California Road Rules for 2015 and Beyond

Associated California Loggers Annual Meeting

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California Department of Forestry and Fire Protection

January 15, 2015

Talk Outline

I. Brief history of Forest Practice Road Rule requirements.

II. Brief summary of road erosion and monitoring results.

III. Overview of forest road drainage principles.

IV. New Road Rules, 2013 rule package requirements related to LTO work.

V. Sources of information.

VI. Summary points.

I. Historic Road Building Practices

1945 CA Forest Practice Act—No Road Related Requirements

Z'Berg-Nejedly Forest Practice Act of 1973

- **The implementation of the modern CA Forest Practice Act (FPA) <u>in the field</u> in 1975 brought protection measures to watercourses for the first time in this state:**
  - **Requirement for a THP**
  - **Logging unit size limitations**
  - **Stream protection zones**
  - **Road drainage requirements**
  - **Watercourse crossing requirements (<u>25 yr flood event</u>)**

- **Required practices have <u>continually been upgraded</u> since 1975 (i.e., FPRs have evolved considerably).**

Significant CA Forest Practice Rule Road and Crossing Changes

- 1983—50 year flood flows for crossings (part of new Road and Landings rules).
- 1991—road-stream diversion potential addressed (part of new Road and Landings rules).
- July 2000—100 year flood flow, along with debris and sediment required (part of interim T/I rules).
- January 2010—ASP rule road requirements, including hydrologic disconnection where feasible (part of ASP rules).
- January 2015—Road Rules, 2013 rule package effective.

Photo: A. Wilson, CVRWQCB

Modern Road Building Practices Required by the California FPRs on Steep Slopes Have Reduced Surface and Mass Wasting Erosion

Soquel DSF

PWA 2014

II. Brief Overview of Road Erosion and Monitoring Results

Unsurfaced logging roads (~80% seasonal roads in CA) and logging road watercourse crossings are generally the **principal source** of sediment delivered to watercourses associated with timber operations.

Road-related sediment sources include:

- Rilling
- Gullying
- Mass Failure (i.e., landslides)
- Cutbank/Sideslope Sloughing
- Watercourse crossing failures

Sediment may be delivered:

- Episodically with catastrophic failure
- Chronically due to incremental surface erosion

Episodic Crossing Failure—Grouse Creek Watershed

June 1991

Chronic Road Surface Erosion Delivering Sediment to a Stream Crossing

Photo: Leroy, PWA

Road Rilling Examples

Decomposed Granite(DG) Gully Erosion Hilt, CA

Gully Erosion near Shaver Lake, California

Gully Erosion
Calaveras Big Trees Sate Park—Soils formed from weathered volcanic rocks.

Road Fillslope Failure

JDSF Road 600 Landslide

Photo: J. Bawcom, CGS (retired)

Road Cutslope Sloughing--Idaho

Road Erosion <u>Monitoring</u> Conducted as Part of three BOF/CAL FIRE Monitoring Programs (1996-2014)

Erosion Void Measurement on Forest Roads

Take Home Messages from Road Monitoring Conducted by CDF/CAL FIRE/BOF from 1996-2014

- ~90% of road-related Forest Practice Rules are properly implemented on the ground.
- Nearly all road erosion problems are related to inadequate road drainage.
- ~5% of road drainage structures (rolling dips, waterbars, etc.) have problems.
- Randomly selected road segments with drainage structures placed at incorrect spacing have a much higher rate of surface erosion features compared to those with correct spacing (~2.5 x).
- Nearly 20% of watercourse crossings and crossing road approaches have had rule implementation or effectiveness problems.

Examples of Forest Practice Road Rule Violations Resulting in Production of Road Erosion Features

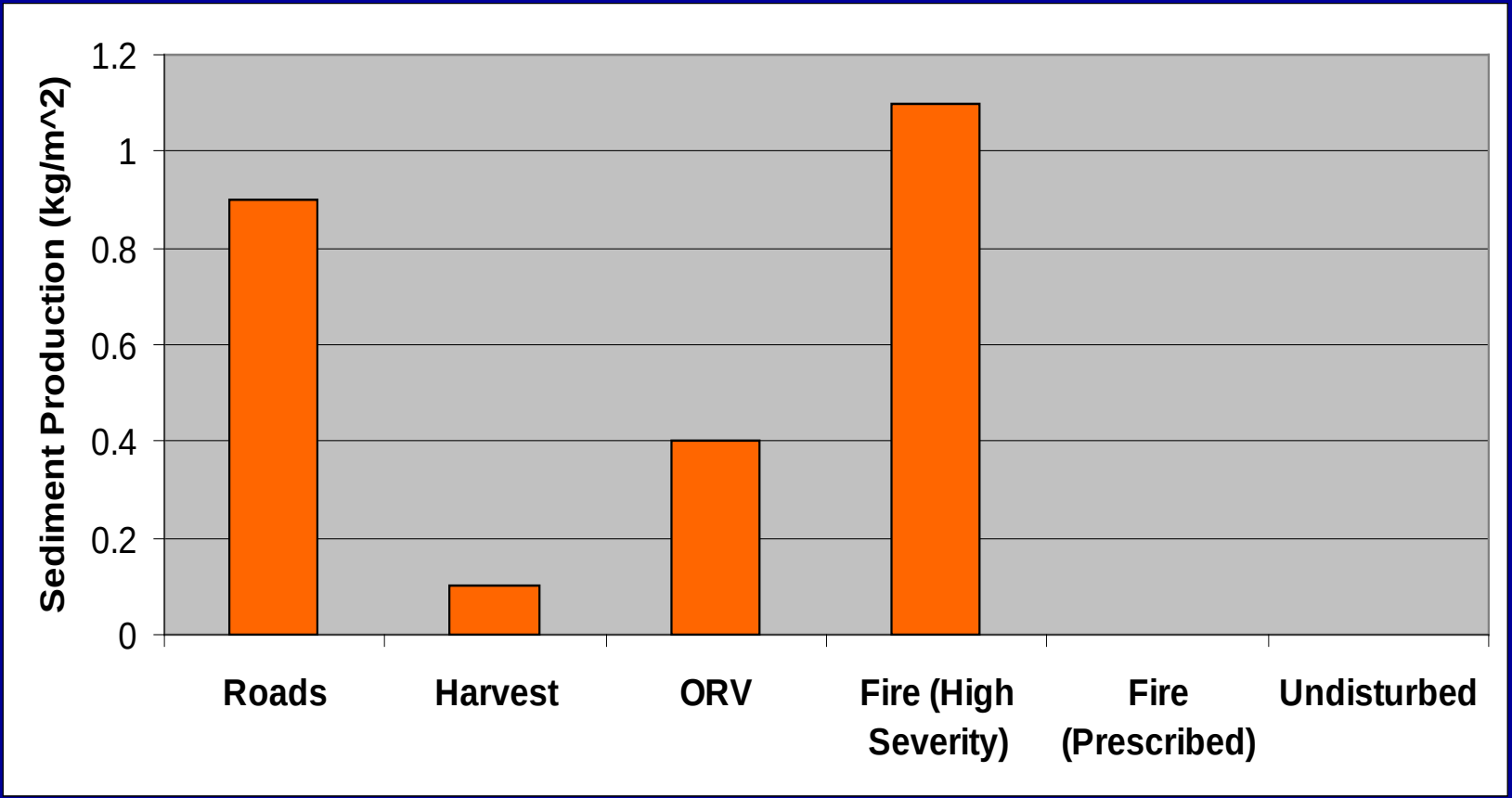
Sediment Fence Road Erosion Measurement

Tehama County—SPI's Judd Creek Watershed

Sediment Fences in the Southern Sierra Nevada Mountains—Kings River Basin

Mean Sediment Production Rates for Different Land Uses (1999-2000)

MacDonald and others (2004)



JDSF Road Sediment Study

Conducted by Dr. David Tomberlin, NOAA Fisheries and Brian Barrett, CAL FIRE

Photos: Barrett, CAL FIRE

Photos: Barrett, CAL FIRE

- Lots of variability over time, among sites.
- The highest sediment producing road segments in the study were unsurfaced the first winter. Road grading made this distinction less clear the second year.

Take Home Messages from Road Monitoring/ Research Work

- Older "legacy" roads that pre-date current Forest Practice Rules and use of Forest Service BMPs 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.
- There is a 16-fold difference in median sediment production rates between rocked and un-rocked road segments.
- Recently-graded roads produce more than twice as much sediment per unit area as un-graded roads.
- Unsurfaced 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.

III. Overview of Forest Road Drainage Principles

“Three of the most important aspects of road design – drainage, drainage, and drainage!”

Keller and Sherar, 2003

Impossible to over-estimate the importance of road drainage

Potential Impacts

Roads can alter both drainage patterns and runoff generation, resulting in:

- **Destabilization of side-cast material and downslope hillsides;**
- **Gullying in the road prism and adjacent slopes;**
- **Increased downstream sediment loads;**
- **Altered stream flow and channel adjustments;**
- **Standing water (pothole, rut, wet area) can weaken the subgrade and accelerate erosion and damage to the road.**

Example Where Road Drainage Structures Are Not Functioning Properly

Example Where Road Drainage Structures Are Not Functioning Properly

Photo: Stopher, DFW

Example Where Road Drainage Structures Are Not Functioning Properly

Remember!

Successfully treating road drainage = **Protecting natural resources** + **Ensuring full use of road and <u>reduced maintenance and repair costs</u>**

Road Prism Shapes—Dictates Type of Road Drainage Structures Used

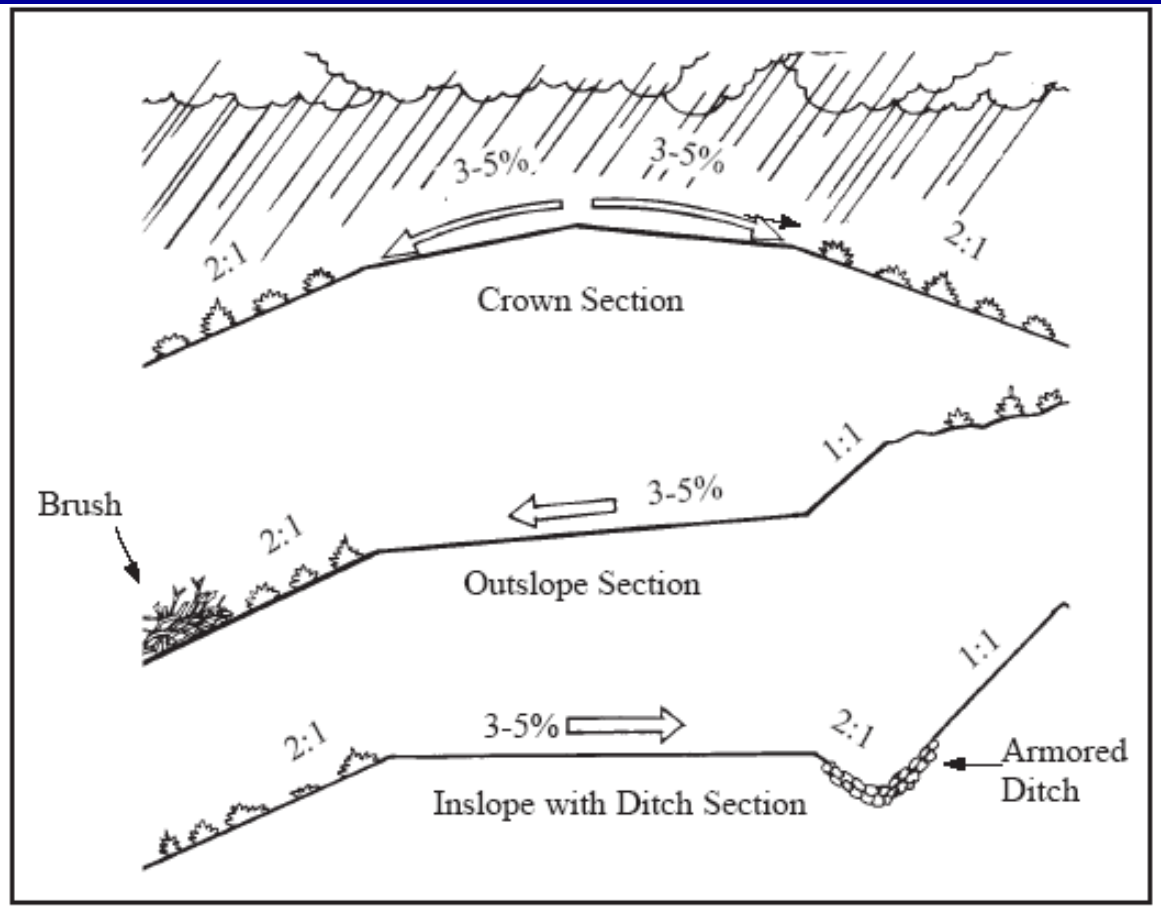
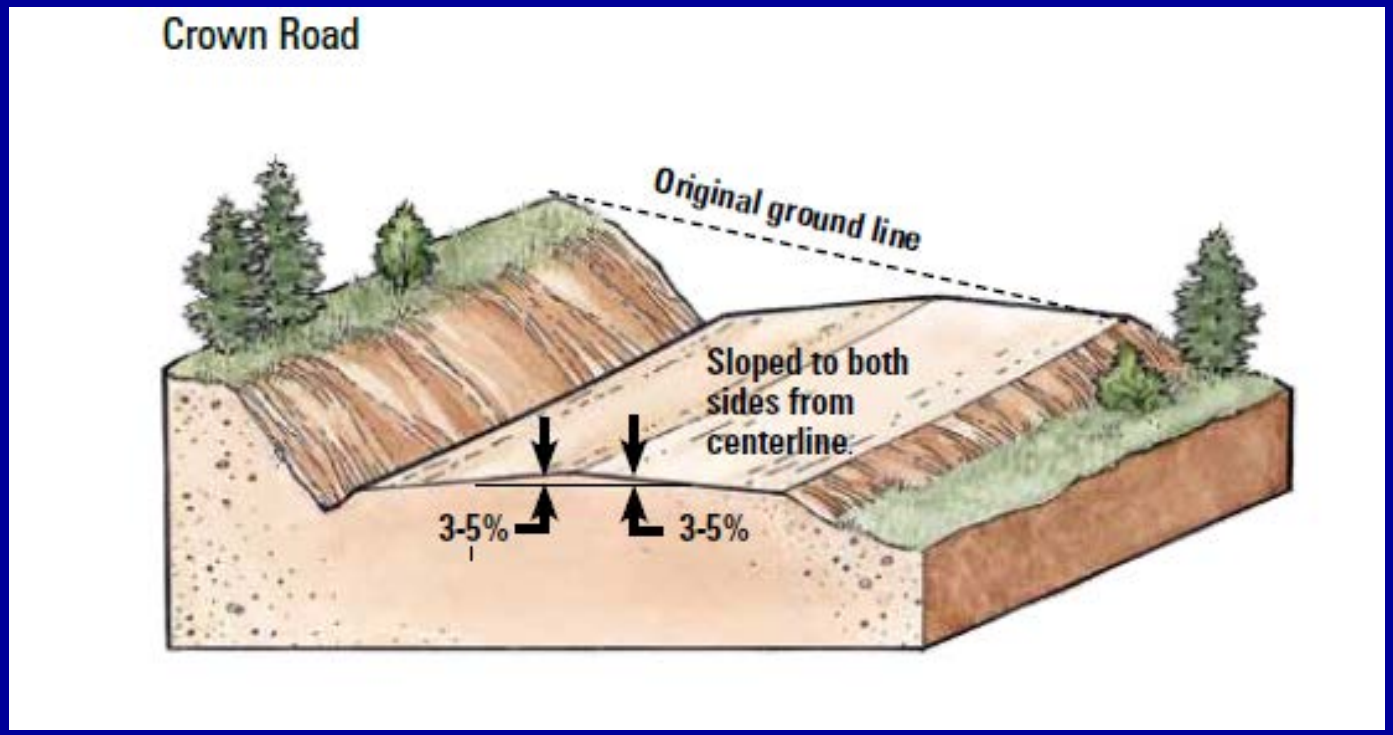


Figure 7.1 Typical road surface drainage options.

