Monitoring Study Group

California Air Resources Board Meeting

December 15, 2010

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

Outline

1. Background Information on the California forestry process.
2. Monitoring Study Group: Purpose and audience for BOF/CAL FIRE water quality monitoring information.
3. Types of water quality monitoring utilized.
4. Implications/actions from monitoring work.
5. Monitoring information availability.
6. Additional monitoring needs.
7. Summary points.

1. Background Information on the California Forestry Process

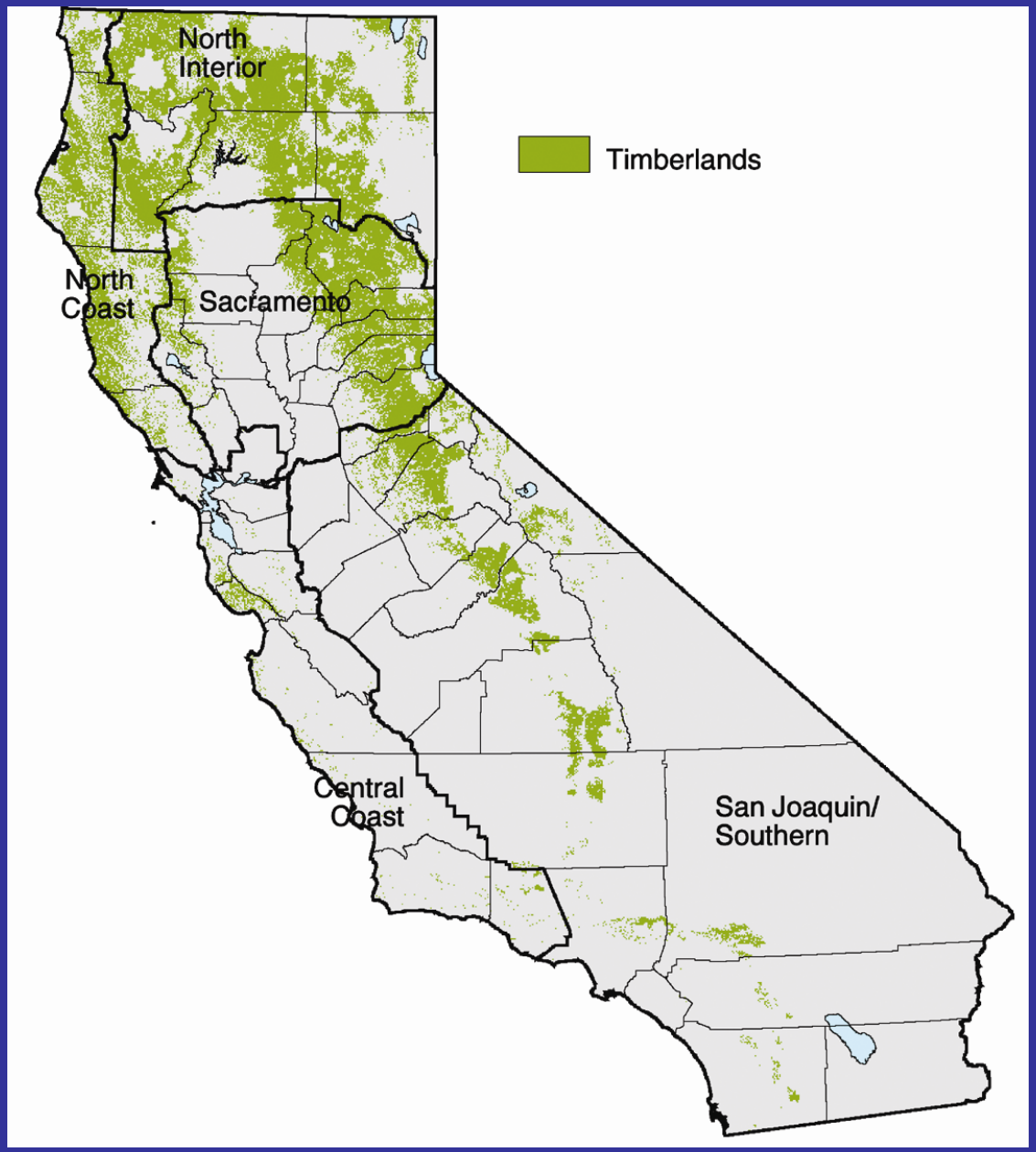


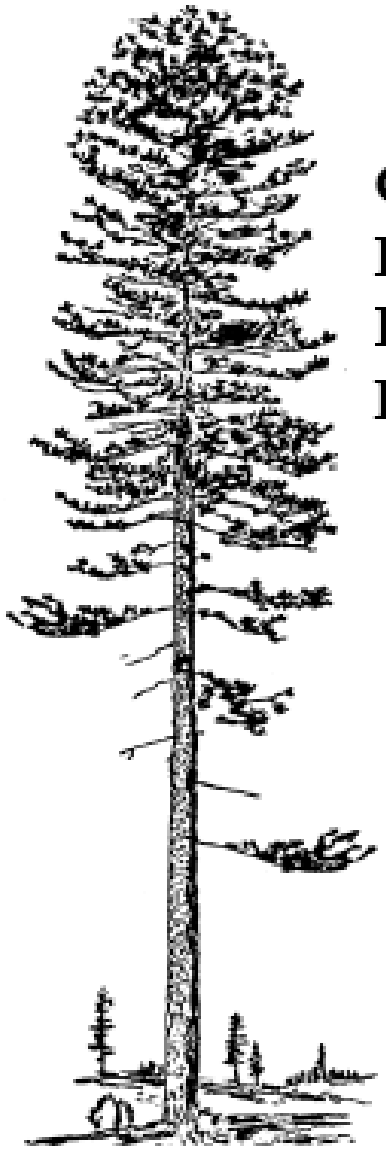
Image: CDF 2003

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.



CALIFORNIA
FOREST
PRACTICE
RULES

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, <u>in addition</u> to water quality-related monitoring and data collection

~50 Forest Practice Inspectors

Fiscal Year <u>2008-09</u>:

