

Monitoring Study Group

California Water Quality Monitoring Council Meeting

August 11, 2010



Pete Cafferata and Clay Brandow
California Department of Forestry and
Fire Protection



Outline

- 1. Purpose and audience for BOF/CAL FIRE water quality monitoring information.**
- 2. Brief description of Water Quality Monitoring Programs used by the BOF and CAL FIRE from 1993 to 2008.**
- 3. Current monitoring work being conducted.**
- 4. Monitoring data/information availability and format.**
- 5. Additional needs/information that would benefit the BOF and CAL FIRE.**
- 6. Summary points.**

**1. Purpose and Audience for
BOF/CAL FIRE Water
Quality Monitoring
Information**

Monitoring Study Group

- **Advisory Committee to the California State Board of Forestry and Fire Protection.**
- **Representatives from 9 agencies, timber industry, public.**
- **Meets approximately every 3 months, usually at Willits, Redding, or Willows.**
- **In existence since 1990.**

MSG Meetings



- No BOF-appointed members.
- 25 relevant organizations invited to attend.
- Email list of 225 people, meetings average ~20 people.
- Widely ranging attendance.
- Subcommittees established when needed.
- ~70 meetings since 1994; minutes since 2002 available online.
- Meetings mostly indoors...



Western Mendocino Co. 2004



Swanton Pacific Ranch, Santa Cruz Co. 2006



Angora Fire Monitoring, Lake Tahoe, 2008



Kings River Exp. Watershed Study, Fresno Co. 2007

Monitoring Study Group

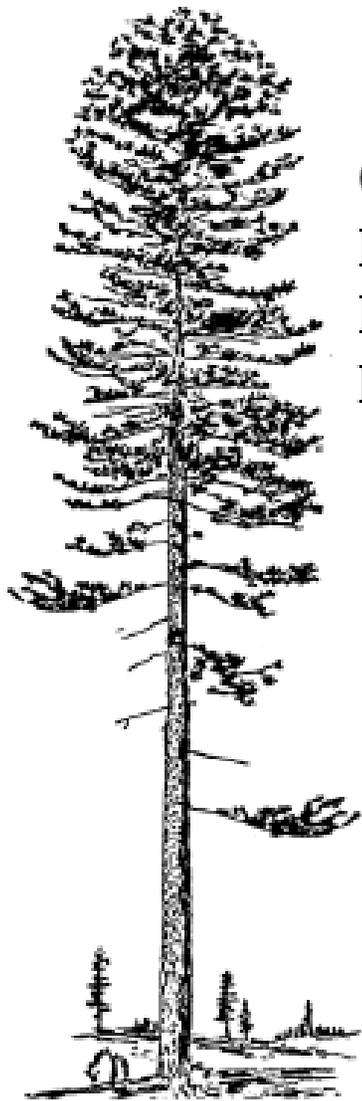
- Provides guidance and oversight to CAL FIRE in implementing a long-term water quality monitoring program.
- Serves as an open public forum for sharing monitoring-related information.
- Chaired by BOF member and staffed by CAL FIRE.

Monitoring Study Group Purpose

- Provide abundant data and information on the implementation and effectiveness of the California Forest Practice Rules (FPRs) specifically designed to protect water quality and beneficial uses, such as riparian/aquatic habitat.
- Provide timely information to be used by forest managers, agencies, and the public in California to improve water quality protection.

Audience for MSG Information

- State Board of Forestry and Fire Protection (BOF).
- California Department of Forestry and Fire Protection (CAL FIRE).
- State Water Resources Control Board (SWRCB).
- Regional Water Quality Control Boards (RWQCBs) with timberland within their jurisdictions (4).
- California Department of Fish and Game (DFG).
- California Geological Survey (CGS).
- NOAA Fisheries (NMFS).
- Other state and federal agencies.
- Universities (e.g., UCB, HSU, Cal Poly, OSU, CSU, etc.)
- Environmental groups.
- Timber companies.
- Interested general public.



**CALIFORNIA
FOREST
PRACTICE
RULES**

2007

**Board of Forestry and
Fire Protection
(BOF) – adopts
regulations.**

**California Department
of Forestry and Fire
Protection (CAL
FIRE) – enforces
and monitors the
rules.**

Logging Plan Permits in California

- Forest Practice Rules and needed additional mitigation measures are enforced as part of approved plans in California (not voluntary BMPs).
- Timber Harvesting Plans (THPs) and other types of plans must be approved by CAL FIRE prior to harvesting (i.e., receive an approved permit).
- Plans are evaluated for compliance with FPRs, CEQA, other state regulations by four state agencies (CAL FIRE, DFG, RWQCBs, and CGS).

CAL FIRE has a substantial program of inspection and enforcement of both the FPRs and Timber Harvesting Plan mitigations and provisions, in addition to water quality related monitoring and data collection



