Sustainable Agriculture

North Fork Grange Hall, Junction City, CA

November 22, 2019

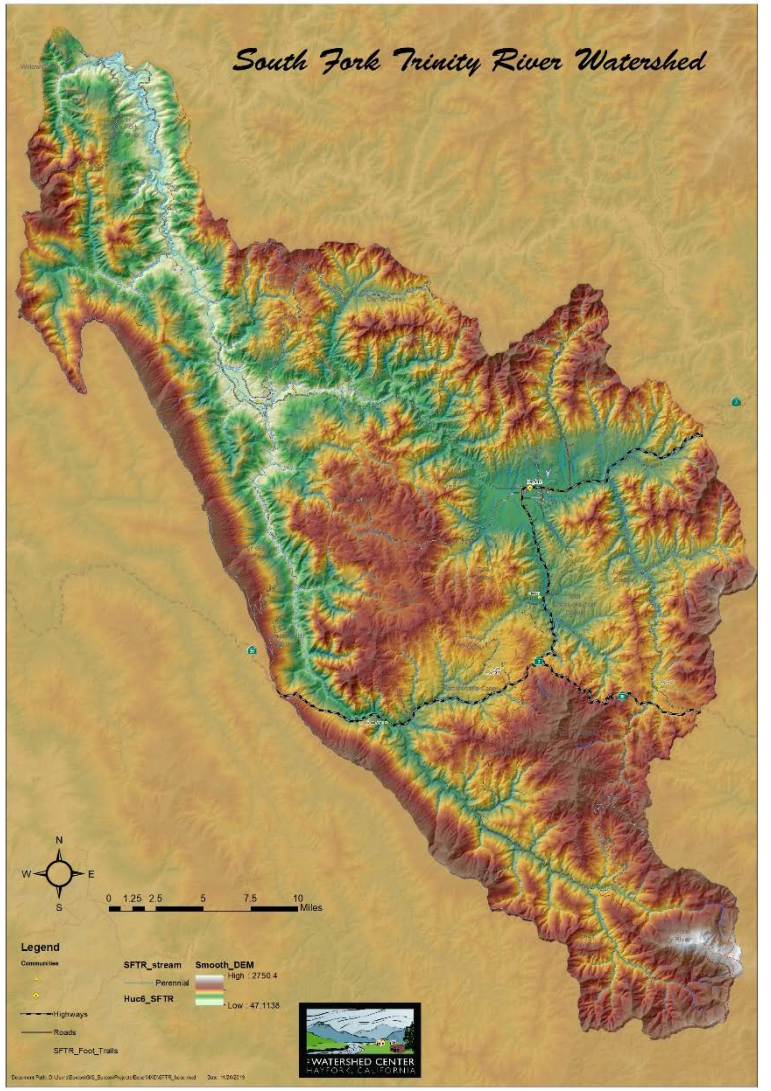
This event was coordinated by the Trinity County Resource Conservation District and funded by the California Association of Resource Conservation Districts.

SUSTAINABLE AGRICULTURE 2019 – WHY CARE?

Working towards healthy watersheds and healthy communities.

THE WATERSHED CENTER
HAYFORK, CALIFORNIA

WHAT IS A WATERSHED?



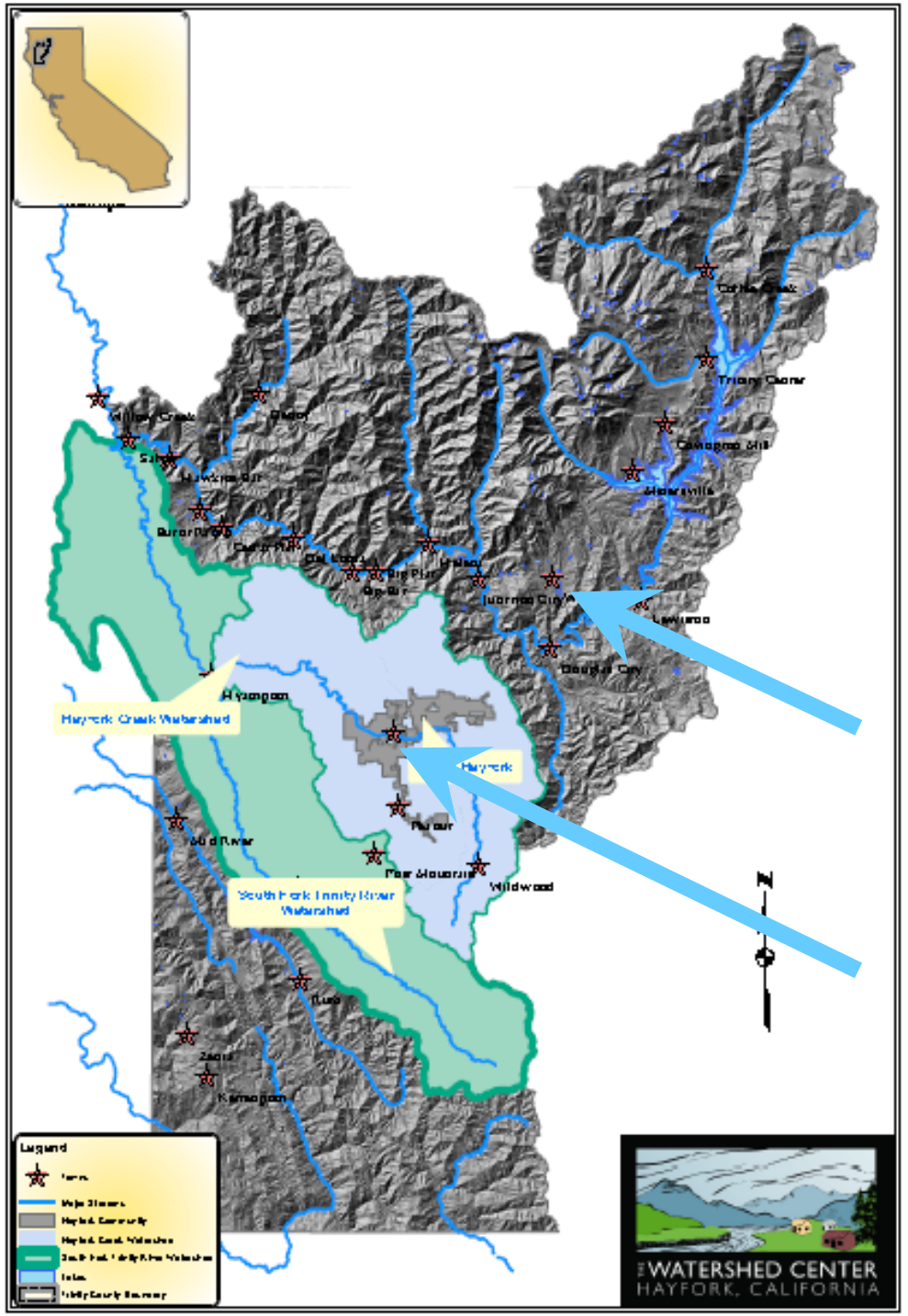
"that area of land, a bounded hydrologic system, within which <u>all living things are inextricably linked</u> by their common water course and where, as humans settled, simple logic demanded that they become part of a community."

John Wesley Powell

OUR WATERSHED:

SOUTH FORK TRINITY RIVER

- Nearly 1,000^2 miles and >90 miles
- California's largest undammed river
- This ecoregion is considered a global center of biodiversity and includes the most diverse coniferous forest in the world.
- One of the last remaining wild spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) populations in California.



ANADROMOUS FISH:

= born in fresh water streams, migrate to sea, return home to spawn.

Steelhead

(*Oncorhynchus mykiss)*

– rainbow trout
– winter run

Coho Salmon

(*Oncorhynchus kisutch)*.

– silver salmon

Chinook (King) Salmon

(*Oncorhynchus tshawytscha)*

– Spring-Run
– Fall-Run

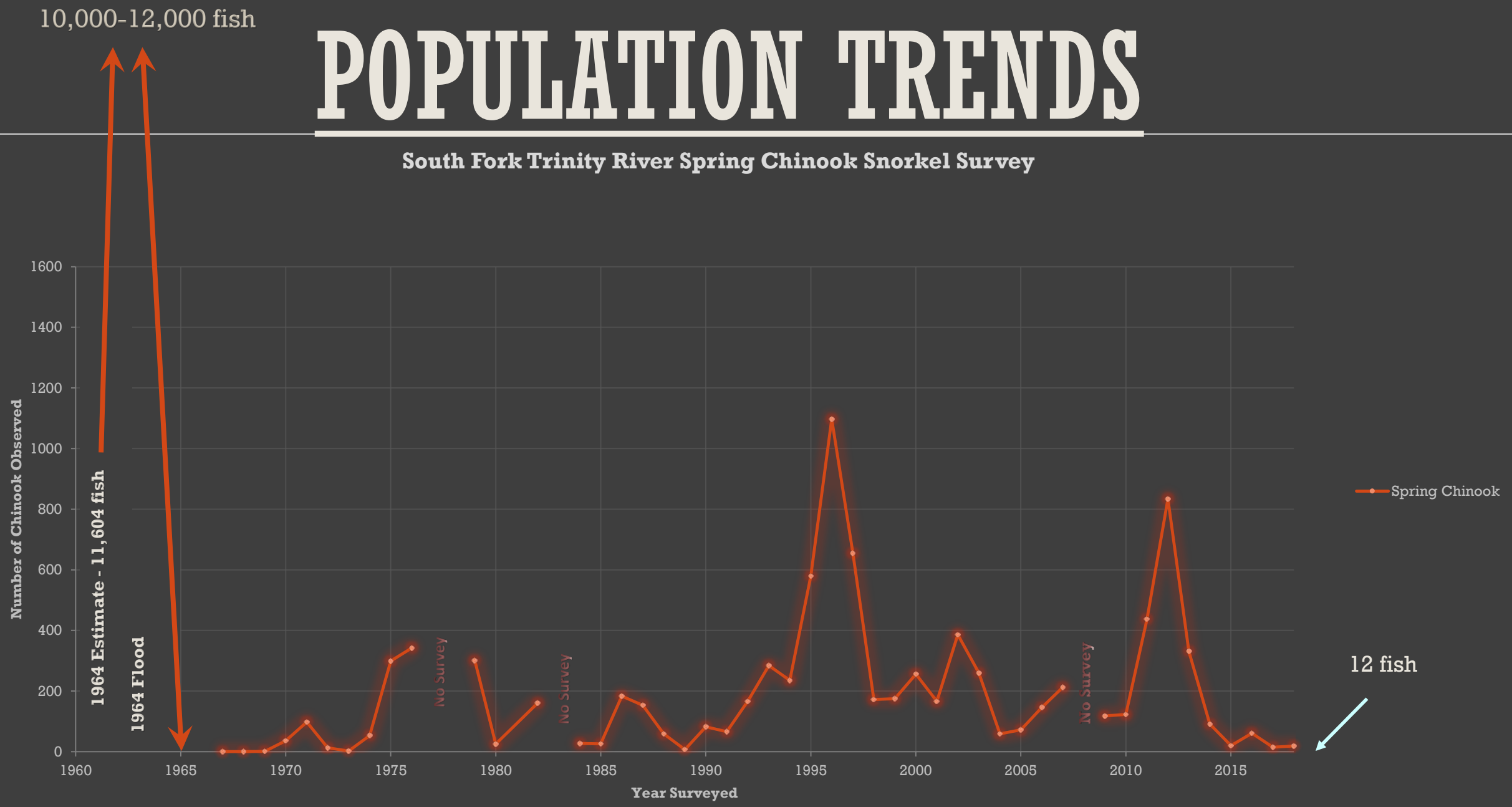
SPRING CHINOOK – "KING" SALMON

Move up rivers in the spring and over-summer before spawning in the Fall.

Don't eat in the river. To survive summer requires fattening up in ocean.

Most prized of the salmon species for size, taste, and oil content.

POPULATION TRENDS



LIMITING FACTORS

Sediment

- Geology
- Human impacts

Water Quantity and Quality

- Climatic
- Human impacts

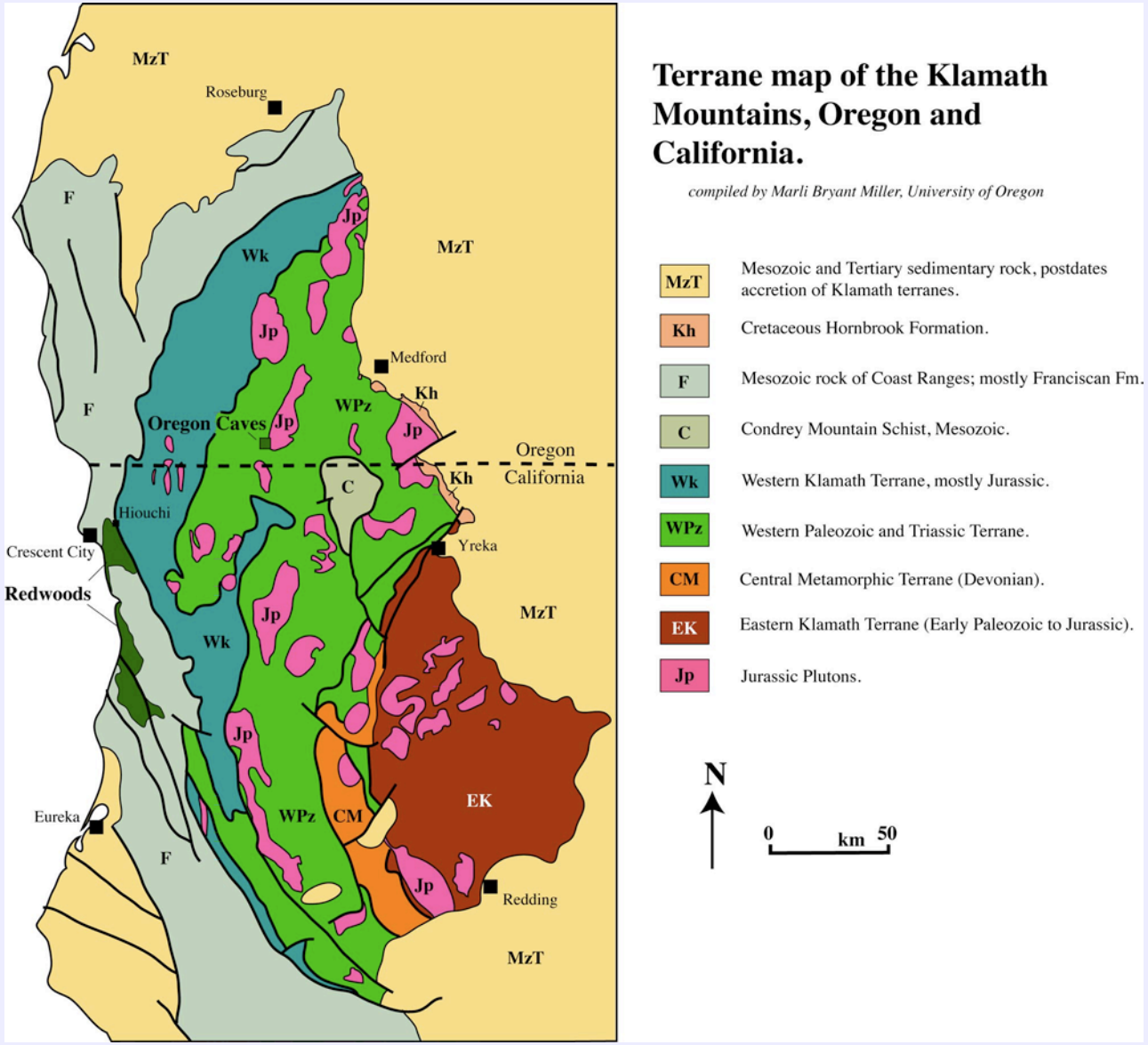
Harvest

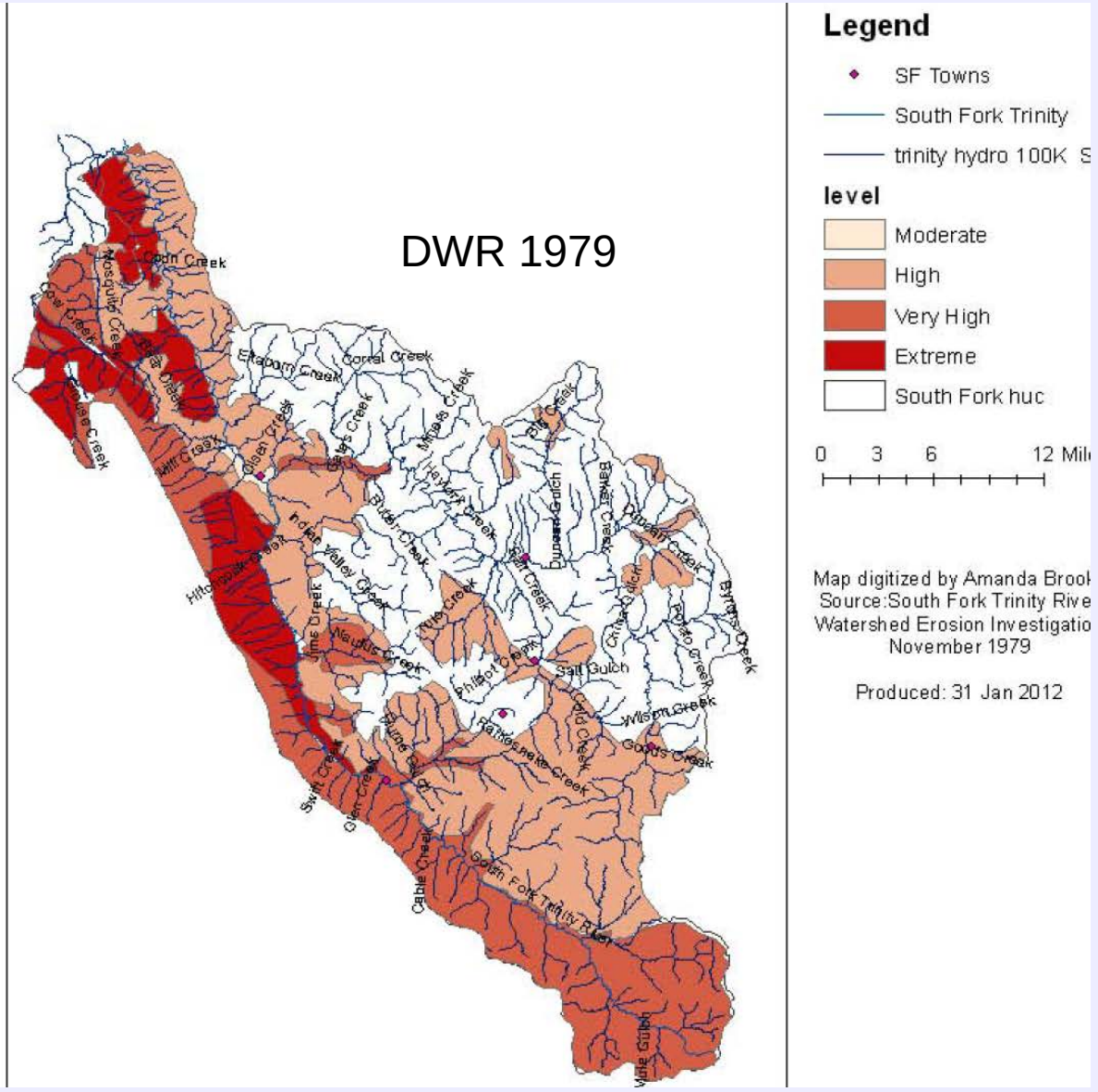
- Commercial, sport, tribal, poaching (< 200!)