~4700 inspections and ~260 rule violations

2. Monitoring Study Group:

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

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.**

Monitoring Study Group

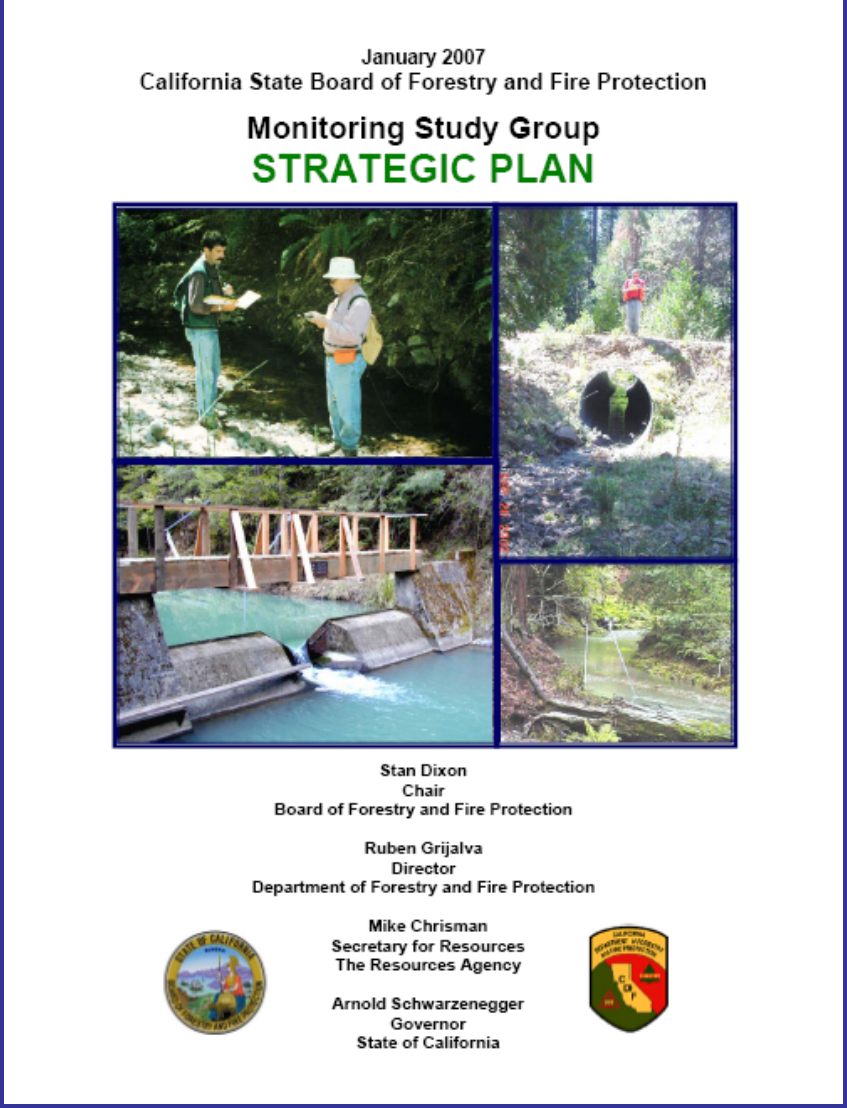
- ***Advisory Committee*** **to the California State Board of Forestry and Fire Protection since 1990.**
- **Provides guidance and oversight to CAL FIRE in implementing a *long-term water quality monitoring program*.**
- **Serves as an *open public forum* for sharing monitoring-related information.**
- **Chaired by BOF member and staffed by CAL FIRE.**

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 and Landowners.
- Registered Professional Foresters (RPFs)
- Interested general public.

Revised MSG Strategic Plan Key Goals

- Providing guidance on developing programs testing FPR implementation and effectiveness related to water quality.
- Meet 3-4 times per year to share monitoring information.
- Providing sound advise to the BOF and the 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.



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

3. Types of Water Quality Monitoring Utilized

Two Types of Water Quality-Related Monitoring Conducted

A. **Upslope Monitoring** (qualitative estimates of rule implementation and quantitative measurements of rills, gullies, landslides, riparian canopy cover, etc.).

B. **Instream Monitoring** (quantitative water column measurements, including suspended sediment concentration, turbidity, water temperature).

A. Upslope Monitoring

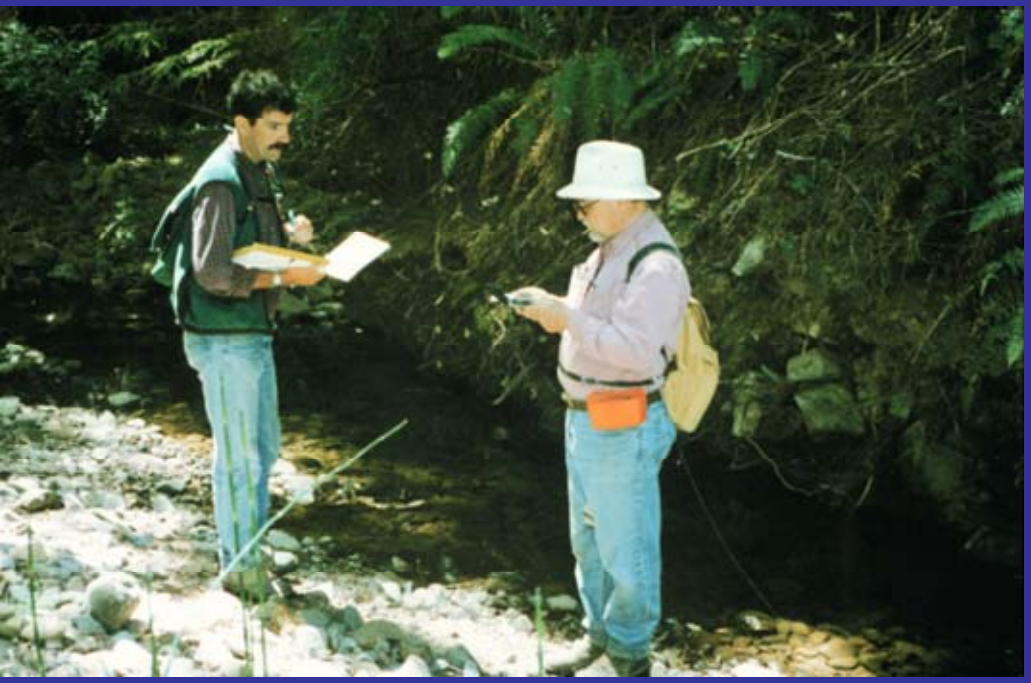
- Close linkage to impacts from recent timber operations.
- Can test implementation and effectiveness of actual logging practices.
- Provides feedback loop to improve practices quickly.

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

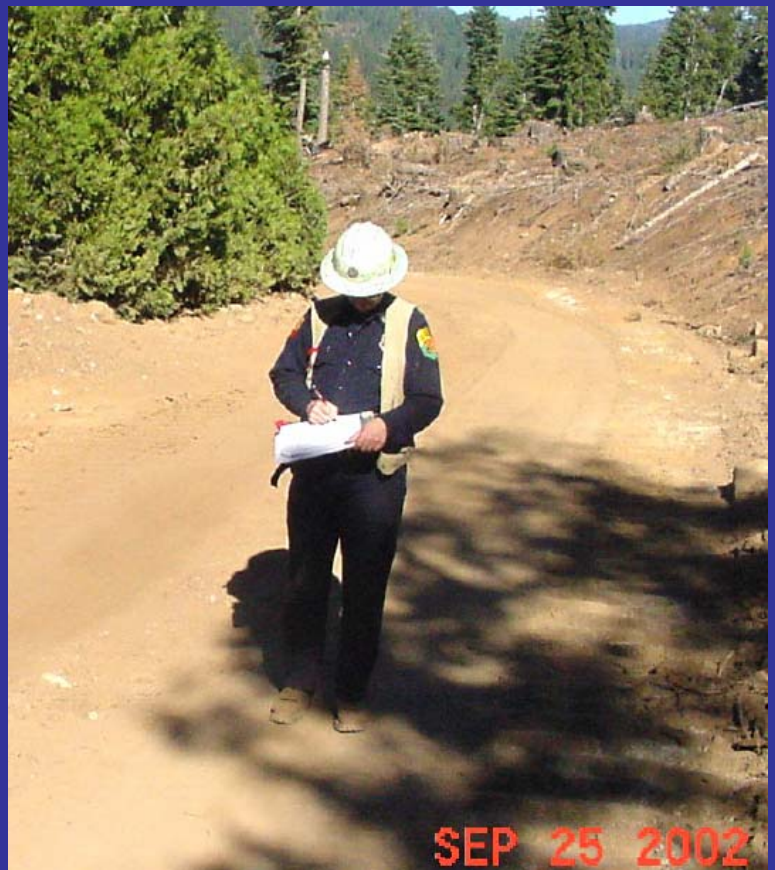
- Pilot Monitoring Program (1993-1995).
- Hillslope Monitoring Program (1996-2002).
- Modified Completion Report Monitoring Program (2001-2004).
- Interagency Mitigation Monitoring Program (2005-2008).
- FORPRIEM (2008-present).

