

POST-FIRE EROSION AND SEDIMENT DELIVERY RATES TO HEADWATER STREAMS IN THE CALIFORNIA COAST RANGES



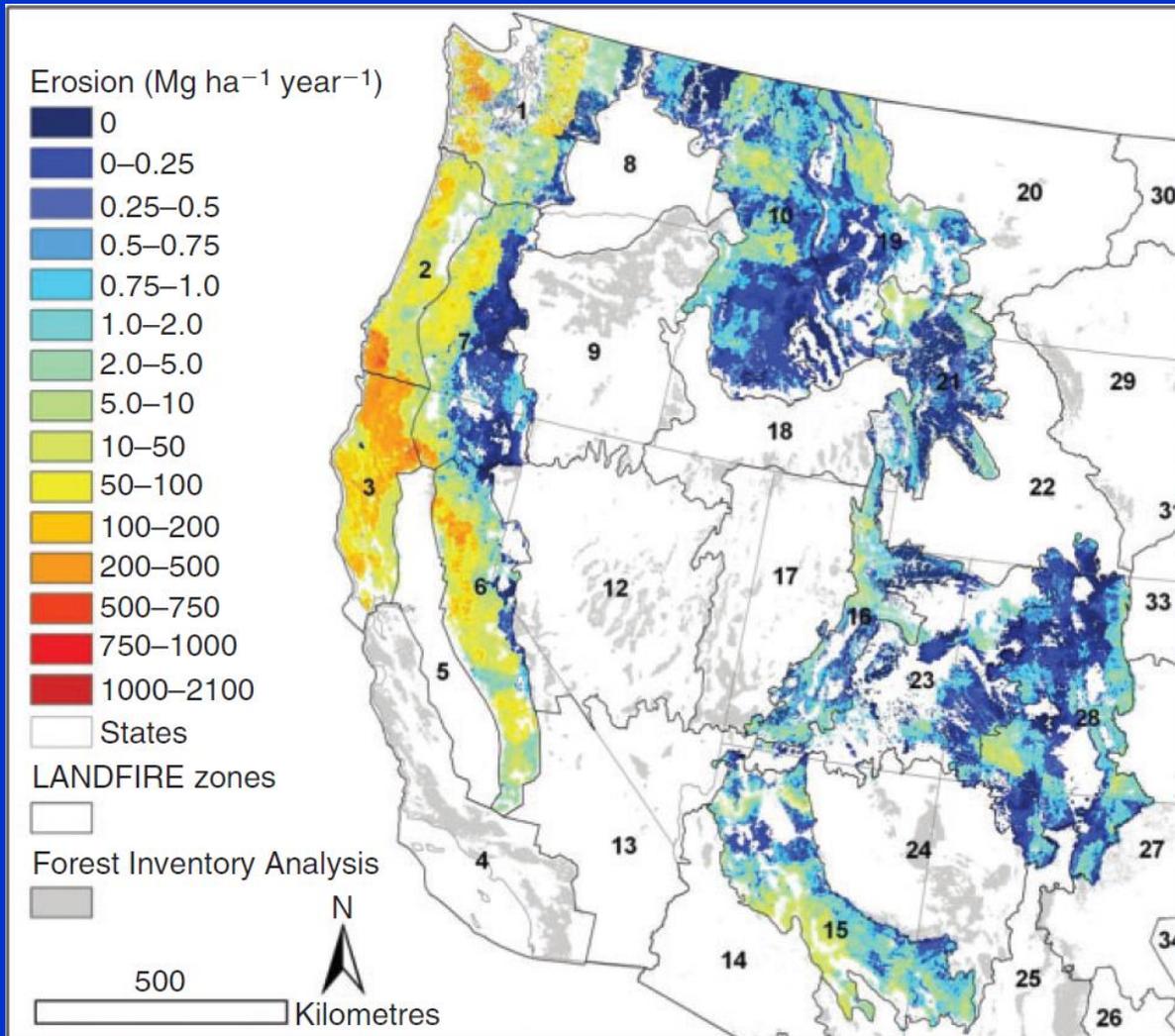
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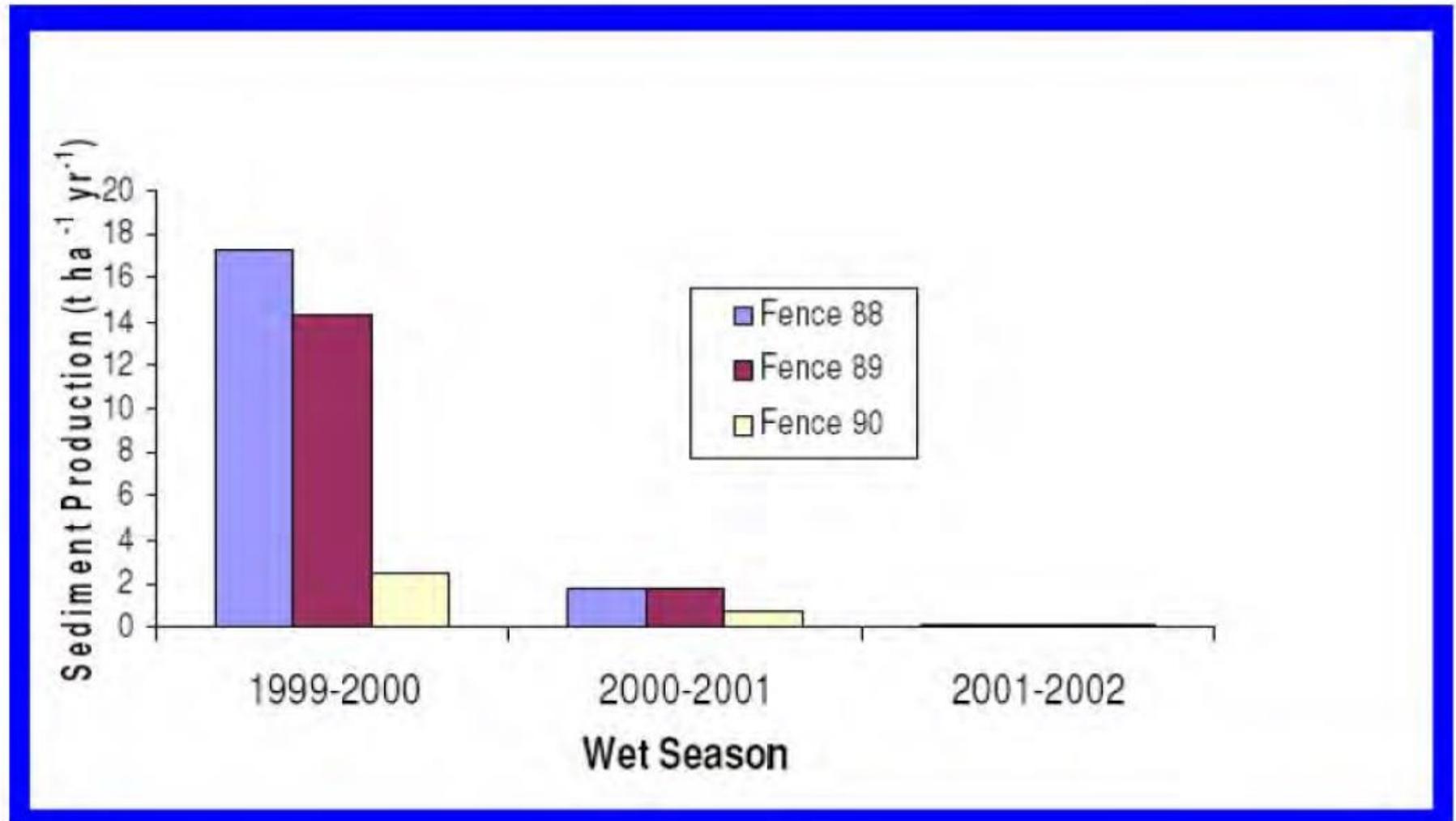
LACK OF DATA FOR NORTHERN CALIFORNIA