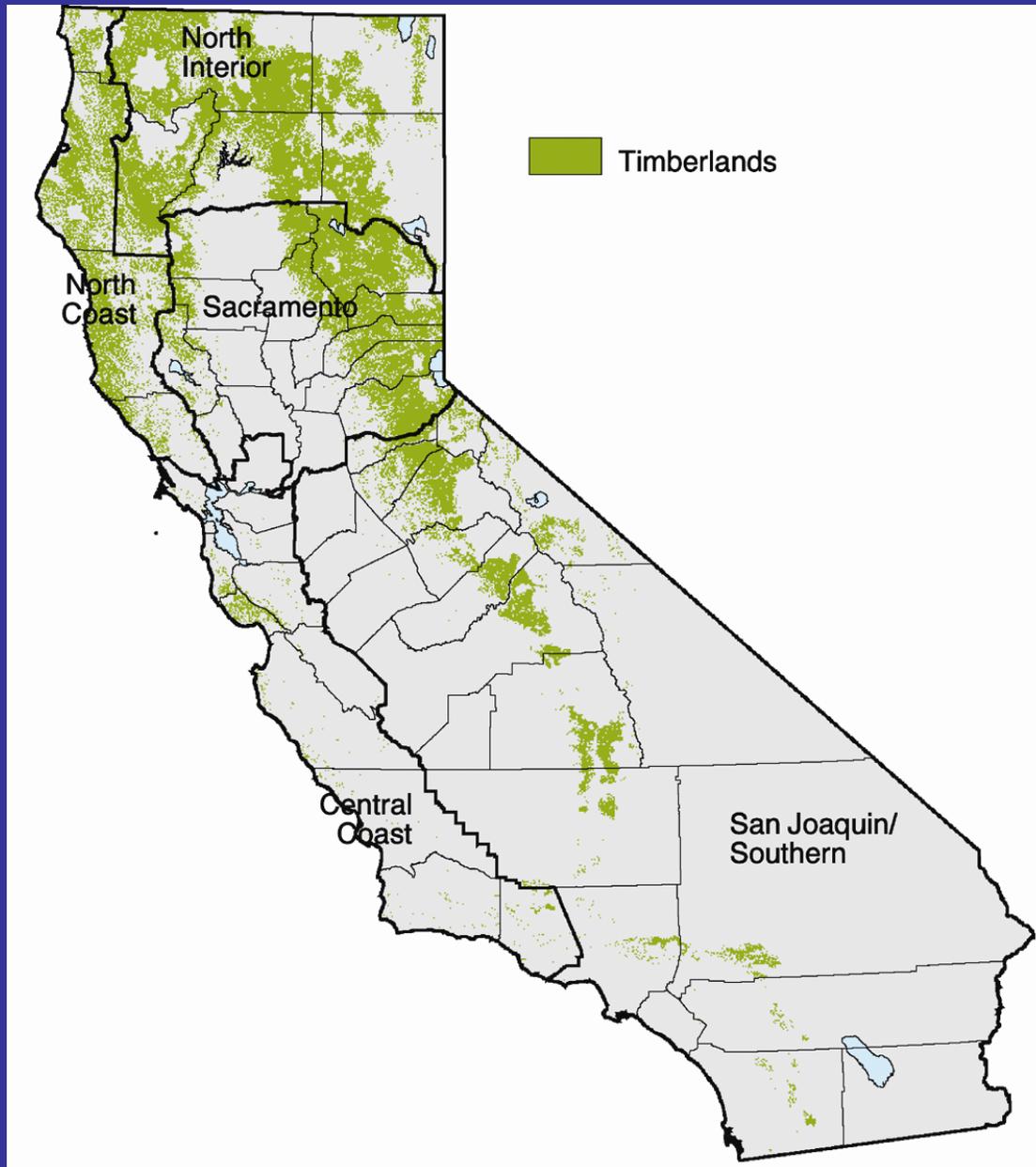
~50 Forest Practice Inspectors

Fiscal Year 2008-09:

~4700 inspections and ~260 rule violations

Examples of Forest Practice Rule Violations Related to Water Quality





CALIFORNIA

- ~101 M acres.
- 16.6 M ac of public and privately owned commercial timberland.
- 9.3 M ac public ownerships.
- 7.3 M ac privately-owned timberland.

CA FPRs apply to non-federal timberlands.

USFS BMPs apply to National Forest lands.

January 2007
California State Board of Forestry and Fire Protection

Monitoring Study Group
STRATEGIC PLAN



Stan Dixon
Chair
Board of Forestry and Fire Protection

Ruben Grijalva
Director
Department of Forestry and Fire Protection



Mike Chrisman
Secretary for Resources
The Resources Agency

Arnold Schwarzenegger
Governor
State of California



**Revised MSG
Strategic Plan
approved by
BOF in
January 2007**

Revised MSG Strategic Plan Key Goals

- Providing guidance on developing programs testing FPR implementation and effectiveness related to water quality.
- Remaining an “unstructured” group, meeting 4 times per year to share monitoring information.
- Forming MSG “structured” subcommittees to produce work products when needed.
- Providing sound advise to the BOF and a BOF-appointed Research and Science Committee.
- Disseminating monitoring information in timely manner.
- Ensuring that the monitoring results are used in training programs to help improve water quality protection.

**2. Brief Description of Water
Quality Monitoring
Programs used by the BOF
and CAL FIRE from
1993 to 2008**

Two Types of Water Quality-Related Monitoring Conducted

- **Hillslope Monitoring** (qualitative estimates of rule implementation and quantitative measurements of rills, gullies, landslides, riparian canopy cover, etc.).
- **Instream Monitoring** (water column measurements, including suspended sediment concentration, turbidity, water temperature).

“Good” Indicators to Monitor Include those that... (Furniss 1999)

- Respond **quickly** to provide results in a desired time frame.
- Have a well understood cause and effect relationship.
- Have a “signal” that is statistically separable from background “noise.”
- Are cost-effective at the required level of precision and accuracy.

Hillslope Monitoring

- **Close linkage to impacts from recent timber operations.**
- **Can test implementation and effectiveness of actual logging practices.**
- **Provides feedback loop to improve practices quickly.**



Instream Monitoring

- Can look at current conditions and long-term trends over time, but...
- Not specific to impacts from timber operations.
- Often cannot tie instream measurements to a given current logging practice.