Genetic structure

- Hatchery influences
- Genetic bottleneck (inbreeding)

SEDIMENT ≈ FACTOR OF GEOLOGY





1964 flood

- 1950-60's - Poorly built roads and poor forest harvest practices
- "1,000 year flood" on unstable geology
- All this lead to…

Mass wasting

- Landslides < 100 ac
- Roads, bridges & homes lost
- Catastrophic sediment pollution

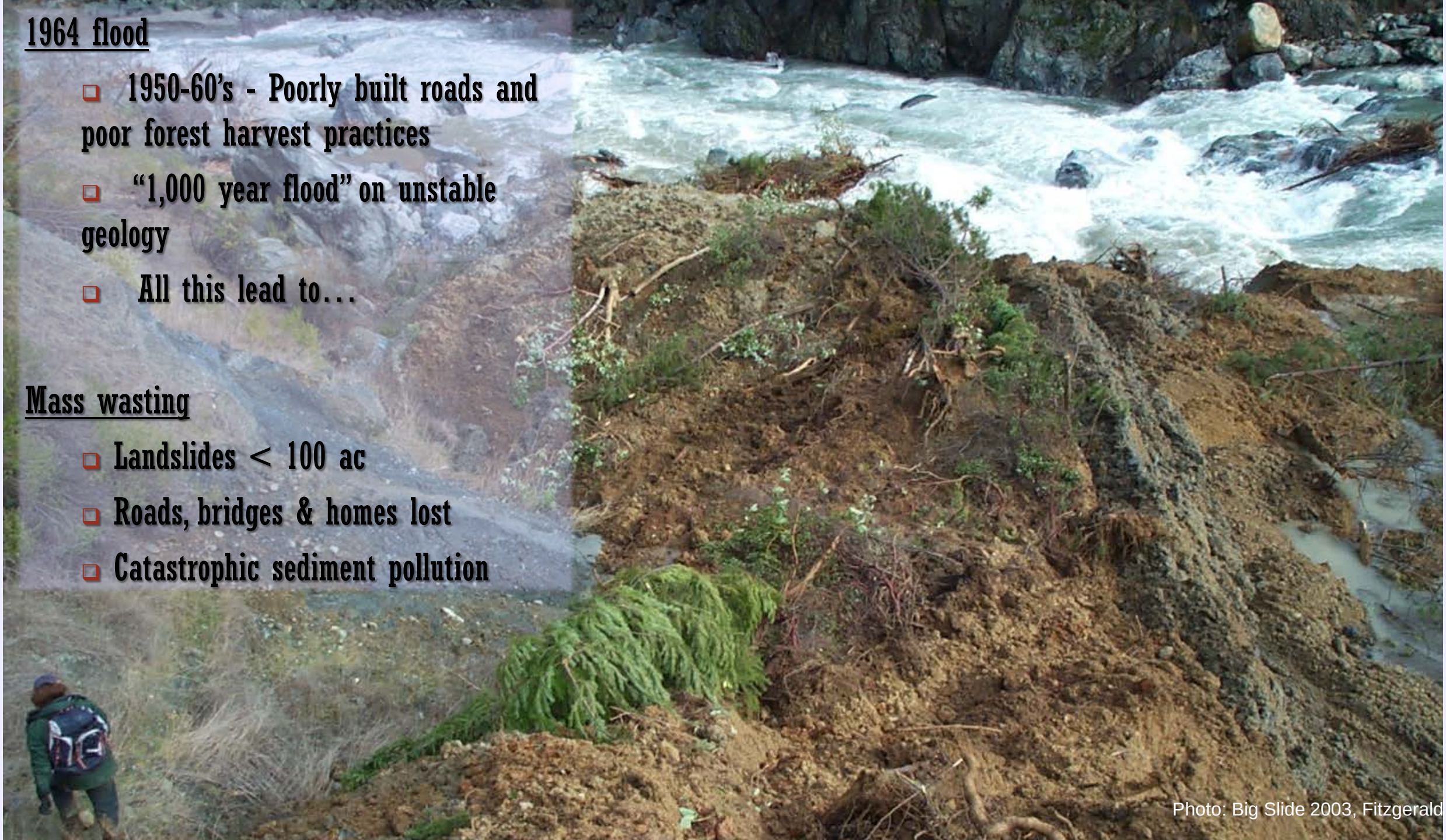
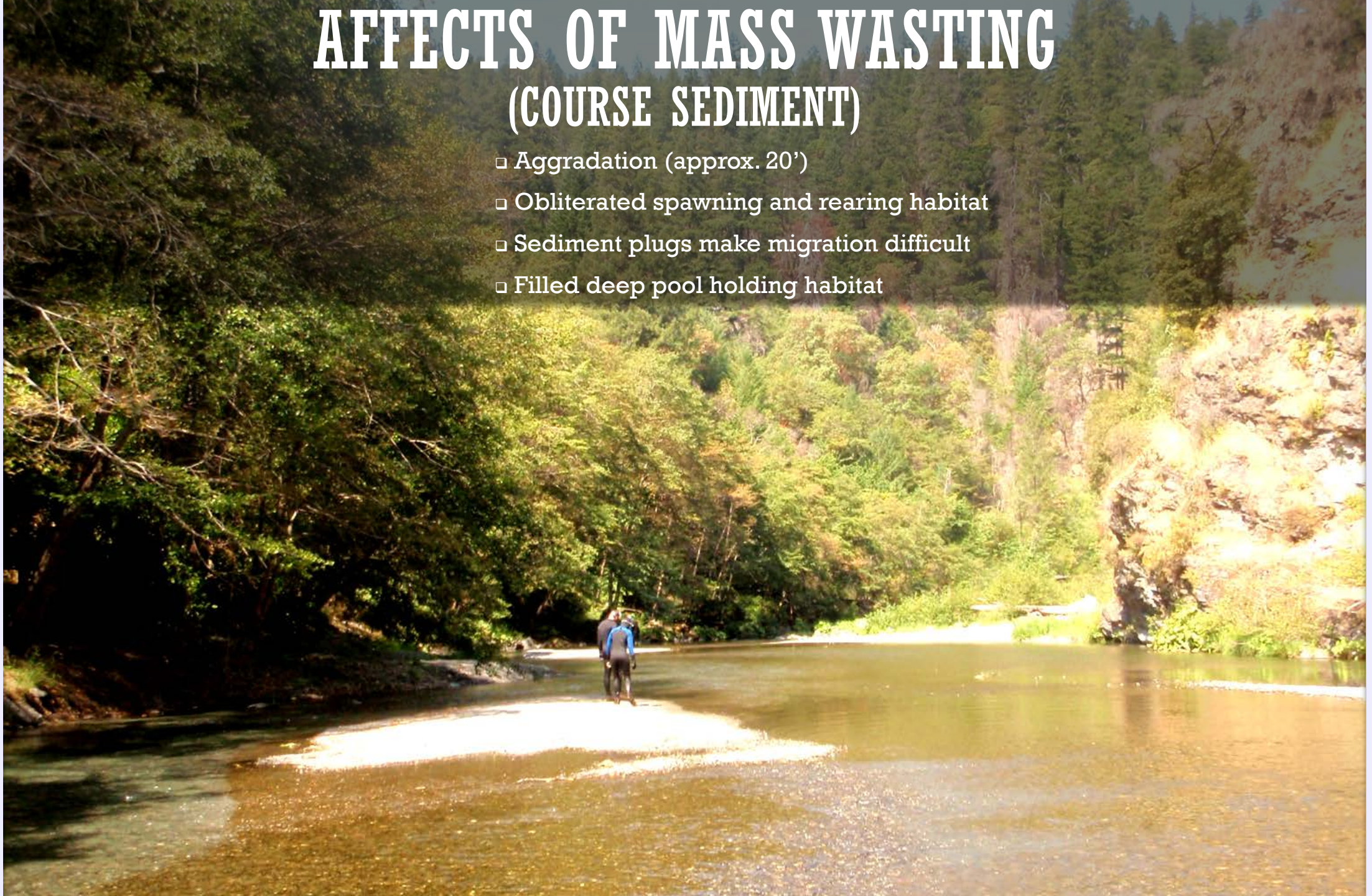


Photo: Big Slide 2003, Fitzgerald

AFFECTS OF MASS WASTING
(COURSE SEDIMENT)

- Aggradation (approx. 20’)
- Obliterated spawning and rearing habitat
- Sediment plugs make migration difficult
- Filled deep pool holding habitat



FINE SEDIMENT

- Turbidity can cause respiration & migration problems
- Fines smother eggs and alevin