- Some of the highest predicted post-fire erosion rates in the Western United States
- Watershed protection increasingly factored into decision-making

(Miller et al., 2011)

Sediment production over time: Pendola fire, Tahoe N.F.

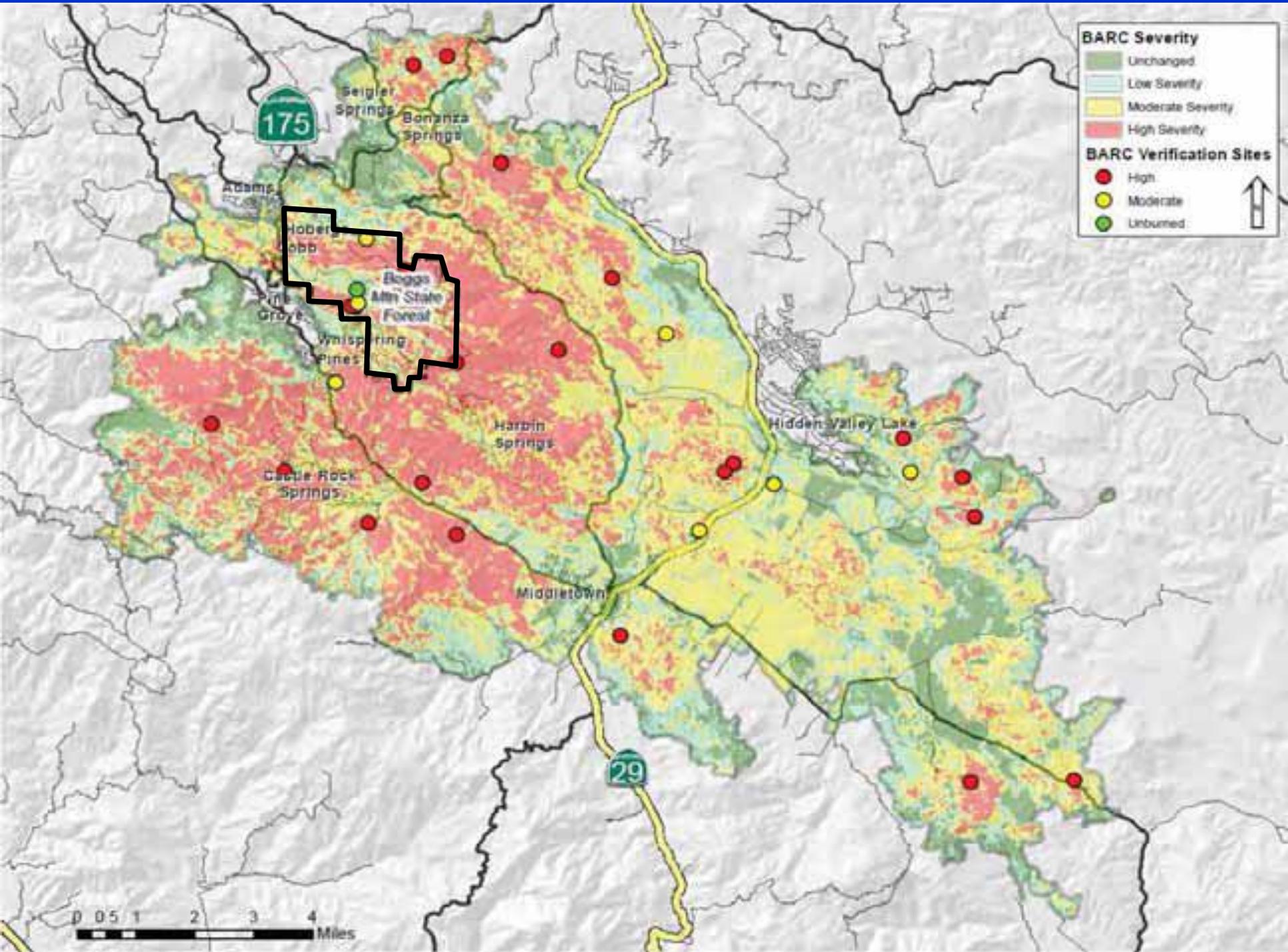


VALLEY FIRE – September 2015

- 76,067 Acres Burned
- 4 Fatalities
- 1280 Homes Destroyed



(Credit: Michael Milirud)