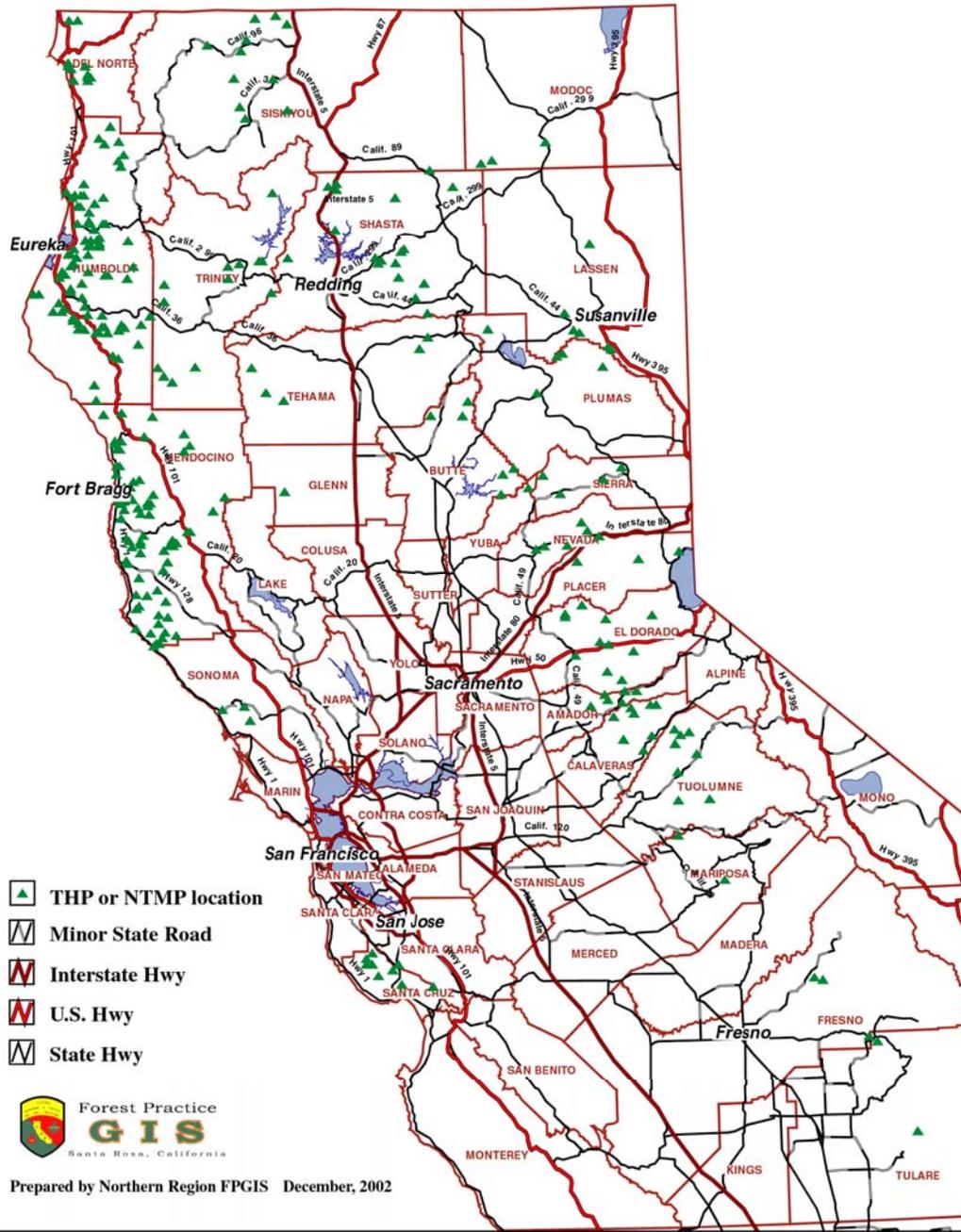
MSG Upslope (Out of Channel) Monitoring Projects: 1993-2008

- **Pilot Monitoring Program (1993-1995).**
- • **Hillslope Monitoring Program (1996-2002).**
- • **Modified Completion Report Monitoring Program (2001-2004).**
- **Interagency Mitigation Monitoring Program (2005-2008).**

Hillslope Monitoring Program

- Operated from 1996 through 2002 to evaluate state-wide random sample of 50 THPs per year
- Data collected by highly qualified contractors, providing a 3rd party audit.
- Random sample of road, skid trail, and riparian zone (WLPZ) segments; landings, and crossings.
- Large erosion events documented where encountered.

Hillslope Monitoring Program 1996-2001



~60% of logging plans in the Coast Ranges; 40% in the interior part of CA



**Hillslope Monitoring Program—Independent
Contractor Collected Data**

Hillslope Monitoring Program

- Interim report prepared for the State Board of Forestry and Fire Protection in June 1999.
- Final report written in 2002.

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CALIFORNIA STATE BOARD OF FORESTRY AND FIRE PROTECTION

HILLSLOPE MONITORING PROGRAM

MONITORING RESULTS FROM
1996 THROUGH 2001

Andrea E. Tuttle
Director
Department of Forestry and Fire Protection

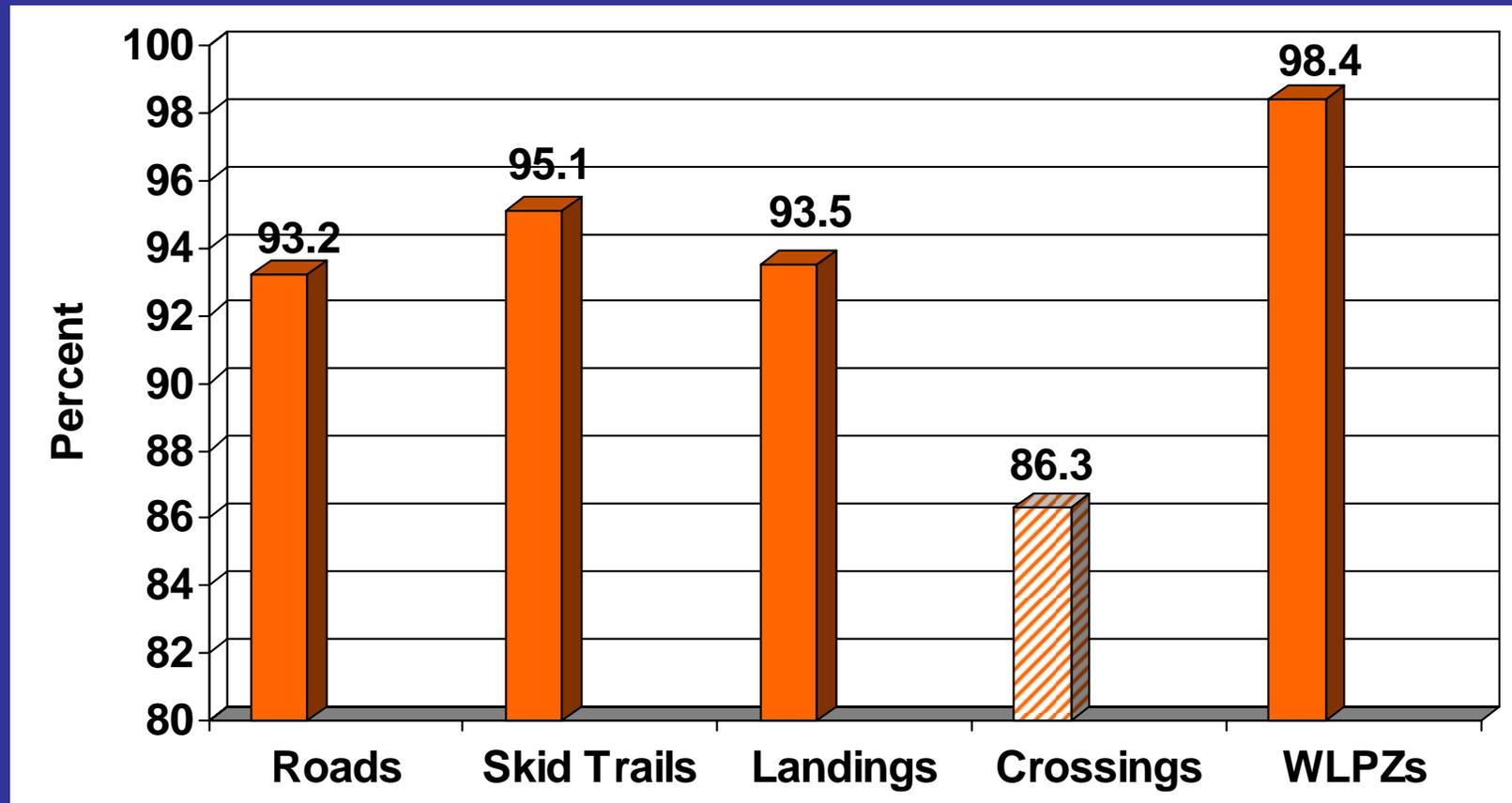
Mary D. Nichols
Secretary for Resources
The Resources Agency