*

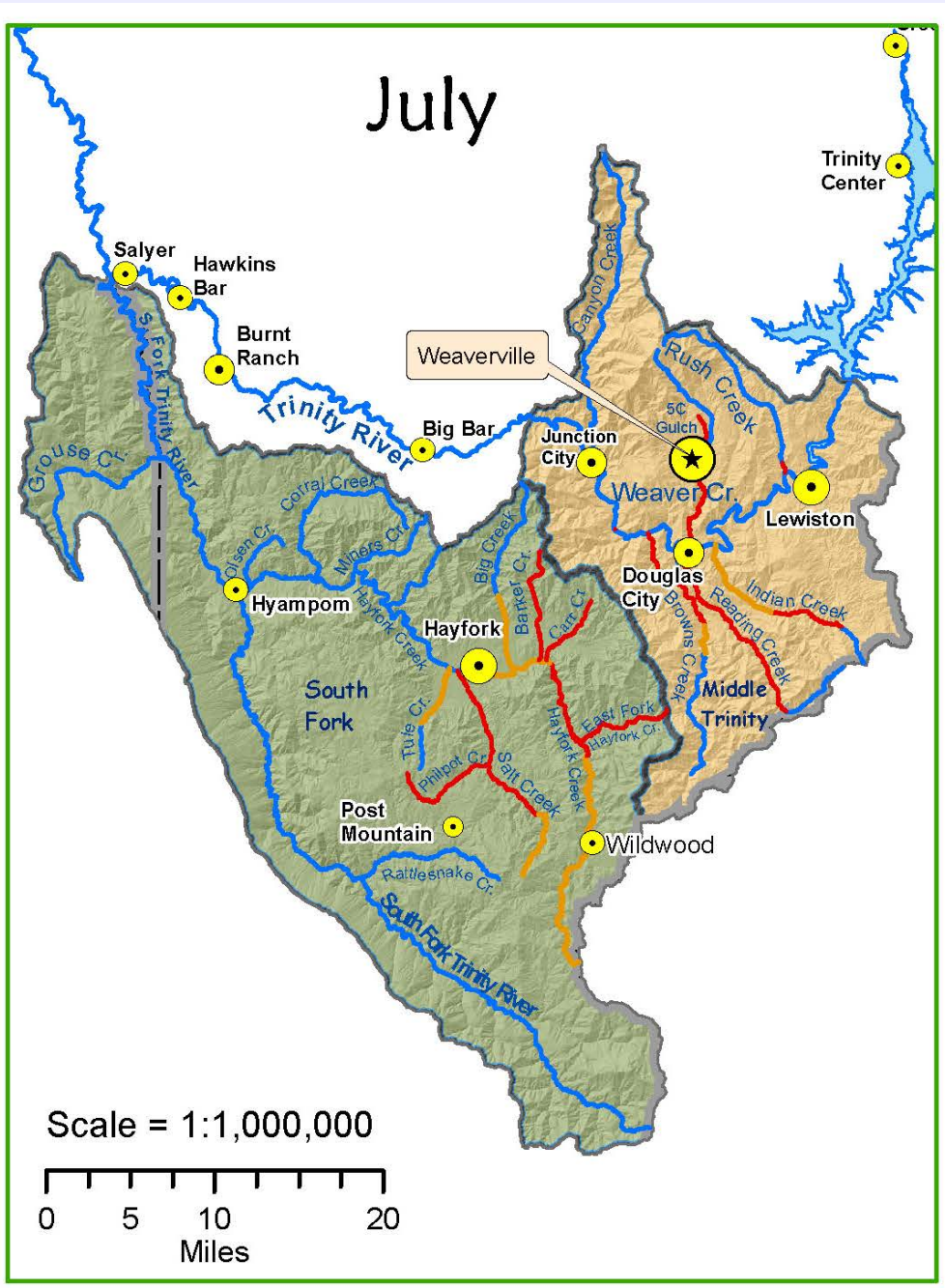
One bonus of all that sediment…

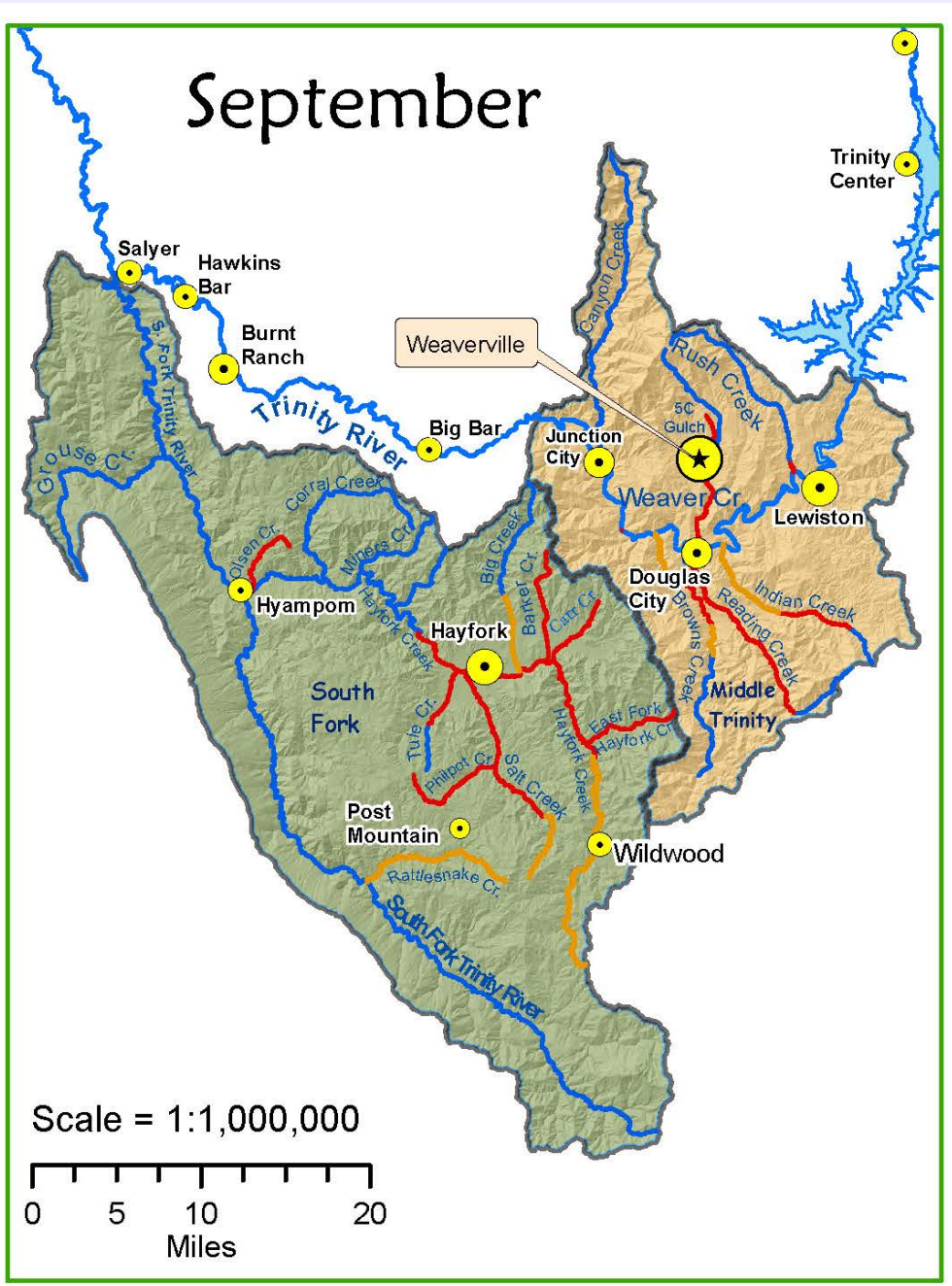
Photo: Calclini


INHERITED PROBLEMS OF THE PAST


POOR GRADING PRACTICES

WATER QUANTITY

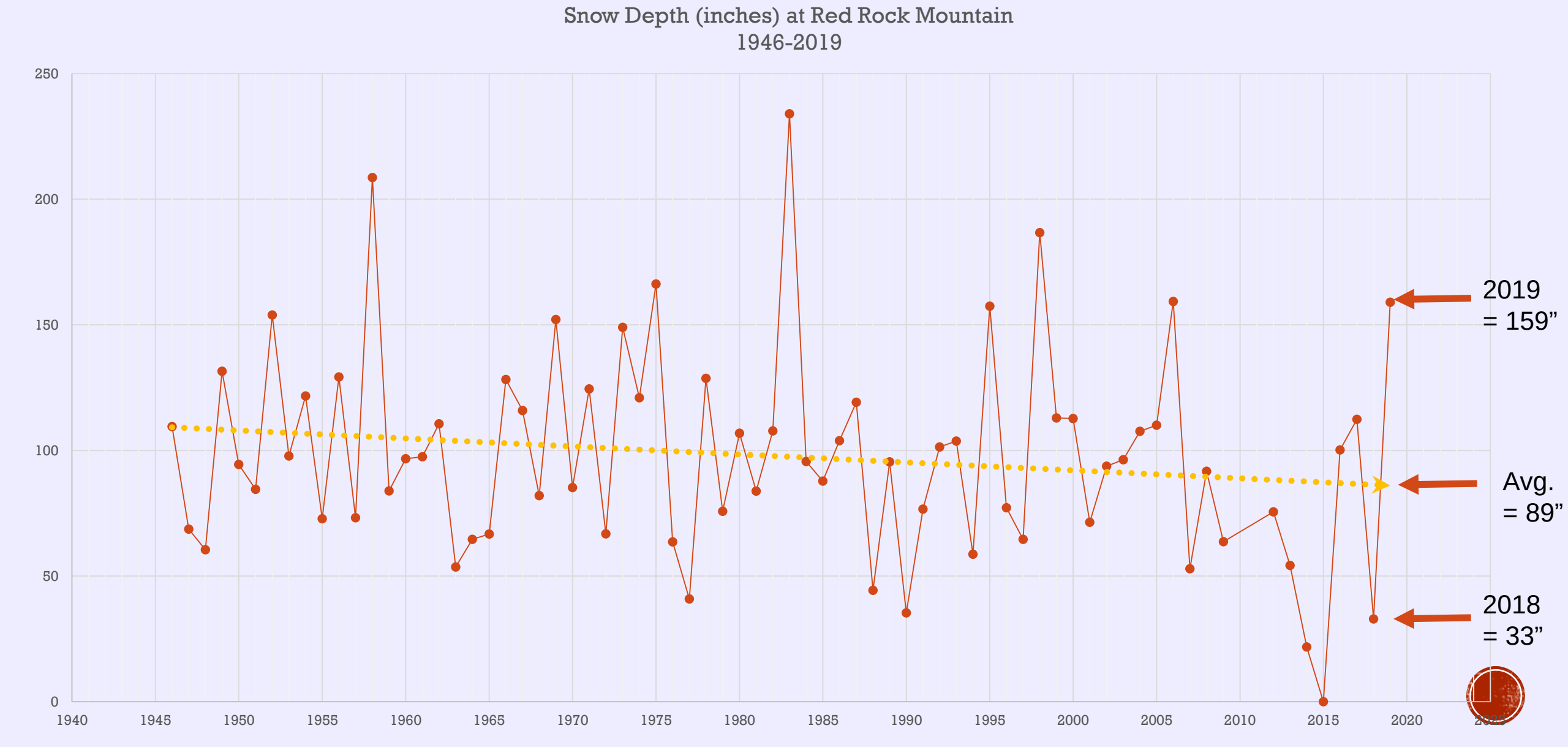


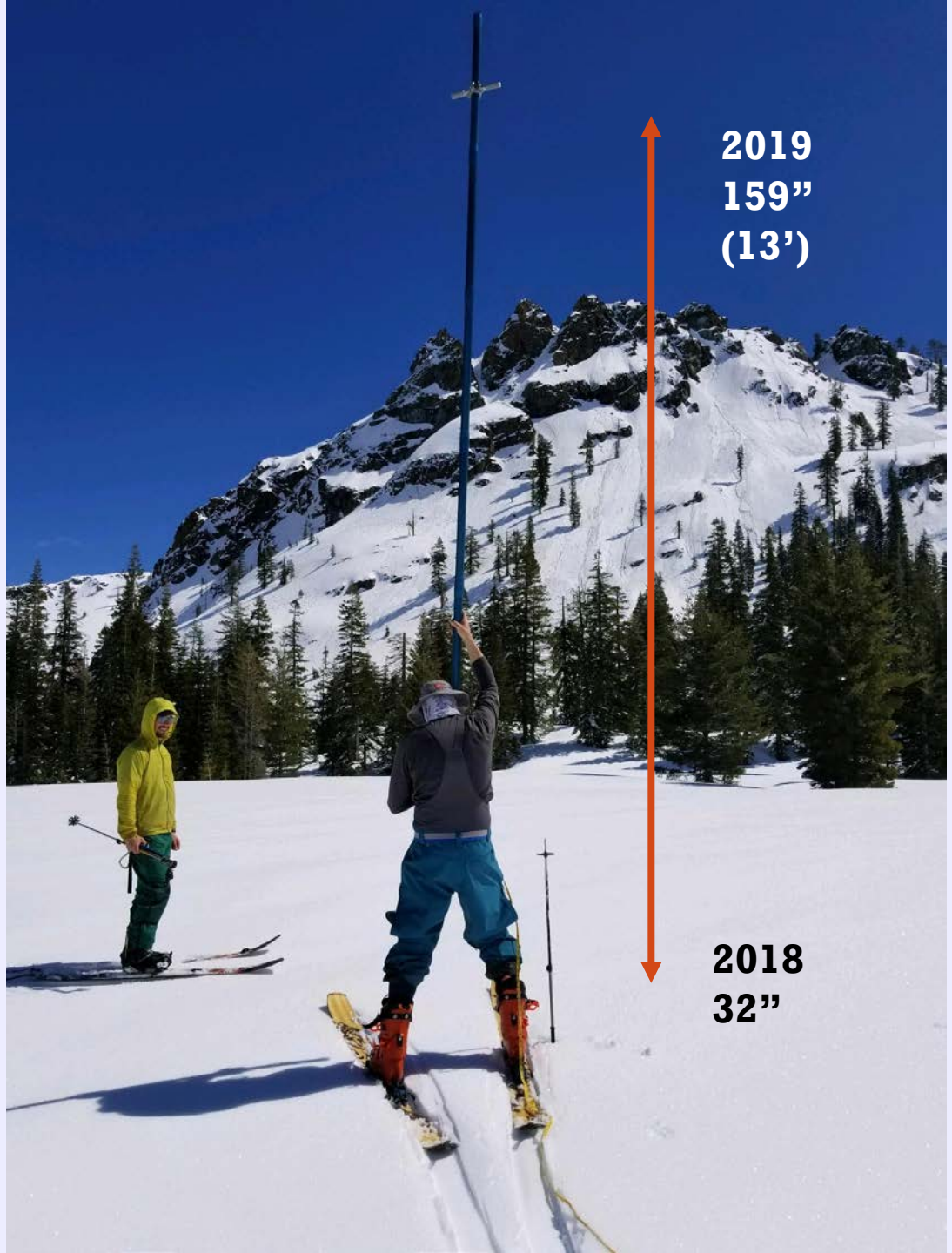


2014 Drought

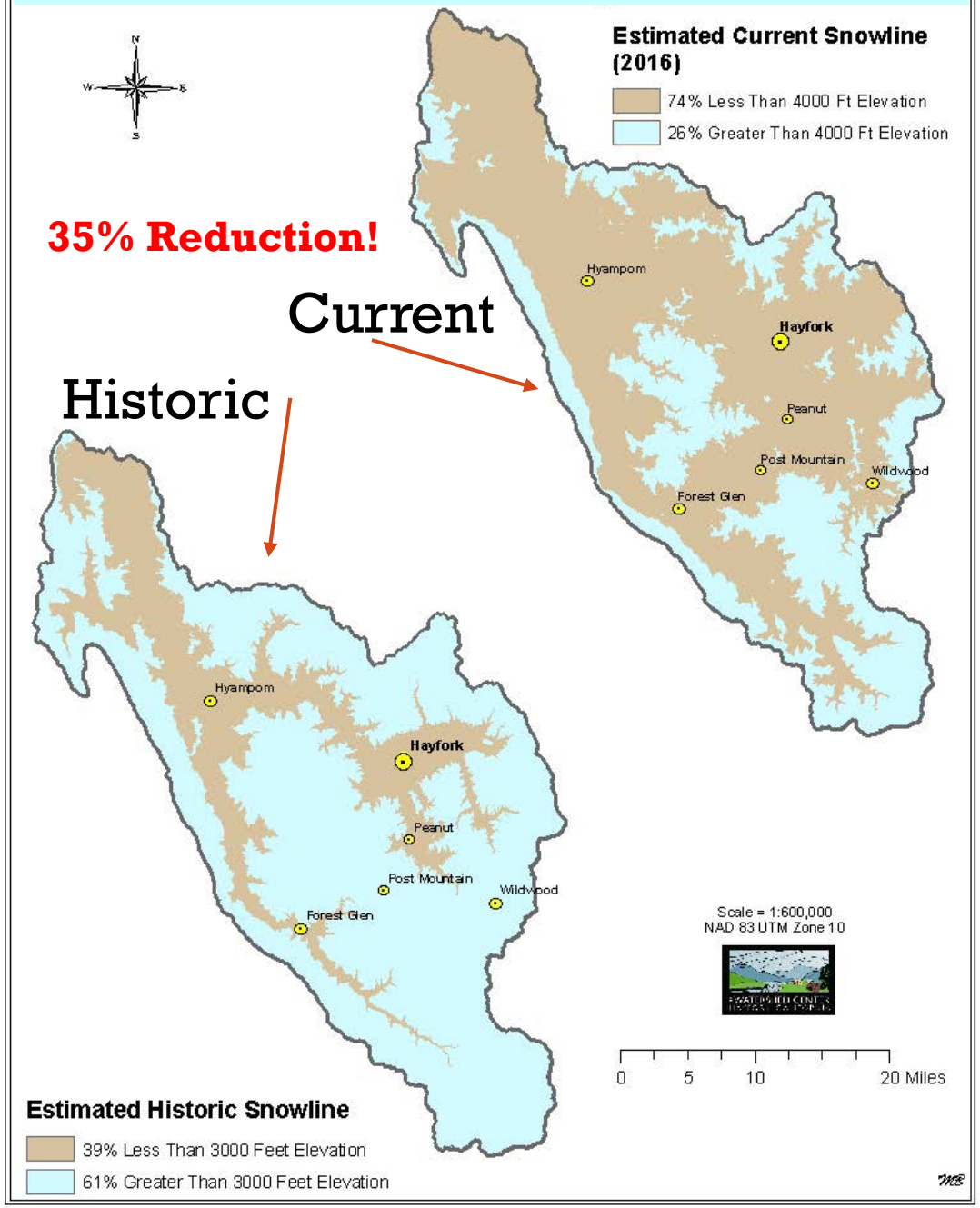
- Blue > 1 cfs
- Yellow < 1 cfs
- Red = dry / subsurface flow

CLIMATE IS KEY





Snowpack Changes (blue = snow)




The “Hay Fork” of the
Trinity River 2014

STREAM FLOW

- Fish need water and so do people.
- Lets try to keep our rivers flowing.
- Low flows = compounding problems

WATER QUALITY

Low stream-flows

High stream temps

Increasing concentrations of pollutants and nutrients

Increasing algae

Decreasing dissolved oxygen

Additional Nutrients

Bad for streams

Waste of money

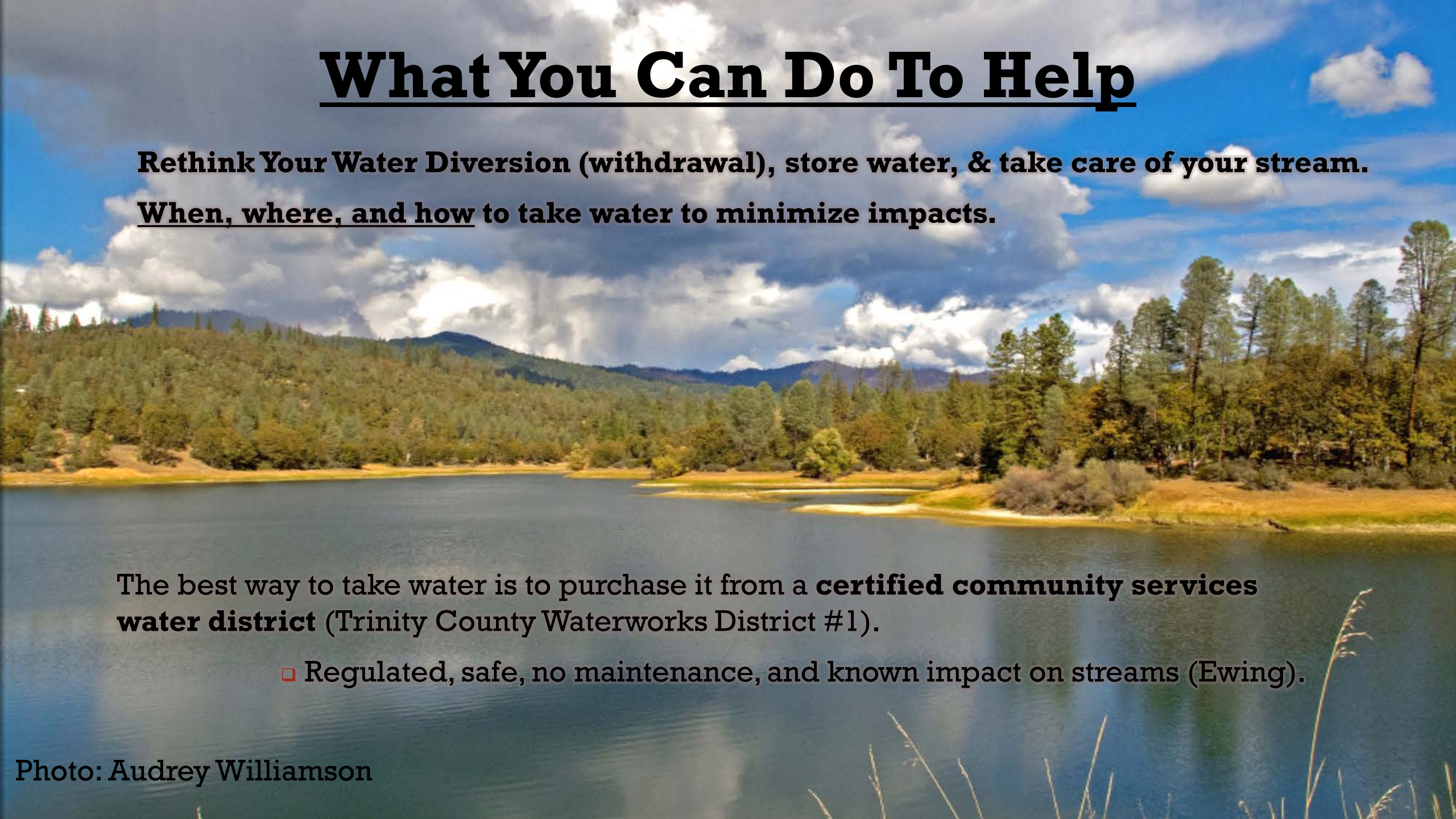
WORST CASE SCENARIO

- Pumping directly from stream with high powered pump during the heat of the day.
- Pumps can draw hundreds of gal/min. If multiple pumps running = fish kills.

What You Can Do To Help

Rethink Your Water Diversion (withdrawal), store water, & take care of your stream.

When, where, and how to take water to minimize impacts.



The best way to take water is to purchase it from a **certified community services water district** (Trinity County Waterworks District #1).

- Regulated, safe, no maintenance, and known impact on streams (Ewing).

Photo: Audrey Williamson

Keep in mind

If no CSD is available and pumping directly from a stream is necessary, here are some **things to keep in mind** about taking water directly from a stream:

- It is illegal to take water from streams without permits * ;

  * “riparian” diverters (“reasonable domestic use” & “statement of diversion”)

- Fines are $1,000 plus $500 per day.
- This includes everything from domestic pumps to water trucks.

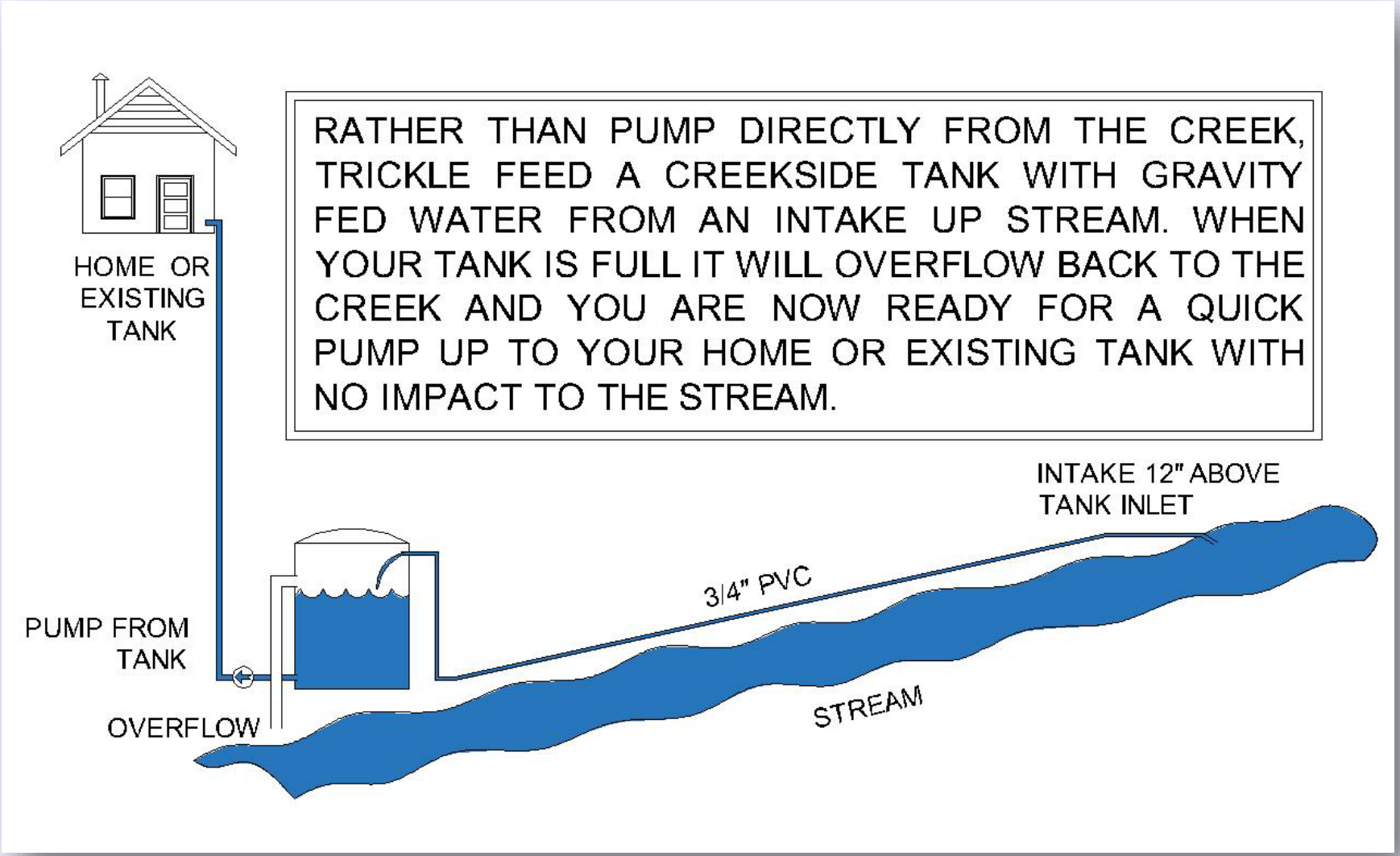
STORE WATER

- Forbearance ~ take water in the winter when its readily available, store it, and forego taking water from streams in summer when most sensitive.
- Do you have water tanks?
  - Need large water storage systems
  - Expands your options for water use
  - Reduce your impact on streams and aquatic life.

Browns Creek Pilot Project

Photo: Sanctuary Forest

“TRICKLE” LOW FLOW SYSTEMS



- Other low flow systems include: Solar pump and Ram pump systems. All require tanks/ponds but allow for the stream to slowly recharge.
- Low flow: 0.5 Gal/Min = 720 Gal/Day. Average daily water consumption is <500 gallons/day.

Rainwater Catchment

Requires LOTS of storage (50,000 gallons +), investment, planning, and attentiveness.

Photo: 5 Counties Program

IF YOU MUST PUMP THEN CONSIDER:

- Low flow systems.
- Pump screens.
- Timing, the best time of day to pump is early morning or late at night.
- Groundwater wells are better than pumps directly in streams because the impacts are buffered.

PUMP SCREENS

- If pumping is unavoidable, it is essential to use a screen to ensure no juvenile fish are taken. Standard mesh screen size: 2.38mm
  - Rattlesnake Cr. Chinook ex.

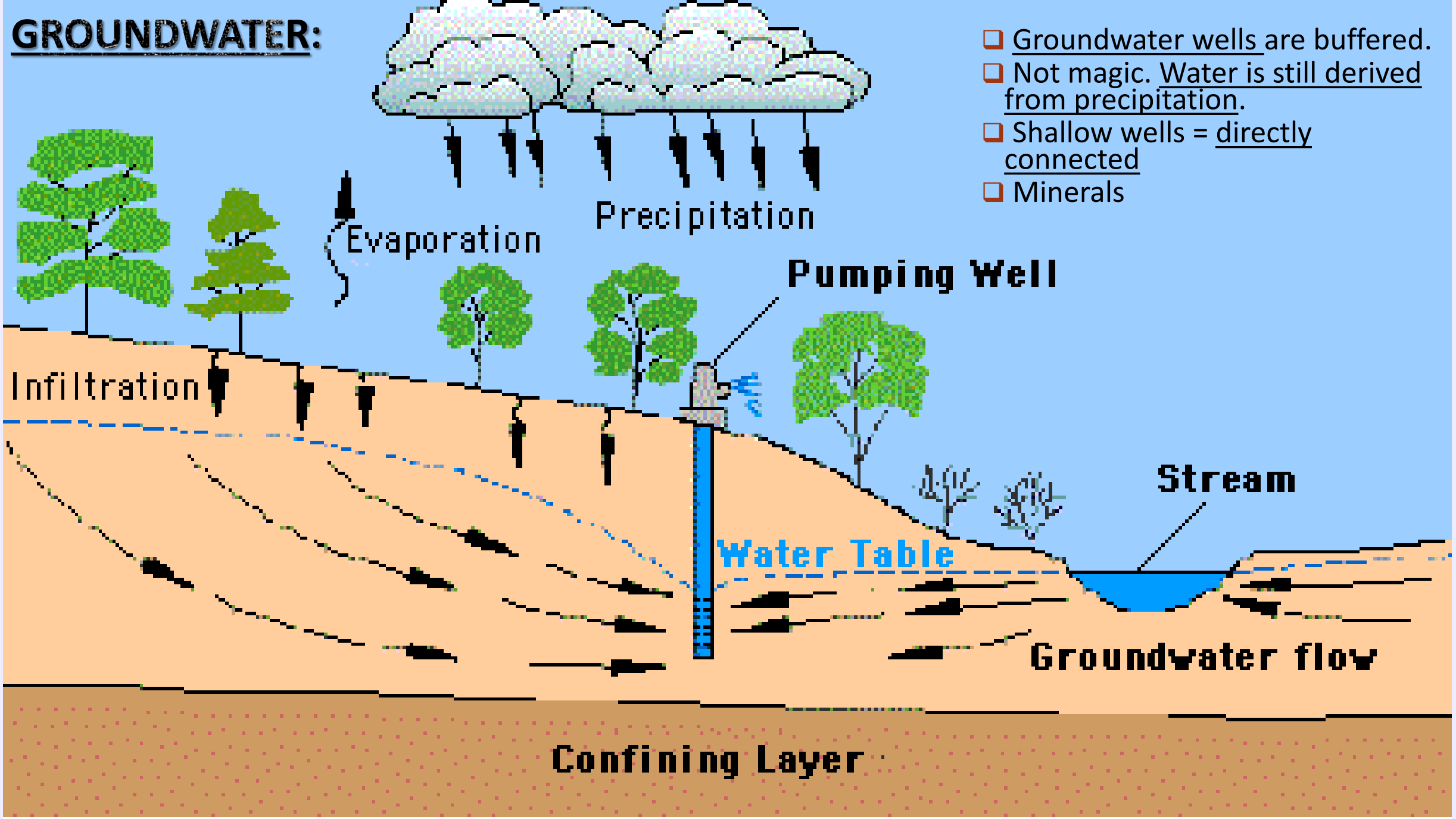
- California Department of Fish and Game. 2016. Fish Screening Criteria. http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp.

No.
Mesh too large.

Yes.