Examples of Upslope Monitoring Programs

Hillslope Monitoring Program (1996-2002)—Contractor-collected data

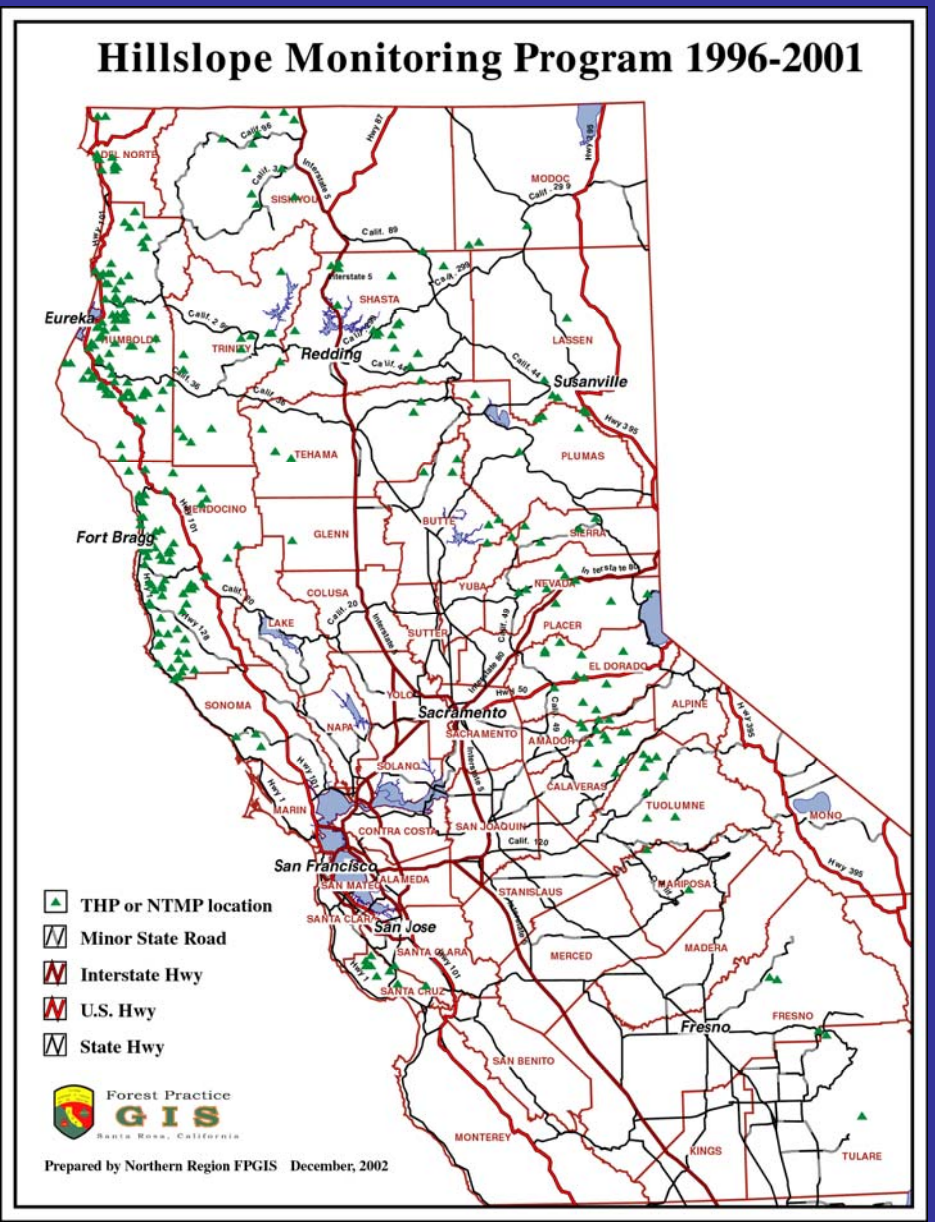


Modified Completion Report Monitoring (2001-2004), FORPRIEM (2008-present)—CAL FIRE Forest Practice Inspectors