Gray Davis
Governor
State of California



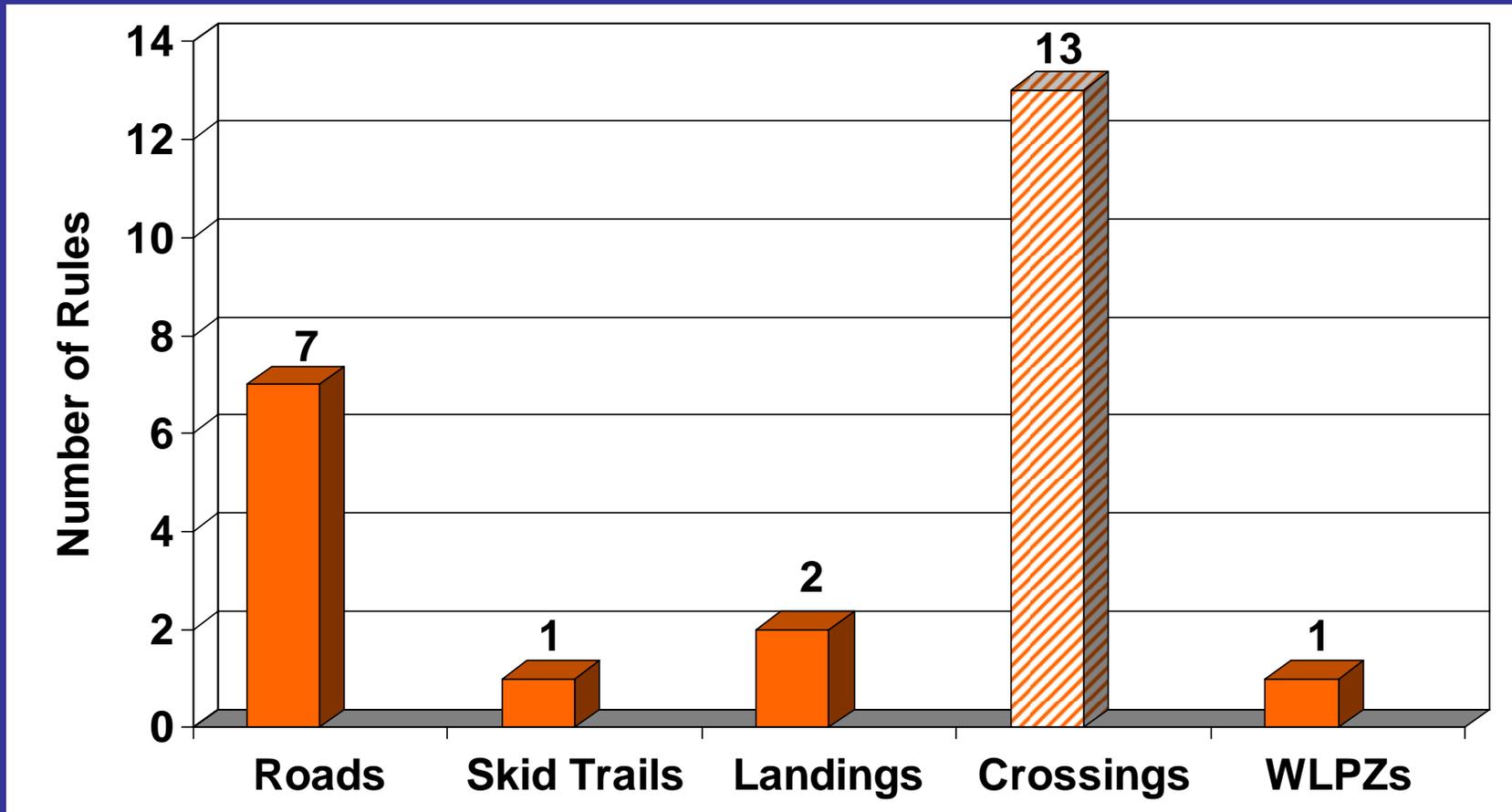
DECEMBER 2002
SACRAMENTO, CALIFORNIA
BOARD OF FORESTRY AND FIRE PROTECTION

Hillslope Monitoring Program— Acceptable Overall Rule Implementation



Overall average acceptable implementation was ~94%

FPR Requirements with $\geq 4\%$ Significant Departures for Implementation



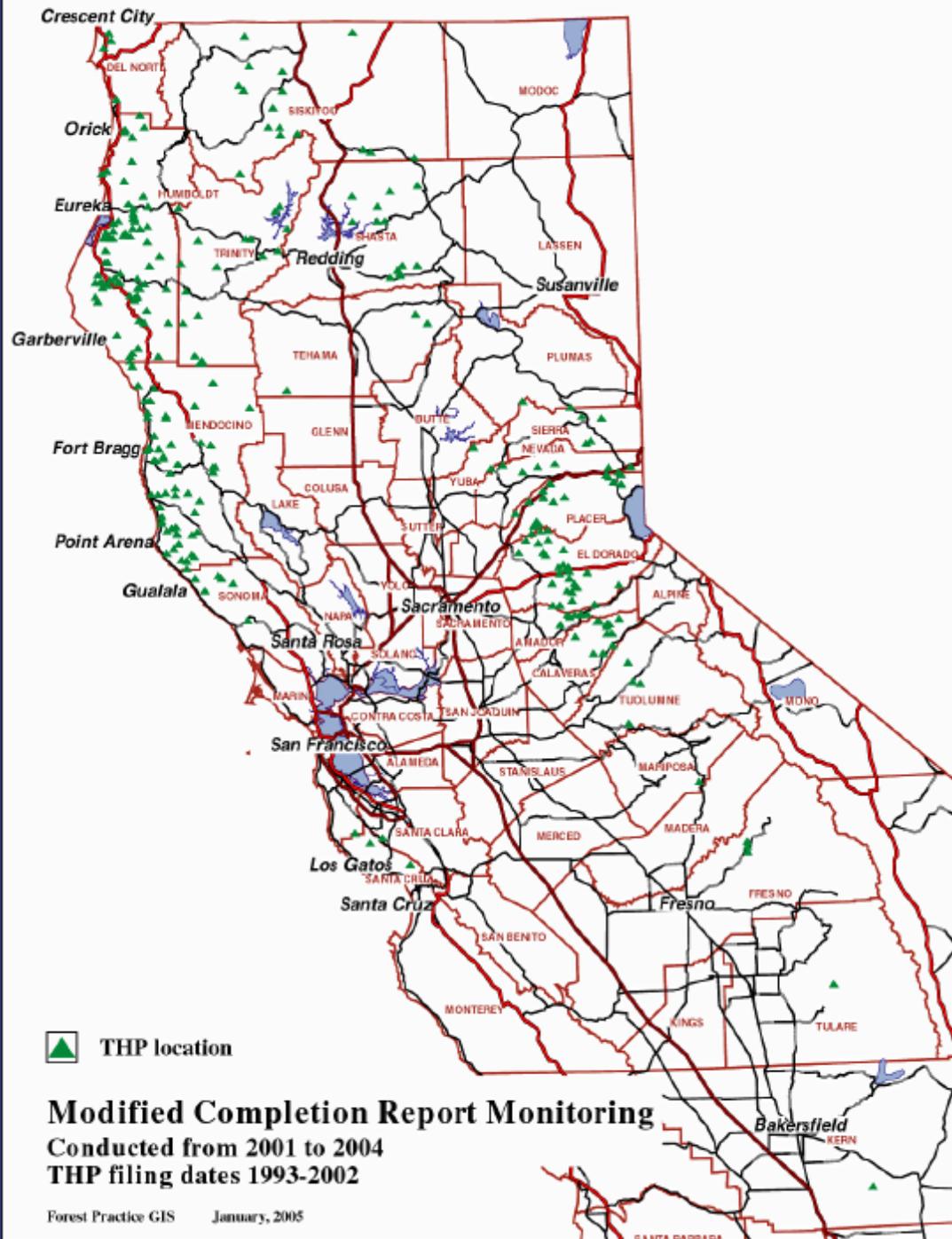
Hillslope Monitoring Program: Summary of Results for 300 Logging Plans

- ◆ Implementation rates for the FPRs related to water quality were high, averaging 94.5% for all rules rated.
- ◆ Individual practices required by the FPRs were generally effective in preventing hillslope erosion features when properly implemented.
- ◆ Erosion features were almost always associated with improperly implemented FPRs.
- ◆ Erosion problems on skid trails and landings were infrequent and produced minor impacts to water quality.
- ◆ Most problems were found on roads and at crossings.

Modified Completion Report Monitoring Program: 2001 to 2004

- **281 THPs evaluated.**
- **CAL FIRE's Forest Practice Inspectors collected monitoring data.**
- **Random 12.5% of all THPs completed were monitored.**
- **Random 1000 ft Road Segments, 200 ft WLPZ Segments, and 2 Watercourse Crossings.**
- **Inspections done after logging completed and at least one over-wintering period.**
- **Final report presented to the BOF in 2006.**