Keller and Sherar, 2003

Often more than one of these designs is used along a road segment

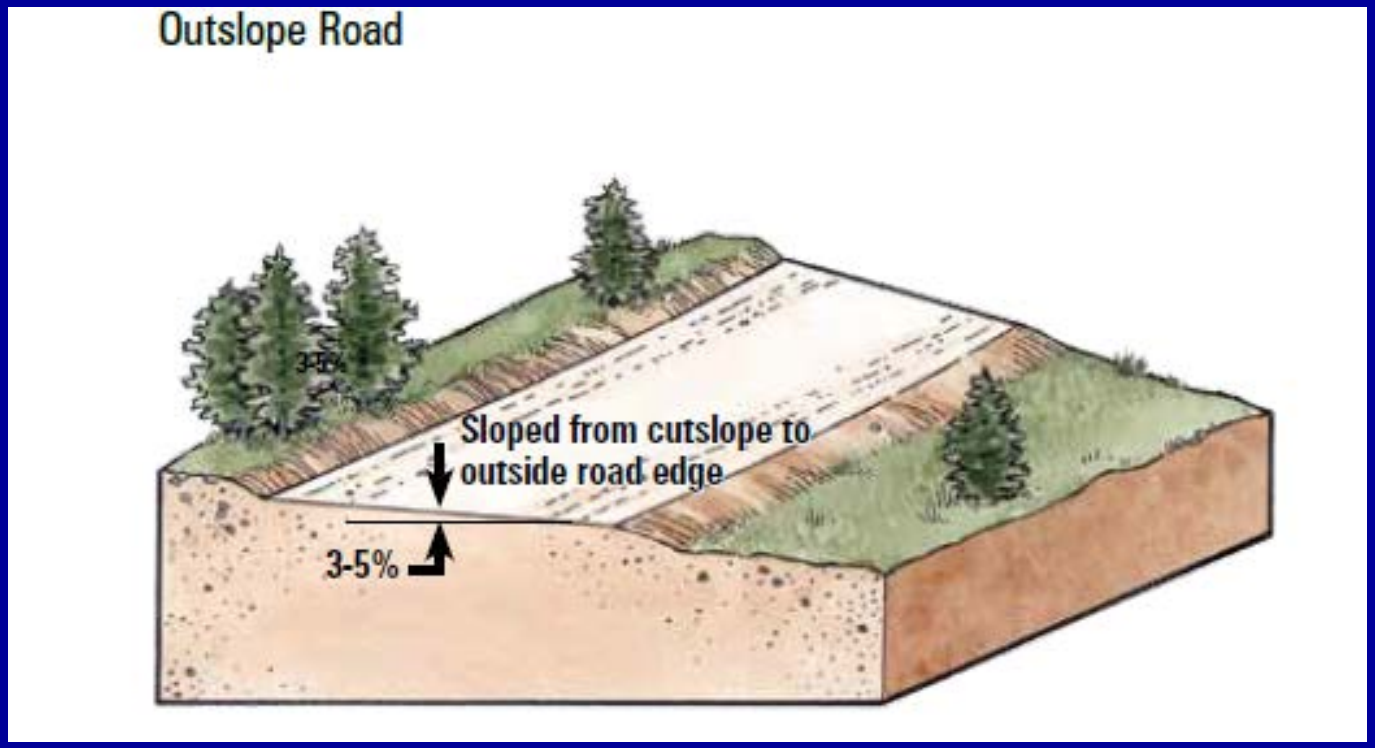


- **Best in high-traffic applications where two lanes of traffic are required.**
- **Good in slippery conditions**
- **They require a large footprint or disturbance area.**
- **They are expensive to build and maintain.**

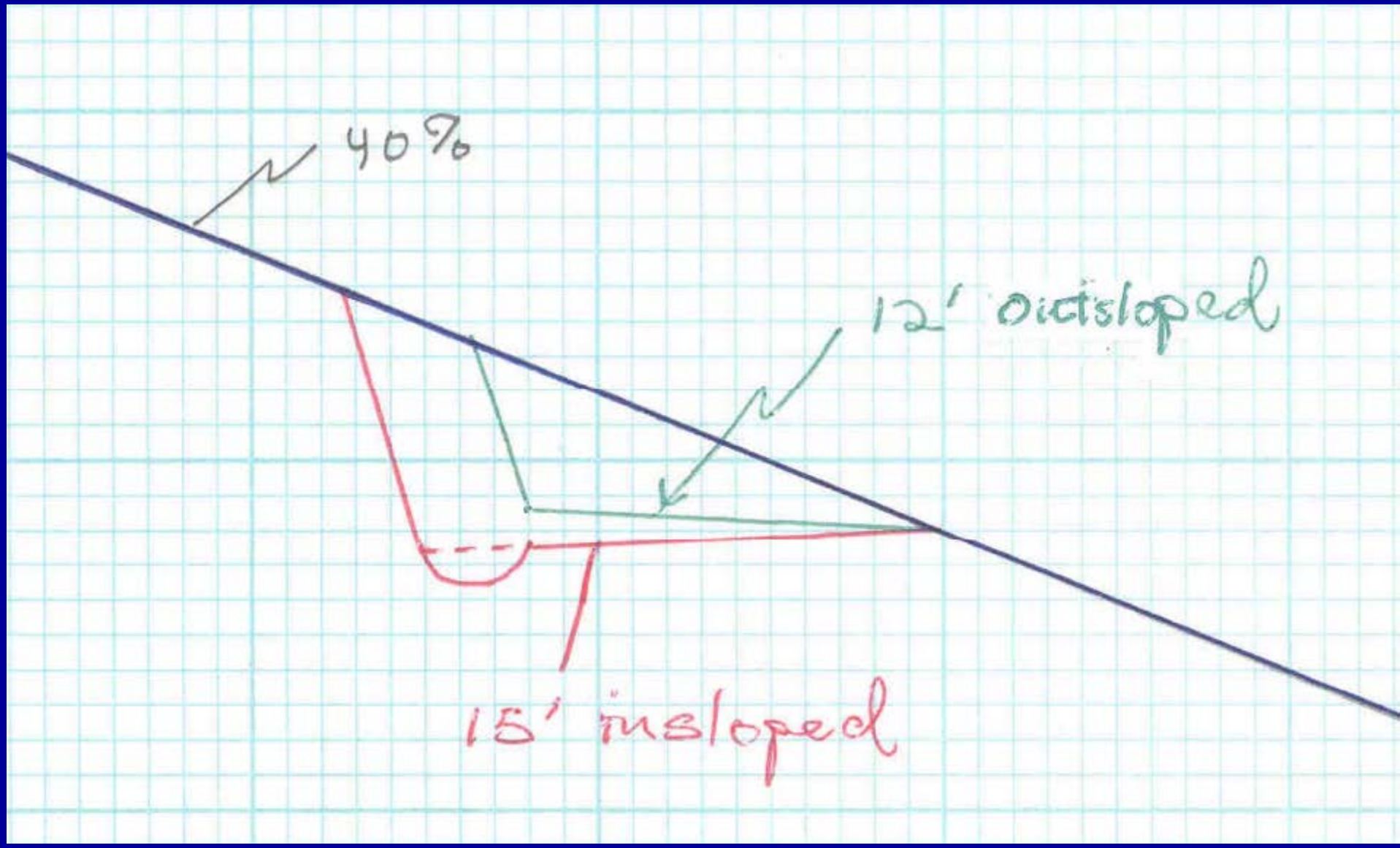
Example of a Crowned Road

Photo: Gordon Keller

Center of the road divides the runoff and shortens distance water travels on the road surface



- Usually considered the best environmentally, since water is not channeled down to stream channels with inside ditchlines (hydrologic connection).
- Cannot be used on steep road slopes (typically >12%).
- Inappropriate where slippery conditions are anticipated (e.g., winter use in snow zones).
- Generally not recommended in highly erodible soils.
- Often the cheapest to construct and maintain.
- They have the smallest area of disturbance, are less prone to intercept groundwater.



Less spoils from excavation—up to 50% less

Figure: M. Wopat, CGS (retired)

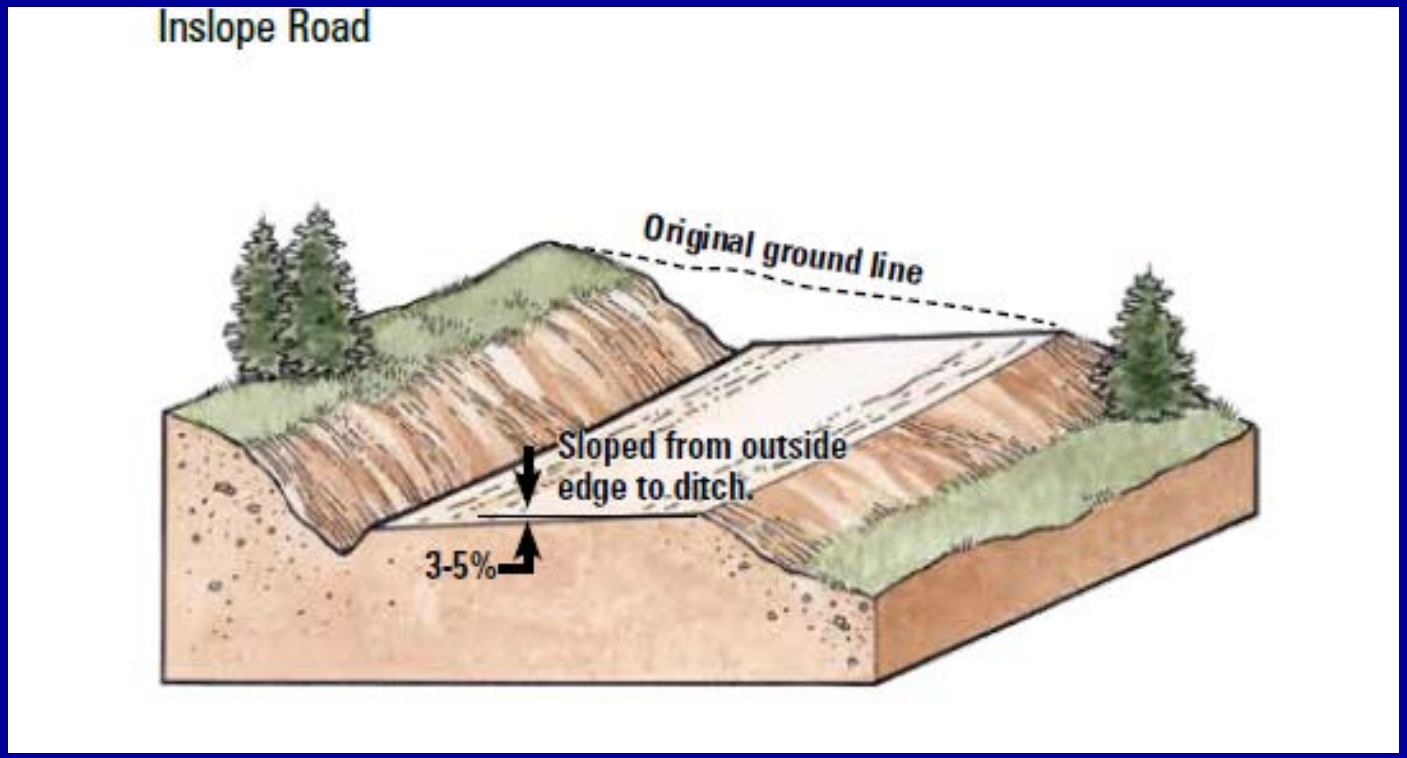
Road outsloping

Image: Weaver, PWA

Driveability, Functionality and Safety

Seasonal use roads with outsloped shapes and rolling dips (no berm or inboard ditch)

Images: Weaver, PWA



- **Inboard roads are better suited for steep road grades and in slippery conditions.**
- **They have a large footprint, and are expensive to construct and maintain.**
- **They are good in unstable or erodible soils where you can direct water away from areas of known instability and high erosion potential.**
- **They are susceptible to storm damage due to failure of the inboard ditch or the cross-drains.**

Example of an Insloped Road

Photo: Matt Boone, CAL FIRE

Photo: USDA Forest Service

Regardless of the Road Shape, Drainage Structures/Facilities are Needed

- Rolling Dips
- Waterbars
- Leadout Ditches
- Inboard Ditches with Ditch Relief Culverts (cross-drains)

Rolling Dips

- Often the best technique for road drainage on permanent and seasonal roads; usually used with outsloped roads, but can be used for insloped and crowned roads.
- Maximum road grade for proper cross drainage often 12%, depending on traffic type.
- When properly constructed, dips are self-maintaining.
- Rolling dips must begin well upslope from the discharge point, and the dip itself must be outsloped.
- Downslope side must have an uphill slope but be gradual enough to prevent breakdown by traffic.