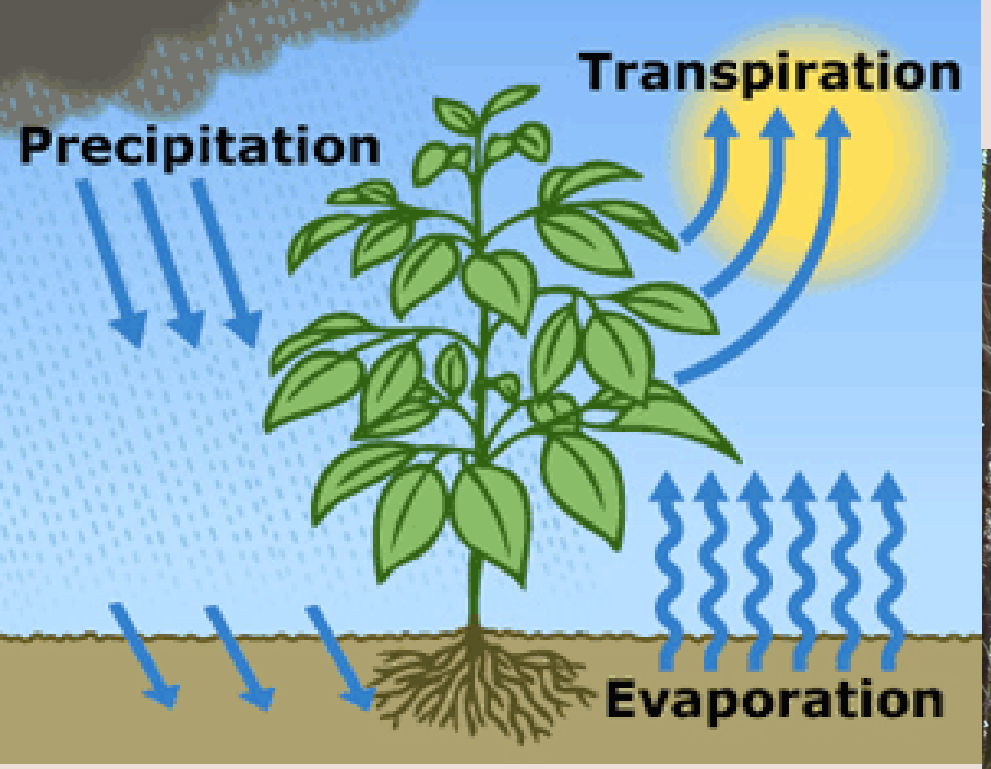
GROUNDWATER:

- Groundwater wells are buffered.
- Not magic. Water is still derived from precipitation.
- Shallow wells = directly connected
- Minerals



(Adapted from USGS)

Evapotranspiration



Evapotranspiration =
Evaporation + transpiration (plant water loss)

A single Douglas-fir tree can transpire up to 100 gallons of water from the soil per day.
http://kula.geol.wwu.edu/rjmitch/L10_evapotranspiration.pdf

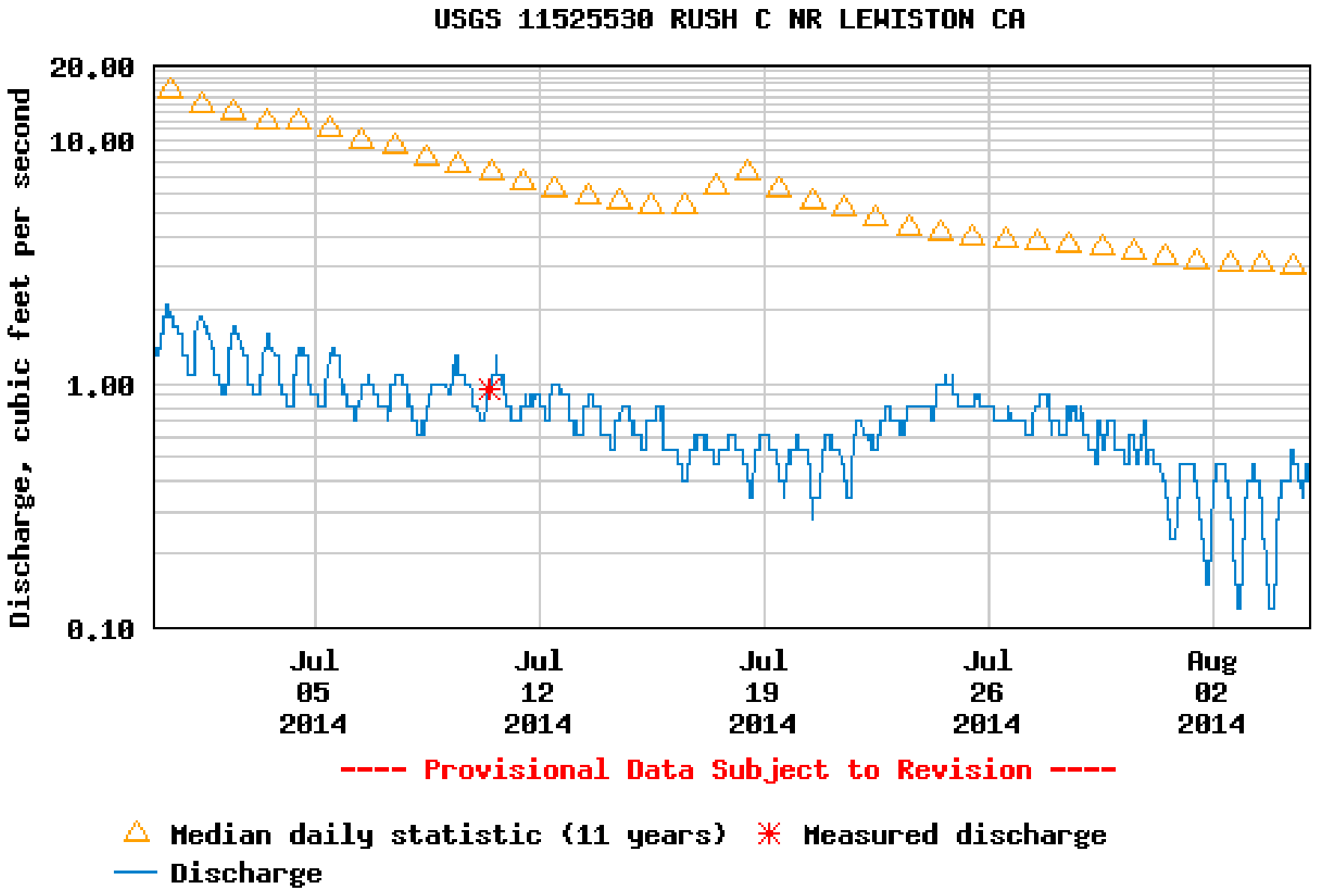
An acre of mature conifer forest can transpire up to a million gallons per growing season.

Fire exclusion has changed forest stand composition.

South Fork Trinity in 2015

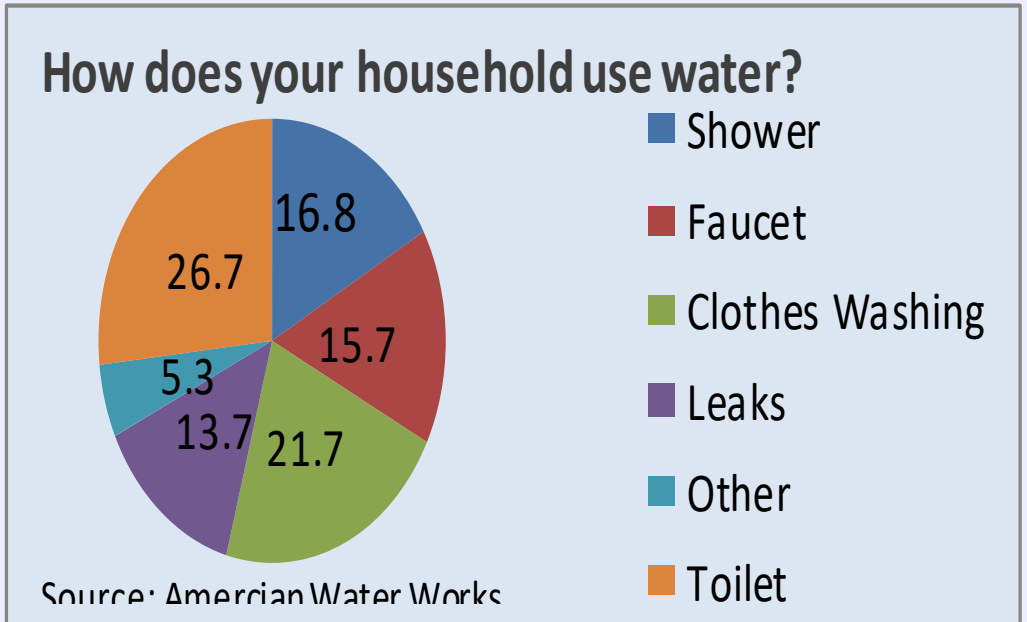
WHEN TO TAKE: DIURNAL FLUCTUATIONS

- Stream flow diminishes in the heat of the day, and recovers at night when trees stop transpiring.
- Max of 1cfs (450 gpm) fluctuation between day and night.
- **Use a tank.**
- **Set a timer for your pump.**



WATER CONSERVATION

- Repair leaks
- Use low flow devices: shower heads, faucets, toilets.
- Reclaim used water: greywater
- Irrigation:
  - Use drip irrigation
  - Set irrigation timers (morning instead of mid day) and adjust timing and application every few weeks.
  - Use compost: helps soil building and moisture retention.
  - Mulch! Cover any bare soil with 4" mulch.
  - Remove weeds, they use lots of water.
  - Use native plants



CONCLUSIONS

- We are asking folks to evaluate your footprint on this place.
  - People can choose to be anywhere, these animals and fish can only be here.
- This is a special place, not just a backwoods.
  - Population centers view as place to protect. Owls over loggers.
- We need industry and jobs. We need land stewards.
  - We can have agriculture with minimal impacts. We just need to keep some water in the streams and the pollutants out!
- Educate yourself!
- We don't have all of the answers, however we do have a lot of resources. Please feel free to contact us!
  - The Watershed Center: 628-4206
    - Josh Smith josh@thewatershedcenter.com
    - Cindy Buxton cbuxton@thewatershedcenter.com
  - The Trinity County Resource Conservation District 623-6004

THANK YOU!

QUESTIONS?

INDIAN VALLEY SUMMER CAMP

- Watershed and natural resources education
- Service learning activities
- Nor El Muk Native American Education
- Fun! - Rafting and more
- Nutrition
- Music
- Art

YOUTH CREW

- Stewardship Values
- Trail Maintenance
- Noxious Weed Removal
- Senior projects
- Work Experience

THANK YOU

QUESTIONS?

Josh Smith
The Watershed Center
628-4206

We don't have all the answers, but we do have resources.

Feel free to call.

SPOTLIGHT: RAINWATER CATCHMENT

Jacob Johnson

Flowerdaze Farm

Road Maintenance

Trinity County Resource Conservation District

Amelia Fleitz

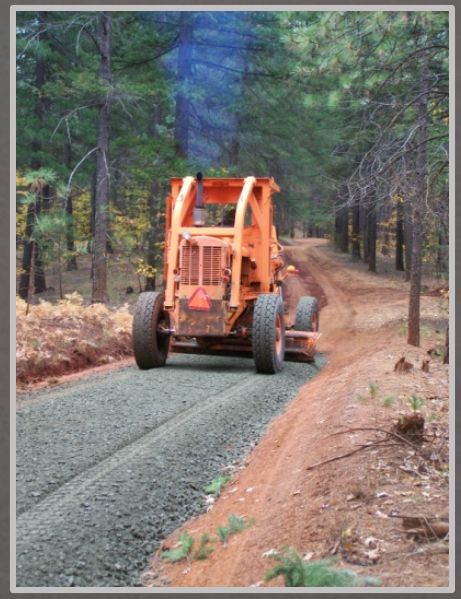
530-623-6004 x 4

afleitz@tcrcd.net

CALIFORNIA ASSOCIATION OF RESOURCE CONSERVATION DISTRICTS

This event was coordinated by the Trinity County Resource Conservation District and funded by the California Association of Resource Conservation Districts.

Disclaimer



- We are not engineers or licensed equipment operators.
- Most of our road upgrade work has been on secondary unsurfaced USFS or private roads
- We have not been involved directly with culvert replacement where design for fish passage was required.
- No bridge experience

Why do we need to maintain private roads?

- Access
- Prevent fines

Why pick on roads?

Roads are the single biggest contributor of "controllable" sediment delivery to watercourses causing degraded water quality and fish habitat.

Photo by Pacific Watershed Associates

The Bigger Picture

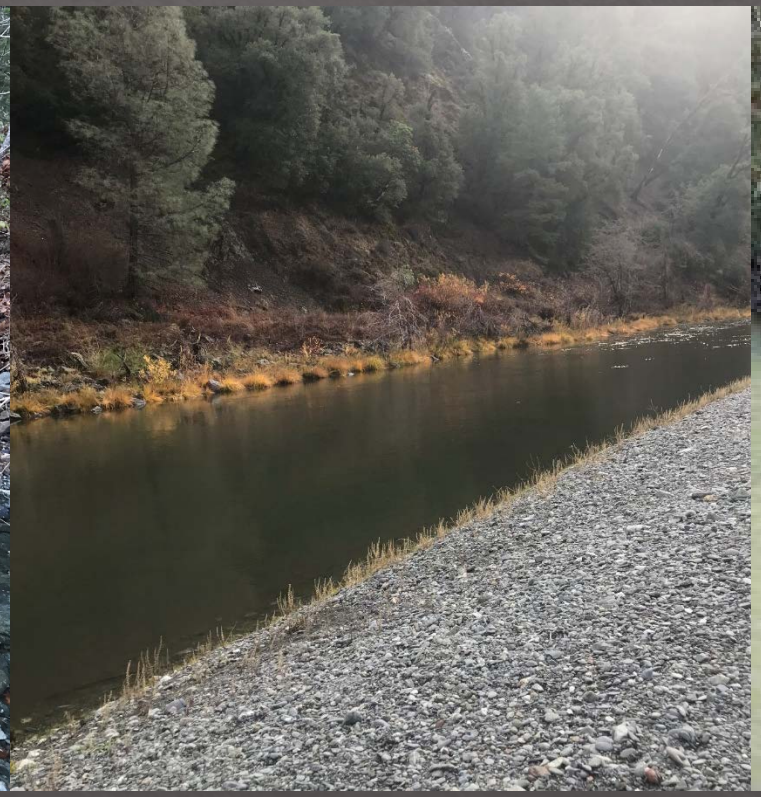


Photo by Herb from Trinity Fly Shop (2015)

What is the goal of road maintenance?

Get water off your roads as fast as possible.

Here are some basic treatments used to reduce the roads influence on sediment delivery.

- Develop slope of the road surface to shed water
- Add rolling dips to dissipate speed of water and direct water off of the road surface
- Maintain and improve culverts at stream crossings

Road Surface Sloping

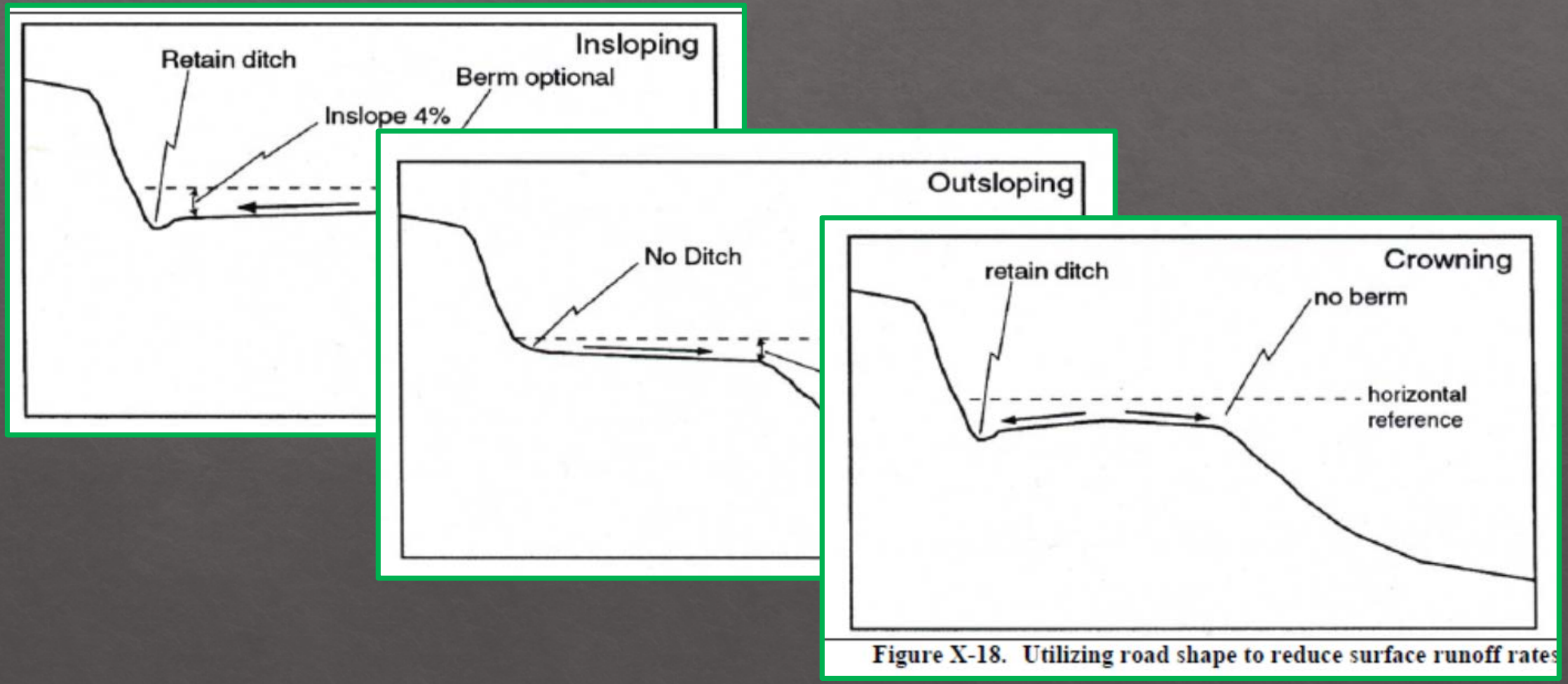
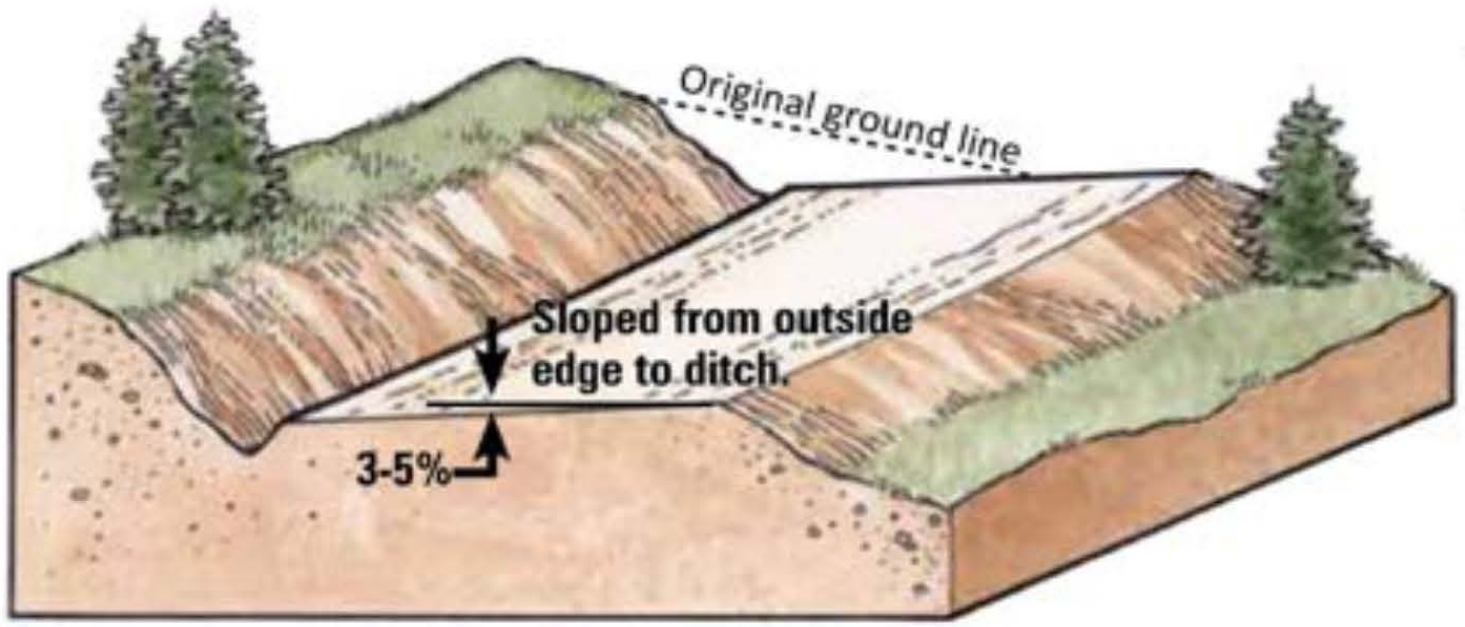