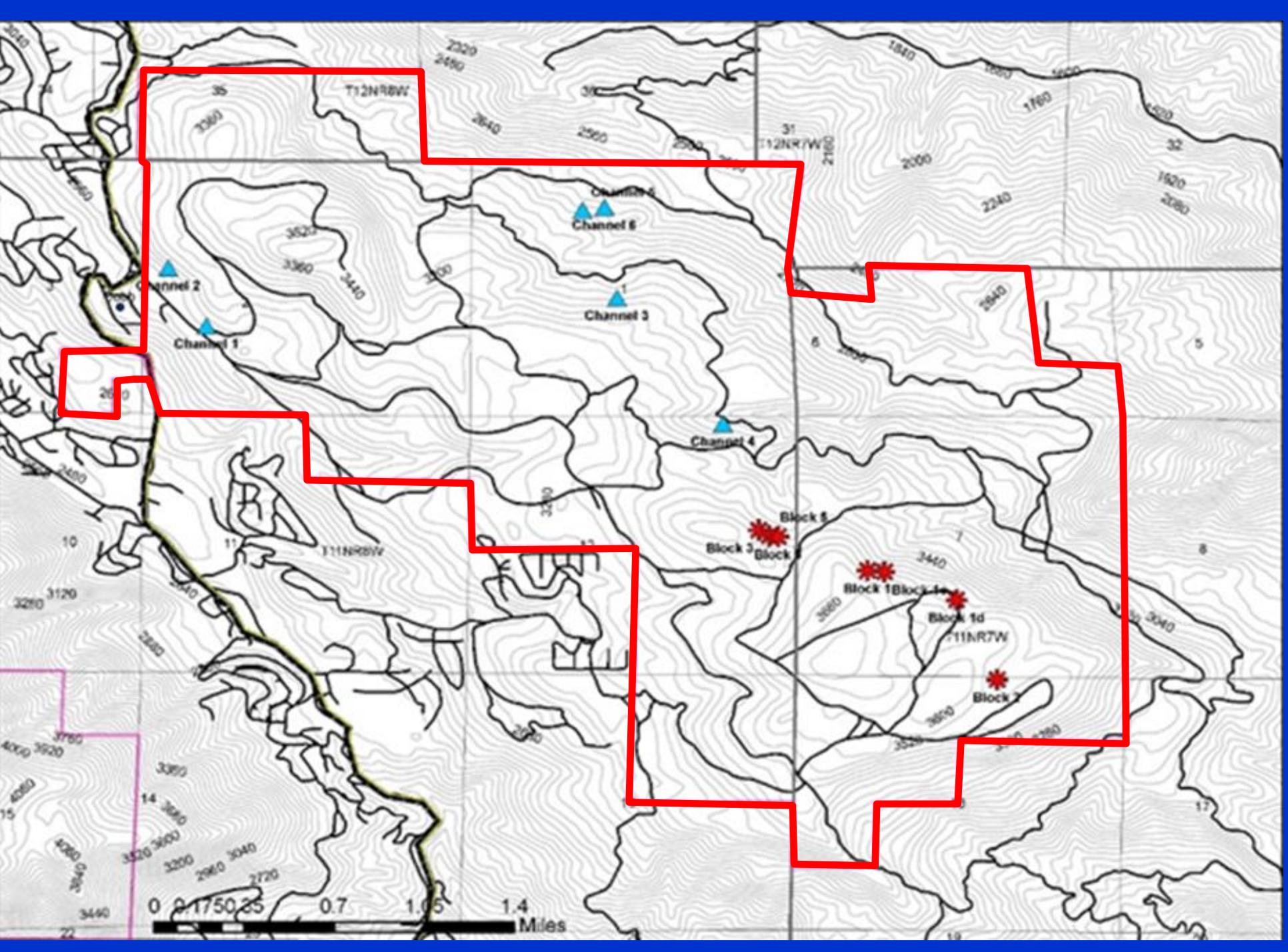


Boggs Mountain Demonstration State Forest

- Area – 14.1 km²
- Elevation - ranges from 719 to 1143 m
- Average precipitation - 1.7 m yr⁻¹; rain dominated
- Geology – Quaternary volcanics (andesitic flows and lahar deposits) capping Mesozoic sedimentary rocks from the Great Valley Sequence
- Ninety-five percent of forest is commercial timberland, mixed-conifer

STUDY OBJECTIVES:

- **To quantify the effects of different soil burn severities on catchment scale runoff rates, sediment delivery, changes in channel and rill networks, and organic matter/soil carbon transport**
- Quantify the effects of post-fire logging and site preparation on runoff, erosion, soil carbon, and vegetation
- Development and demonstration of alternative BMPs for post-fire salvage operations



Sediment Delivery Study

Channel	Soil Burn Severity	Area (ha)	Slope (%)	Initial Bare Soil (%)
1	Low	0.26	24	42
2	Low	0.15	46	50
3	Moderate	0.65	41	38
4	High	0.29	34	68
5	High	0.18	26	64
6	Moderate	0.20	34	58