~50% of
 THPs from
 the Coast
 Ranges and
 50% from
 the interior
 part of the
 state.

Modified Completion Report Monitoring
 Conducted from 2001 to 2004
 THP filing dates 1993-2002

MCR Summary Results

- Post-harvest total canopy cover is high in the coast region and adequate in the inland regions.
- Road-related FPR departures were nearly always related to inadequate implementation of road drainage requirements.
- Crossing effectiveness ratings were generally similar to HMP results and show substantial amounts of plugging, diversion potential, and scour at the outlet.

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PROTECTION

Modified Completion Report MONITORING PROGRAM

Implementation and Effectiveness of
Forest Practice Rules related to Water Quality Protection

MONITORING RESULTS FROM
2001 THROUGH 2004

Ruben Grijalva
Director
Department of Forestry and Fire Protection

Mike Chrisman
Secretary for Resources
The Resources Agency

Arnold Schwarzenegger
Governor
State of California



July 2006
SACRAMENTO, CALIFORNIA

HMP and MCR Water Quality Monitoring Program Results (1996-2004)

- ~5% of road drainage structures had poor FPR implementation and erosion problems.
- 8-15% of road erosion features delivered sediment to stream channels, usually when FPRs incorrectly implemented.
- ~20% of the road-stream crossings had significant implementation/effectiveness problems.