Figure X-18. Utilizing road shape to reduce surface runoff rates

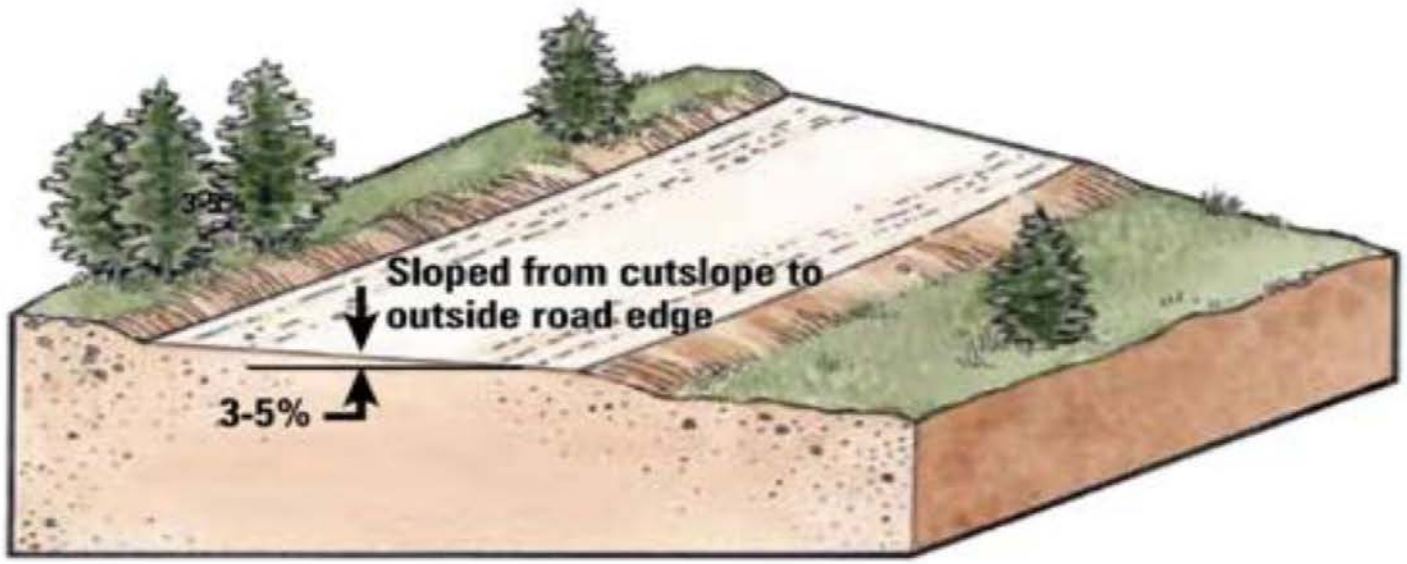
Road Surface Sloping



Insloped roads are used:

- where road grades are moderate to steep (≥8-12%)
- where road grades are moderate or steep and slippery (muddy, snowy or icy)
- where cutbanks are wet and ditches are used
- where ditches can be maintained
- where fillslopes are unstable or highly erodible

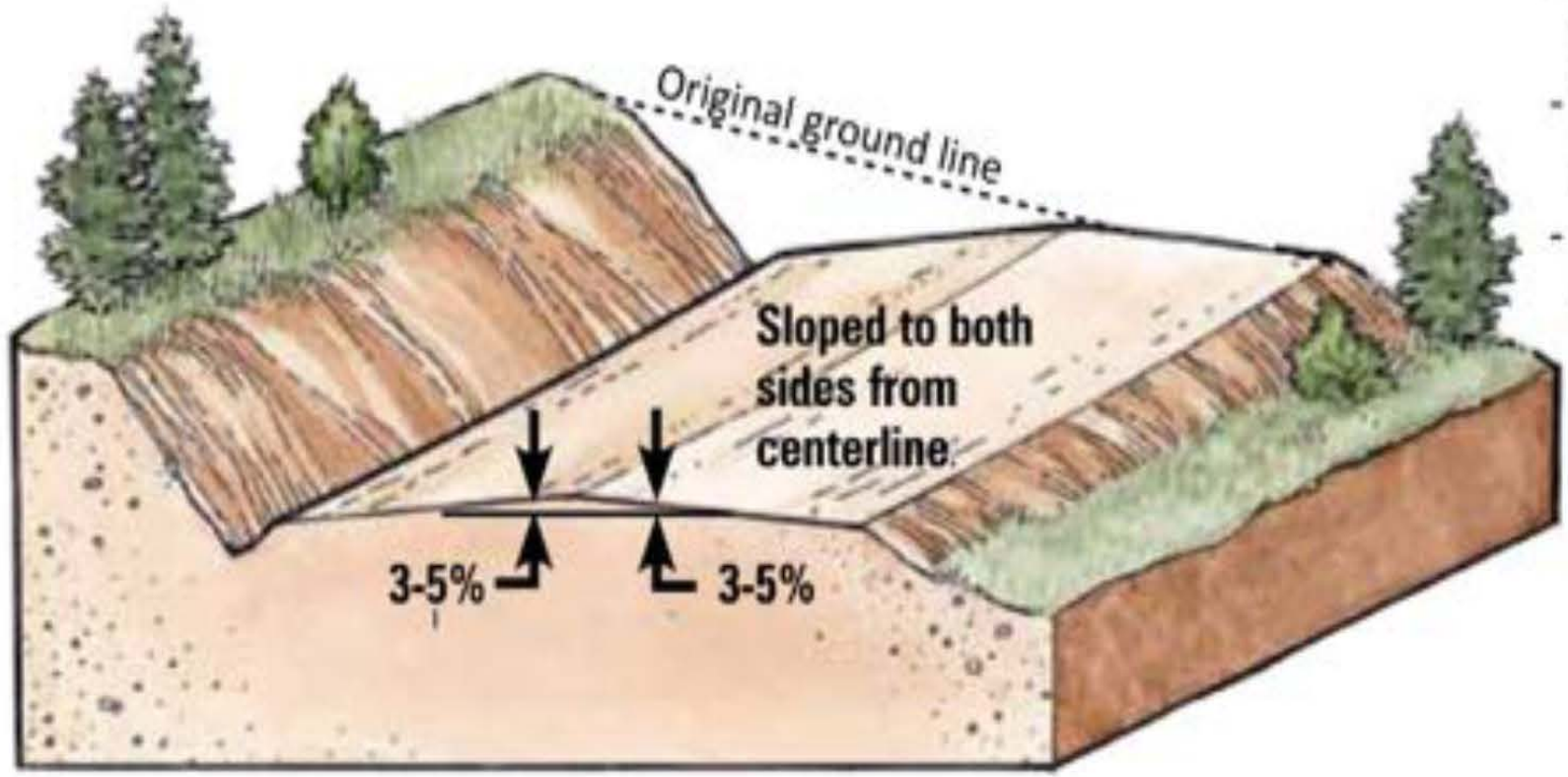
Road Surface Sloping



Outsloped roads are used:
- where road grades are gentle or moderate (≤8-12%)
- to minimize construction costs
- where cutslopes are dry
- with an inside ditch, where cutbanks are wet
- where road surface drainage is to be dispersed
- always in concert with rolling dips

Pacific Watershed Associates

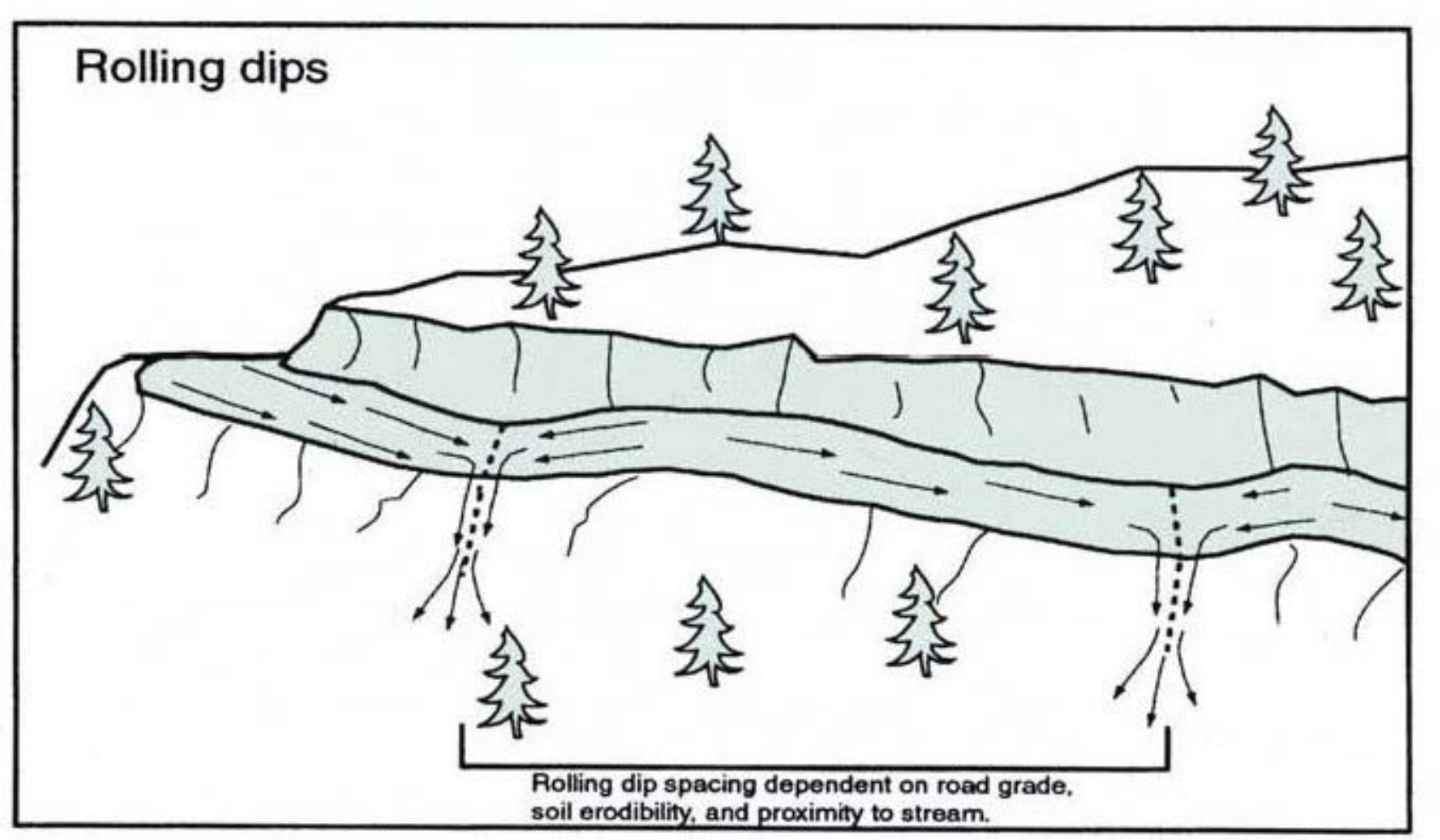
Road Surface Sloping



Crowned roads are used:

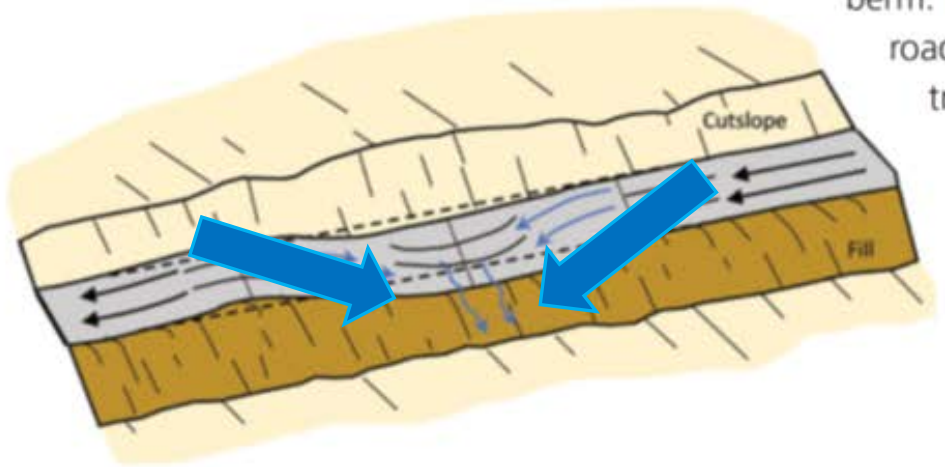
- where road grades are gentle or moderate (≤8-12%)
- where ditches are maintained and can be drained frequently
- where roads are wide and two way traffic is common
  - where commercial or high traffic use is common
- where slippery or icy conditions are common

Pacific Watershed Associates



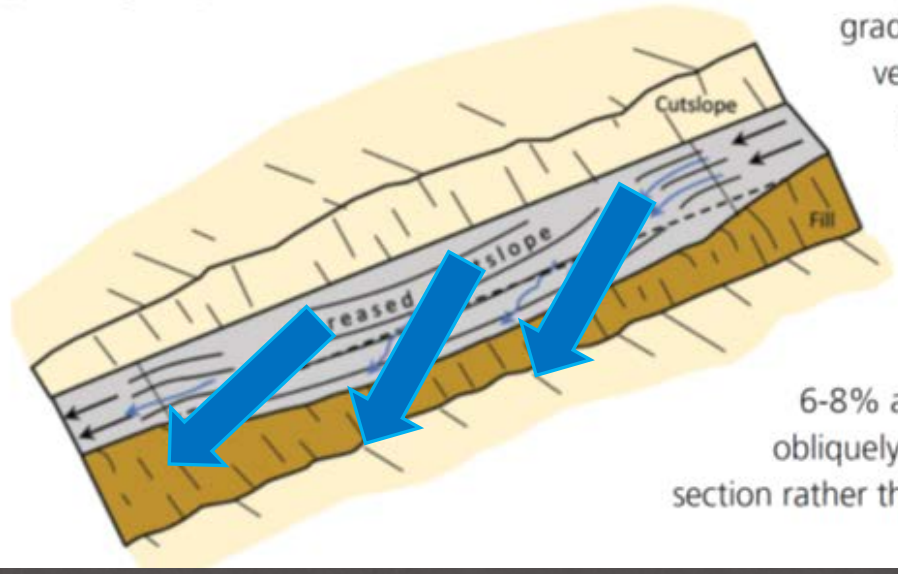
Use topography to your advantage when planning for Rolling Dip installation

Type 1 Rolling Dip (Standard)



Type 1 rolling dips are used where road grades are less than about 12-14% and road runoff is not confined by a large through cut or berm. The axis of the dip should be perpendicular to the road alignment and sloped at 3-4% across the road tread. Steep roads will have longer and more abrupt dip dimensions to develop reverse grade through the dip axis. The road tread and/or the dip outlet can be rocked to protect against erosion, if needed.

Type 3 Rolling Dip (Steep road grade)



Type 3 rolling dips are utilized where road grades are steeper than about 12% and it is not feasible to develop a reverse grade that will also allow passage of the design vehicle (steep road grades require more abrupt grade reversals that some vehicles may not be able to traverse without bottoming out).

Instead of relying on the dip's grade reversal to turn runoff off the roadbed, the road is built with an exaggerated outslope of 6-8% across the dip axis. Road runoff is deflected obliquely across the dip axis and is shed off the outsloped section rather than continuing down the steep road grade.

FIGURE 224A. *Ditched, gullied, deeply rutted, and bermed seasonal road before being converted to an outsloped road with rolling dips.*

FIGURE 224B. *The same road after being converted to an outsloped road with rolling dips to improve road drainage and decrease maintenance requirements and costs. The road was also gravel surfaced so it could be used during wet weather periods.*

In most cases between 20-60 yards of material will be re-arranged during construction of a common rolling dip