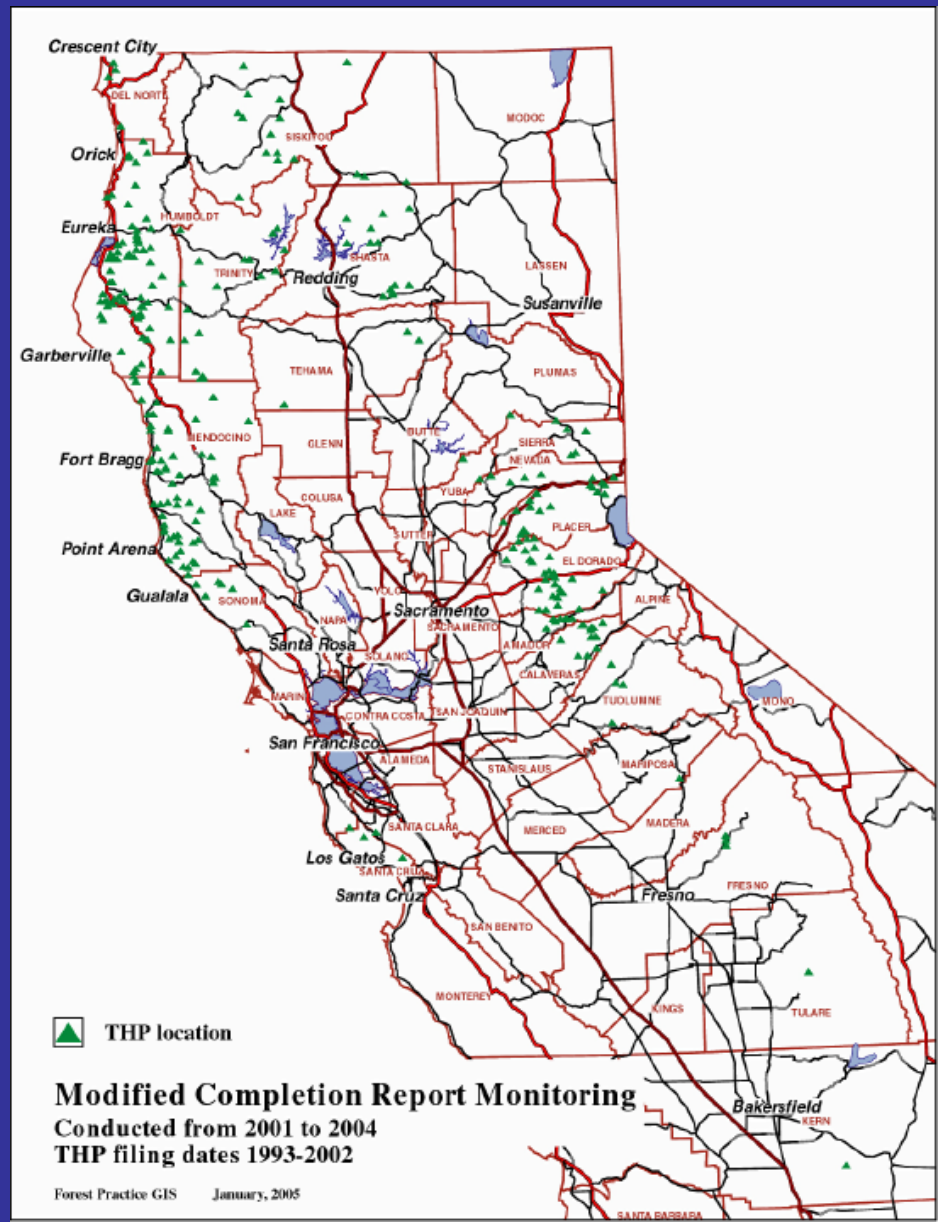


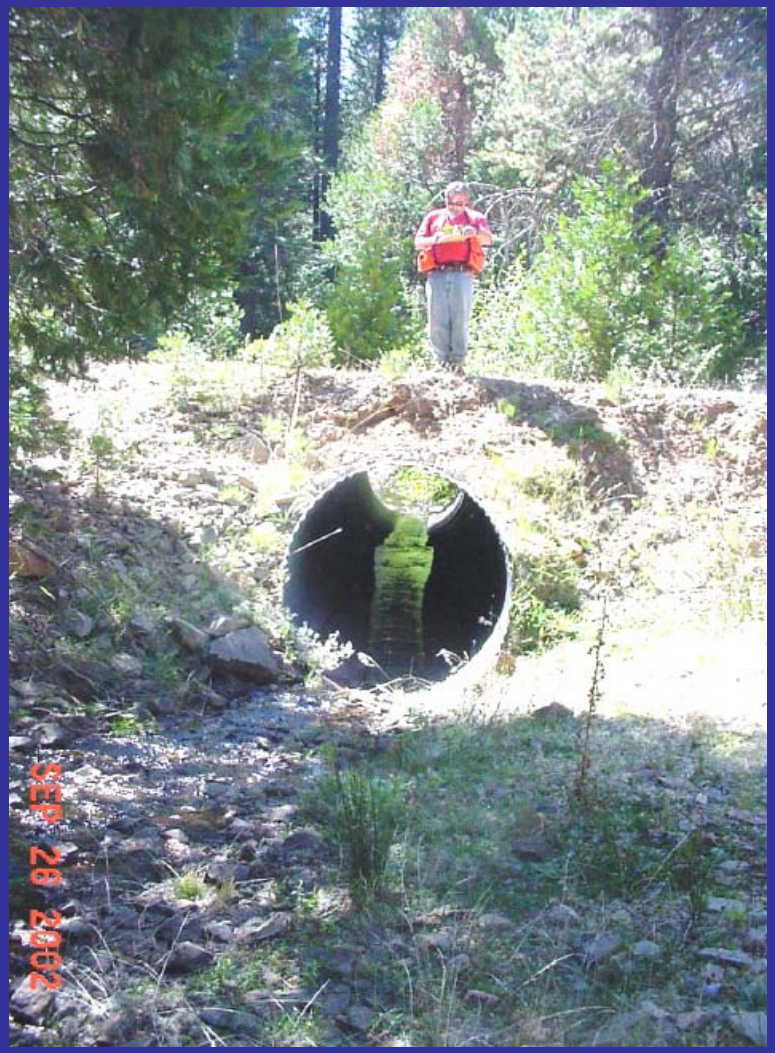
Examples of Upslope Monitoring Programs

300 THPs



281 THPs





Watercourse Crossings

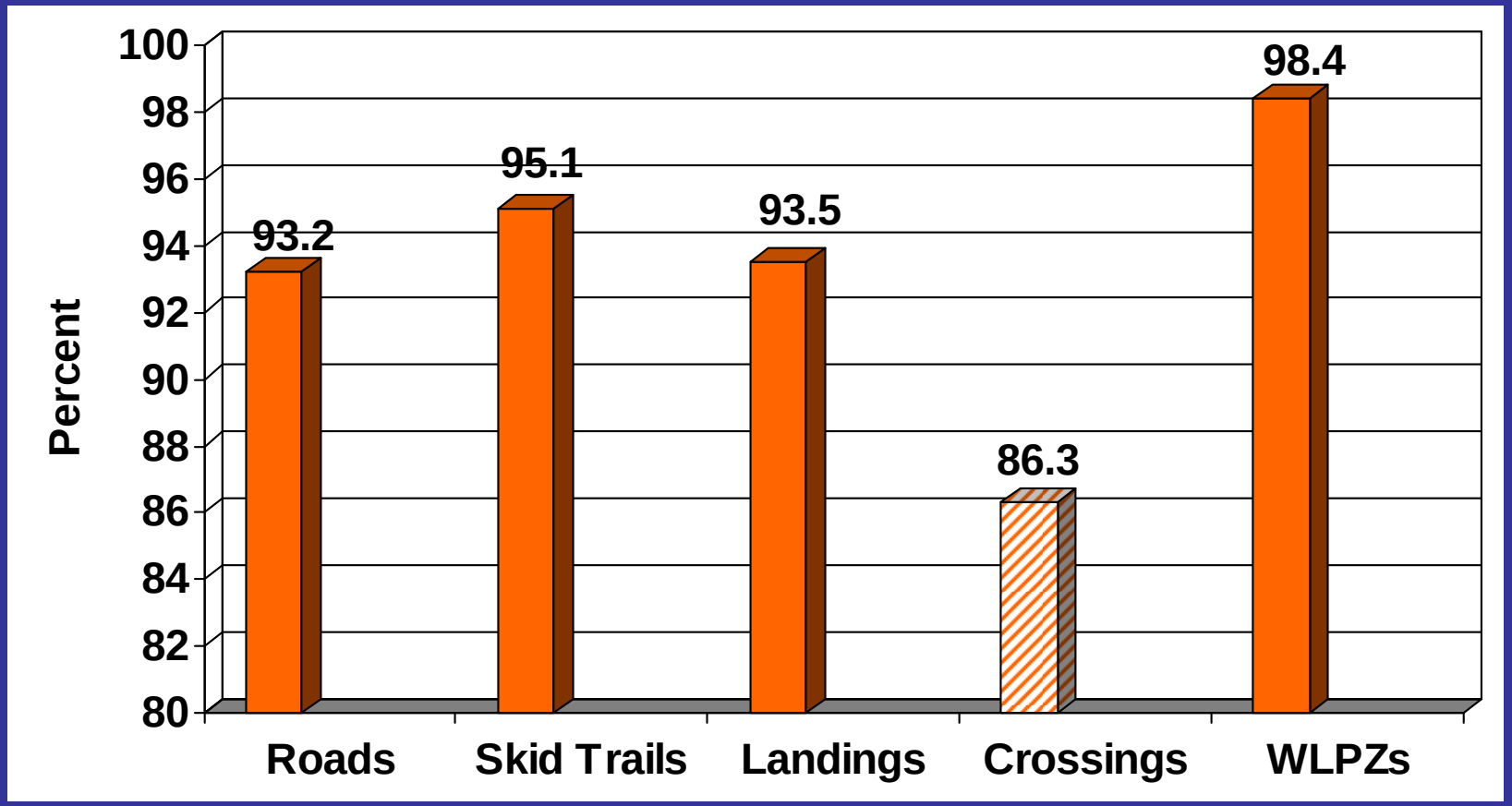
Forest Roads

Riparian Canopy Cover

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.
- Riparian zones retained high levels of post-harvest canopy.
- Most problems were found on roads and at crossings.

