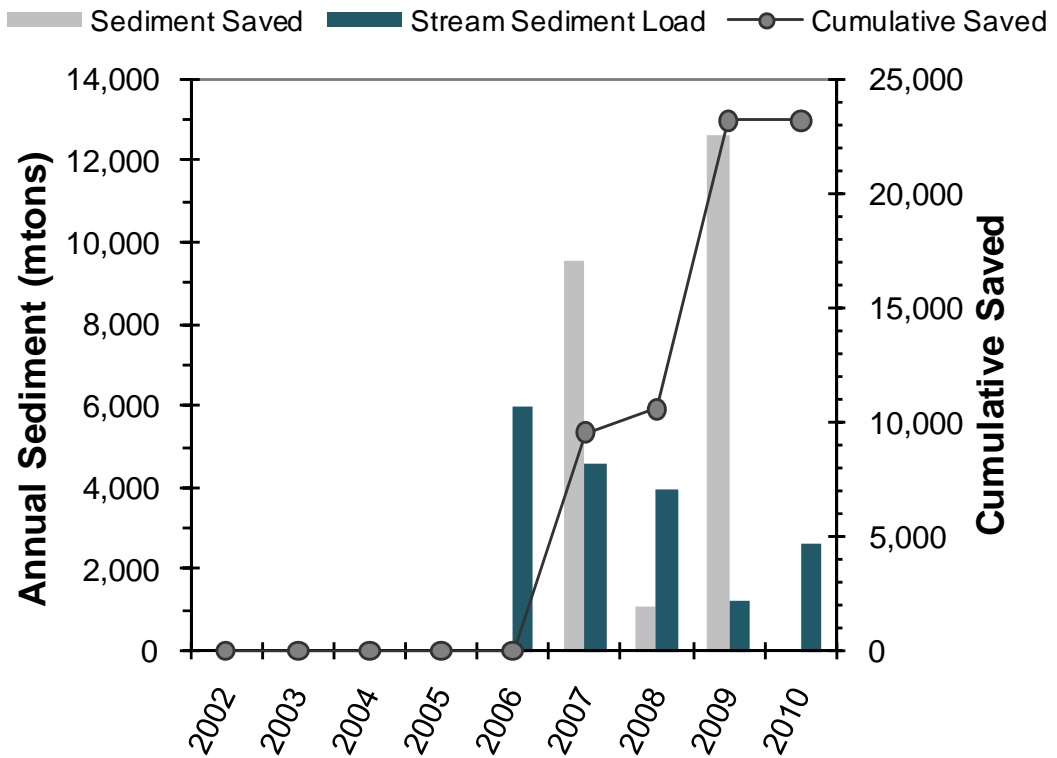


Comparing Toms Gulch to All Other Sites



# Water Quality—Toms Gulch

## Tom's Gulch During Stream Monitoring Period



**Despite more erosion following construction, water quality has been improving**