Typical Rolling Dip Design Dimensions

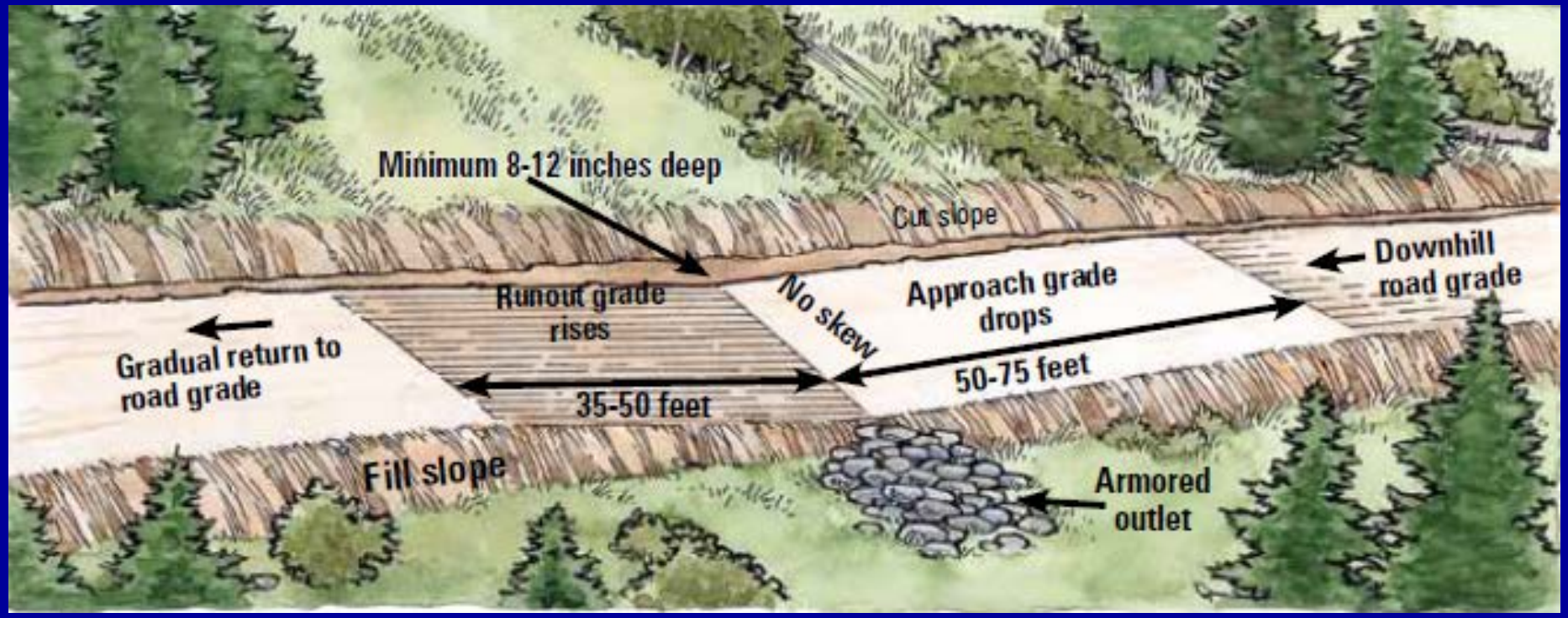


Image: OFRI, 2011

Outsloped road
built for logging
truck use with
rolling dips

Waterbars

- Common drainage technique—but prone to problems.
- High maintenance drainage structures (not permanent).
- Best for steep, low-standard seasonal or temporary roads, but they:
  - Impede traffic.
  - Wear out quickly with traffic—especially in the winter.
- Should be reserved for roads with little traffic and/or no wet season use. More effective if behind *locked gates*.

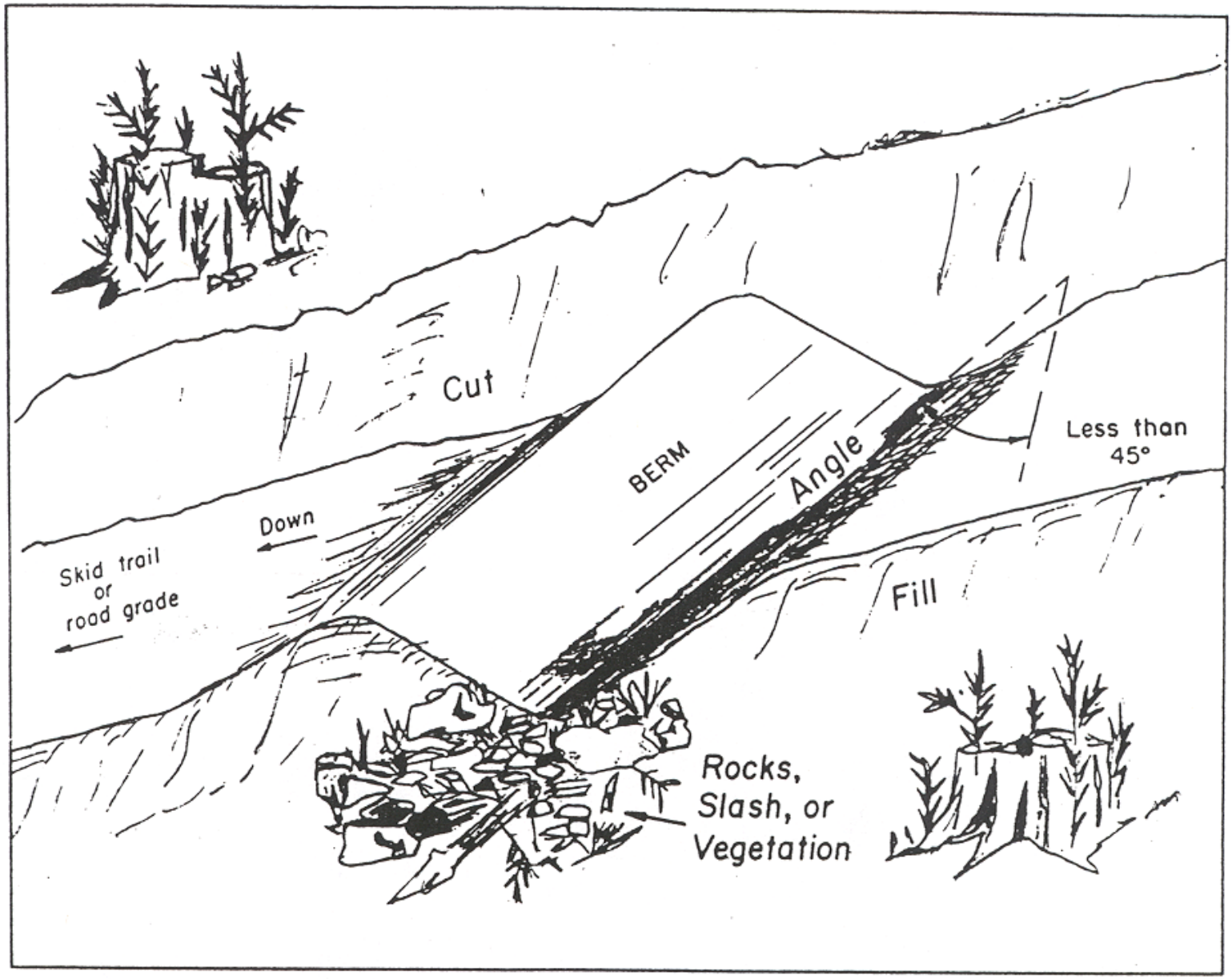


Figure 1. Diagram of a Waterbar (Source: State Forest Note #65)

ATALLIS
FD 145

Waterbars on Volcan Mountain <u>not</u> Built Appropriately

Leadout Ditches

- Used for insloped or crowned roads.
- Constructed with a dozer turning the ditch out into the surrounding slope.
- Can be used when the road is a throughcut (below grade) and water cannot be directly diverted off the road.
- Leadout ditch should have same grade or a steeper grade than the road grade to prevent it from silting in and requiring maintenance (i.e., self-cleaning).

Lead-out ditch or cut drains

Image: Weaver, PWA

Lead out ditches on a road with a through cut cross section

Inboard Ditches with Ditch Relief Culverts

- Old, standard method of draining forest roads.
- More expensive to construct and maintain.
- Much greater chance of producing sediment delivery to stream channels (avoid use if possible).
- Frequent ditch relief culverts of sufficient size (18 inches standard, minimum 15 inches) needed to minimize concentration of runoff and disperse flow to downslope areas.
- Culverts are to be installed at a grade at least 2% greater than ditch grade, and with an angle of 30 degrees perpendicular to the ditchline.

Ditch Relief Culvert installed on a Low Volume Permanent Road

Image: PWA 2014

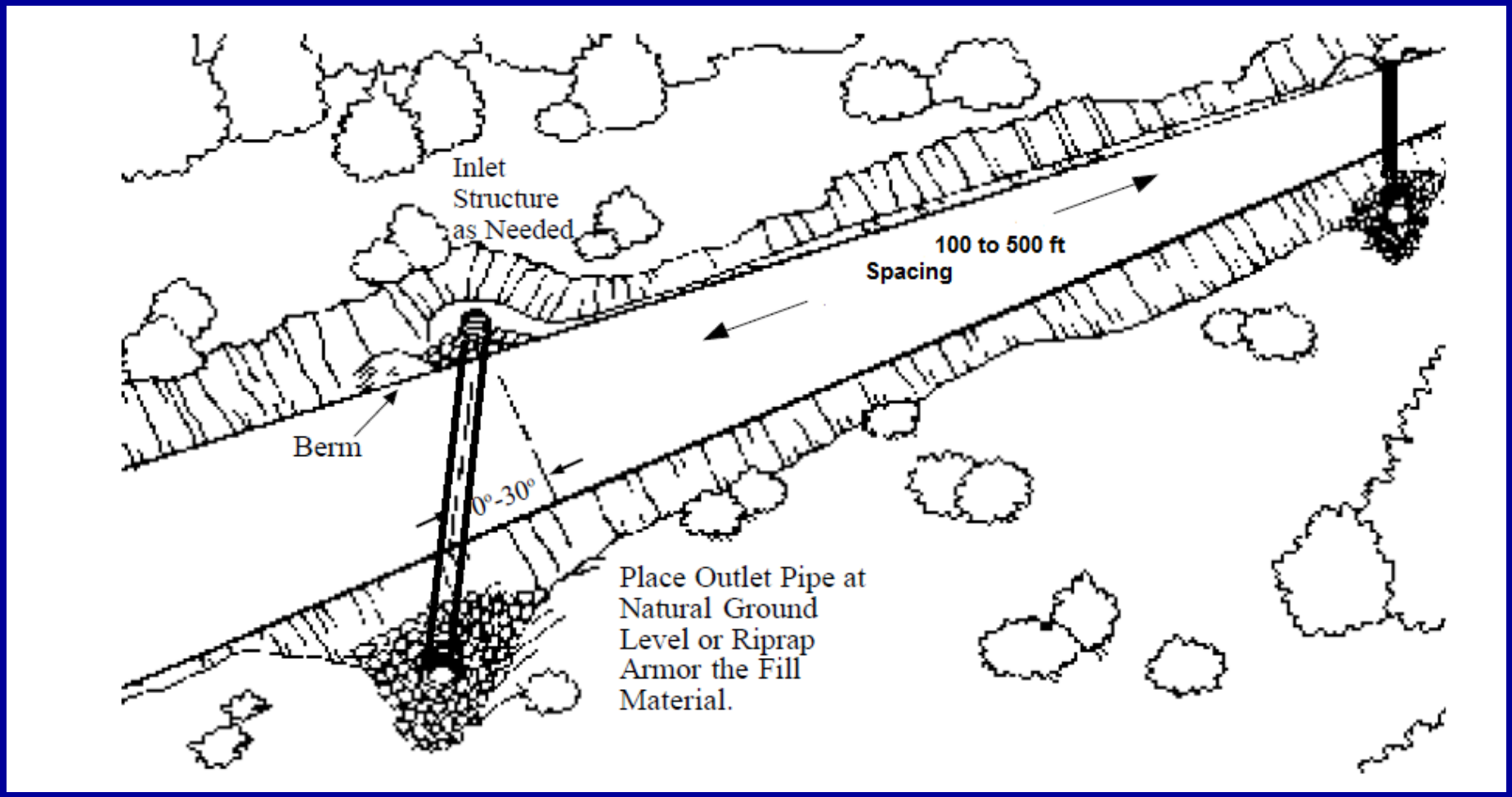


Image: Modified from Keller and Sherar 2003

Lots of Problems Possible with Inside Ditchlines and Ditch Relief Culverts

Ditch erosion downstream of bypassed ditch relief culvert inlet

Ditch erosion on LaTour Demonstration State Forest, 1990's

Ditch relief culvert failure due to crushed pipe inlet

Cross drain pipe inlet dented during maintenance operation contributes to deposition in the inlet basin

Image: USFS

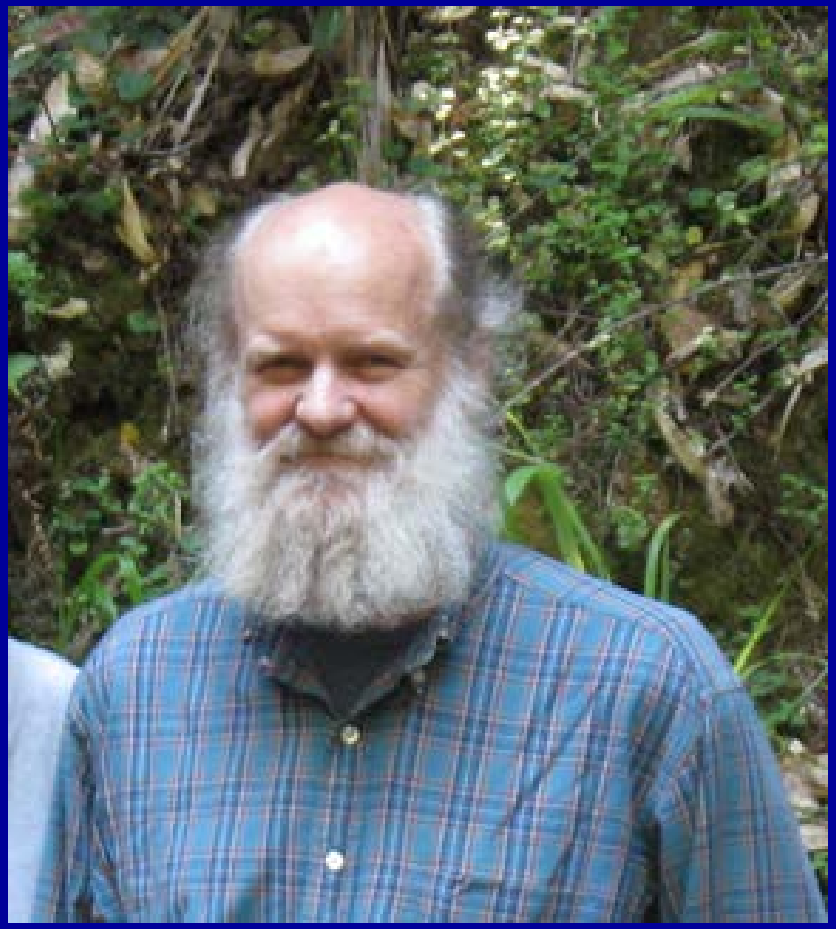
IV. Road Rules, 2013 Rule Package

Brief History of the Road Rules, 2013 Rule Package

- 14 year process—rule package development began in 1999.
- Two Board of Forestry appointed committees developed draft rule packages.
- January 2014: BOF approved Road Rules, 2013 rule package.
- June 2014: OAL approved Road Rules, 2013 package.
- January 2015: Road Rules, 2013 rule package became effective.