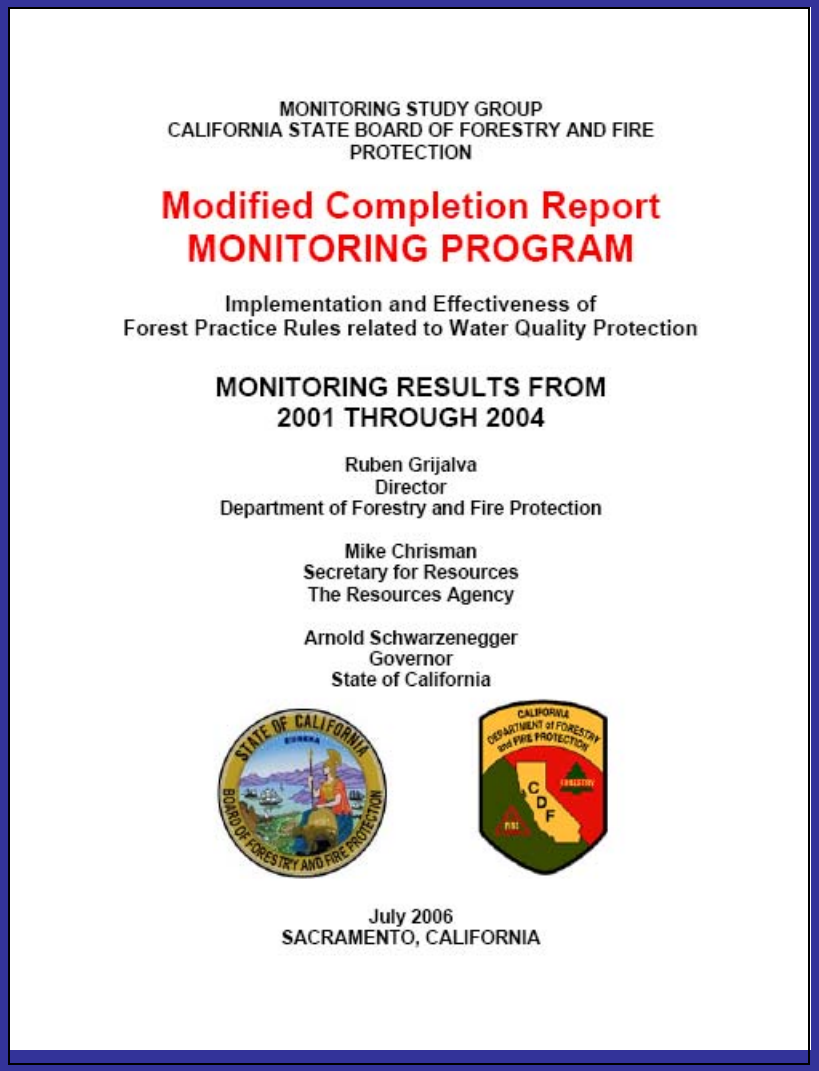
Hillslope Monitoring Program—Acceptable Overall Rule Implementation



Overall average acceptable implementation was ~94%
Overall national rate is estimated to be 89% (Ice et al. 2010)

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.



MONITORING STUDY GROUP
CALIFORNIA STATE BOARD OF FORESTRY AND FIRE 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)

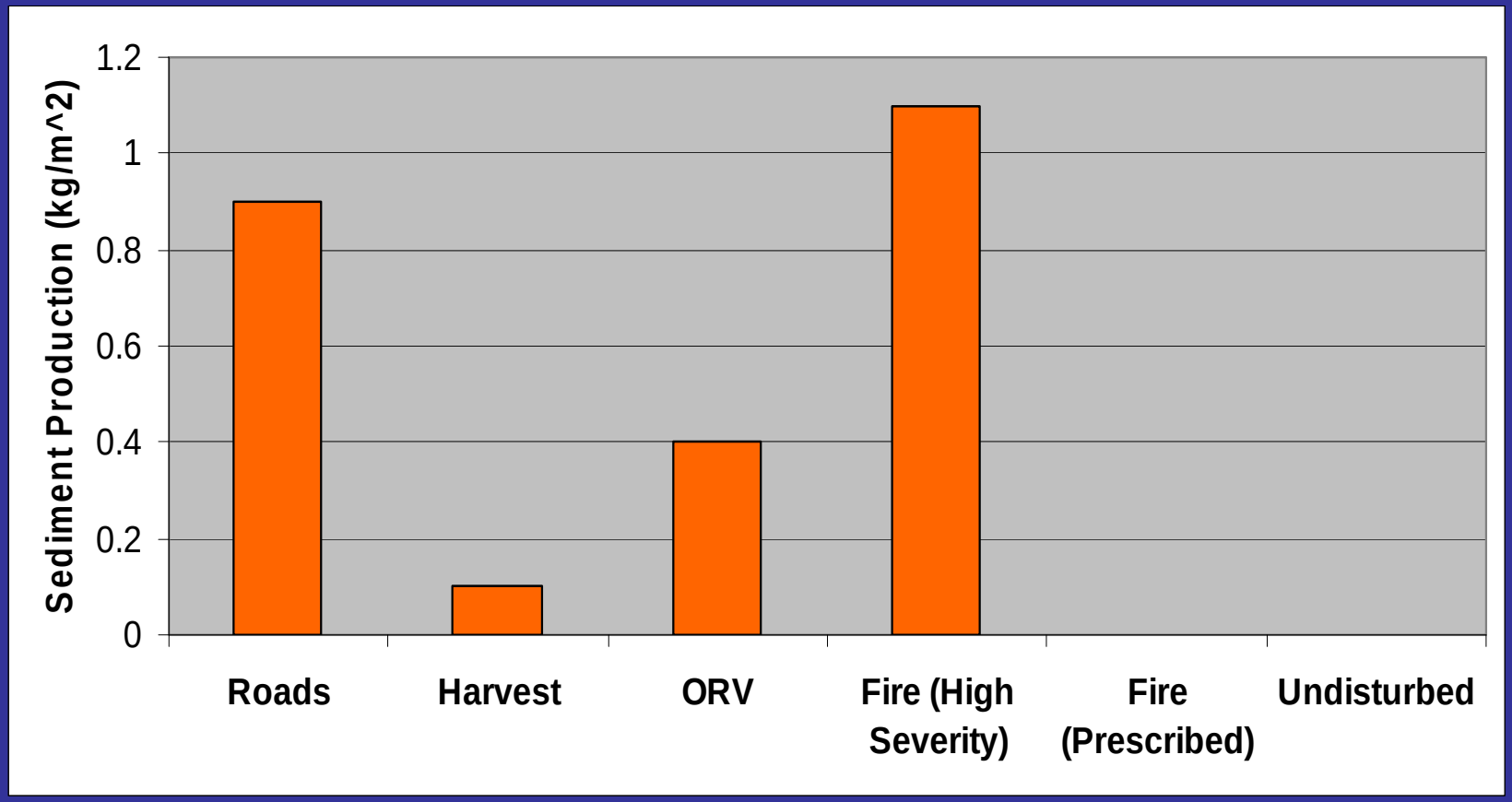
- ~5% of road drainage structures had poor FPR implementation and erosion problems.
- 8-15% of road erosion features delivered sediment to stream channels, usually when FPRs incorrectly implemented.
- ~20% of the road-stream crossings had significant implementation/effectiveness problems.