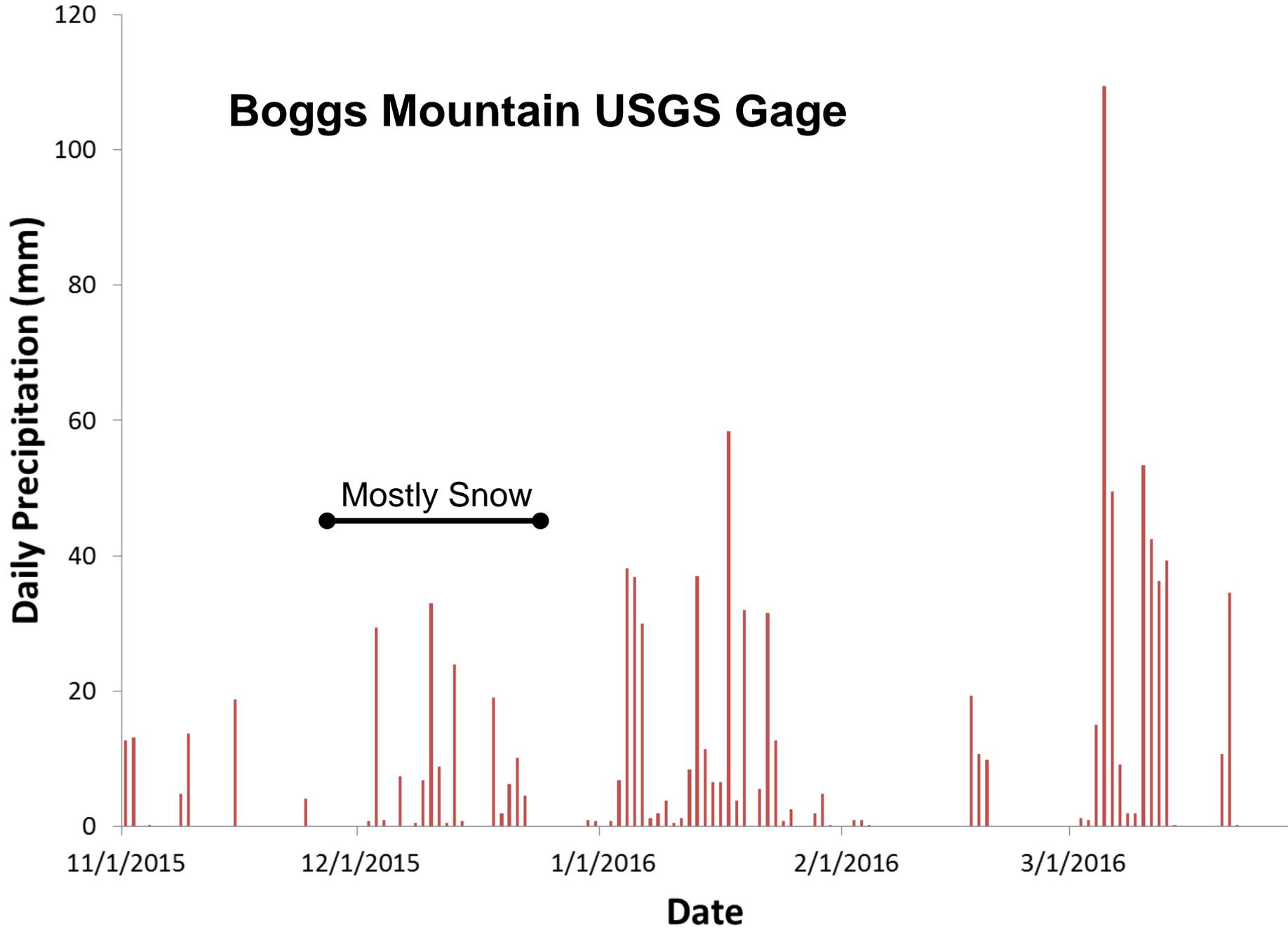




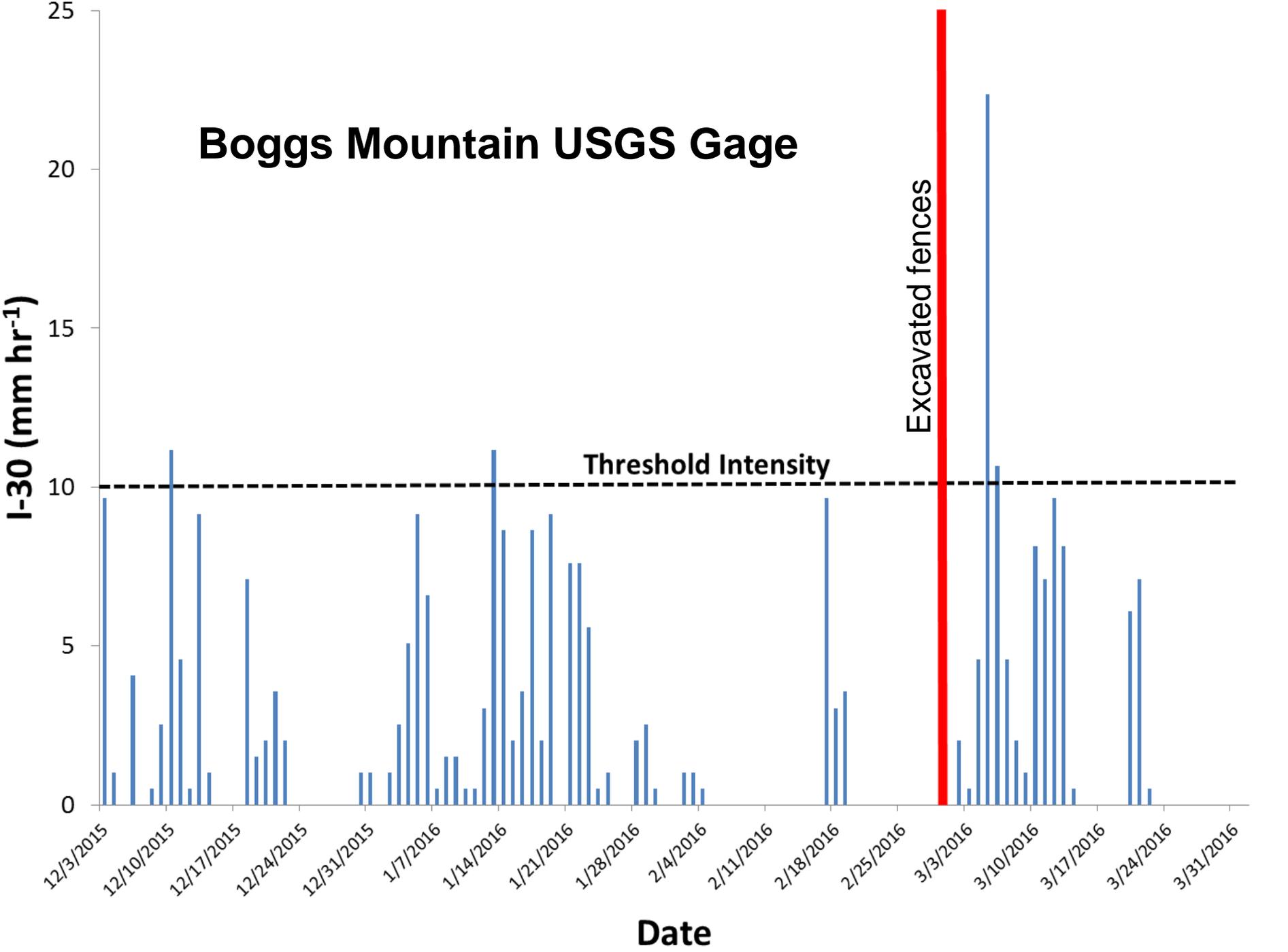