Online version of 2015 CA Forest Practice Rulebook is expected to be posted on the CAL FIRE website by January 23, 2015

Road Rules, 2013 Rule Package: Key Players



Tom Spittler, CGS (retired)

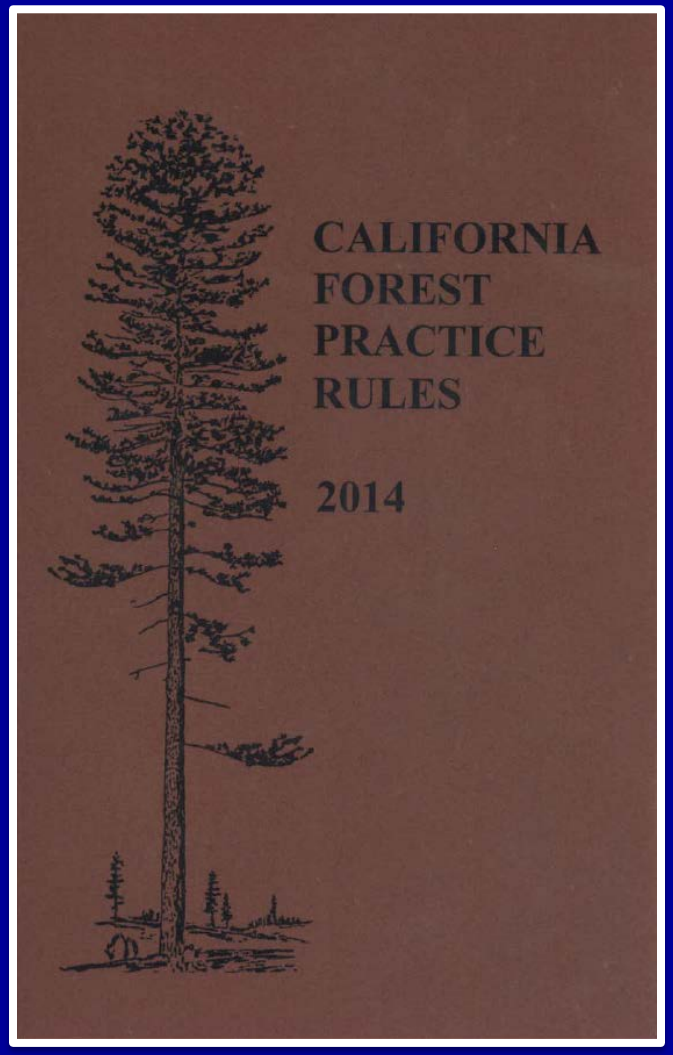
Peter Ribar, Campbell Global

Goals of the Road Rules, 2013 Rule Package

1. To ensure that all road-related Forest Practice Rules are adequate to **prevent adverse impacts** to beneficial uses of water.

2. To organize all road-related Forest Practice Rules into a logical order and locate them in **one portion** of the Forest Practice Rulebook for ease of use by all.

3. Most of the road rules are very similar to the existing rules (reorganization).



Overview of the Organizational Structure of the Road Rules, 2013 Rule Package

- **923 [943, 963] Road Rules Chapters**

• 923 [943,963]	**Intent** for Logging Roads, Landings, and Logging Road Watercourse Crossings
• 923.1[943.1, 963.1]	**Planning** for Logging Roads and Landings
• 923.2 [943.2, 963.2]	**Design and Location** for Logging Roads and Landings
• 923.3 [943.3, 963.3]	**Mapping** and Identification for Logging Roads and Landings
• 923.4 [943.4, 963.4]	**Construction and Reconstruction** for Logging Roads and Landings
• 923.5 [943.5,963.5]	**Erosion Control** for Logging Roads and Landings
• 923.6 [943.6, 963.6]	**Use** of Logging Roads and Landings
• 923.7, 943.7, 963.7	**Maintenance and Monitoring** for Logging Roads and Landings
• 923.8[943.8, 963.8]	**Abandonment** and Deactivation of Logging Roads and Landings
• 923.9 [943.9, 963.9]	**Watercourse Crossings**

Road Rules, 2013, Rule Package

- The new Road Rules are more performance-based, rather than prescriptive- based, than in the past.
- This requires a broad-based understanding of road design, construction, maintenance, and abandonment principles.
- This approach allows the RPF more:
  - Flexibility
  - Innovation
  - Professional judgment

Example

- RPF determines:
  - Cross drain spacing, rolling dip spacing
- RPF can propose exceptions to any of the road rules if explained and justified (and approved by the Director).

Performance-based rules rely on proper outcomes

Summary of Key Changes

1. Definitions
2. Hydrologic Disconnection
3. Road Drainage
4. Road Erosion Site Inventory
5. Watercourse Crossing Rules
6. Road Maintenance and Monitoring
7. Technical Rule Addendum No. 5

1. Brief Overview of Key Changes-- 14 CCR § 895.1 Definitions

Twenty (20) New Definitions

Abandoned Road	Appurtenant Road
Connected Headwall Swale	Critical Dip
Crowning	Deactivated Road
Deactivation	Extended Wet Weather Period
Ford	Harvest Area
Insloping	Outsloping
Reconstructed	Road Approach
Road Maintenance	Road Prism
Seasonal Road	Significant Sediment Discharge
Through Cut	Significant Existing or Potential Erosion Site

Abandoned Road

- Proactive measures must be applied to **remove** it from the permanent road network.
- Road prism still exists in most areas. Only portions removed (crossings and unstable fill).
- Shall be "Blocked" (blockage design shall be described in the plan) [923.8(d)].

Photo: N. Simpson, DFW

What is Does “Blockage” Mean?

<u>NOT</u> a gate for abandoned roads.

<u>Examples</u>:
Tank Traps
Large Boulders

Photo: N. Simpson, DFW

Deactivated Road

- Logging road **<u>remains</u>** part of permanent road network.
- Measures implemented to prevent use by logging trucks and 4-wheel drives.
- Road shall be "blocked" prior to winter period [923.8(d)]. <u>Gates can be used for blockage</u>.

Photo: N. Simpson, DFW

Significant Sediment Discharge Definition

- Soil erosion that is currently, or, as determined based upon visible physical conditions, **may be in the future**, discharged to watercourses or lakes ***in quantities that violate Water Quality Requirements*** or result in significant individual or cumulative adverse impacts to the beneficial uses of water.

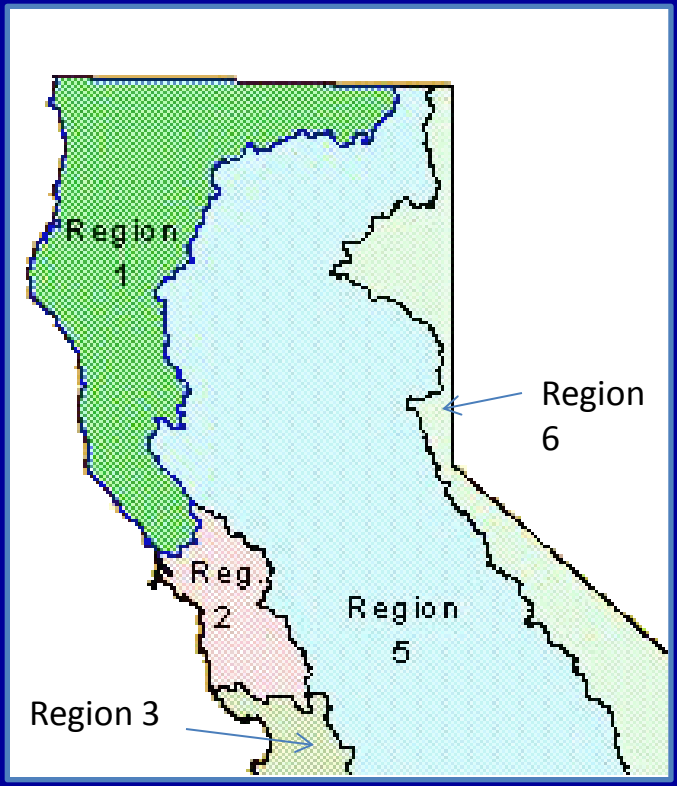
- One indicator of a Significant Sediment Discharge is a **visible increase in turbidity** to receiving Class I, II, III, or IV waters **(Statewide application)**.

Used in 42 rule sections

Significant Sediment Discharge Definition

- **Discharges "in quantities that violate Water Quality Requirements" is based on the requirements of a Regional Water Board <u>Basin Plan</u>.**

- **Four main Water Board Regions in California with commercial timberlands, each with its own Basin Plan.**



Water Board Regions

Example of a Significant Sediment Discharge

Visible increase in turbidity to a receiving watercourse is an indicator of a SSD

Visible Increase in Turbidity

- **<u>Work done to address a significant sediment discharge source</u>** that produces a flush of visible turbidity does not count (e.g., crossing upgrade, road drainage structure improvement).*

Photo: J. Croteau, DFW

*assuming the practice is implemented correctly

Visible Increase in Turbidity

- **Instantaneous or very short-duration exceedances are not the focus of Basin Plan turbidity limitations.**

- **<u>Consider longer term or chronic exceedances</u>.**

Photo: D. Fowler, NCRWQCB

§ 895.1 Definitions (continued)

Twelve (12) Revised Definitions

Abandonment	Berm
Excess Material	Fill
Hydrologic Disconnection	Permanent Road
Permanent Road Network Crossing	Permanent Watercourse
Prescribed Maintenance Period	Reconstructed Roads
Sidecast	Temporary Road

Temporary Road now includes the provision for deactivation in addition to abandonment

2. Brief Overview of Key Changes--Hydrologic Disconnection

Old Road Rules	New Road Rules
• Requirement for **hydrologic disconnection** on logging roads to the extent feasible in the **ASP rule area only (areas with listed salmonids)**.	• Logging roads and landings shall be **hydrologically disconnected** from watercourses and lakes **to the extent feasible** to minimize sediment delivery from road runoff to a watercourse—**statewide**.

Addressed in 5 of the 9 Section 923 rule sub-sections

Definition

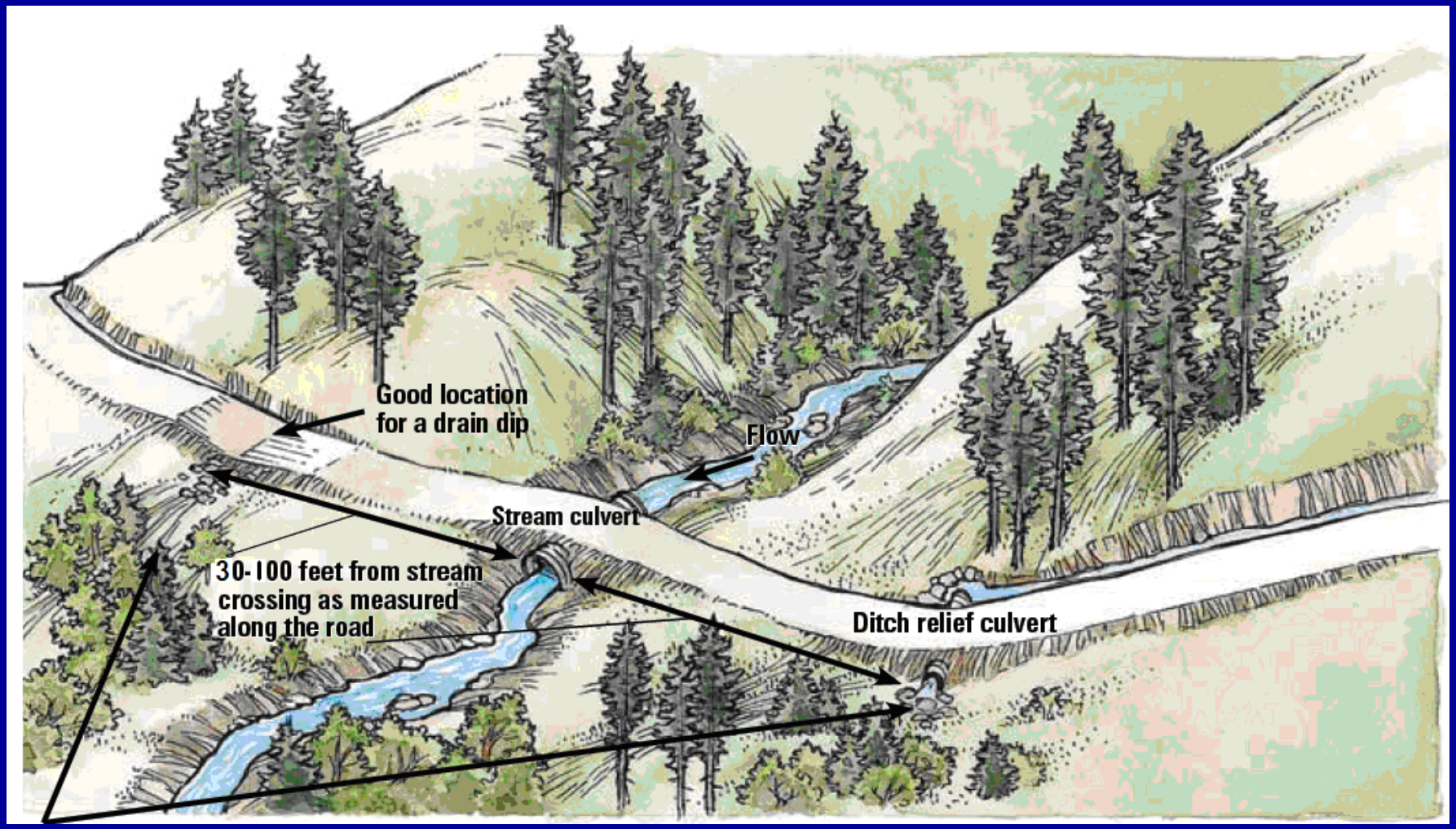
<u>Hydrologic Disconnection</u> means the removal of direct routes of drainage or overland flow of road runoff to a watercourse or lake.