Examples of Forest Road Problems

Summary from California Monitoring Work

- Older “legacy” roads that pre-date current Forest Practice Rules are major sources of sediment.
- Roads often produce at least two-thirds of management-related sediment in forested watersheds.
- Usually a small proportion of the total road system produces most of the sediment, and erosion problems are usually associated with required practices that were incorrectly implemented.
- Un-surfaced road segments located within 200 feet of streams that are connected to the channel with inboard ditches are particularly high risk for fine sediment delivery.

3. Current Monitoring Work Being Conducted

Monitoring Study Group

Main Current Monitoring Components

- **Forest Practice Implementation and Effectiveness Monitoring (FORPRIEM).**
- **Cooperative Instream Monitoring Projects.**

FORPRIEM Monitoring

- Similar to earlier MCR monitoring program.
- CAL FIRE Forest Practice Inspectors conduct the monitoring.
- Random 10% sample of THPs completed since July 1, 2008.
- Random sample in a THP of one road segment, one riparian zone segment, and two watercourse crossings.
- QA/QC program to be implemented.
- Data collected on ~55 THPs to date; interim report to be written when 100 THPs completed.

**11 Training Sessions Provided to
CAL FIRE Foresters**



Choose Form

- Watercourse Crossing Site Information Form 1
- Watercourse Crossing Implementation Form 1
- Watercourse Crossing Effectiveness Form 1
- Watercourse Crossing Site Information Form 2
- Watercourse Crossing Implementation Form 2
- Watercourse Crossing Effectiveness Form 2
- Road Site Information Form
- Road Implementation Form
- Road Effectiveness Form
- WLPZ Canopy Sampling Form
- WLPZ Erosion Features Form

Choose THP

- 1-02-218
- 1-02-236
- 1-02-245
- 1-03-024
- 1-03-117
- 1-03-126
- 1-03-177
- 1-03-224
- 1-03-233
- 1-04-016
- 1-04-026
- 1-04-097
- 1-04-124
- 1-04-130
- 1-04-139
- 1-04-235
- 1-04-262

Load Form

Maintenance

- Observers
- THPs
- Forms
- Items
- Responses

Add Responses to an Item

Add Items to a Form

Reports

FORPRIEM Database:
Main Menu

Cooperative Instream Monitoring Projects

- USFS-Pacific Southwest Research Station.
- Cal Poly San Luis Obispo—Swanton Pacific Ranch.
- Campbell Timberland Management/ Hawthorne Timber Company.
- Sierra Pacific Industries.

These projects are documenting the water quality impacts of contemporary logging practices.

CAL FIRE/BOF/MSG Cooperative Instream Monitoring Projects

- **Caspar Creek Watershed Study**—1962 to present (USFS-PSW and CAL FIRE)
 - <http://www.fs.fed.us/psw/topics/water/caspar/>
- **Little Creek Watershed Study** – 2001 to present (Cal Poly San Luis Obispo, CAL FIRE, and others)
 - <http://www.scottscreekwatershed.org/habit.html>
- **Wages Creek** – 2004 to present (Campbell Timberland Management and CAL FIRE)
 - http://www.bof.fire.ca.gov/pdfs/SFWages_EffectivenessProposal_Nov2004.pdf
- **Judd Creek** – 2004 to present (Sierra Pacific Industries and CAL FIRE)
 - http://www.bof.fire.ca.gov/pdfs/Judd%20Creek%20Final_Prospectus_MSG_maps.pdf

Wages
Creek

Caspar
Creek

Judd
Creek

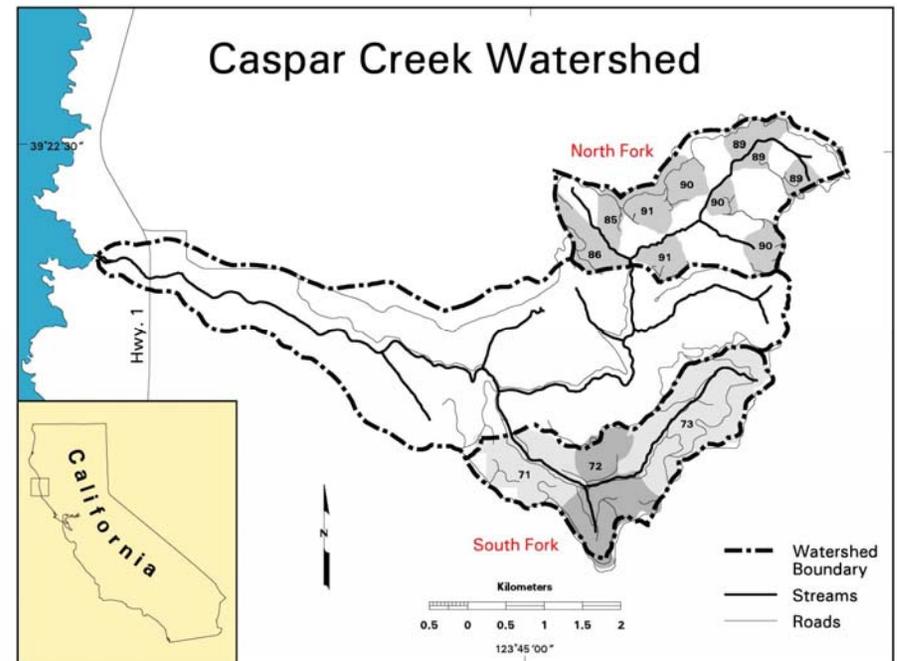
Little
Creek

**Locations of
Cooperative
Instream
Monitoring
Projects**



Caspar Creek Watershed Study

- Began in 1962.
- Only long-term forested watershed study in CA.
- Cooperative project with USFS-PSW.
- 100-yr agreement to continue study to 2099.
- Over 150 published papers, theses available online.