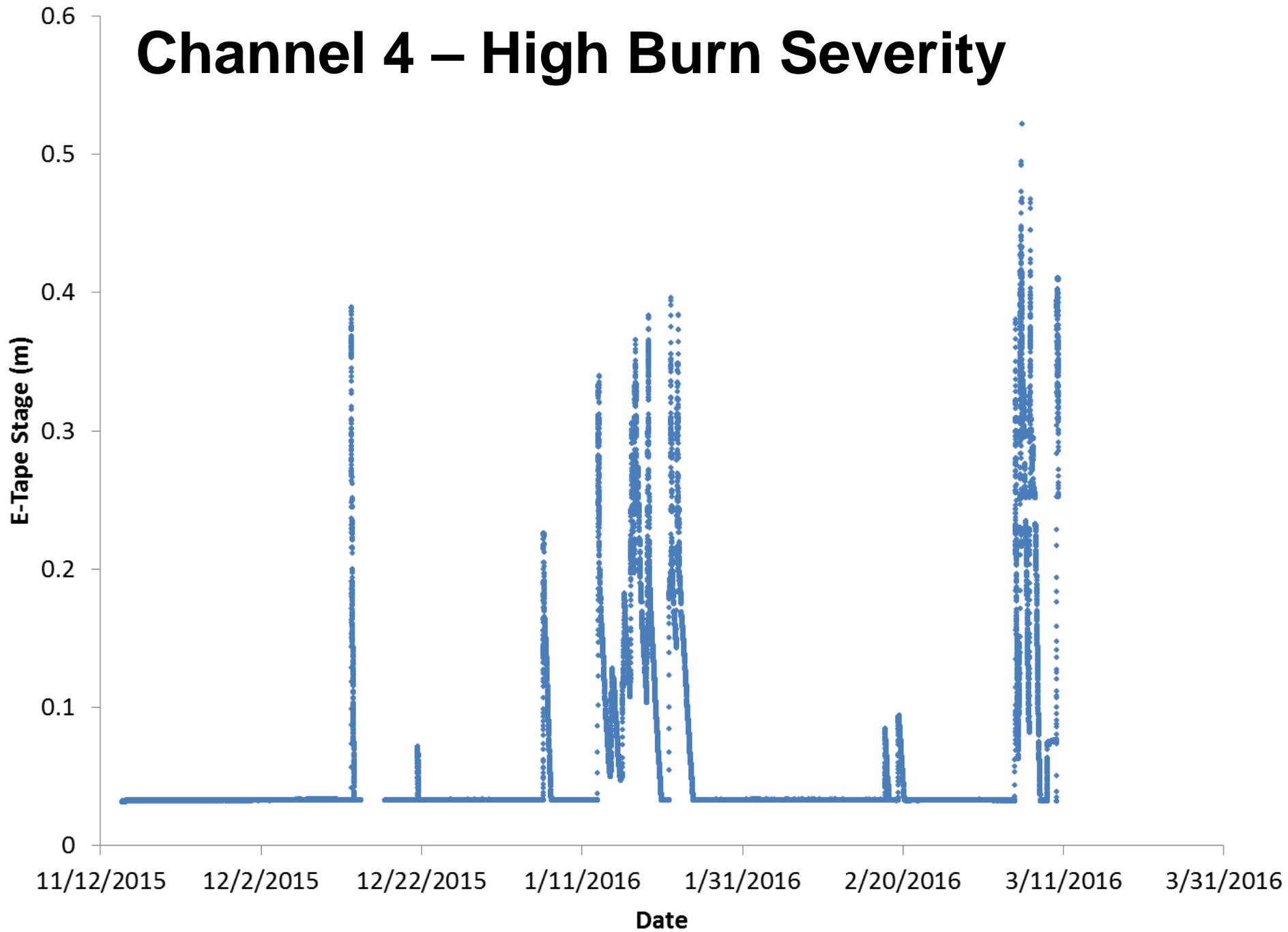
Boggs Mountain USGS Gage



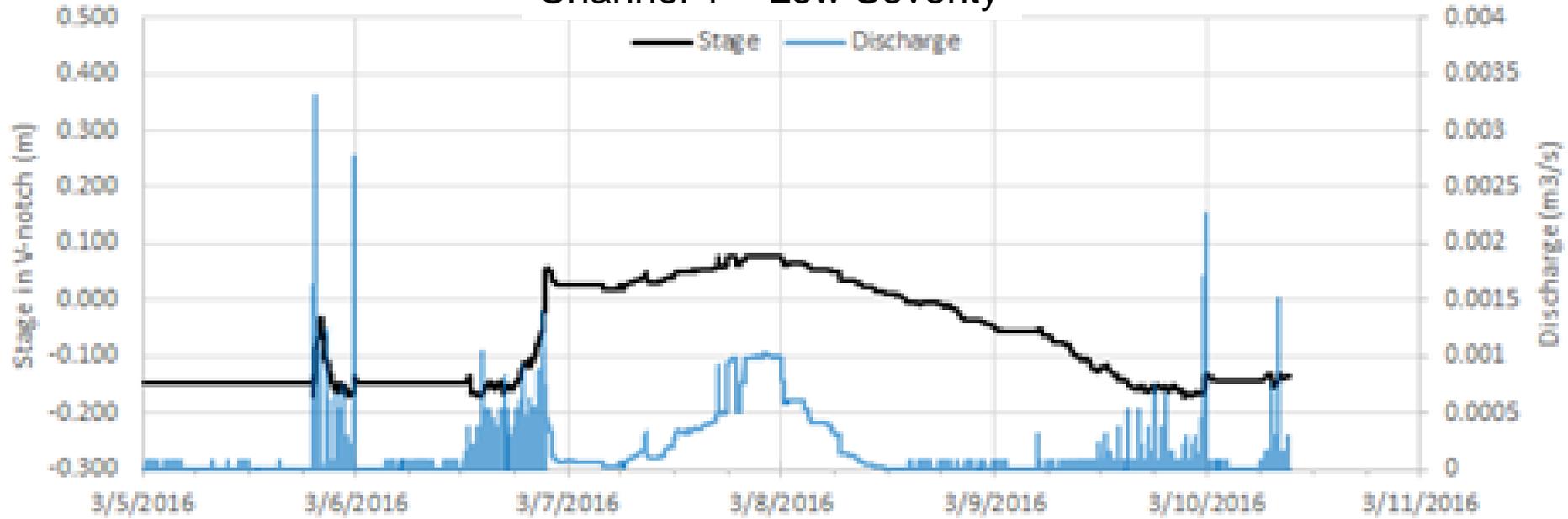