Photo: Weaver, PWA

Hydrologic Connectivity

Delivery from road surfaces and ditches

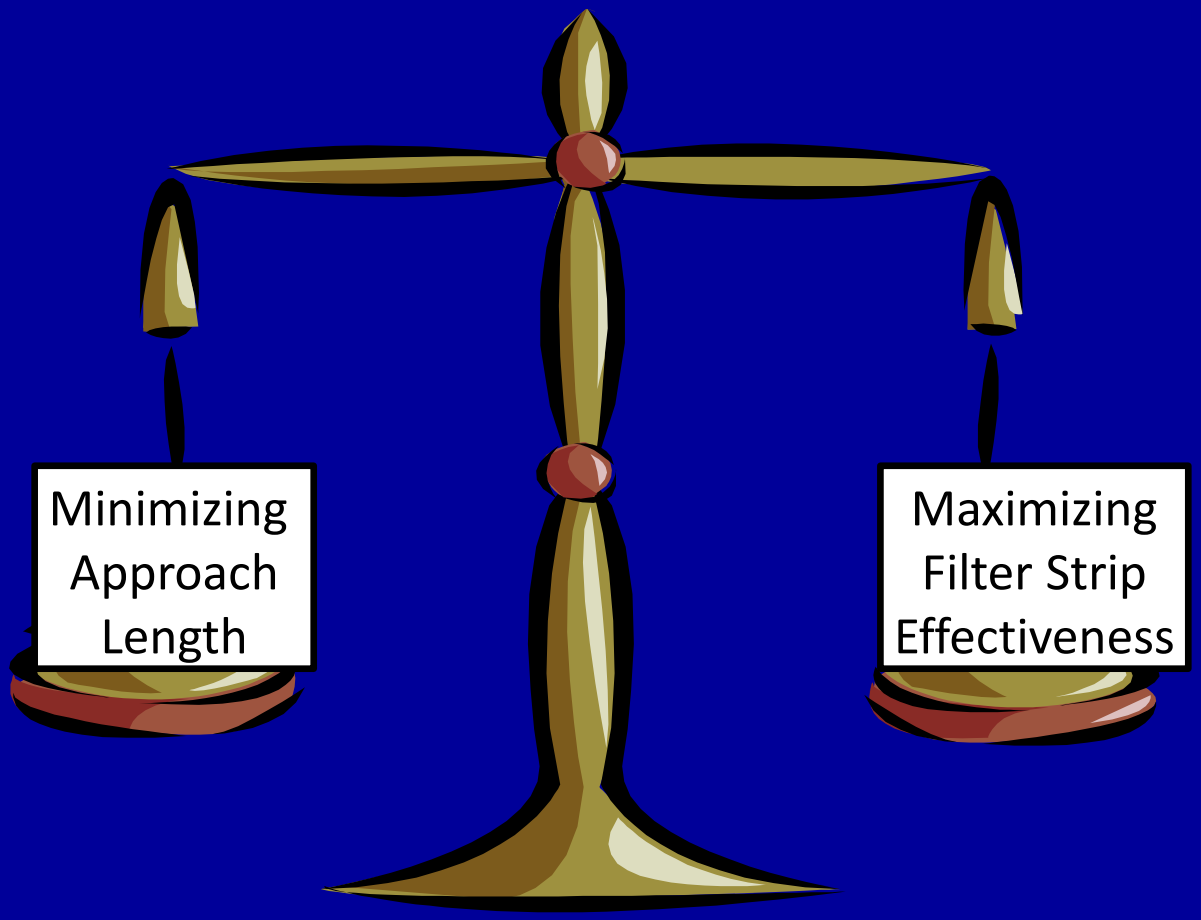
Hydrologic Disconnection to Keep Sediment from Entering Streams



30-100 feet

Image: Oregon Forest Resources Institute 2011

How to Avoid Connectivity – Watercourse Crossings

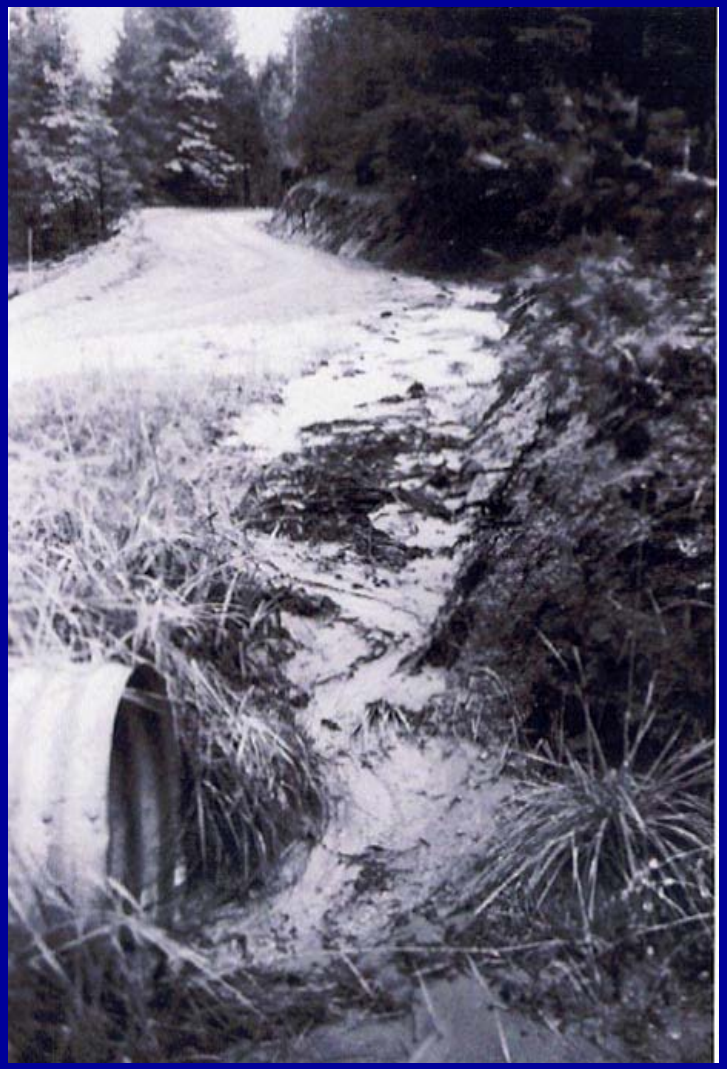


Ideally, disconnect 30-100 feet from crossing

Image: D. Coe, CAL FIRE

French Creek Watershed

Before RMP - 1990



After RMP – 1991-99

Photos: S. Sommarstrom

Greater Hydrologic Connectivity With:

- Older geologic formations with high drainage densities (i.e., more streams per unit area)
- Areas with high road densities.
- Road design that concentrates runoff, rather than disperses it (insloped roads).

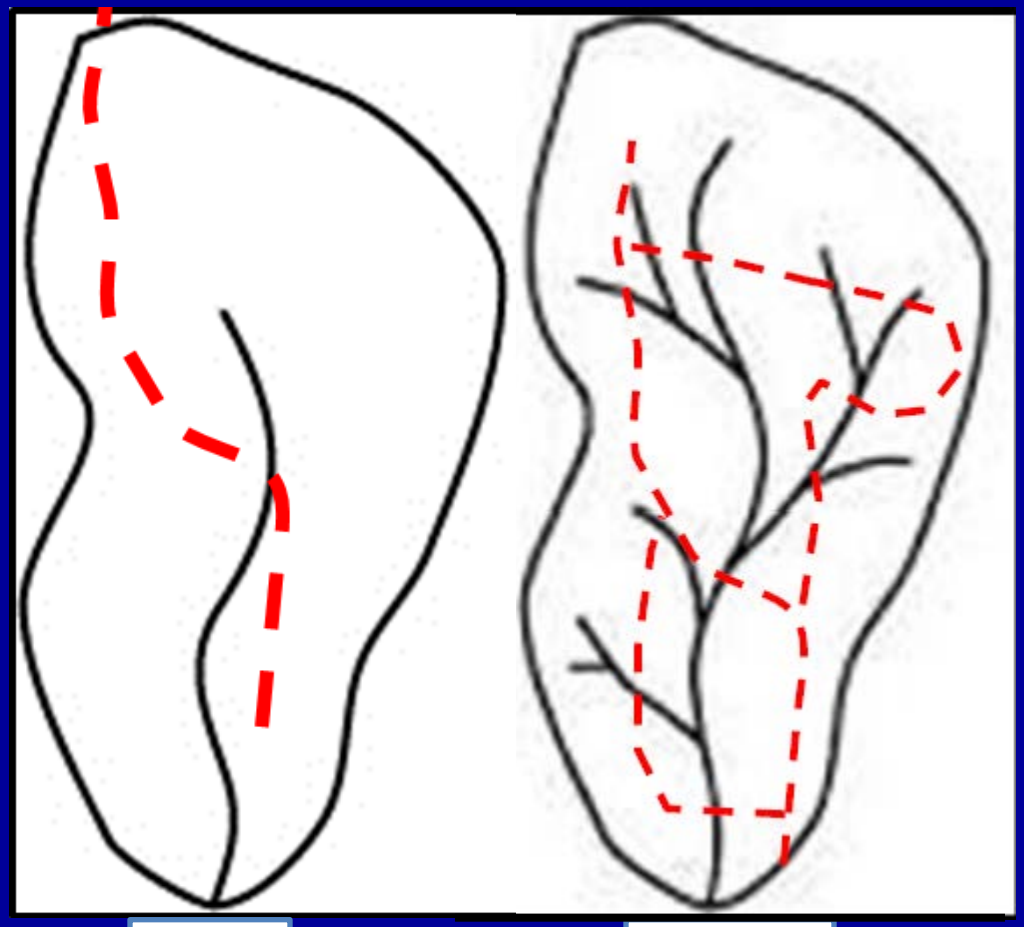


Image: D. Coe (CAL FIRE)

Ford with Connected Approaches

Image: Weaver, PWA

Design, Upgrade, and Maintain Roads to Minimize Hydrologic Connectivity and Protect Water Quality

Road approaches to bridges are often hydrologically connected

Image: Weaver, PWA

Where Do We Evaluate Hydrologic Connectivity and Where to Treat?

- Road segments close to watercourses—close to crossings (e.g., 200-300 ft).
- Roads that accumulate and concentrate, rather than disperse, runoff (i.e., those with inside ditchlines).
- Roads and hillslopes with high erosion potential.

Guidance Provided in TRA #5

Key Point

- **Hydrologic disconnection most critical at the approaches to watercourse crossings.**
  - **Recommended to decrease distance between drainage structures for at least 2 drainage structures above the crossing.**
  - **It may be recommended during THP review to have an RPF mark the location of drainage structures near streams until LTOs become accustomed to the practice.**

Image: D. Coe, CAL FIRE

Turbid inside ditch on insloped road

Classical Road Drainage Engineering:

Connected Road, Cutbank and Ditch

Image: Weaver, PWA

Connected!

Classical Road Drainage Engineering:

Connected Road, Cutbank and Ditch

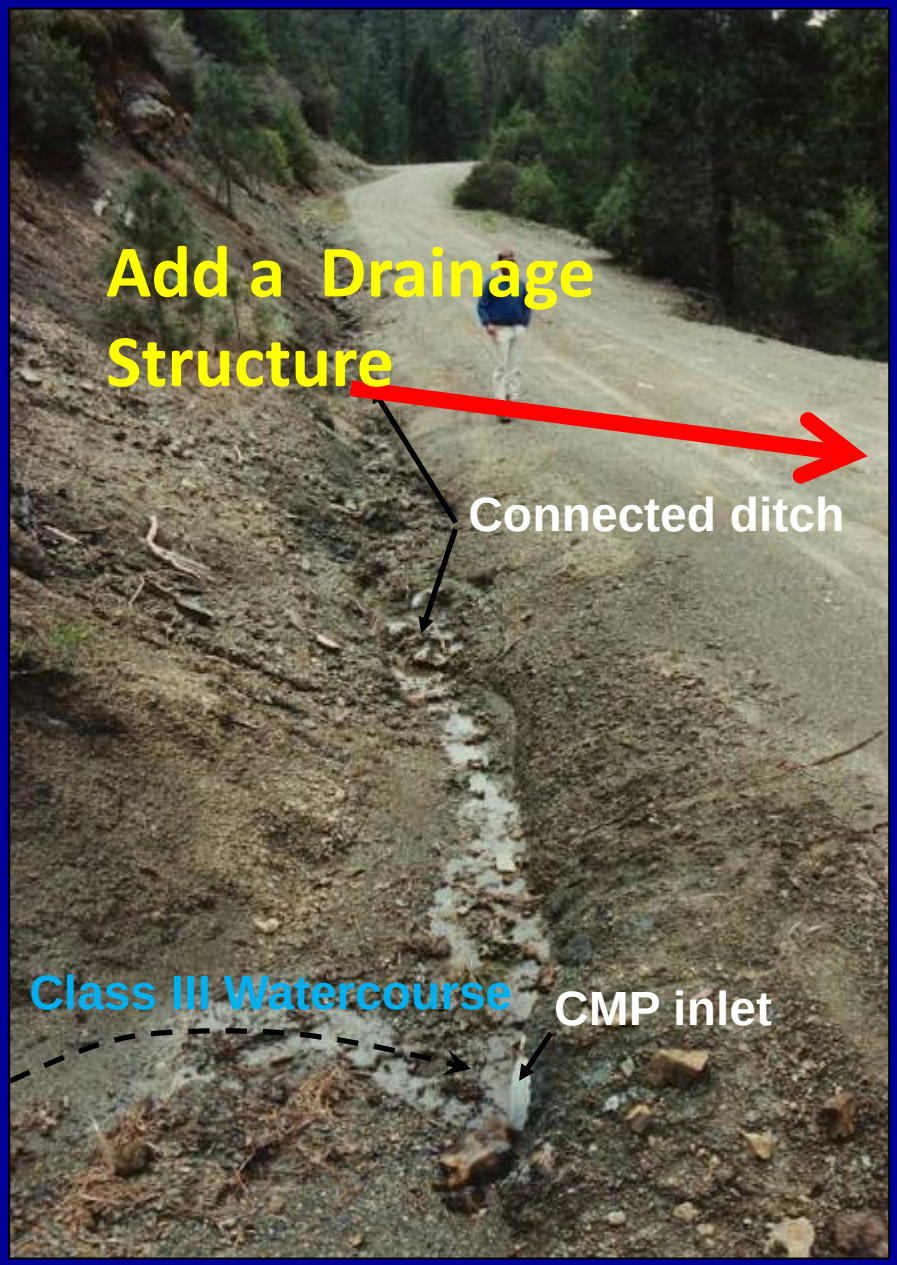
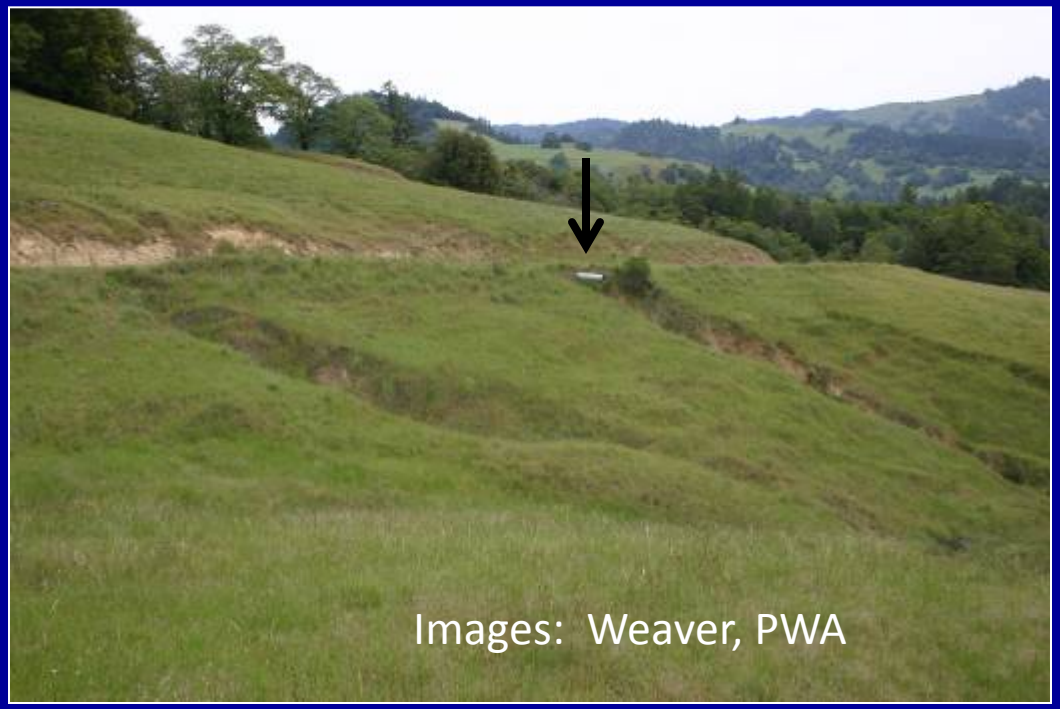