Before – Pacific Watershed Associates

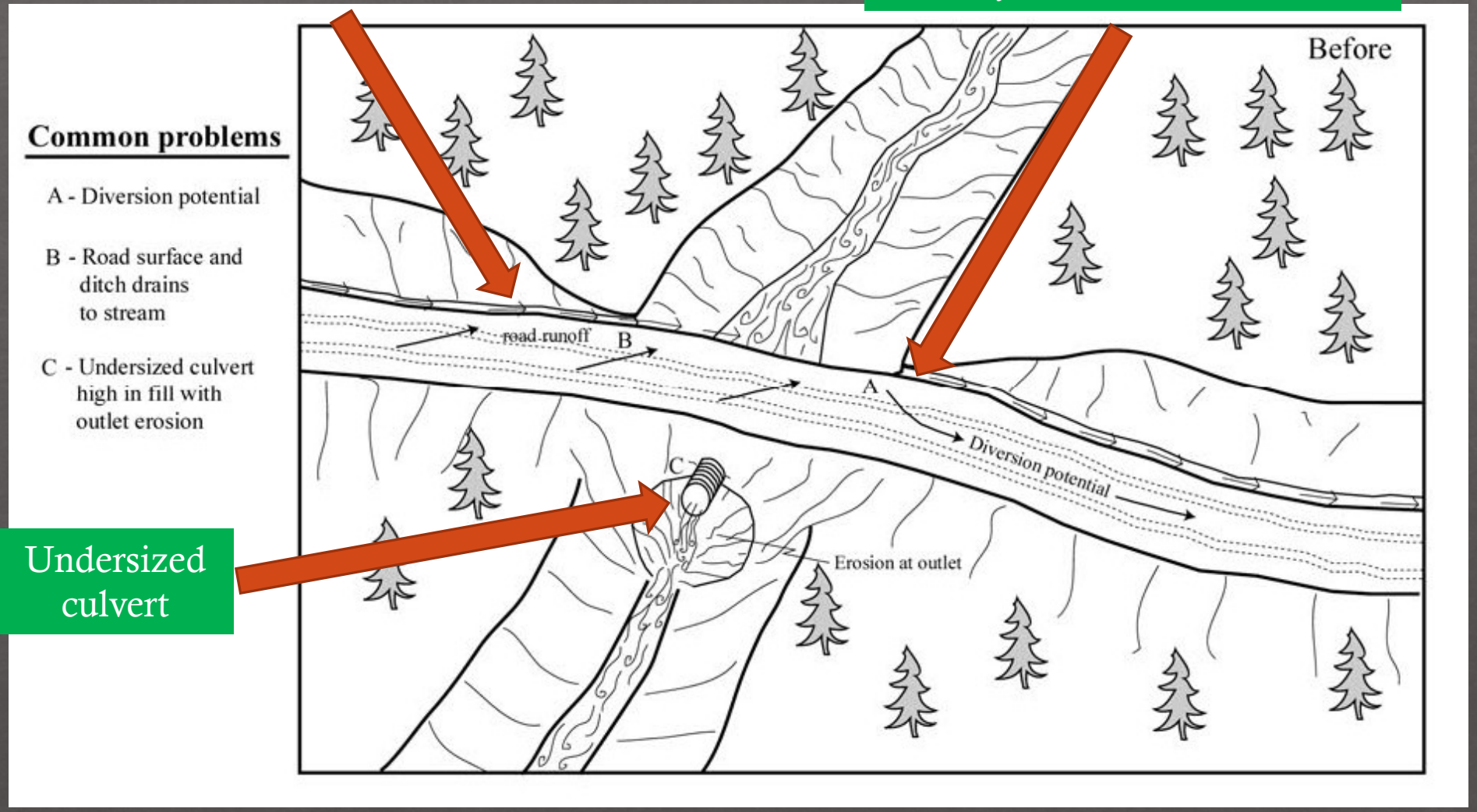
After - Pacific Watershed Associates

Stream Crossings

Prevention

Ditch and road surface drains into stream crossing

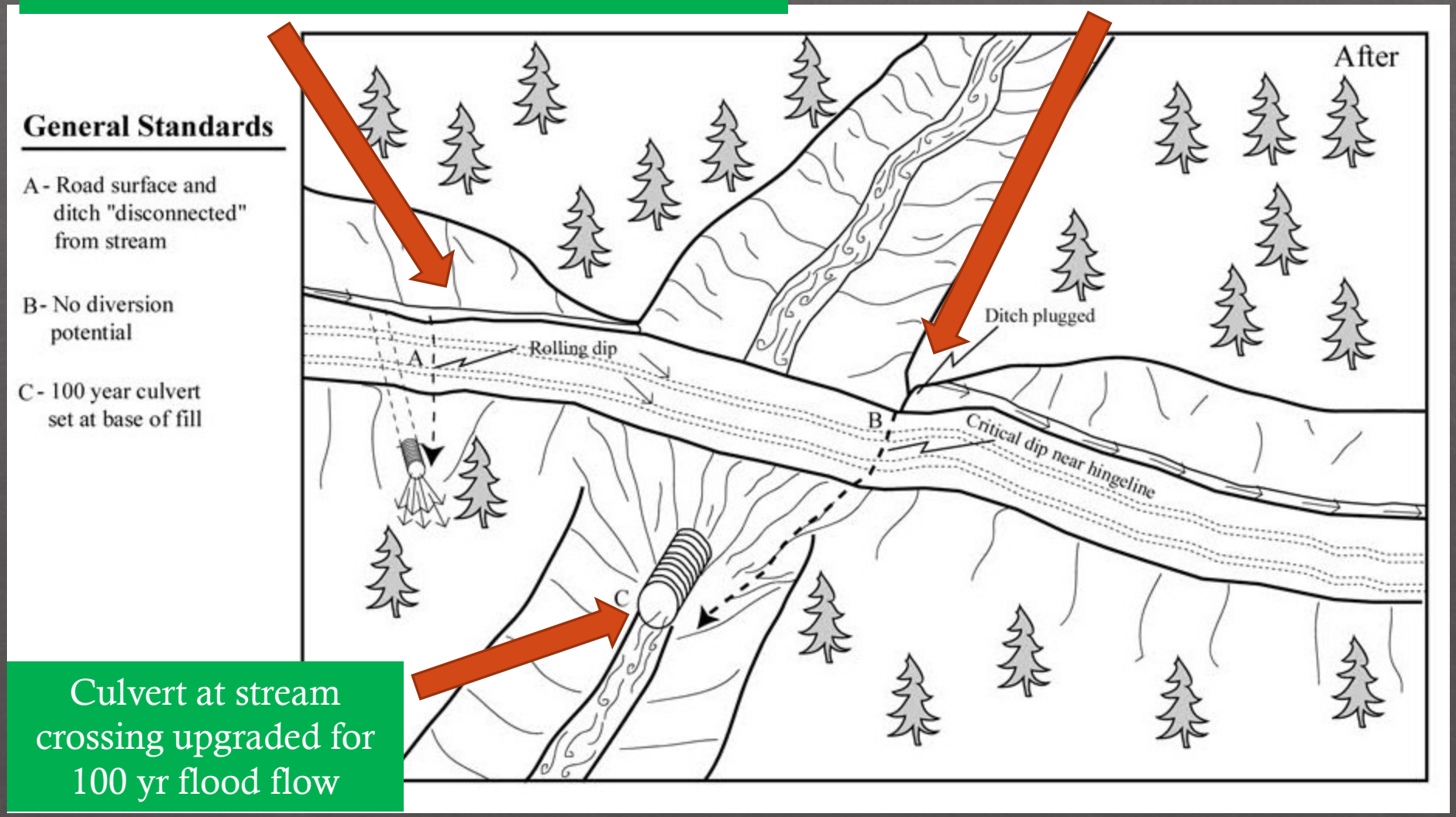
If culvert was to plug for any reason, stream would divert away from natural course



Undersized culvert

Road surface drainage corrected by full outslope (elim.of ditch), construction of rolling dips, installation of ditch relief culvert or combination of treatments

Diversion potential eliminated with Critical Dip



Culvert at stream crossing upgraded for 100 yr flood flow

Critical Dips

- an armored rolling dip at the downstream hingeline of a stream crossing
- constructed to keep creek from diverting due to plugging and overtopping road fill

BEFORE

AFTER


Critical Dip at hinge

Point of Diversion at stream crossing. After repair of roadway a critical dip was constructed here

BEFORE

AFTER

Don’t Try This at Home

BEFORE

DURING

AFTER

Final Product

Before

After

Slide courtesy The Watershed Research and Training Center

What is the goal of road maintenance?

Get water off your roads as fast as possible.

What can you do?

- On you way home pay attention to your road. Are there steps you can take to prepare for winter?
  - Check your culverts

- Having runoff issues – talk to someone that can help.

Questions or Comments?

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Trinity County Grading Ordinance

DAVID COLBECK

dcolbeck@trinitycounty.org

530-623-1365 x 3409

ORDINANCE NO. 1347

AN ORDINANCE OF THE BOARD OF SUPERVISORS OF THE COUNTY OF TRINITY RESTRICTING MASS GRADING

Findings and Declarations

The Board of Supervisors of the County of Trinity, State of California, hereby finds and declares as follows:

1. **WHEREAS**, the State Planning and Zoning Law (Cal. Gov' t Code Sections 65000, et seq.) broadly empowers the County to plan for and regulate the use of land in order to provide for orderly development, the public health safety and welfare, and a balancing of property rights and the desires of the community, and
2. **WHEREAS**, grading is defined as any excavation or filling or combination thereof, and
3. **WHEREAS**, mass grading is defined as grading over a large volume or over a large area, and
4. **WHEREAS**, unregulated grading has the potential to endanger structures intended for human or animal occupancy, threaten the stability of any public road, or obstruct watercourses and drainage conduits, and
5. **WHEREAS**, The County of Trinity has not adopted rules and regulations specifically applicable to grading, and the lack of such controls may lead to increased sedimentation and the inability to regulate grading in a manner that will protect the general public, homes and businesses adjacent to and near such grading activities, and
6. **WHEREAS**, Trinity County's geographic and climatic conditions, low population density, availability of resource lands previously utilized for forestry and grazing, and history and reputation as a Cannabis producing region have attracted a steady influx of individuals for the purpose of participating in Cannabis activity, whether for medicinal

trol Board ("SWRCB"), the North Coast
California Department
of Fish and Wildlife (
tion sites, corresponding
of sediments, pesticides,
result from the widespread
development,

Available at: https://www.trinitycounty.org/Transportation

Trinity County Code Section 15.24 shall be created to read:

SECTION I. Grading Restrictions

1. Prohibition on grading activities

This Ordinance is adopted pursuant to California Constitution, Article XI, Section 7, and Government Code Section 25123.

This ordinance is necessary for the preservation of the public peace, health, safety and environmental protection by balancing the needs of individual landowners and their renters, leasees and representatives with the needs of the community to be protected from public safety and nuisance issues associated with mass grading.

The use of equipment to mass grade, excavate or fill native or nonnative material, soil, rock or combination thereof is prohibited.

2. Restrictions Applicability:

The restrictions prohibit all grading activities in the unincorporated area of Trinity County, including underground excavations associated with human occupancy, agricultural grading activities that convert undisturbed vegetation to agricultural cropland and activities that modify previously cleared land unless the proposed activities are exempt from this requirement pursuant to Section I.4. These grading restrictions apply to all individual parcels and any activity that:

A. Affects, contains, involves or consists of a volume of graded material greater than 800 cubic yards, whether contiguous or noncontiguous; and/or

B. The total contiguous or noncontiguous surface area to be graded is greater than 20,000 square feet.

3. Fees:

Normal Use Permit planning fees shall apply in addition to associated direct costs accrued by the County for staff time related to plan review, site inspection, administration and coordination.

Thank you!

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RESOURCE
CONSERVATION DISTRICTS

REFERENCES

- California Salmonid Stream Habitat Restoration Manual – Chapter X – Upslope Assessment and Restoration Practices by California Dept of Fish and Game https://www.wildlife.ca.gov/Grants/FRGP/Guidance

- A Water Quality and Stream Habitat Protection Manual for County Road Maintenance in NW California – 5 Counties Salmon Conservation Program

- Pacific Watershed Associates – Forest, Ranch and Rural Roads Handbook http://www.pacificwatershed.com/PWA-publications-library

- The Watershed Research and Training Center – Barker Valley Road work presentation.

- Pacific Watershed Associates - Leroy – Transitioning from a Grower to a Farmer Presentation

Sustainable Agriculture Public Workshops:

Winterization

Matthew Johnson
Trinity County Fairgrounds
20 November 2019

Down River Consulting

Introduction

- Why Winterize?
- What is Winterization?
- How do we achieve Winterization?
- Where should Winterization be implemented?
- When should Winterization be complete?
- Who should perform the Winterization?

Winterization

- Why should we Winterize our sites?

  - Keep the site in compliance with the General Order.
    - The General Order provides a Waiver of Waste Discharge Requirements.
    - 12 Best Practicable Treatment or Control (BPTC) requirement categories related to water diversion and waste discharge.
    - Do not want to lose this waiver.
    - $$$

<u>BPTC Categories</u>

- Riparian and Wetland Protection and Management
- Water Diversion, Storage, and Use
- Irrigation Runoff
- Land Development and Maintenance, Erosion Control
- Soil Disposal
- Stream Crossing Installation and Maintenance
- Fertilizer and Soil Use and Storage
- Pesticide and Herbicide Application and Storage
- Petroleum and Other Chemical Use and Storage
- Cultivation Related Waste Disposal
- Refuse and Human Waste Disposal
- Winterization

General Citation: (SWRCB 2019)

Winterization

- Why should we Winterize our sites?

  - To protect our waterways and local ecosystems.

    - Individuals practicing good land stewardship will collectively lower the impacts of development.

    - Winterization provides a means to prevent erosion and subsequent sediment transport.

    - Sediment is a surrogate for pollutants.

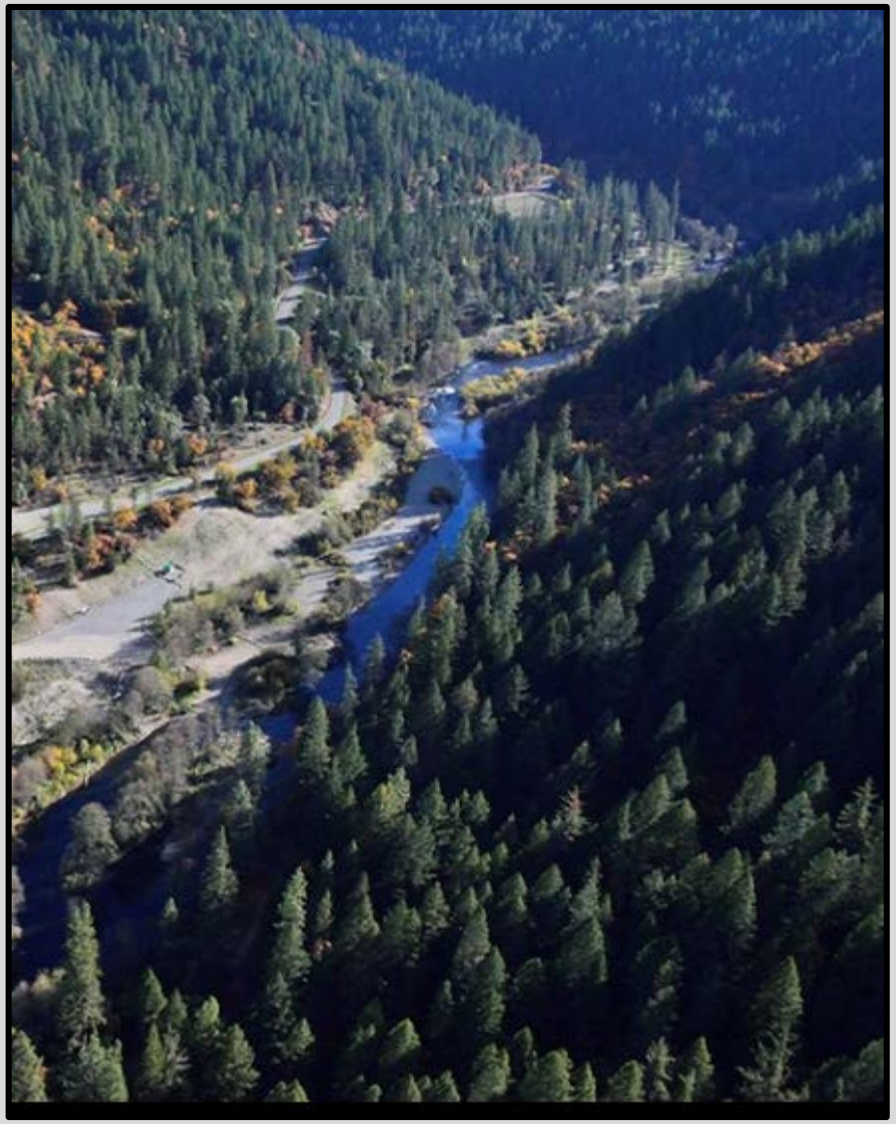

Figure 1- An Image of the Wild and Scenic Trinity River (Wick N.d.).

Winterization

- Why should we Winterize our sites?
  - To save money.
    - Not Winterizing your site can result in costly damage to infrastructure.
    - Not Winterizing your site can result in remediation requirements and plans.
    - Not Winterizing your site can result in violations and penalties from agencies.

Figure 2- An Image of a Non-Compliant Culvert (Manthorne N.d.).

Winterization

- What is Winterization ?

<u>General Order Requirements</u>

- Seasonal Road Closures
- Spoils and Soils Management
- Equipment Operation and Construction
- Erosion Control
- Culvert Maintenance

<u>Other Considerations</u>

- Irrigation Systems
- Other Road Considerations
- Housekeeping
- Nitrogen Cycles and Cover Crops

Figure 3- A Properly Constructed Stream Crossing on a Seasonal Road (Weaver et. al 2005).

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- General Order Requirement
- Seasonal Road Closures
    - **№** 127: Required to block or close seasonal/temporary access roads by the onset of the winter period.

Figure 4- An Example of a Waterbar and Ditch Relief Culvert used in Concert (Weaver et. al 2005).

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- General Order Requirement
  - Spoils and Soils Management
    - **№** 126: Must abide by Spoils and Soils Management requirements in the General Order.
    - Spoils and Soils Management: **№** 57 through **№** 62
    - Compliance before onset of the winter period

Figure 5- The Trinity River in June 2017 (Johnson 2017).

General Citation: (SWRCB 2019)

Winterization

- Spoils and Soils Management

№ 57: Storing materials outside of riparian setbacks, stable slopes

№ 58: Separation of soils from other organic materials

№ 59: Methods of storage (e.g. tarps and wattles)

№ 60: Long term storage and contouring to natural lay of the land. Slope failure prevention.

№ 61: Long term storage, seeding, mulching, erosion control fabrics if slope > 2:1

№ 62: Hauling and disposal

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- General Order requirement
  - Equipment Operation and Construction

№ 128
- No heavy equipment use during the winter period.
- Special exceptions:
  - Explicit Water Board approval

№ 132
- Loose construction materials should be covered and berms used as necessary
- Watch weather forecasts

Figure 6- An Image of Instream Work in progress (Weaver et. al 2015).

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- General Order Requirement
  - Erosion Control

№ 126: Must abide by Erosion Control requirements in the General order. Compliance before the onset of the winter period.

№ 129: Sheet flow control

№ 131: Managing land disturbance

№ 133: Application of control measures

General Citation: (SWRCB 2019)

General Citation: (SWRCB 2019)

Winterization

- **№** 126: Erosion Control

  № 8: Selection of appropriate erosion control measures, weed-free straw mulch application (two tons per acre)

  № 9: Planting noxious weeds, stabilizing surfaces with native plant species

Figure 7- Typical Fiber Roll Installation (Caltrans 2017).

Figure 8- Typical Gravel Bag Installation (Caltrans 2017).

General Citation: (SWRCB 2019)

Winterization

- **№** 126: Erosion Control

№ 10: Integrate erosion and sediment control into general operations

- Applying control measures within 7 days of land disturbance (interim methods)
- Required in any instance heavy equipment is used
- Implement long term measures as soon as possible
  - Road drainage
  - Culvert sizing
  - Long term stabilization
- Monitoring features
  - Early identification
  - Confirming performance

Figure 9- A Rolling Dip Installed on a Rural Access Road (Weaver et. al 2015).

General Citation: (SWRCB 2019)

Winterization

- **№** 126: Erosion Control

  № 11: Geotextile dictation, wildlife protection from ensnarement

  № 12: Slope inspections, 30% or greater monitoring requirements, stability indicators

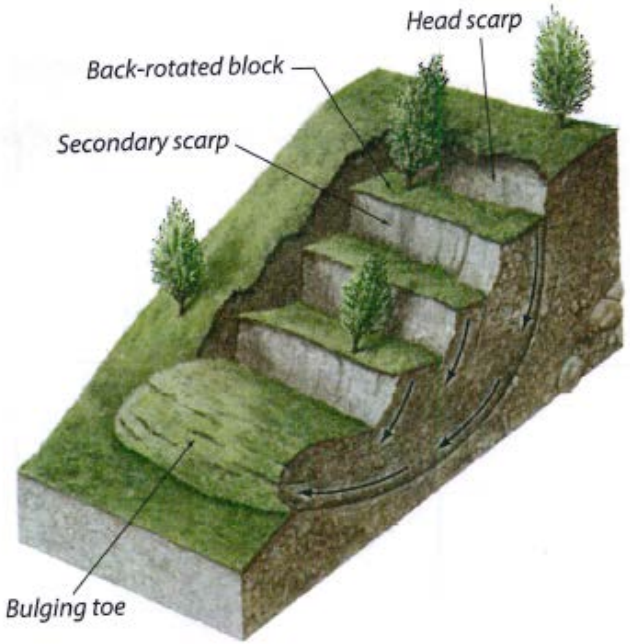

Figure 10- A Cartoon of an Example of Hillslope Failure (Biermann and Montgomery 2014).

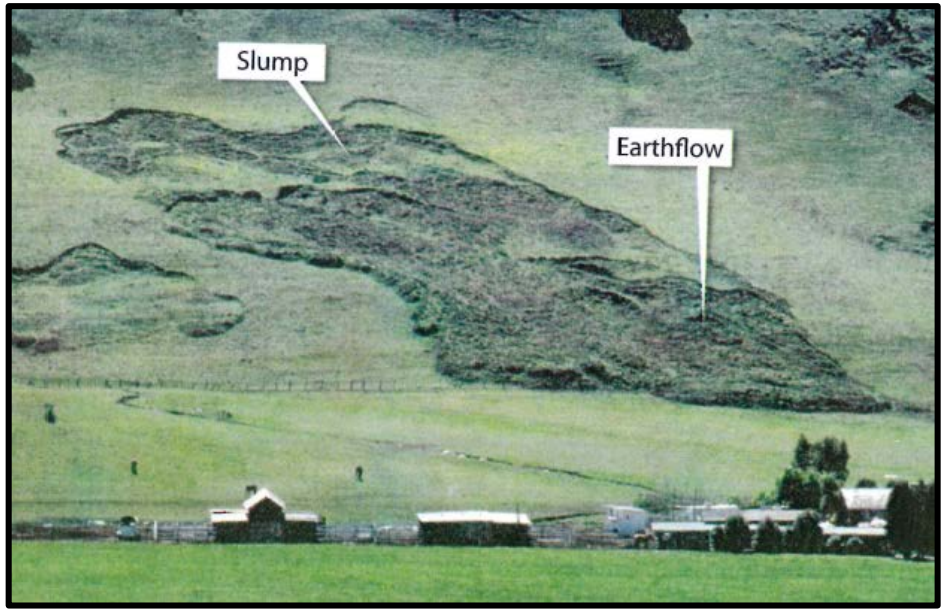

Figure 11- A Photo of Hillslope Failure (Biermann and Montgomery 2014).