Caspar Creek Watershed Study: Cooperative Project with the USFS-PSW since 1962



North Fork Caspar Cr., NFC weir, stormflow



Little Creek: Cooperative Instream Monitoring Project with Cal Poly San Luis Obispo/ Swanton Pacific Ranch

**South Fork Wages Creek: Cooperative Instream Monitoring Project
with Campbell Timberland Management**



**Judd Creek: Cooperative Instream Monitoring Project
with Sierra Pacific Industries**



4. Monitoring Data/Information Availability and Format

Data Availability

- Twelve MSG monitoring reports and over 30 MSG supported reports are available on-line at the MSG website.
- These reports contain information, analyses and summaries of the data.
- With the exception of the cooperative Caspar Creek watershed study, with data located on the USFS-PSW website, the original monitoring data is archived.



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MONITORING STUDY GROUP MORE INFO...

MSG MONITORING REPORTS

- [Draft Monitoring and Tracking Subcommittee Report--November 2009 \(1.5MB PDF\)](#)
- [Interagency Mitigation Monitoring Program Pilot Project Final Report -- Longstreth et al. 2008 \(5.0 MB\) \(5.0MB PDF\)](#)
- [IMMP General Framework Report 2006 \(751KB PDF\)](#)
- [MCR Report 2006 \(1.6MB PDF\)](#)
- [HMP Final Report 2002 \(1.3MB PDF\)](#)
- [BOF Interim HMP Report 1999 \(553KB PDF\)](#)
- [PMP Summary of Long Term Monitoring Program 1997 \(195KB PDF\)](#)
- [Hillslope PMP Report 1995 \(2.8MB PDF\)](#)
- [Rae Pilot Instream PMP Report 1995 \(12.0MB PDF\)](#)
- [Pilot Geological Input for HMP, PMP Report 1995 \(51KB PDF\)](#)
- [MSG-Kier Rec's for Pilot Monitoring Project Report 1993 \(11.2MB PDF\)](#)
- [BEAC Report 1991 \(3.8MB PDF\)](#)

Examples of Supported Monitoring Projects

- Testing Indices of Cold Water Fish Habitat (Chris Knopp, USFS)
- V* and other instream parameter evaluations (Dr. Tom Lisle, USFS-PSW)
- Evaluation of Road Stream Crossings (Sam Flanagan, BLM)
- Sediment Composition as an Indicator of Stream Health (Drs. Mary Ann Madej, USGS, and Peggy Wilzbach, HSU)
- Watershed Reference Catalog (internal MSG Workgroup)



GOVERNOR SCHWARZENEGGER



Visit his Website

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- Forest Practice Committee
- Policy Committee
- Management Committee
- Range Management Advisory Committee
- Technical Advisory Committee
- Interagency Forestry Working Group
- Research and Science Committee

MONITORING STUDY GROUP MORE INFO...

MSG Supported Reports

Archives: **Current Data**

2009 SUPPORTED REPORTS

- [Composition of the Suspended Load as A Measure of Stream Health - Wilzbach and Cummins 2009 \(687KB PDF\)](#)

2008 SUPPORTED REPORTS

- [Measuring the effects of Increasing Loads of Fine Sediment from Timber Harvest and Road Building on Aquatic Populations of Dicamtondon Tenebrosus \(Pacific Giant Salamander\) in California's Redwoods- Pogue M.S. Thesis 2008 \(640KB PDF\)](#)
- [Cooperative Monitoring for Turbidity and Suspended Sediment Monitoring and Research on Three Tributaries of Elk River, California Hydrologic Years 2004-2006-Robison 2008 \(8.8MB PDF\)](#)

2007 SUPPORTED REPORTS

- [The Significance of Suspended Organic Sediments to Turbidity, Sediment Flux, and Fish-Feeding Behavior - Madej, Wilzbach, Cummins, Ellis, and Hadden 2007 \(1.3MB PDF\)](#)
- [Comparisons of Turbidity Data Collected with Different Instruments-Lewis, Eads and Klein 2007 \(3.0MB PDF\)](#)

2006 SUPPORTED REPORTS

- [Garcia River Trend and Effectiveness Monitoring: Spawning Gravel Quality and Winter Water Clarity in](#)

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(510) 559-6300



<http://www.fs.fed.us/psw/topics/water/caspar/>

Research Topics

Water & Watersheds: Caspar Creek Watershed Study

[^ Main Topic](#) | [CALFED](#) | [Caspar Creek Watershed Study](#) | [Turbidity Threshold Sampling Study](#) | [Fine Sediment in Pools](#)