Image: Weaver, PWA

Connected!

Gully erosion caused by road surface runoff



Connected!

How to Avoid Connectivity – Pipe Outlets

<u>Discharge runoff onto</u>:

1. Hydraulically rough surfaces (i.e., dense vegetation.
2. Non-erodible material.
3. Avoid convergent topography.
4. Avoid flow concentration.

Photo: R. Harris, UCCE (retired)

Elk River Watershed Example

35% connected in the early 1990's (PWA 1999)

PALCO "Road Drainage" circa 1995

Elk River Watershed

35% connected in the early 1990's (PWA 1999)

PALCO "Road Drainage" circa 1995

Elk River Watershed

~13% connected in Freshwater Creek watershed (PWA 1999)

PALCO "Road Drainage" circa 2005

What Do You Do With the Remainder of the Connected Road Network?

- 10-15% of roads will typically remain connected.
- RPF to determine if there will be a significant sediment discharge and treat accordingly.

3. Brief Overview of Key Changes--Road Drainage

Old Road Rules	New Road Rules
• <u>ASP watersheds only</u>: – These roads shall be outsloped where feasible and drained with water breaks or rolling dips…	• All <u>new or reconstructed</u> logging roads and landings shall be outsloped where feasible and drained with waterbreaks and/or rolling dips…(statewide) [923.2(a)(4)].

Examples of Outsloped Roads with Rolling Dips

Drainage Structure Spacing

923.5 (a) (b) (d) (f) (g), TRA #5

- **Drainage structures are to be constructed at a spacing that will prevent excessive erosion either in the inboard ditch, along the road surface, or downslope of the road.**

- **Spacing is a function of:**
  - **Road grade**
  - **Soil type**
  - **Road surfacing**
  - **Proximity to a watercourse**

- **Modify structure locations to account for landscape features as necessary (topography, wet areas, landslides, etc.).**

Inadequate Drainage Structures

Photo: M. Boone, CAL FIRE

Image: D. Lindsay, CGS

TRA #5 Table 1. An example of ditch-relief culvert and rolling dip spacing guidelines.

Road Grade (percent)	Soil Erodibility	
	Low to Non-erosive soils	Erosive soils
0-3%	400'	250'
4-6%	300'	160'
7-9%	250'	130'
10-12%	200'	115'
12+	160'	100'

Note: (1) **Low Erosion Soils** – Coarse Rocky Soils, Gravel, and Some Clay

(2) **High Erosion Soils** = Fine, Friable Soils, Silt, Fine Sands

Inflexible spacing distance is not recommended; some locations are more suitable to receive runoff than others. Mandatory waterbreak spacing table in Rules.

4. Brief Overview of Key Changes--Road Erosion Site Inventory

Old Road Rules	New Road Rules
• No CA Forest Practice Rule requirement for a **road erosion inventory**. • Erosion Control Plan (ECP) required for GWDR permit from the NCRWQCB in the North Coast Hydrologic Basin (existing and potential erosion sites inventoried).	• RPF or supervised designee shall: (i) locate and map **significant existing and potential erosion sites** and (ii) specify feasible treatments to mitigate significant adverse impacts from the road or landing—**statewide**.

Significant Existing or Potential Erosion Site Definition

- **Means a location where soil erosion is currently, or there are visible physical conditions to indicate soil erosion may be in the future,**
- **discharged to watercourses or lakes in quantities that violate Water Quality Requirements,**
- **or result in significant individual or cumulative adverse impacts to the beneficial uses of water.**

Road Erosion Site Inventory

Erosion Site Inventories

- **Only for "logging roads" in the "logging area."**
- **Only for sites that can discharge to a watercourse!**

Three Steps:

1. **Evaluate logging roads for evidence of Significant Existing and Potential Erosion Sites.**
2. **Develop Necessary and Feasible Treatments.**
3. **Document Sites and Treatments.**

Photo: D. Fowler, NCRWQCB

Indicators of Significant Existing or Potential Road Erosion Sites

- **Evidence of direct sediment entry to a watercourse.**
- **Ditch scour or downcutting.**
- **Gullies below the outlets of road drainage structures.**

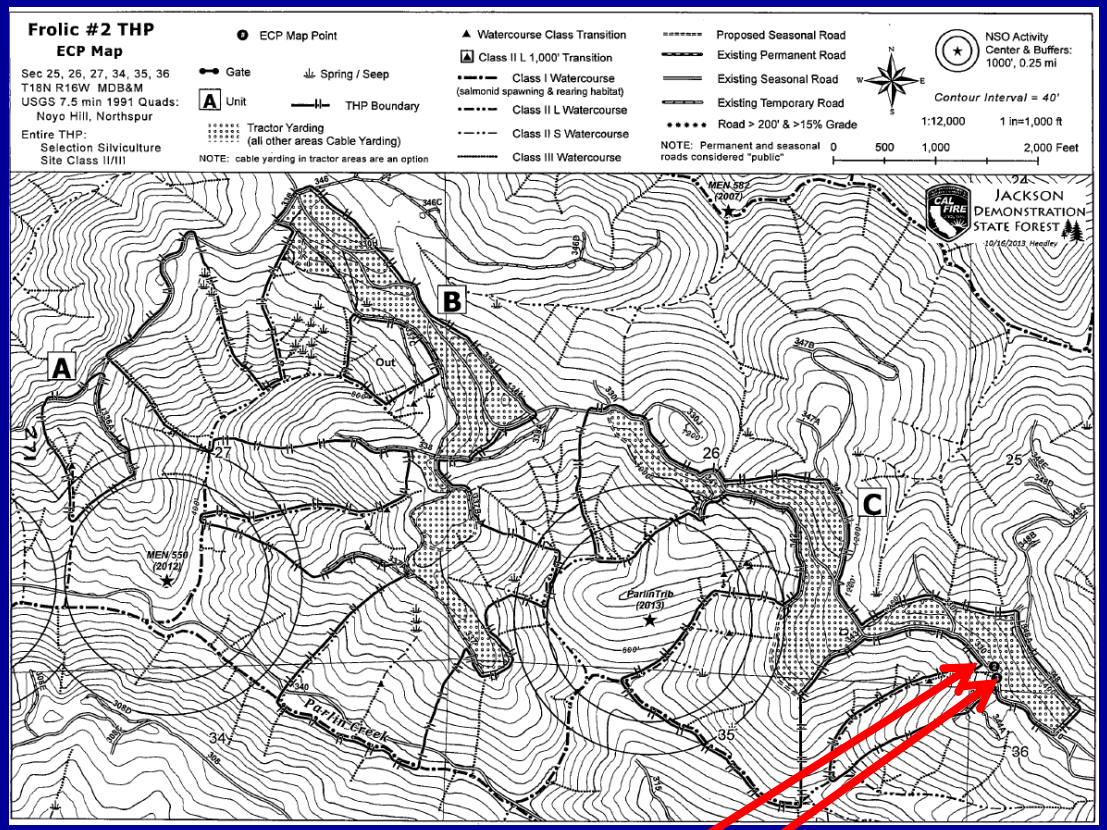
LaTour DSF—1990's

Develop Necessary and Feasible Treatments

923.1(e)(2)	Factor
• The RPF shall consider the following key factors as part of developing necessary treatments:	• Type of Road • Age of Road/History of Sediment Delivery • Beneficial Uses • Hillslope Grade, Road Gradient • Soil erodibility • Length of Hydrologic Connectivity/Filter Strip • Site Specific Information

Document Necessary and Feasible Treatments

923.1(e)(3)	Requirement
• The RPF shall submit a list of the *significant existing and potential erosion sites* identified which have feasible treatments with the plan, including...	A. A map showing the location(s). B. (B) Brief description of present condition of the mapped site. C. Brief description of proposed treatments. D. Items (B) and (C) can be provided in tabular form.



Jackson Demonstration State Forest Frolic #2 THP **Erosion Control Plan** for the NCRWQCB GWDR permit

Controllable Sediment Discharge Sources

Map Point	Estimate of Potential Volume (cu. yds.)	Potential for Delivery to Watercourse	Priority for Treatment	Implementation Schedule (season/year)	Description and Treatment
2	40	low	low	Prior to completion	Road erosion drains into Class III watercourse. Install rock ford.
3	40	low	low	Prior to completion	Road erosion drains into Class III watercourse. Install rock rolling dip.

Examples of Existing Road Erosion Sites

Logical Order of Treatment

923.1(e)(5)

- **Where feasible treatments for *significant existing or potential erosion site* are proposed, the RPF shall describe in the plan a <u>logical order of treatment</u>.**
- **No mandatory timing of treatment prior to the expiration of the plan required.**
- **Do work when it is needed to protect water quality.**

High Priority—List First

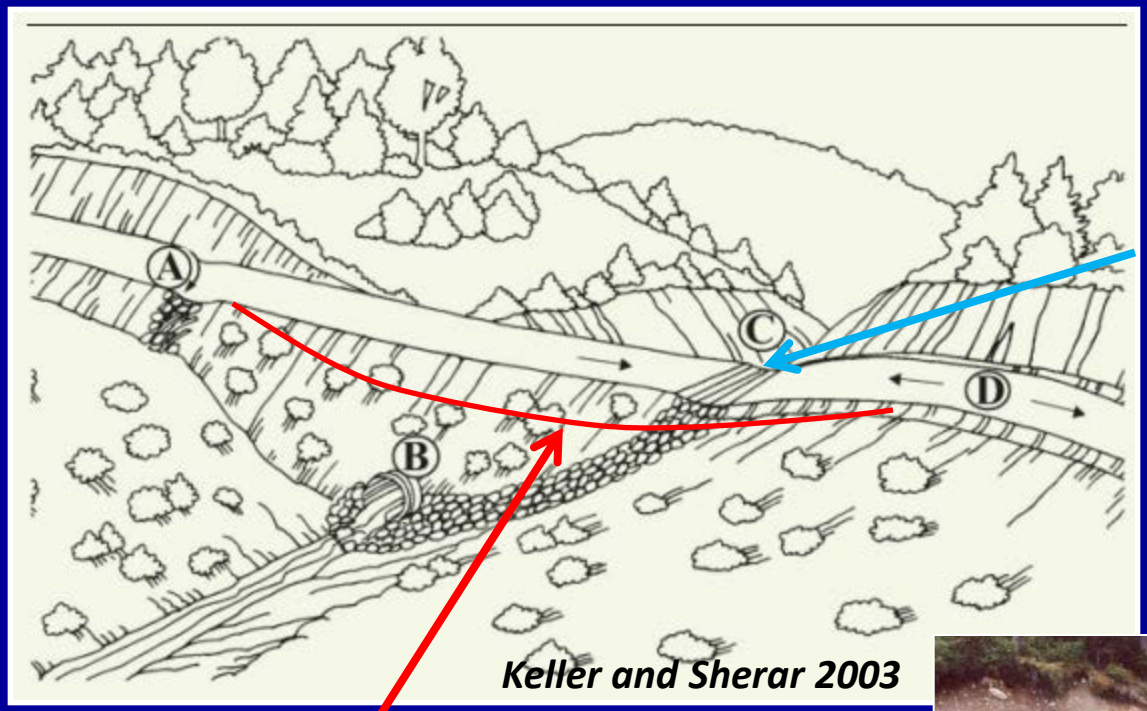
5. Brief Overview of Key Changes--Watercourse Crossing Rules 923.9

Watercourse Crossing Rules 923.9

- Number of crossings shall be kept at a minimum.
- Unrestricted passage for all aquatic species and their life stages.
- Location of all new permanent (construction and reconstruction) and temporary crossings must be shown on a map.
- Permanent crossings sized for 100-year flows, including debris and sediment loads.
- Fill requirements--compacted in approximately one-foot lifts during installation.
- Critical dips installed during construction/ reconstruction of crossings utilizing culverts , except where diversion is addressed by other methods.

