# Post Fire Drainage and Erosion Control
## September 25, 2018 Shasta College

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Objectives:

1. Characterize Impacts of wildfire on watersheds – hydrology and storm damage potential
2. Assess risk factors
3. Evaluate erosion and flood control alternatives

# Watershed/ Drainage Area Fire Impacts will Vary with:

- Extent (percentage) of area burned
- Intensity of burn (affecting soil properties)
- Remaining vegetation

Predicted Runoff for high intensity burn areas in the 2012 Salt Fire north of Shasta Lake were twice that of normal

Extreme measures were warranted to protect a house directly in harm's way at the watershed outlet

In the case of the Salt Fire, damaging storms came within weeks:  a 25-year event plus two 10-year events between Nov 20 and Dec 5 2012

Preparing for the worst saved the house from severe damage or loss

# Prepare in Advance

> No one can predict our storm intensities far enough in advance to install storm proofing on short notice (diversions, debris racks, culverts). Where significant risks are identified, flood and debris protection should be completed before the rains come.

> Regrowth and recovery of watershed vegetation to pre-fire conditions takes years. Mitigation for flood and erosion control should be maintained for several winter seasons. Damaging storm(s) may come this year, or not for 2 or 3. High intensity storm runoff is the primary cause of flooding and soil erosion.

# Conclusion on Hydrology (storm runoff)

If storm runoff can increase by up to 100% post-fire, then:

> 2-year rainfall could produce 5-year peak runoff

> 5-year rainfall could produce 25-year peak runoff

> 10-year rainfall could produce 100-year peak runoff

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Limit |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 1.1 | square miles | 0.07 | 2000 |
| ELEV | Mean Basin Elevation | 703 | feet | 90 | 11000 |
| PRECIP | Mean Annual Precipitation | 44 | inches | 15 | 100 |

Peak-Flow Statistics Flow Report [2012 5113 Region 3 Sierra Nevada]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | (100% bulking) | Value | Unit | PII | Plu | SEp |
|---|---|---|---|---|---|---|
| 2 Year Peak Flood | 187 = 2 x | 93.4 | ft^3/s | 30.6 | 285 | 74.4 |
| 5 Year Peak Flood | 384 cfs | 193 | ft^3/s | 81.4 | 456 | 54.4 |
| 10 Year Peak Flood | 524 | 263 | ft^3/s | 116 | 597 | 51.5 |
| 25 Year Peak Flood | 690 | 345 | ft^3/s | 151 | 787 | 52.3 |
| 50 Year Peak Flood | 822 | 411 | ft^3/s | 174 | 972 | 54.6 |
| 100 Year Peak Flood | 948 cfs | 474 | ft^3/s | 192 | 1170 | 58 |

# Carter Creek, Harlan Drive – preventative maintenance by City of Redding

- Clearing of debris that will carry downstream to plug bridges or culverts
- Provide pathway for storm runoff to reach the outlet (river or creek)
- Preserve vegetation on banks (erosion control) but open channel center for flow
- Preserve wildlife habitat; consult with environmental specialists

# Drainage and Erosion Control – Concepts and Cautions (Do's and Don't

- Diverting flow to a safe outlet around the house is one of the best defenses.
- Straw bales can divert flow if they are well anchored. Sandbags can be used to reinforce a bale dike, or stand-alone.
- Concrete blocks are the most stable where concentrated flow has significant energy
- Diversion channels must have a positive gradient (no ponding) to carry flow and not overtop or fail
- One goal is to disperse flow and dissipate energy. Cut trees and brush can be chipped or laid on the contour to break flow energy
- Limbs and debris should not be placed in creek channels. They don't control erosion, and often are carried downstream to plug culverts

# Diversions – direct flow around or away from the house

- Channel must adequate gradient and cross section to carry flow
- Berm/ dike must be well compacted to resist failure when saturated
- Prevent ponding; control rodent damage

# Mulching with wood chips or straw can help control sheet and rill erosion – mulch should be anchored to the soil.

Straw is typically combined with Hydroseeding to protect slopes from erosion. Straw is fastened in place either by punching it into the soil with a sheepsfoot-roller, or by gluing it to the soil surface by covering it with Hydromulch.

*Above left pictures and text courtesy of Caltrans*
*Erosion control website 2018*

# Erosion Control Blankets are warranted with steep slopes exposed to concentrated flow, e.g. streambanks

- Seedbed preparation, seeding and fertilization prior to placing blanket
- Blanket is lapped like shingles, and attached to slope using wire staples
- Seed will germinate with rainfall and grow through blanket
- Erosion control products are available from local suppliers (Anderson, Redding)


# Sources of Information and Technical Assistance

- Erosion control specification sheets and schematics available in foyer
- Collaborate with neighbors:  drainage rarely follows property boundaries
- Maintain/ improve protective measures during storm season
- Personal resilience and persistence is an asset