Winterization

- **№** 126: Erosion Control

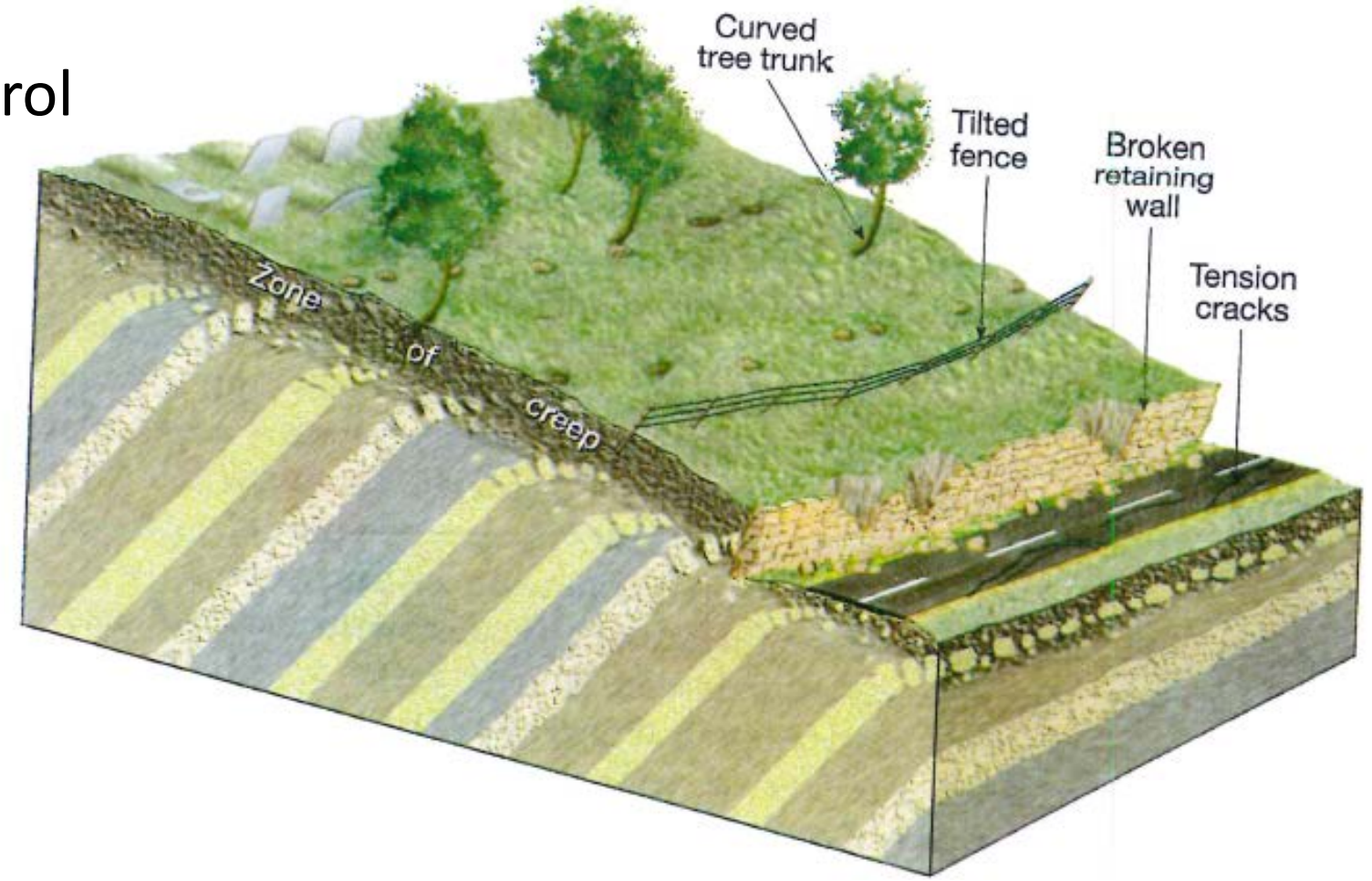

Figure 12- A Diagram Showing Typical Soil Creep (Tarbuck and Lutgens 2008).

General Citation: (SWRCB 2019)

Winterization

- **№** 126: Erosion Control

  № 13: Favoring native vegetation over rock placement, retaining wall requirements.

  № 14: Monitoring requirements for erosion control features, 0.5 inches in a single day or 1.0 inches in seven days.

Figure 13- Rip Rap Placement for Slope Stability (Weaver et. Al 2015).

Figure 14- A Culvert with Velocity Dissipaters In Place (Caltrans 2017).

General Citation: (SWRCB 2019)

Winterization

- **№** 129: Sheet flow control
  - Application of “linear sediment controls”
  - Disruption of sheet flow, no concentration of runoff

Figure 15- A Ditch with Fiber Roll Check Dams (Caltrans 2017).

Table 1- Limitations on Sheet Flow Length as Dictated be the General Order.

Slope as Percent	Sheet Flow Length in Feet
0-25	20
25-50	15
>50	10

Winterization

- **№** 131: Management of Land Disturbance
  - Stabilization of all disturbed surfaces
  - Stabilization of construction ingress/egress areas
  - Prevention of erosion and subsequent sediment transport

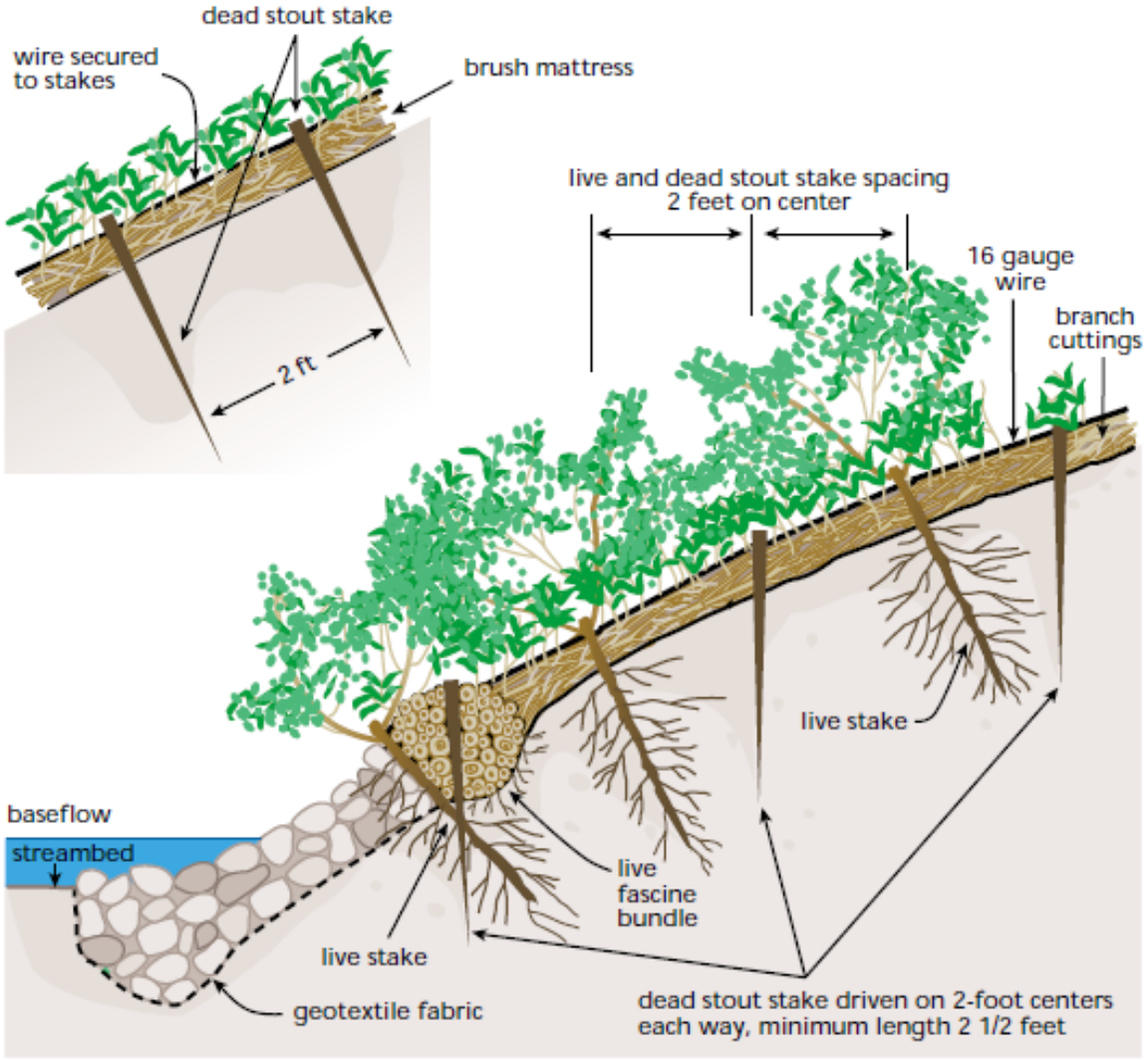

Figure 16- A Typical Streambank Stabilization Diagram (USDA 2001).

General Citation: (SWRCB 2019)

Winterization

- **№** 133: Applying Control Measures
  - Application of control measures on all bare surfaces
  - Repair measures as needed
  - Preemptive measures to protect waters of the state

Figure 17- An Example of Hydroseeding (Caltrans 2017).

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- General Order Requirement
  - Culvert Maintenance

№ 130

- Clear features of debris
- Inspect outlets for erosion
- Inspect prior to onset of winter/fall rains
- Inspect following events producing 0.5 inches in day or 1.0 inches in seven days

Figure 18- An Example of the Potential Results of Neglecting Culverts (Weaver et. al 2015).

General Citation: (SWRCB 2019)

Winterization

- How do we achieve Winterization?
- Other Considerations
  - Irrigation Systems
    - Purge irrigation systems to prevent line bursts
      - A leak of one “drip’ per second results in a net annual loss of 3,153 gallons (MCRCD 2018).
    - Protect sensitive equipment such as meters
      - Check operational ranges
    - Save money and reduce carbon footprint
    - Different for surface water diverters

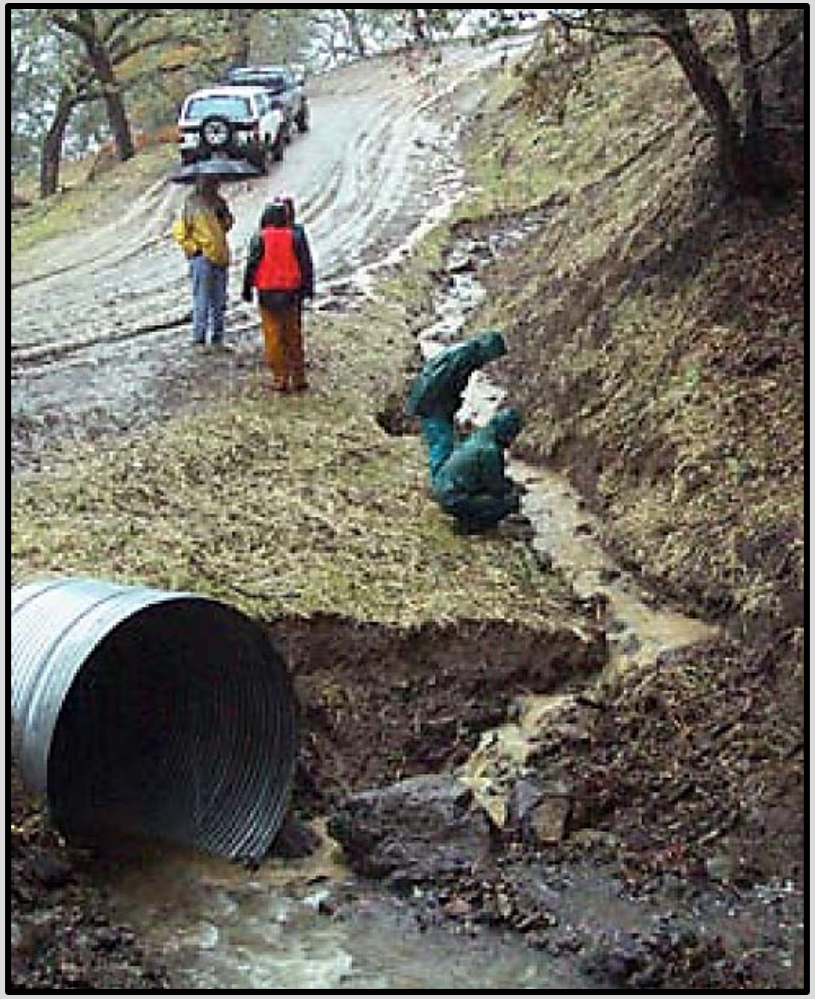

Figure 19- A Hydrologically Connected Road and Stream Channel (Weaver et. al 2015).

Winterization

- How do we achieve Winterization?
- Other Considerations
  - Thoughts on Roads
    - Land Disturbance and Access Roads
      - Maintaining roads in accordance with the PWA Handbook for Forest, Ranch & Rural Roads.

Figure 20- Rills Forming on a Natively Surfaced Road (Weaver et. Al 2015).

General Citation: (SWRCB 2019)

Winterization

- Other Road Considerations
  - Drainage management
    - Ditch Relief Culverts
    - In-sloping and out-sloping
    - Inboard ditches
    - Rolling dips
    - Waterbars
    - Road rock

Figure 21- An Example of a Beautiful Road (Weaver et. al 2015).

General Citation: (SWRCB 2019)

Winterization

- Other Road Considerations
  - Seasonal vs. Year-Round Roads
  - Waterbars vs. Rolling Dips

FIGURE 40. *Waterbars are constructed on unsurfaced forest and ranch roads that will have little or no traffic during the wet season. The waterbar should be extended to the cutbank to intercept all ditch flow (1) and extend beyond the shoulder of the road. A berm (2) must block and prevent ditch flow from continuing down the road during flood flows. The excavated waterbar (3) should be constructed to be self-cleaning, typically with a 30° skew to the road alignment with the excavated material bermed on the downhill grade of the road (4). Water should always be discharged onto the downhill side on a stable slope protected by vegetation. Rock (shown in the figure) should not be necessary if waterbars are spaced close enough to prevent serious erosion. (5) The cross ditch depth (6) and width (7) must allow vehicle cross-over without destroying the function of the drain. Several alternate types of waterbars are possible, including one that drains only the road surface (not the ditch), and one that drains the road surface into the inside ditch (BCMF, 1991).*

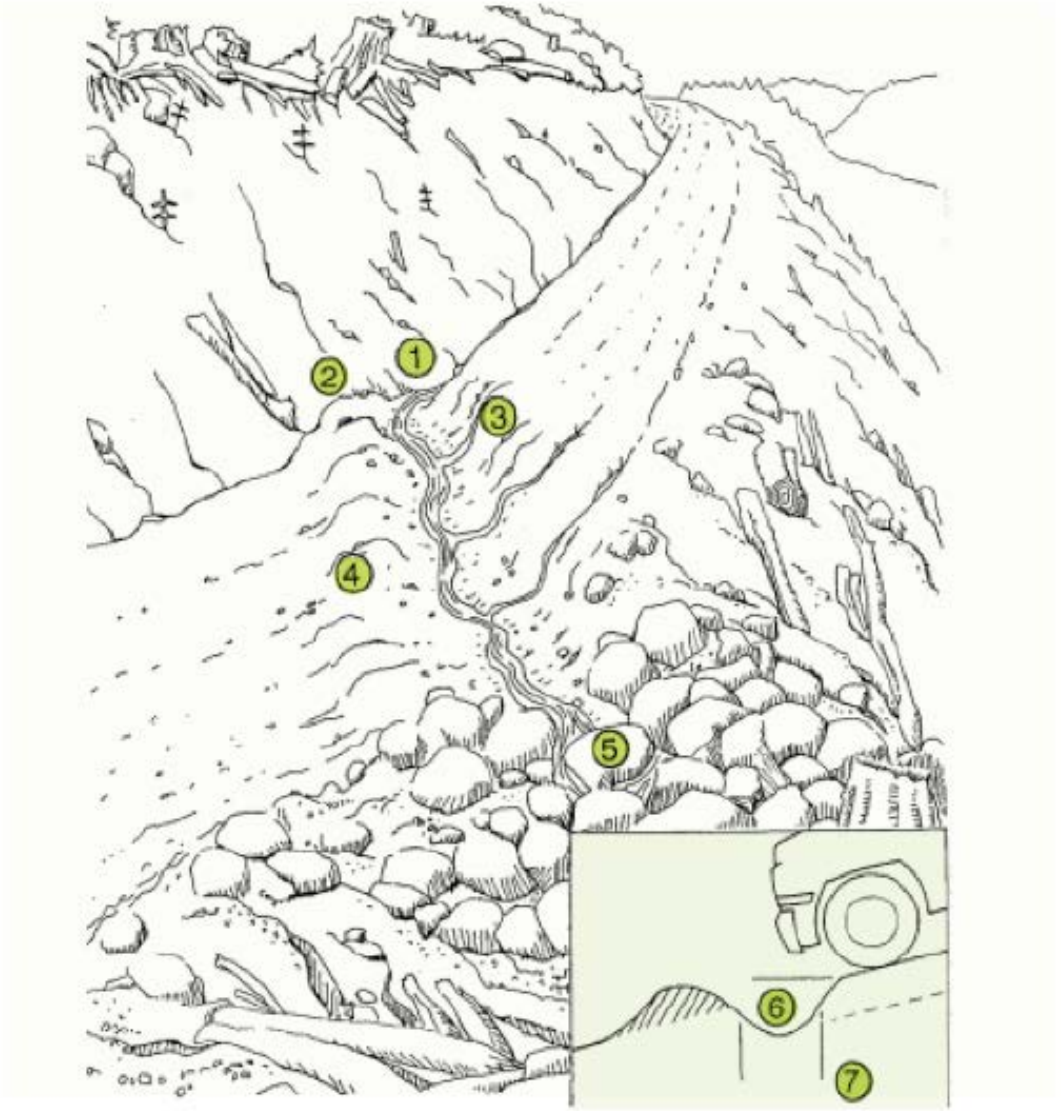

Figure 24- A Diagram of a Typical Waterbar (Weaver et. Al 2015).

Winterization

- Other Road Consideration
  - Decommissioning
    - Ripping the road
    - Revegetation
    - Culvert removals
    - Cross drain installation

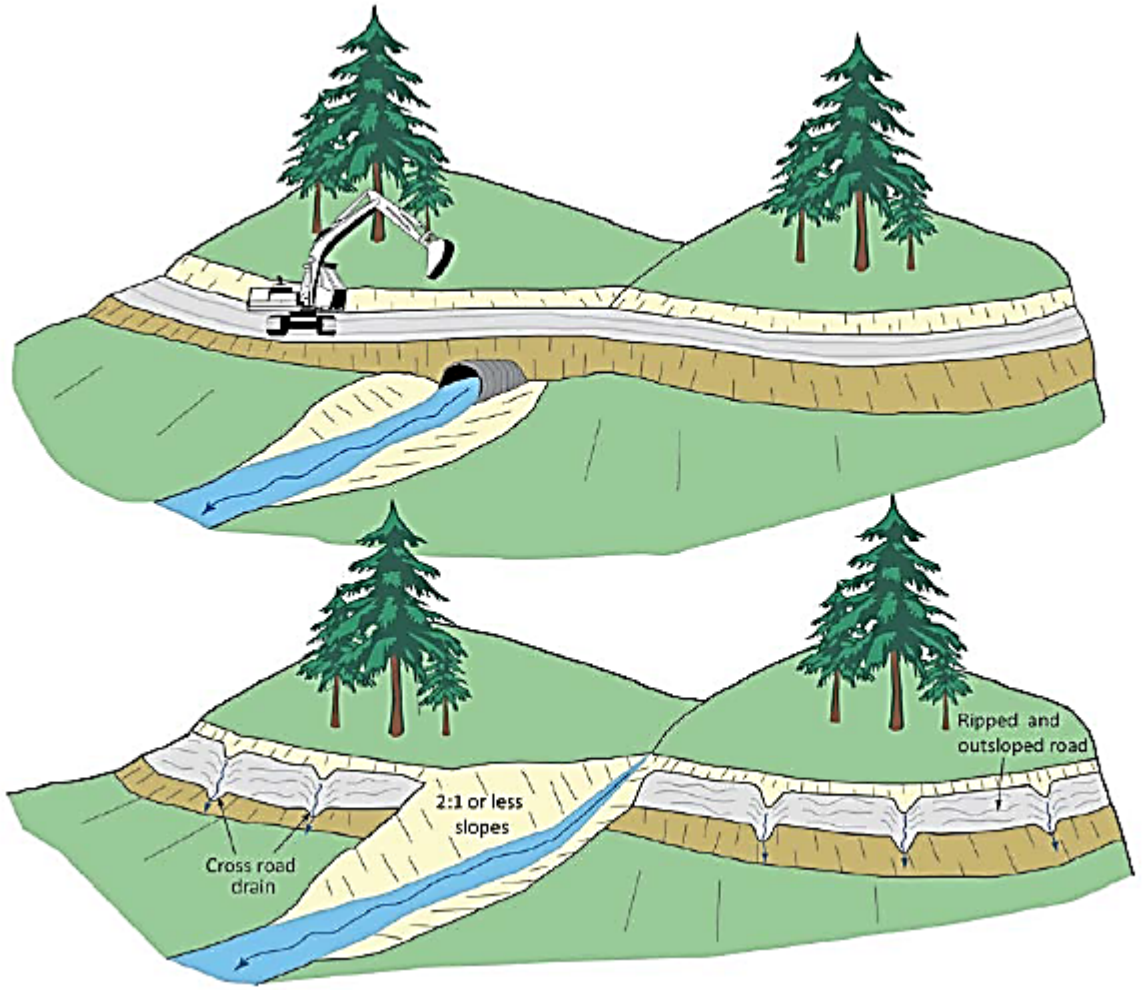

Figure 23- One Component of Road Decommissioning is Setting Back Slopes on Stream Banks (Weaver et. al 2015).