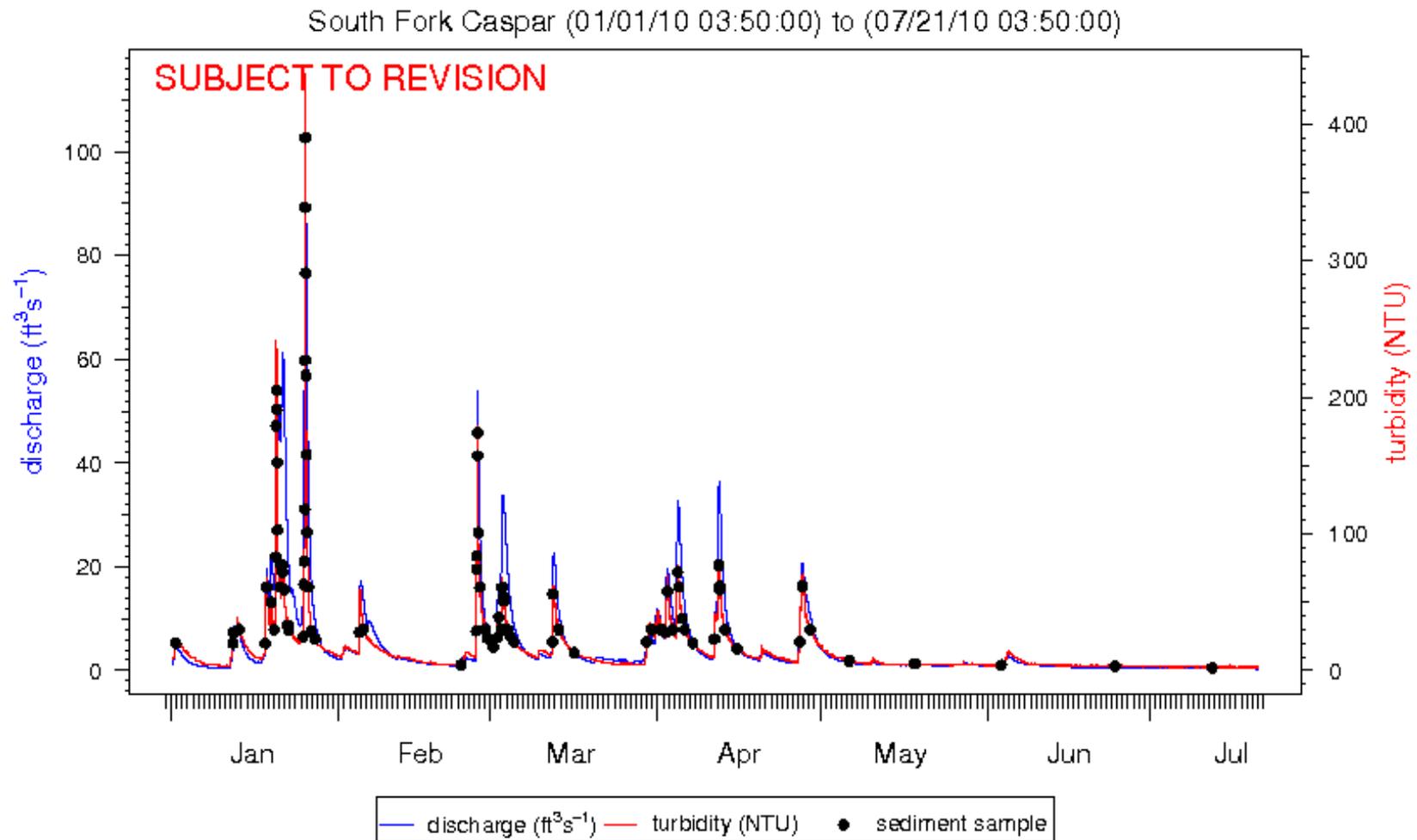
The Caspar Creek Experimental Watershed Study, located on the [Jackson Demonstration State Forest](#) near Fort Bragg, California, is a cooperative venture of the [Redwood Sciences Laboratory](#) and the [California Department of Forestry and Fire Protection](#) that has been operating continuously since 1962.

Caspar Creek Data:

- [Plot current streamflow, sediment, rainfall, and temperature](#)
- Caspar Creek Experimental Watersheds Hydrologic and Climatic Data
 - Note:** due to technical problems, data downloaded before 8/16/02 contained errors that have now been corrected. [Details.](#)
 - [1962 - 1997](#)
 - [1986 - 2004](#) (1986 - 2004 for Rainfall, 1989 - 2003 for Temperature, 1996-2003 for Streamflow) Complete data sets are available on CDs released in May 1998 and in June 2001. For a copy, contact our Data Manager, [Jayme Seehafer](#).
These data files now include:
 - Streamflow
 - Sediment
 - Rainfall
 - Solar
 - Air and water temperature
 - Channel cross-sections
 - Subsurface hydrology
 - Detailed streamflow and sediment data for 13 tributary stations that were installed in the North Fork in August 1985.
- Fish surveys
 - [2004-2005 adult salmonid estimates from redd surveys](#)
 - [1987-2005 juvenile salmonid counts from downstream migrant traps](#)
- Maps of Caspar Creek
 - [Entire Caspar Creek watershed](#)
 - [Topography of North and South Forks Caspar Creek](#)
 - [North Fork Caspar Creek](#)
 - [South Fork Caspar Creek](#)
[Information about the names of the South Fork Tributaries.](#)
 - [Longitudinal profile of North Fork stream channels](#)
 - Geologic and Geomorphic Features Related to Landsliding, North and South Forks of Caspar Creek, Mendocino County, California. California Division of Mines and Geology Open File Report OFR 95-08.

DATA

Caspar Creek Real-Time Discharge and Turbidity Data Plot: January 1, 2010 to July 21, 2010



Other Forms of Data Dissemination

- Professional conference presentations.
- Journal and conference published papers.
- Newsletters.
- Training workshop presentations.

Flared Metal End Sections

- Flared ends at the inlet of a culvert improve flow by guiding the water into the culvert, minimizing turbulence.
- Flared metal end sections have the same headwater discharge relationship as a metal pipe with a headwall.
- Flared metal end sections do not improve the hydraulic performance of culverts appreciably over the performance of a mitered inlet.

**RPF/Landowner Watercourse
Crossing Workshop
March 11, 2008; Redding, CA**



Interagency Watercourse Crossing Workshop, Nov. 30, 2007, Santa Cruz, CA



5. Additional Needs

- Adequate funding has been problematic over the last decade and has been an increasing problem in recent years.
- MSG and CAL FIRE have had to reassess priorities to keep the most critical multi-year monitoring ongoing.
- Development of a comprehensive Effectiveness Monitoring Program (EMP) is being discussed to determine if newly adopted FPRs rules are effective in protecting beneficial uses such as salmonid habitat, or if further modification is required.

6. Summary Points

Over the past 20+ years, much has been learned from forestry-related water quality monitoring work in California, including:

- Individual practices required by the FPRs are generally effective in preventing hillslope erosion features when properly implemented.
- Forest road drainage and proper watercourse crossing design, construction, and maintenance are areas of concern and require improvement.
- Implementation of the modern FPRs (post-1975) have substantially reduced water quality impacts (Caspar Creek results).

Summary Points (continued)

- 12 MSG monitoring reports, primarily with hillslope monitoring data, have been produced from 1990 to 2009 and are available online.
- Four cooperative instream monitoring projects complement hillslope monitoring work and provide water column data related to timber operations. Caspar Creek instream data is available online.
- Obtaining adequate funding is challenging.
- One solution is to rely more heavily on additional state agency/ private company partnerships for effectiveness monitoring work (merging monitoring priorities).

A landscape photograph capturing a sunset. The sun is a bright, glowing orb positioned just above the horizon, casting a warm orange and yellow light across the sky. The sky is filled with large, dark, textured clouds that catch the light from the sun, creating a dramatic play of light and shadow. Below the horizon, the silhouettes of rolling hills and a field are visible against the bright sky. The overall mood is serene and peaceful.

Thanks for Your Attention!