Boggs Mountain USGS Gage



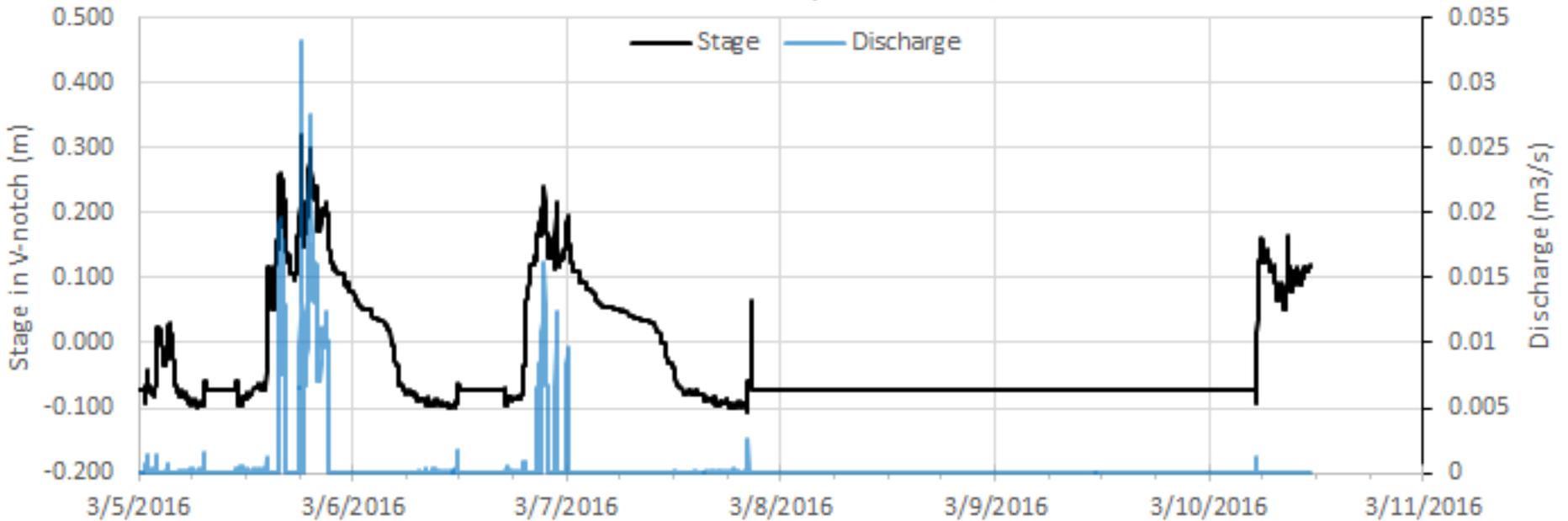
Channel 4 – High Burn Severity