Reducing (eliminating) risk of stream diversion

923.9 (j)



Keller and Sherar 2003

Critical dip

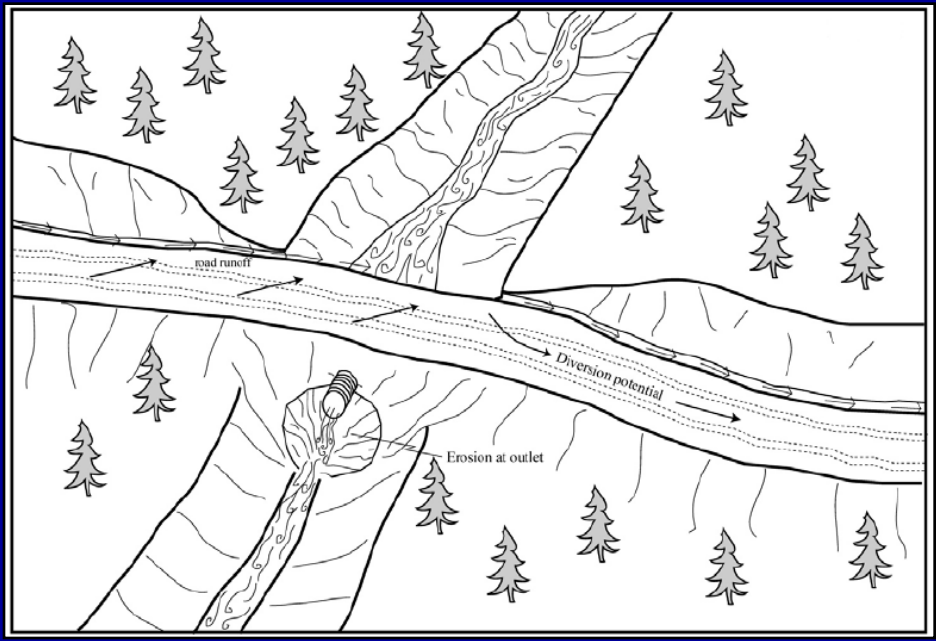
Lowered fill

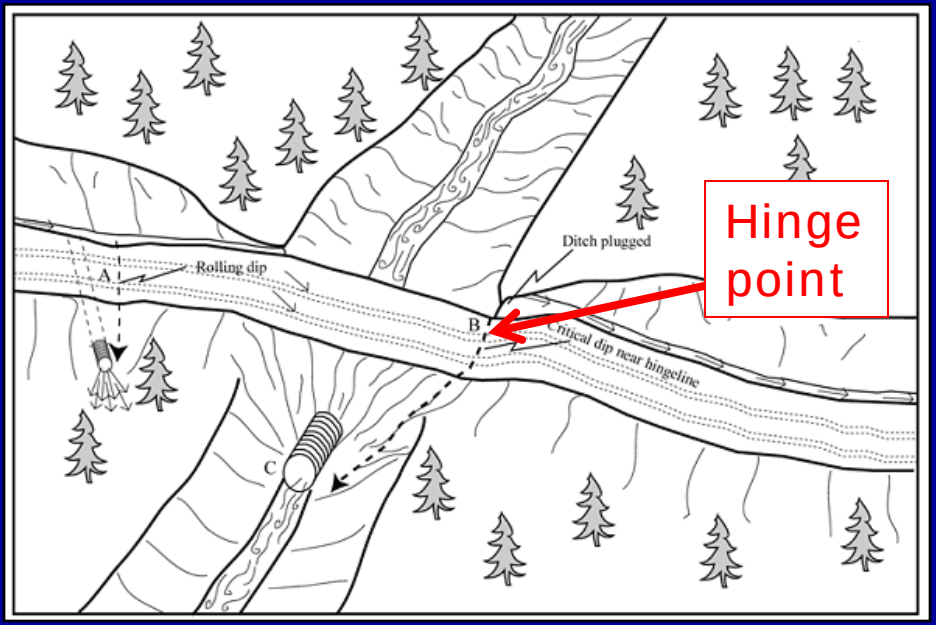
Critical dip

Image: Weaver, PWA

Minimizing Diversion Potential

- Adequate crossing sizing
  - Minimize plugging risk
  - Critical dip – at the hinge point.



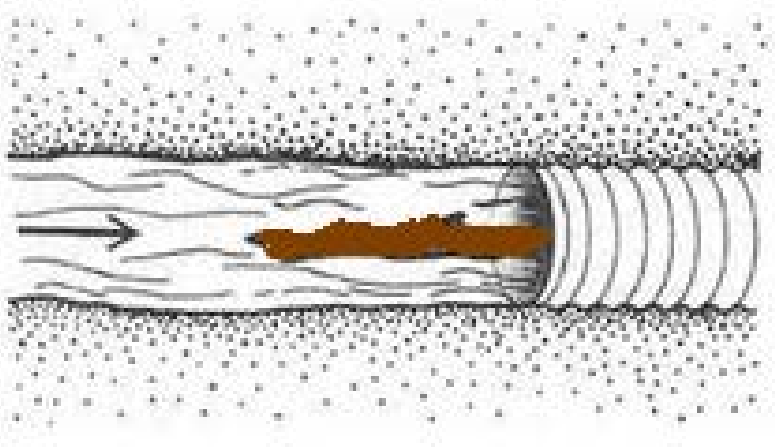


TRA#5

Diversion

Photos: Weaver, PWA

Culverts Installed on the Same Alignment as the Natural Stream Channel (923.9(g))



GOOD

Reduced Plugging Hazard

BAD

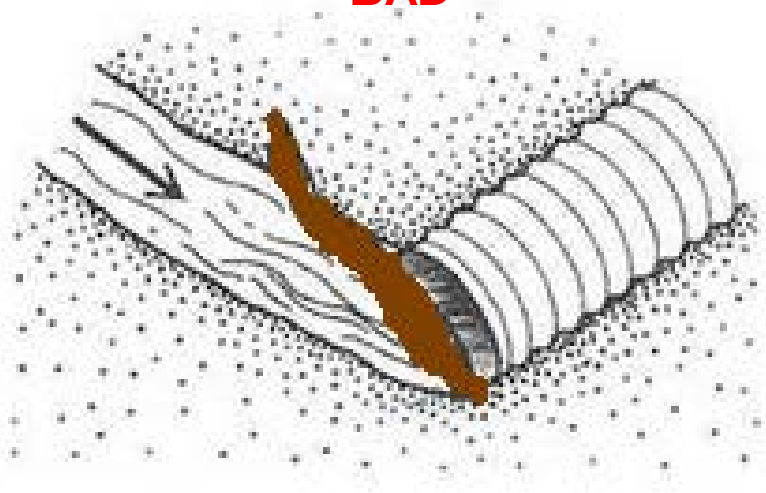
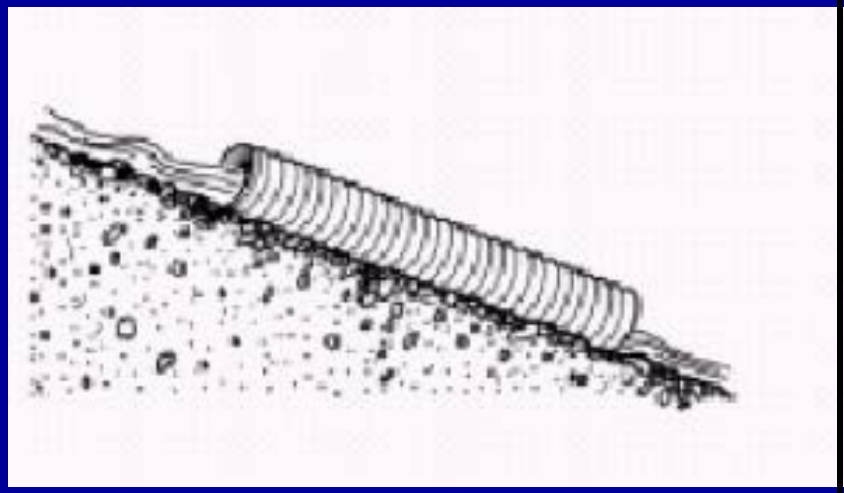
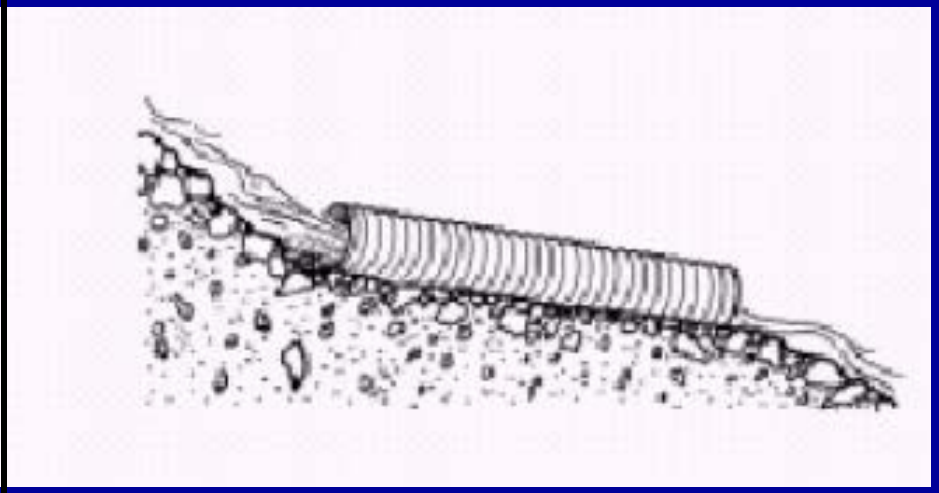


Image: Furniss et al. 1998

Culvert Set to Maintain the Natural Channel Grade to Avoid Bedload Accumulation (923.9(g))





GOOD

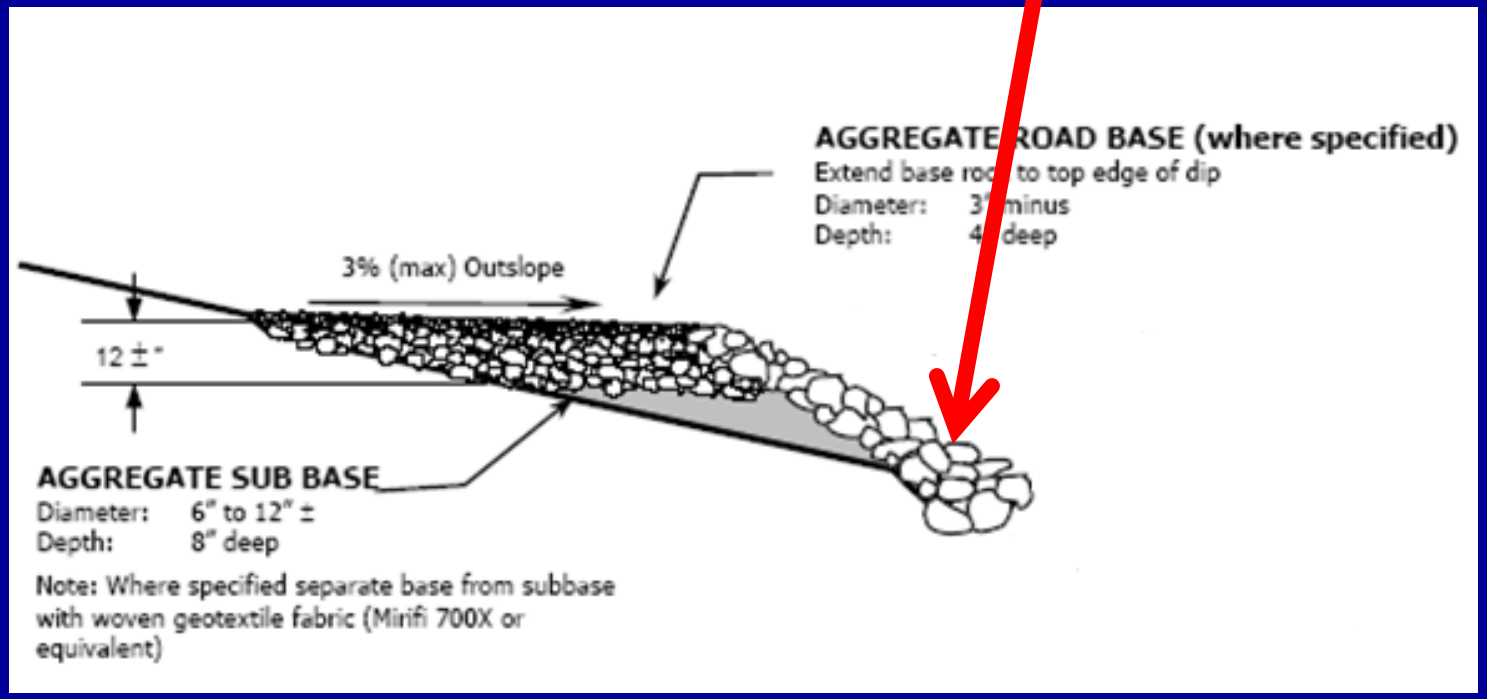
Reduced Plugging Hazard

BAD

Image: Furniss et al. 1998

Key Road Rule Changes

923.9(l)	**<u>Rock used to stabilize the outlets of crossings shall be adequately sized to resist mobilization, with the range of required rock dimensions described in the plan.</u>**



Modified Diagram from Tim Best, CEG

Examples of Rock Armored Crossings

6. Brief Overview of Key Changes--Road Maintenance and Monitoring

- Monitoring Inspection Timing [923.7(k)]:
  - Monitoring to occur a sufficient number of times to evaluate function of drainage structures and facilities.
  - At least once annually during maintenance period.
  - Focused after large winter storm events.

Photo: N. Simpson, DFW

Road Maintenance and Monitoring

- Monitoring Inspections are to Include Checking for Evidence of:
  - Downcutting
  - Plugging
  - Overtopping
  - Loss of function
  - Sediment delivery to a watercourse
    - If evidence of existing or potential sediment delivery exists, corrective measures shall be implemented when feasible.

Road Maintenance and Monitoring

- CAL FIRE shall also conduct monitoring inspections at least once during the prescribed maintenance period.

7. Brief Overview of Key Changes--Technical Rule Addendum No. 5

Old Road Rules

- No technical rule addendum to assist with road drainage rule requirements.

New Road Rules

- Technical Rule Addendum #5 provides **guidance** to RPFs, LTOs, and agency personnel on:
  - **Hydrologic Disconnection,**
  - **Road Drainage,**
  - **Minimization of Diversion Potential, and**
  - **High Risk Crossings.**

Guidance to RPFs on where and when disconnection is "necessary and appropriate."