Summary from All California Upslope 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.
- In the interior part of California, high intensity wildfires and forest roads are the largest sources of erosion and sediment.

Mean Sediment Production Rates for Different Land Uses in the Central Sierra Nevada

MacDonald and others (2004)



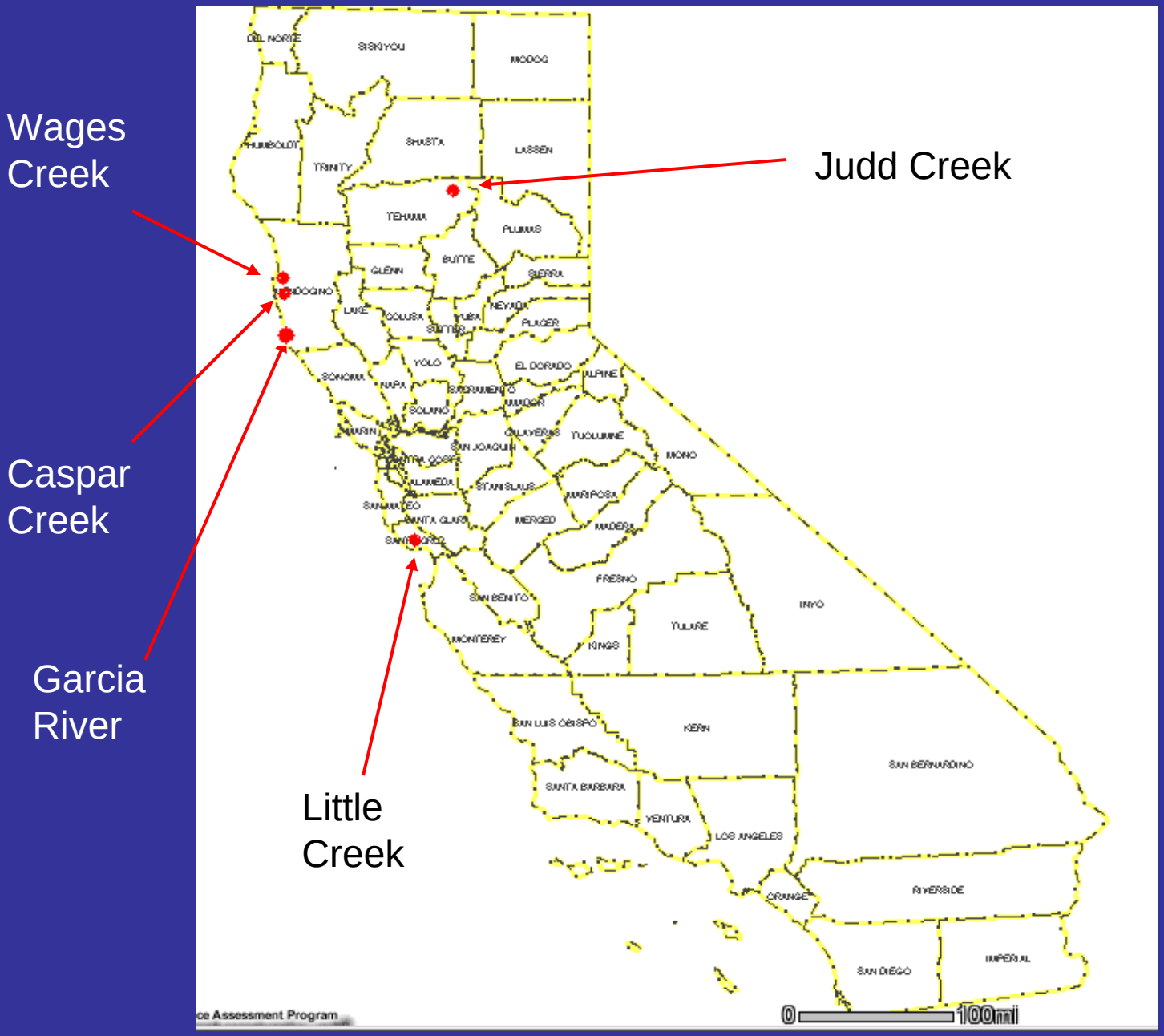
B. Instream Monitoring

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

Cooperative Instream Monitoring Projects (<1990 to Present)

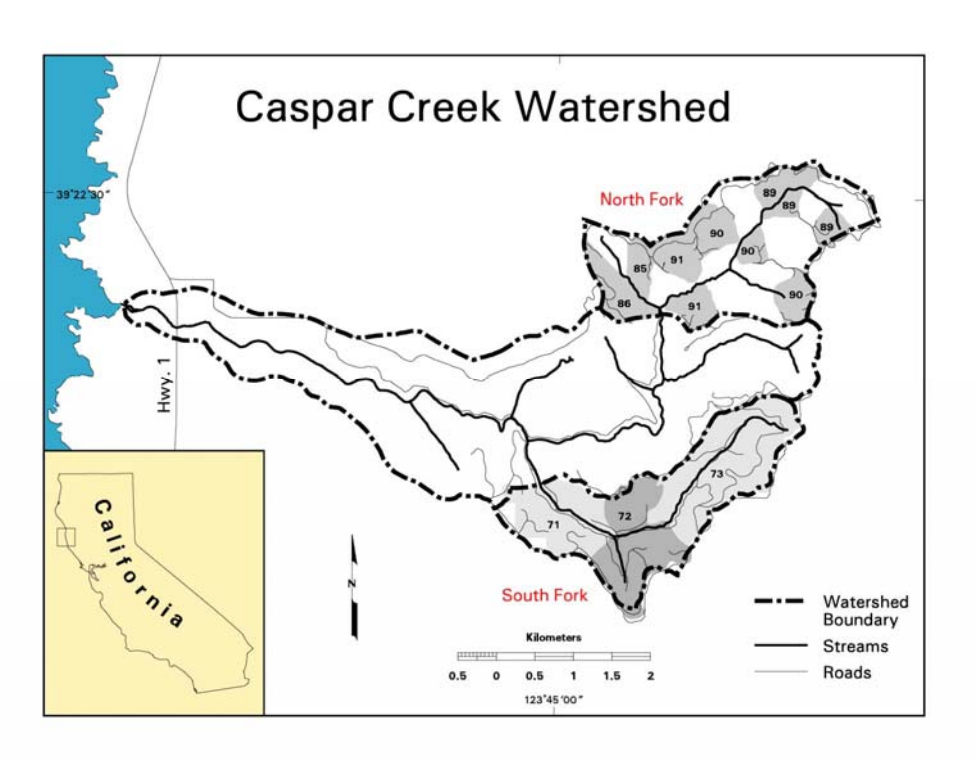
- Caspar Creek Watershed Study (1962-present).
- Garcia River Monitoring Project (1998-2001, 2004-2006).
- Judd Creek Monitoring Project (2004-present).
- South Fork Wages Creek Project (2004-present).
- Little Creek Watershed Study (2005-present).