Channel 1 – Low Severity

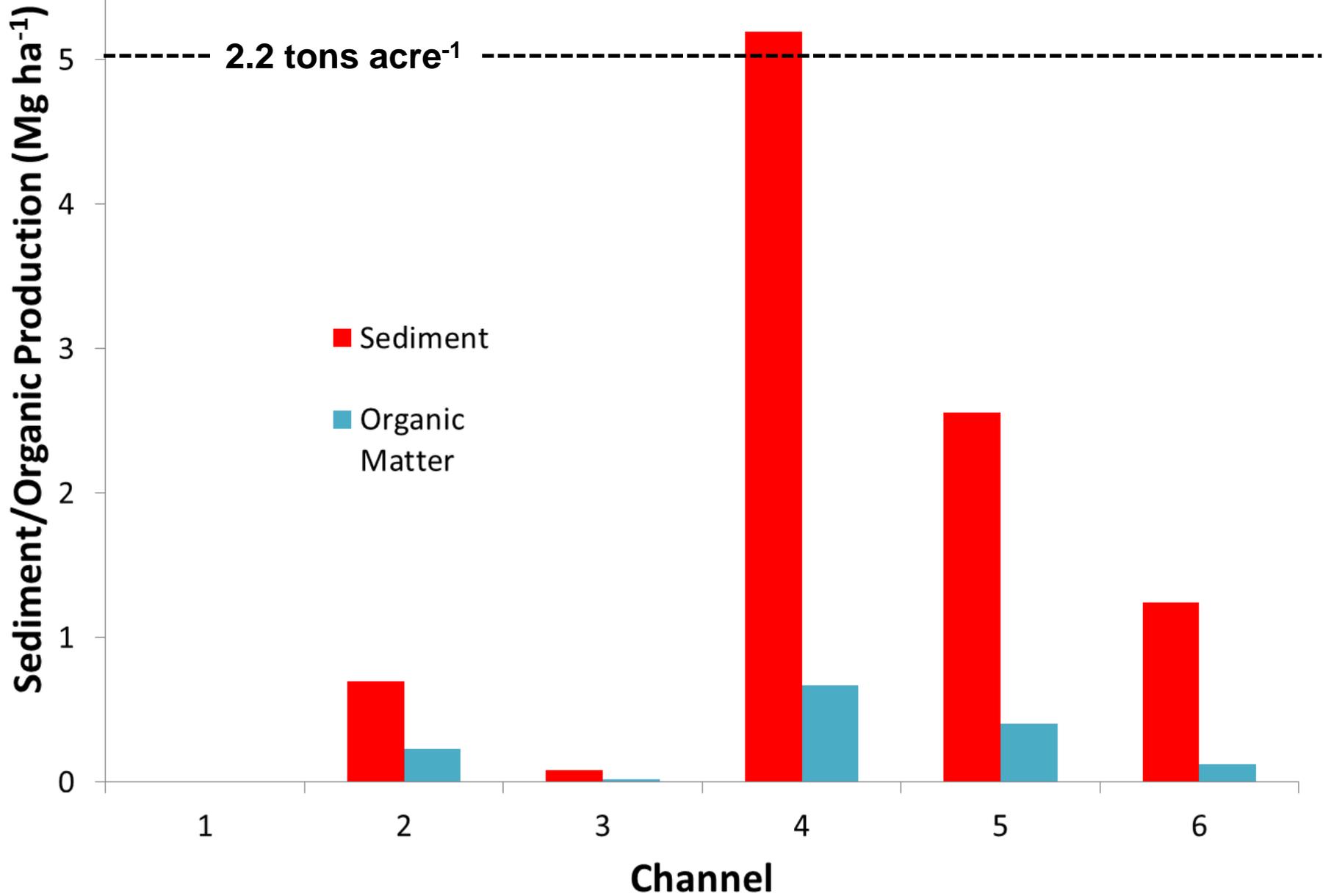


Channel 5 – High Severity