Board of Forestry Roads Rules Field Workshop,
Jackson Demonstration State Forest
January 19, 2012

Photos: J. Hendrix, DFW

Inside ditch delivering sediment to a West Chamberlain Creek tributary

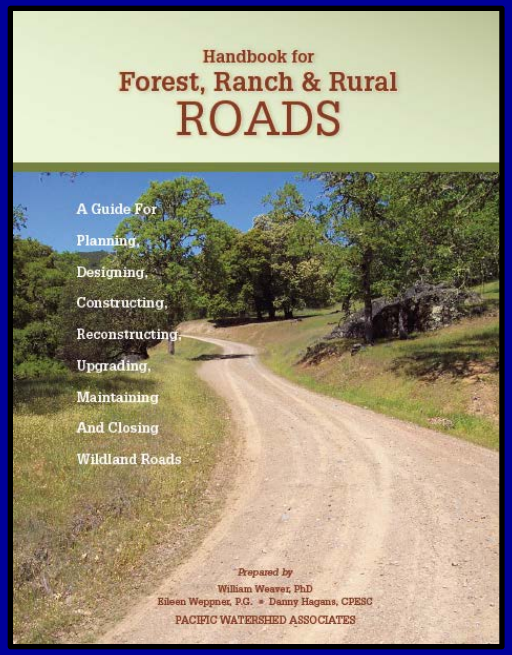
Does this Road Need Hydrologic Disconnection?

Is hydrologic disconnection necessary and appropriate?

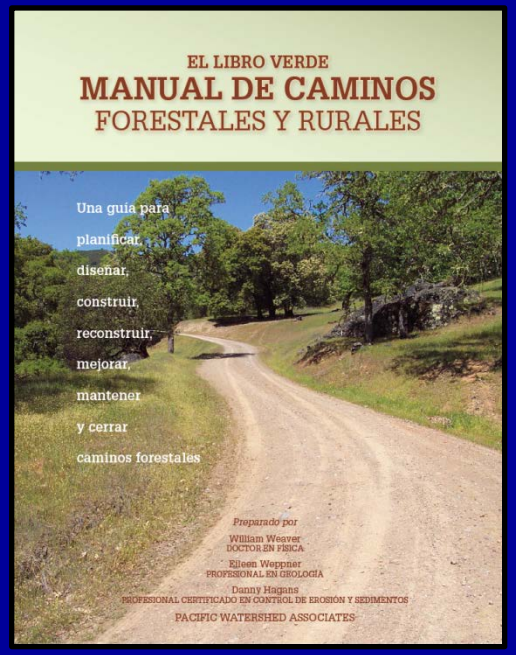
TRA#5 provides guidance on when and where it is necessary.

V. Additional Information for Assistance

REVISED Weaver, Weppner, and Hagans—Handbook for Forest, Ranch and Rural Roads



English Version

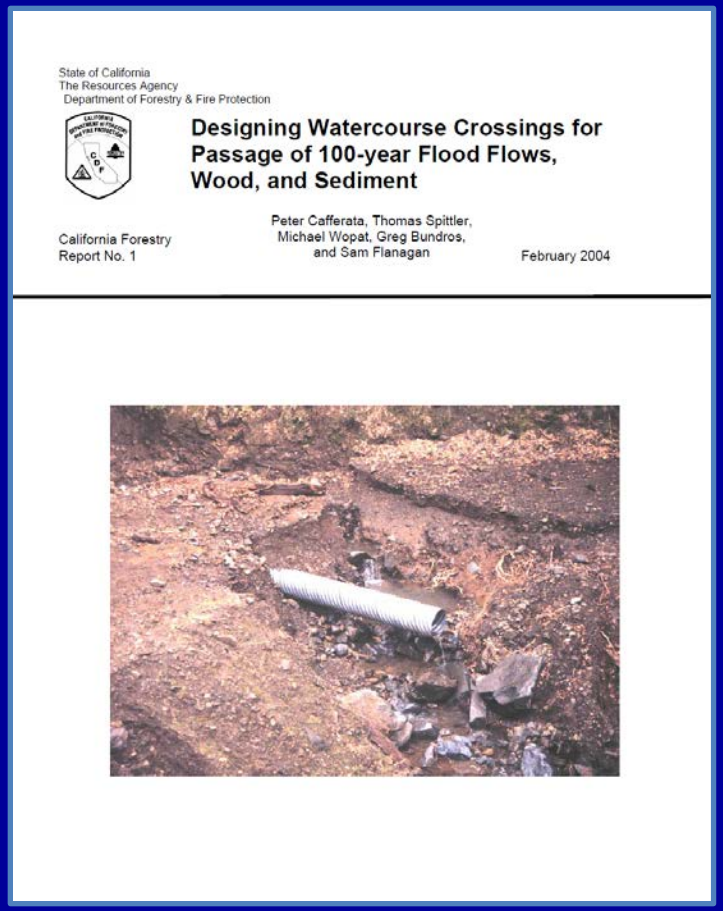


Spanish Version

Pacific Watershed Associates' principal geologists, Dr. Bill Weaver, Danny Hagans, and Eileen Weppner.

Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment

- **2004 Watercourse Crossing Design Guidance Document (California Forestry Report No. 1).**



State of California
The Resources Agency
Department of Forestry & Fire Protection

Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment

California Forestry Report No. 1

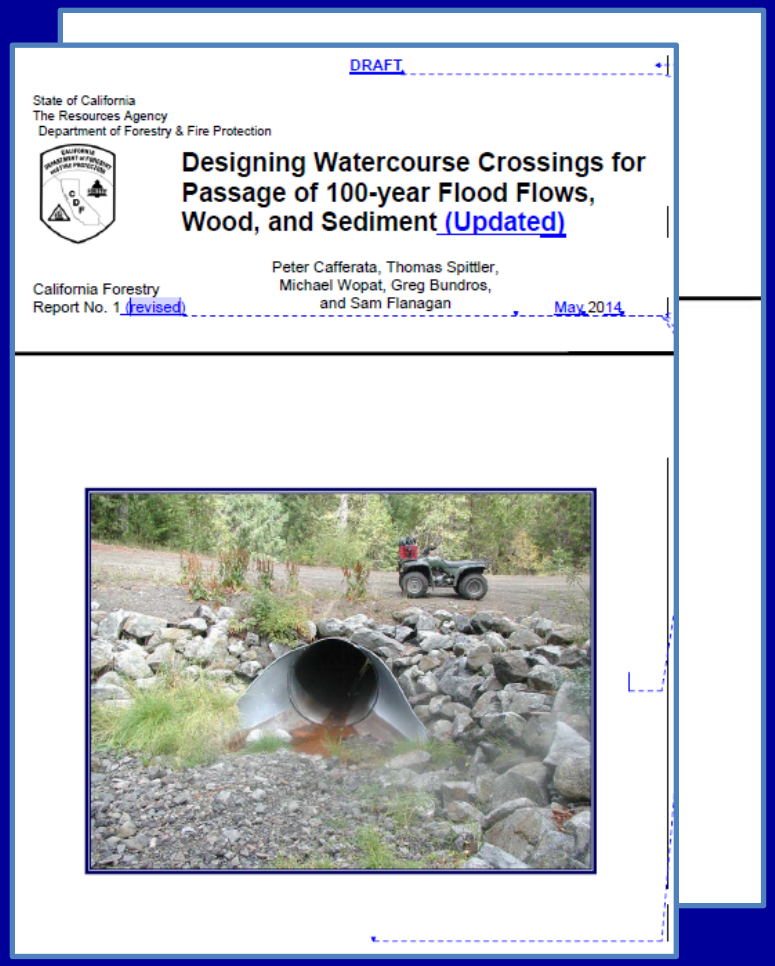
Peter Cafferata, Thomas Spittler, Michael Wopat, Greg Bundros, and Sam Flanagan

February 2004

REVISED Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment

- 2004 Watercourse Crossing Design Guidance Document (California Forestry Report No. 1).

- New revised document draft available for agency review available by mid 2015.



DRAFT

State of California
The Resources Agency
Department of Forestry & Fire Protection

Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment (Updated)

Peter Cafferata, Thomas Spittler, Michael Wopat, Greg Bundros, and Sam Flanagan

California Forestry Report No. 1 (revised)

May 2014

USFS Road Maintenance Video Set

- Video 1: Forest Roads and the Environment.
- Video 2: Reading the Traveled Way.
- Video 3: Reading Beyond the Traveled Way.
- Video 4: Smoothing and Reshaping the Traveled Way.
- Video 5: Maintaining the Ditch and Surface Cross Drains.

San Dimas Technology and Development Center

Easy to watch on YouTube

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Reforestation
What's New?
California Forests
Forest Stewardship
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Carbon Sequestration
Carbon Sequestration Tool for THPs
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Forest Ecosystems and Growth
Insects and disease
Forest Plants
Policy, Regulations & Planning
Forest Products
Forest Roads
Forest Streams
Forest Trees and Types

Managing Forest Roads

Roads are an essential improvement on your forest property. They provide access for recreation and for management activities. Roads are also the major environmental impact we have on the forest and watershed, being the principal source of erosion and stream sedimentation. Properly sited and constructed roads will produce minimal environmental impact and minimize maintenance effort and costs such as potholes that need repeated filling, and washboarding and rutting which requires annual blading.

Rolling dip, mid-picture, on an out-sloped road. Source: Bill Weav
Pacific Watershed Associates.

In addition to the physical and biological aspects of roads, there are many social/legal aspects to consider: easements, maintenance agreements, access and trespass. For an overview of road maintenance and design issues, please see Forest Stewardship Series 17 - Forest Roads.

More UC Resources:

Rural Roads - Construction and Maintenance Guide for California Landowners

UCCE in collaboration with the NorCal Chapter of the Society of American Foresters hosted a ***three part webinar series*** on rural road design, maintenance and improvement in 2012 along with a series of three

Key Resources Available

- REVISED **Weaver and Hagans Handbook for Forest, Ranch and Rural Roads.** http://mcrcd.org/publications/

- **Guidance Document**: **Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment (new version to be posted).** http://calfire.ca.gov/resource_mgt/downloads/reports/ForestryReport1.pdf

- **USFS Road Maintenance Video Set:** available for download or to view over the Internet (made in 2002):
  - http://www.ruraltech.org/projects/roads/

- **UC Rural Roads Webinar Series** (PPTs and references posted at:
  - http://ucanr.edu/sites/forestry/Webinars/Rural_Roads_Webinar_Series/
  - http://ucanr.edu/sites/forestry/Webinars/Rural_Roads_Webinar_Series/Rural_Roads_Webinar_Resources/

Road Rules, 2013 Rule Package Training Workshops—

Eureka, Willits, Redding, Ione, and Felton (Sept 3-18, 2014)

Recorded Video:

http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice_pubsmemos_memos.php

CD ROM with PowerPoint Presentations and Selected References

Redding—Whiskeytown NRA

Eureka--Arcata
Community Forest

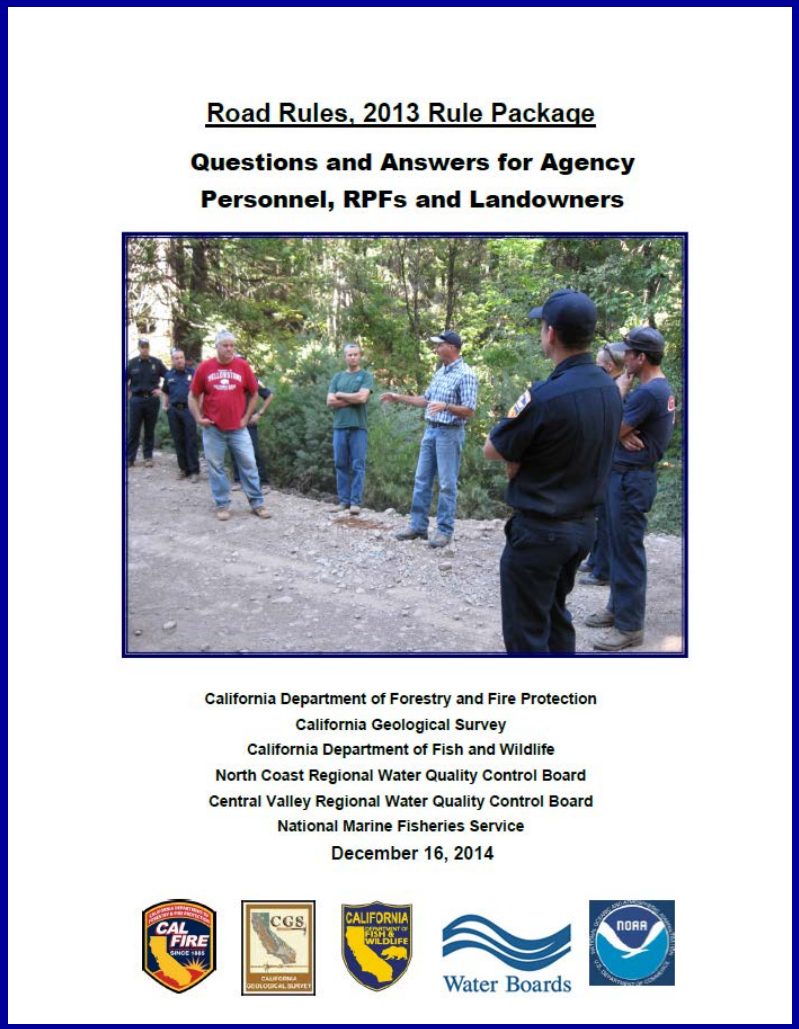
Felton—Redwood Empire, Soquel Cr Basin

Willits—Jackson Der
State Forest

tation THP

Road Rules, 2013 Question and Answer Document

- The questions from the 6 road rules training workshops were documented.
- The BOF Forest Practice Committee reviewed the draft Q and A document.
- The final document is posted on the BOF website at: http://bofdata.fire.ca.gov/hot_topics_resources/road_rules_q_and_a_document.pdf



Road Rules, 2013 Rule Package

Questions and Answers for Agency Personnel, RPFs and Landowners

California Department of Forestry and Fire Protection
California Geological Survey
California Department of Fish and Wildlife
North Coast Regional Water Quality Control Board
Central Valley Regional Water Quality Control Board
National Marine Fisheries Service
December 16, 2014

VI. Overall Summary Remarks

- Roads are the dominant management-related sediment source in forested watersheds.
- Monitoring and research work has shown that proper road drainage, as well as watercourse crossing design, construction, and maintenance, are areas that need improvement.
- The Road Rules, 2013 rule package, 14 years in the making, addresses these needs.
- It is a performance-based rule package that integrates all the road rule requirements into one section of the rule book and includes new statewide requirements for hydrologic disconnection and road erosion inventories.
- A new TRA #5 is included to provide guidance on hydrologic disconnection, road drainage, minimization of diversion potential, and high risk crossings.
- Considerable reference materials are available to help LTOs and RPFs implement the new rules on the ground.

Acknowledgments

- Dr. Bill Weaver, Pacific Watershed Associates
- Don Lindsay, California Geological Survey
- Bill Short, California Geological Survey
- Drew Coe, CAL FIRE
- Stacy Stanish, CAL FIRE
- Dave Fowler, NCRWQCB
- Nick Simpson, DFW

Thanks for Your Attention!