Locations of Cooperative Instream Monitoring Projects

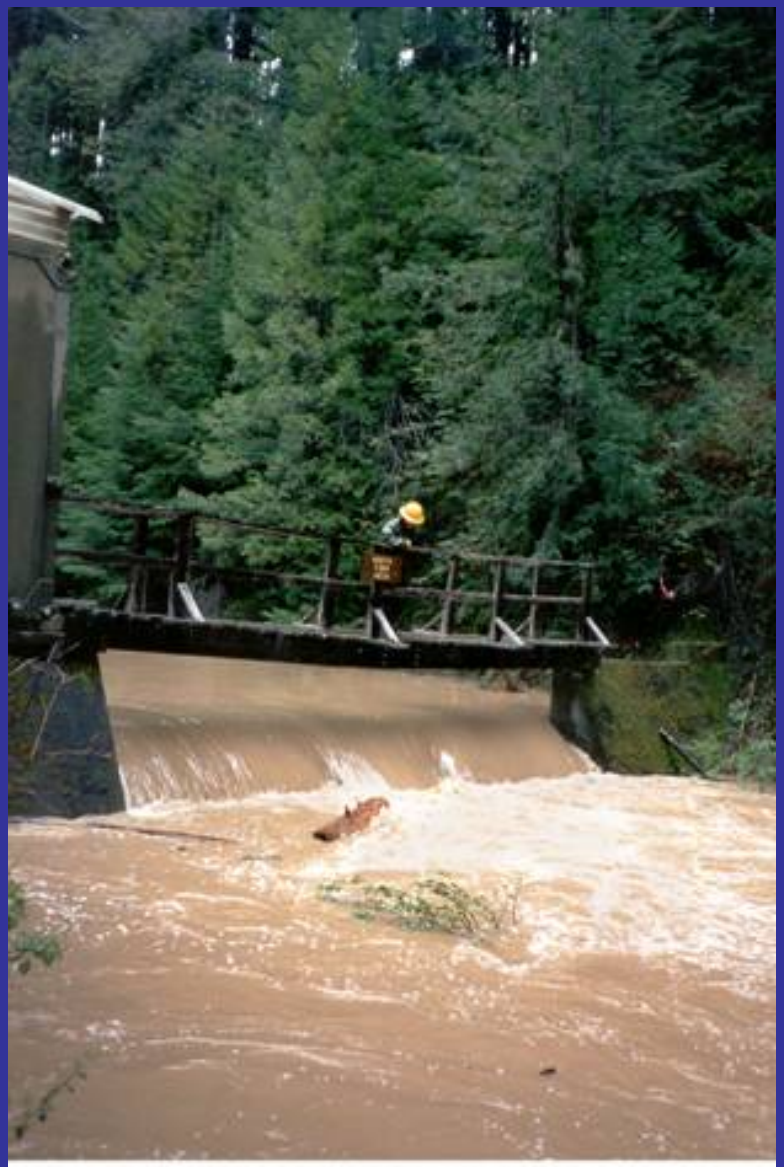


Caspar Creek Watershed Study

- 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

Caspar Creek Results

Older selective logging in the South Fork without the modern Forest Practice Rules (FPRs) produced 2.4 to 3.7 times more sediment than more recent clearcut harvesting conducted under modern FPRs.

Changes in peak flows were relatively small following clearcut logging of nearly half the North Fork watershed in 3 years.

North Fork logging produced little or no evidence of sediment impacts to aquatic insect communities.

Variability was high, but no dramatic changes in the abundance of coho salmon or steelhead trout were recorded after the North Fork logging.

Garcia River: Cooperative Instream Monitoring Project with Mendocino County RCD and the North Coast Regional Water Quality Control Board

Judd Creek: Cooperative Instream Monitoring Project with Sierra Pacific Industries

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

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

4. Implications/Actions from Monitoring Work

How has the Upslope Monitoring Data been Used?

- **BOF adopted rule language in 2000 requiring RPF supervision of active timber operations to improve rule implementation.**

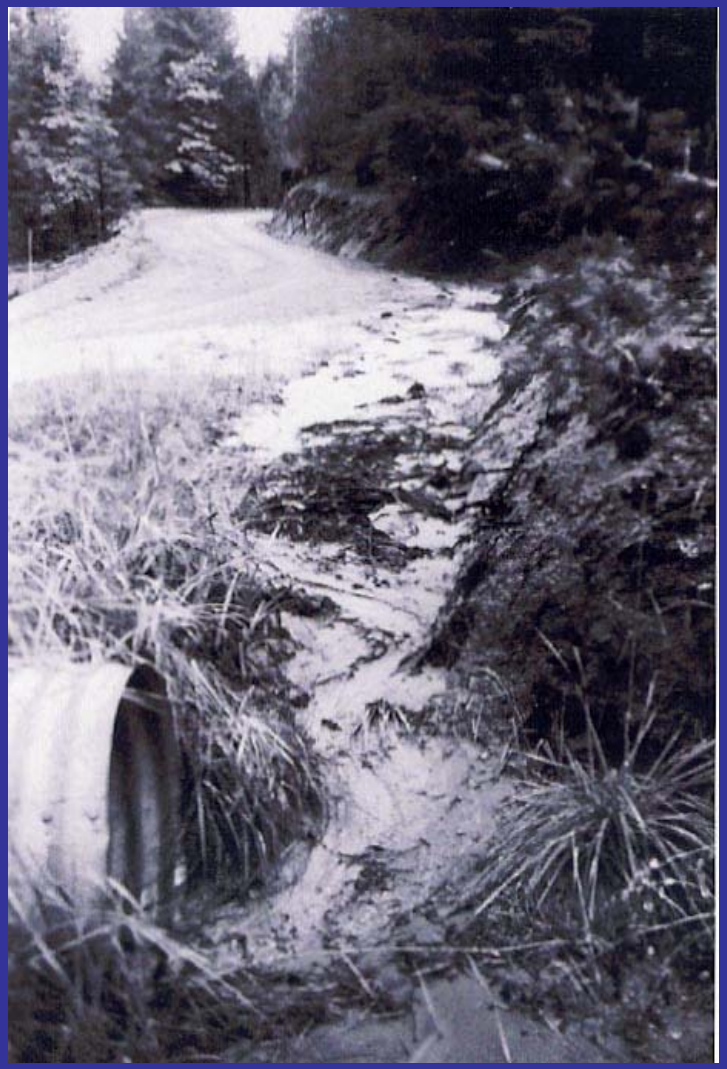
- **Development of Road Management Plan procedures adopted as Forest Practice Rules by the Board of Forestry and Fire Protection in 2007 (effective Jan. 1, 2008).**

- **To educate Registered Professional Foresters to improve practices on roads and crossings through the use of training sessions and guidance documents.**