Winterization

- How do we achieve Winterization?
- Other Considerations
  - Housekeeping (SWRCB N.d.)
    - Common sense
    - Schedule routine trash hauling operations
    - Remove/store any hazardous materials for the winter period

Figure 24- Another Example of a Beautiful Road (Weaver et. al 2015).

Winterization

- Cover Crops and the Nitrogen Cycle
- Other Considerations
    - Cover Crops and the Nitrogen Cycle
        - Closing nitrogen loops and sustainability
        - Decreased nitrogen application
        - Increased ground cover

Figure 25- An Example of Mulch Applied to a Disturbed Area (Caltrans 2017).

Winterization

- Cover Crops and the Nitrogen Cycle

- Nitrogen fixation
- Save money and reduce impacts
- Biochar

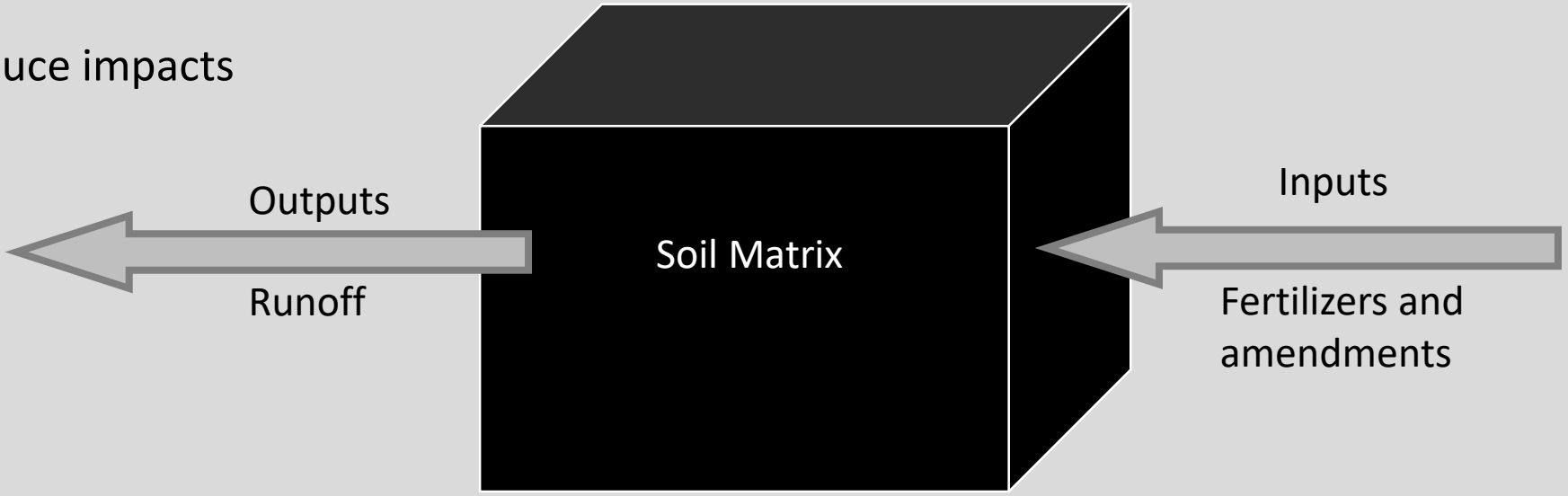

Figure 26- A Simple Blackbox Model of Nitrogen Application.

Winterization

- Cover Crops and the Nitrogen Cycle

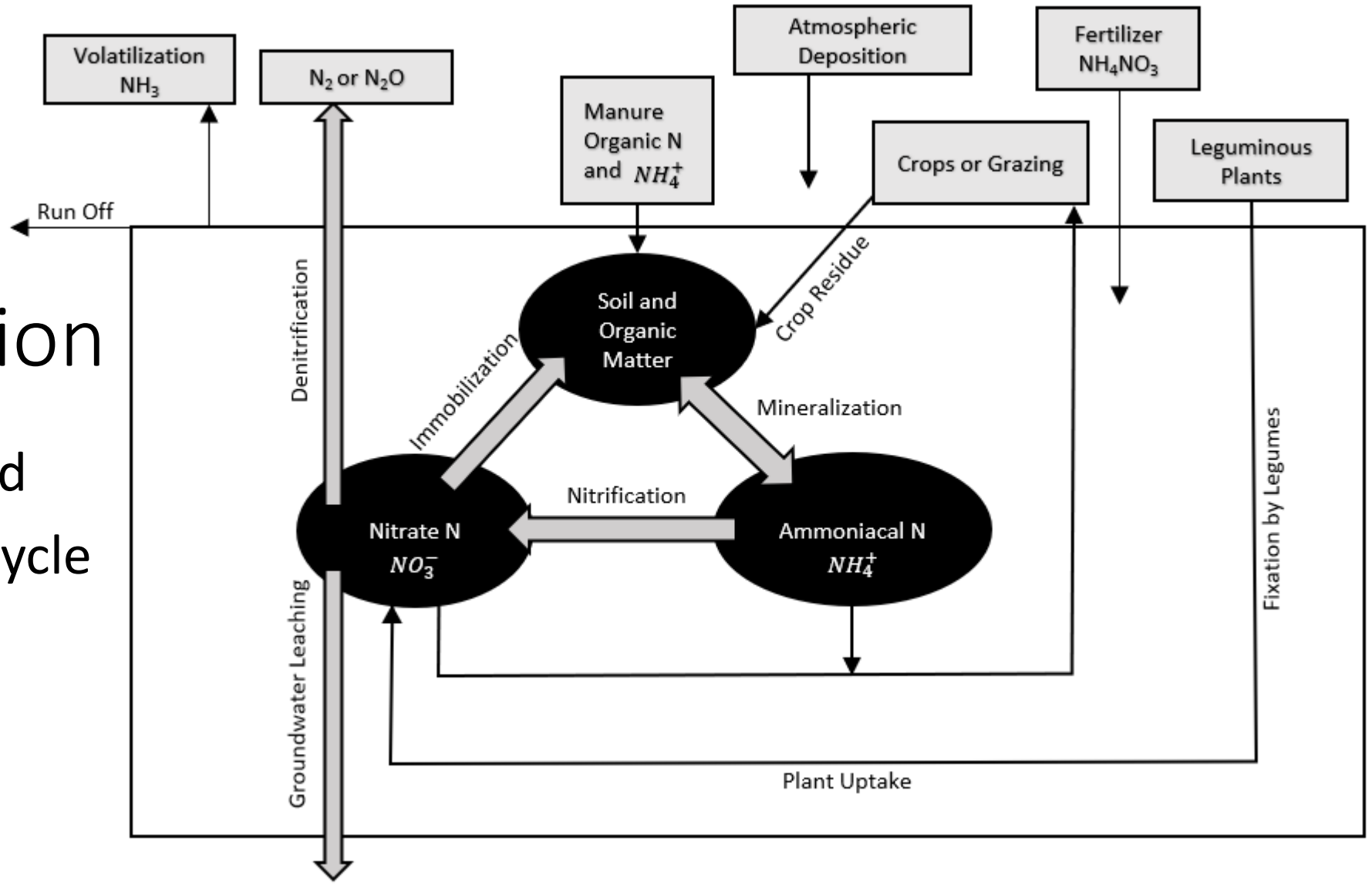

Figure 27- A More Complex Model of Nitrogen Application (Adapted from Davis and Masten).

Winterization

- Where should Winterization be Implemented?
  - Site dependent
  - Invoke critical thinking
  - № 134: May be forced to Winterize per SWRCB direction if water quality is not adequately protected
  - Ask a professional

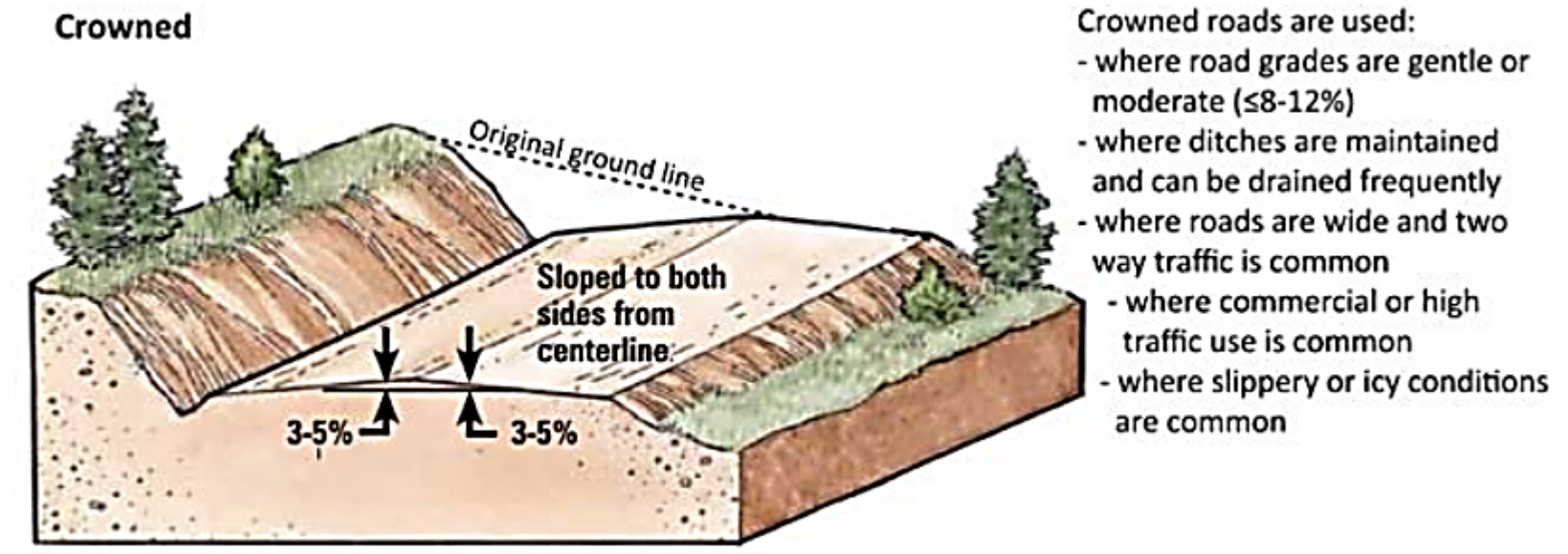

Figure 28- A Simple Diagram of a Road with a Crowned Surface (Weaver et. al 2015).

Winterization

- When should Winterization be completed?
  - Before the onset of the winter period as defined by SWRCB
    - Definition № 108: November 15 to April 1
  - Sometimes CDFW will define a different winter period
    - Wet years versus dry years

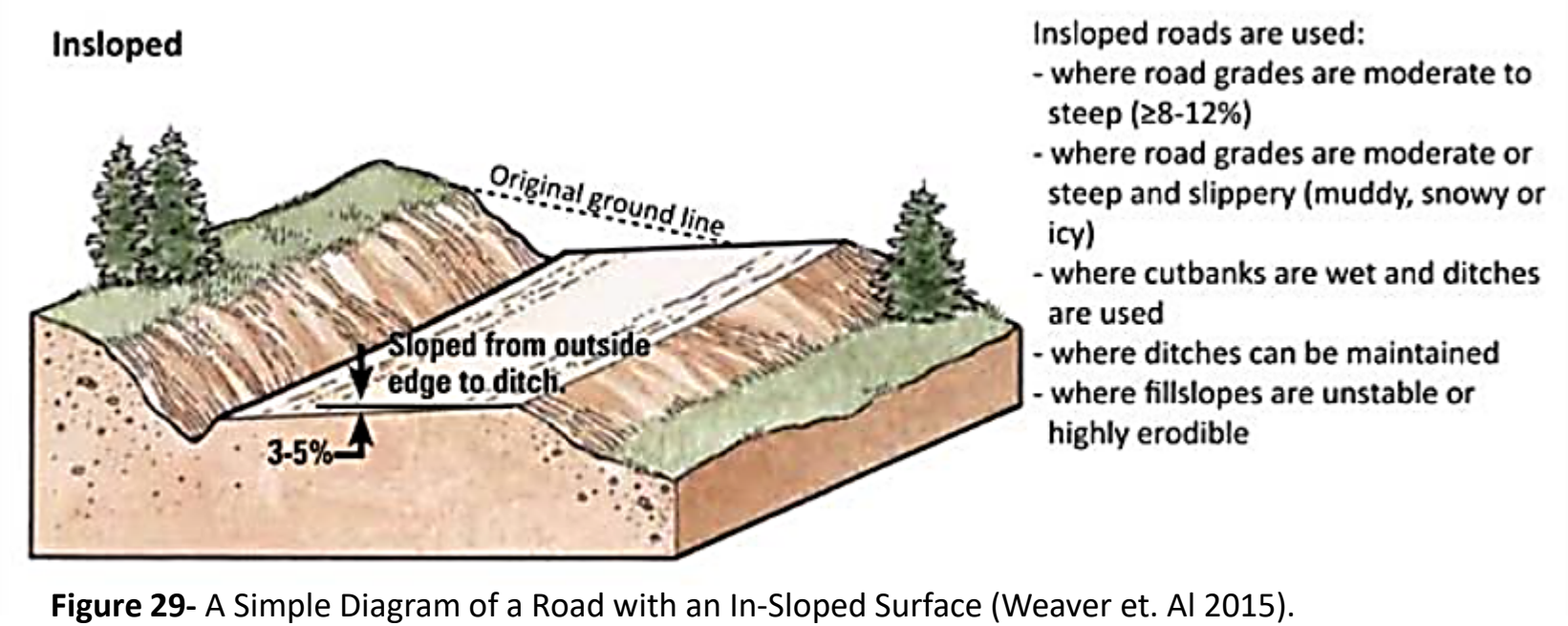

Figure 29- A Simple Diagram of a Road with an In-Sloped Surface (Weaver et. Al 2015).

Winterization

- Who should perform Winterization?
    - Land owners, dischargers, and site caretakers are all liable parties in the eyes of SWRCB and NCRWQCB
    - Ask only people you trust, and know do good work, to achieve compliance with/for your
    - Adage " if you want something done right, do it yourself"

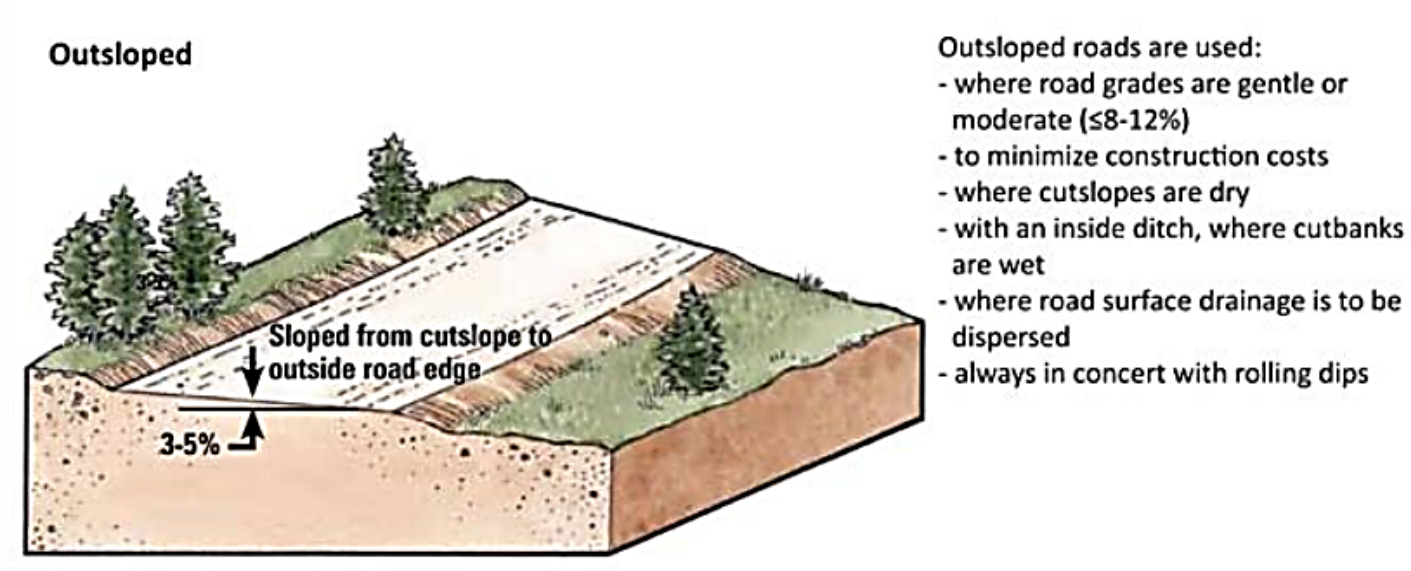

Figure 30- A Simple Diagram of a Road with an Out-Sloped Surface (Weaver et. Al 2015).

Review

- Why Winterize?
- What is Winterization?
- How do we achieve Winterization?
- Where should Winterization be implemented?
- When should Winterization be complete?
- Who should perform the Winterization?

- Conclusions

References

Bierman, Paul and David Montgomery. 2014. *Key Concepts in Geomorphology.* W.H. Freeman and Company Publishers.

Caltrans. 2017. *Construction Site Best Management Practices (BMP) Manual.* California Department of Transportation: Division of Environmental Analysis, Stormwater Program.

Davis, Mackenzie and Susan Masten. 2009. *Principles of Environmental Engineering and Science.* McGraw-Hill.

Johnson, Matthew. 2017. *An Image of the Trinity River.* Private Citizen.

Johnson, Matthew. 2019. *An Image of a Fish Passage Structure on Hayfork Creek.* Private Citizen.

Manthorne, David. N.d. *CDFW Compliance Guide.* California Department of Fish and Wildlife

Mendocino County Resource Conservation District (MCRCD) . 2018. *Watershed Best Management Practices for Cannabis Growers and other Rural Gardeners.*

State Water Resources Control Board (SWRCB). 2019. *Cannabis Cultivation Policy: Principles and Guidelines for Cannabis Cultivation.*

State Water Resources Control Board (SWRCB). N.d. *Cannabis Cultivation: Best Management Practices.*

Tarbuck, Edward and Frederick Lutgens. 2008. Dennis Tasa Ill. *Earth: An Introduction to Physical Geology.* Pearson Prentice Hall.

United State Department of Agriculture (USDA)- Natural Resources Conservation Service. 2001. *Part 653 of the National Engineering Handbook.*

Weaver, William, Eileen Weppner, and Danny Hagans. 2015. *Handbook for Forest, Ranch & Rural Roads.* Pacific Watershed Associates.

Wick, Bob. N.d. *Trinity Wild and Scenic River.* Bureau of Land Management. Accessed 2019. https://www.nps.gov/articles/wild-and-scenic-rivers.htm

Questions..?

Figure 31- An Image of a Fish Passage Structure on Hayfork Creek (Johnson 2019).

Thank You for Your Time

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Thank you!

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