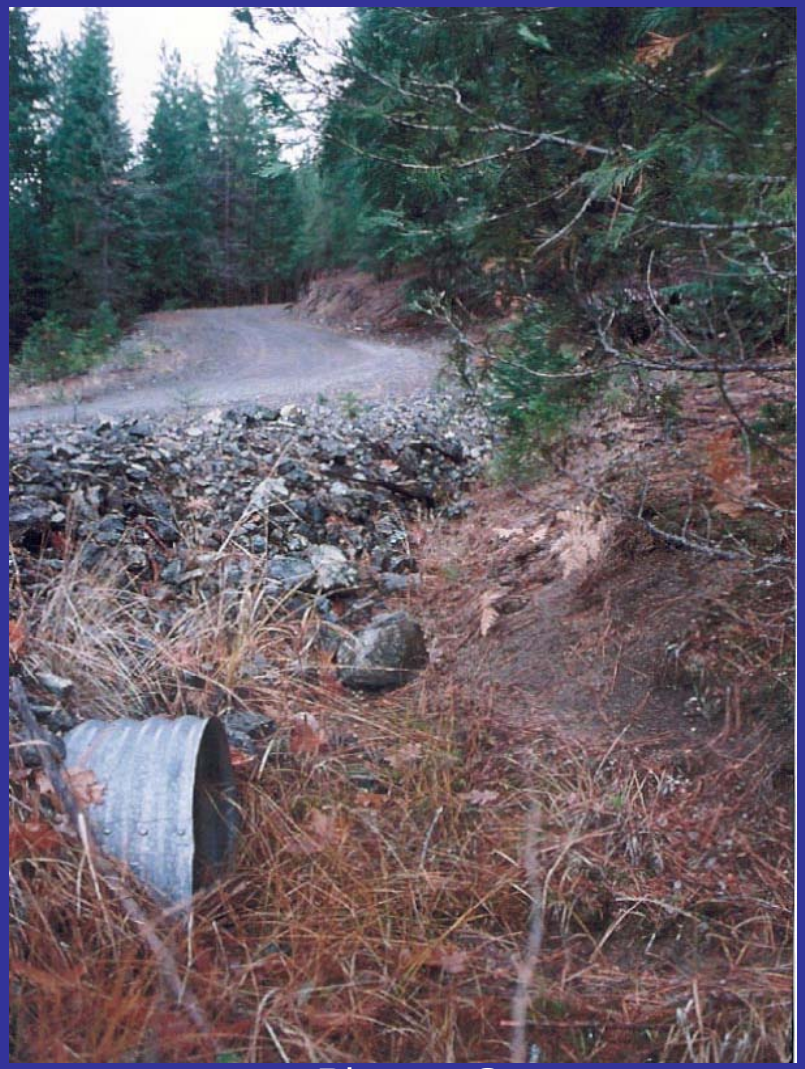
French Creek Watershed-Klamath River Basin

Road Management Plan – 1992

Before 1990



After 1992



Photos: Sommarstrom

How has the Caspar Creek Instream Monitoring Data been Used?

- Prediction of changes in peak flows associated with timber harvesting.
- Evaluation of expected changes in annual water yield and summer low flows.
- Estimation of rates of landsliding and hillslope erosion in tractor and cable-logged areas.
- Assessment of the relative contributions of sediment from different source areas on the landscape.
- Prediction of large wood recruitment to stream channels.
- Prediction of changes in water temperatures following riparian zone harvesting.
- Assessment of the relative importance of fog drip in annual water yield.
- Consideration of nutrient export rates following clearcut harvesting.
- Evaluation of biological impacts to salmonids and macroinvertebrate communities.

5. Monitoring Information Availability

Monitoring Report Availability

- Twelve MSG monitoring reports and over 30 MSG supported reports are available on–line at the MSG website.

- >150 Caspar Creek published papers, theses, etc. available on-line at the Caspar Creek website (USFS-PSW).

- With the exception of the cooperative Caspar Creek watershed study, with data located on the USFS-PSW website, the original monitoring data is archived.

GOVERNOR SCHWARZENEGGER
Visit his Website

MSG Monitoring Reports

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)

GOVERNOR SCHWARZENEGGER
Visit his Website

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 Dicamtodon 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

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)

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

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(510) 559-6300

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

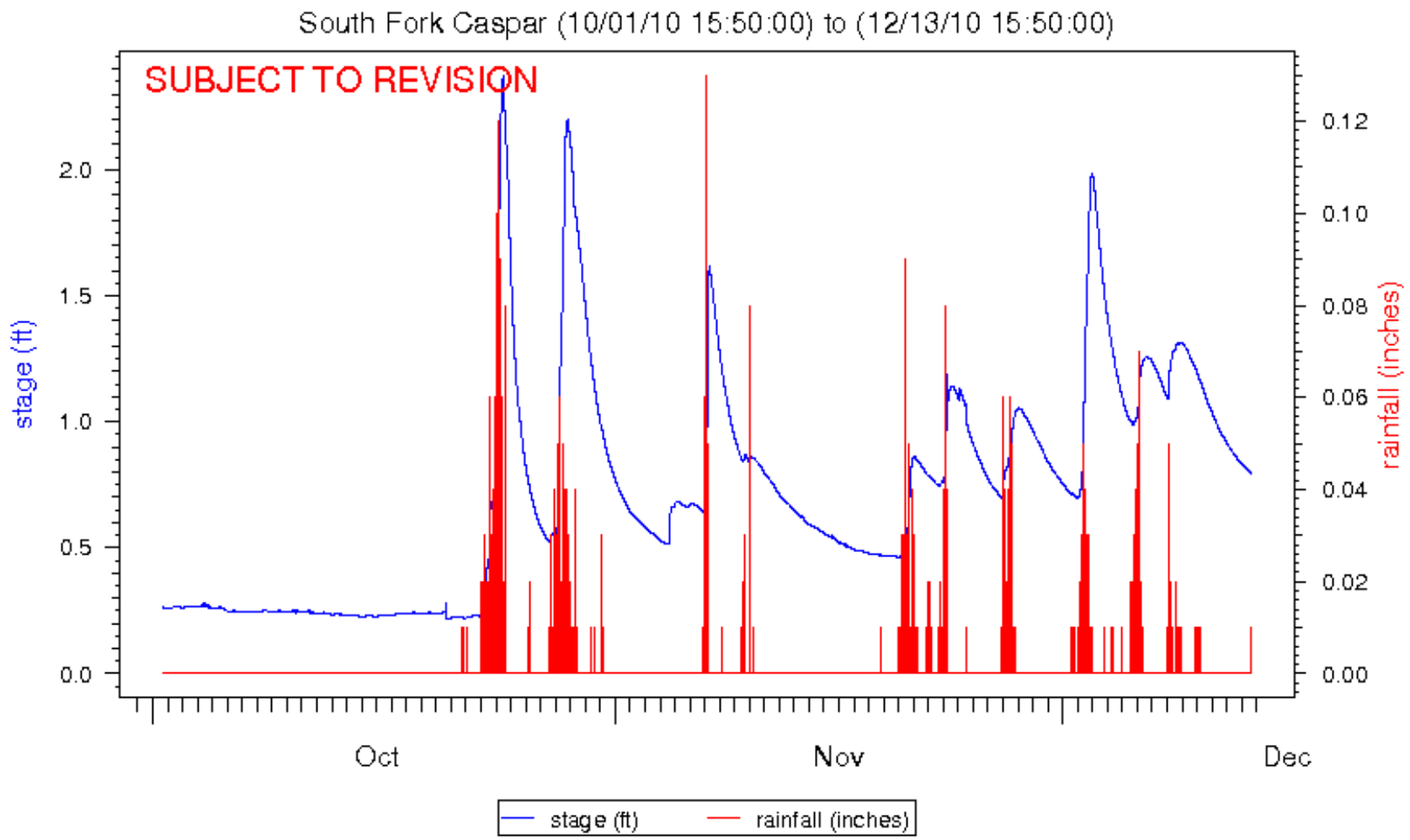
  Note: due to technical problems, data downloaded before 8/16/02 contained errors that have now been corrected. Details.

  - 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.

DATA

- 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.

Caspar Creek Real-Time Discharge and Rainfall Data Plot: October 1, 2010 to December 13, 2010



Other Forms of MSG Monitoring Information Dissemination

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

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

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

6. Additional Monitoring 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.**

7. 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 have been produced from 1990 to 2009 and are available online.
- Currently, four cooperative instream monitoring projects complement hillslope monitoring work and provide water column data related to timber operations.
- 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).

Thanks for Your Attention!