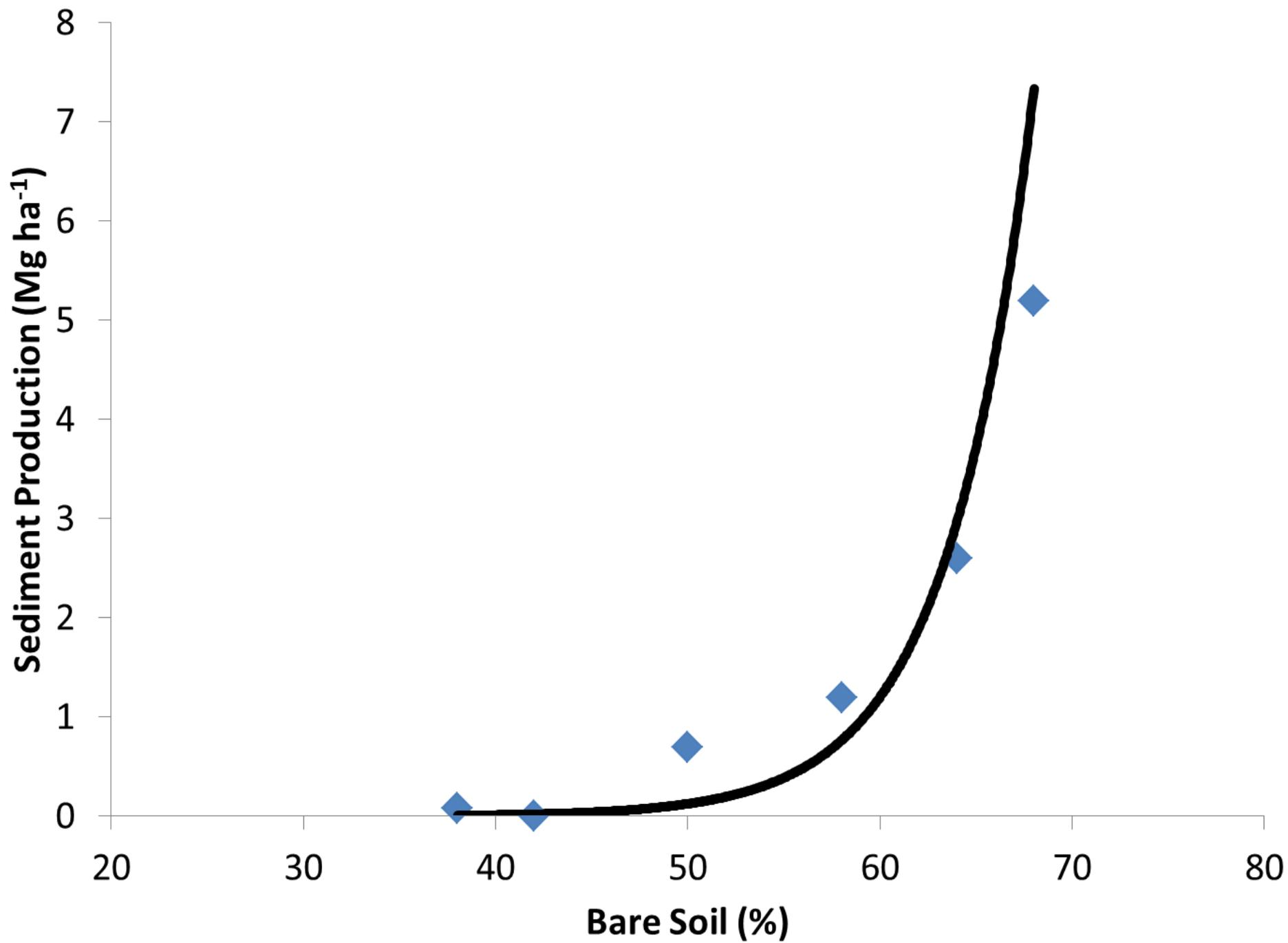




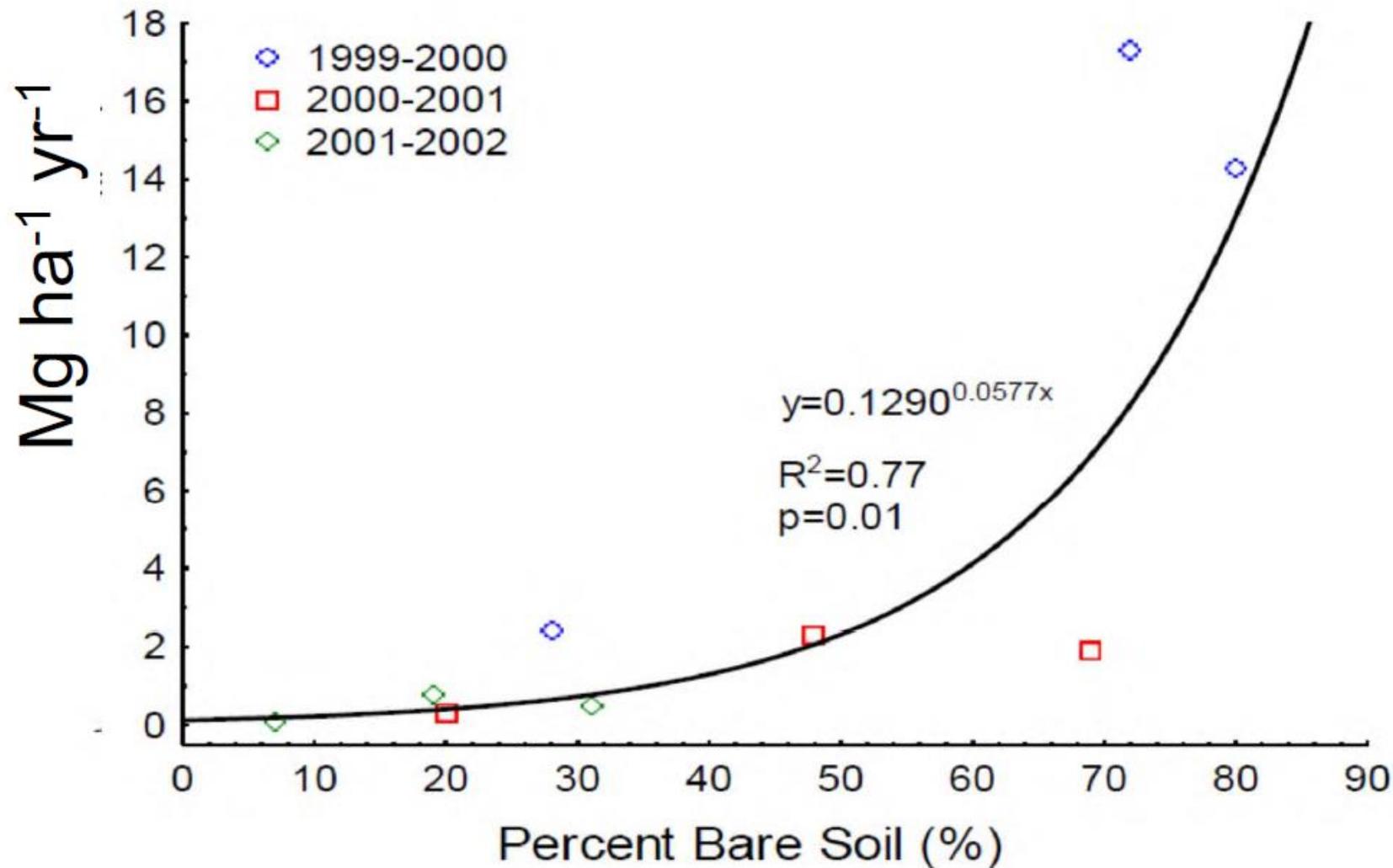
Production Rates Up to 3/4/16







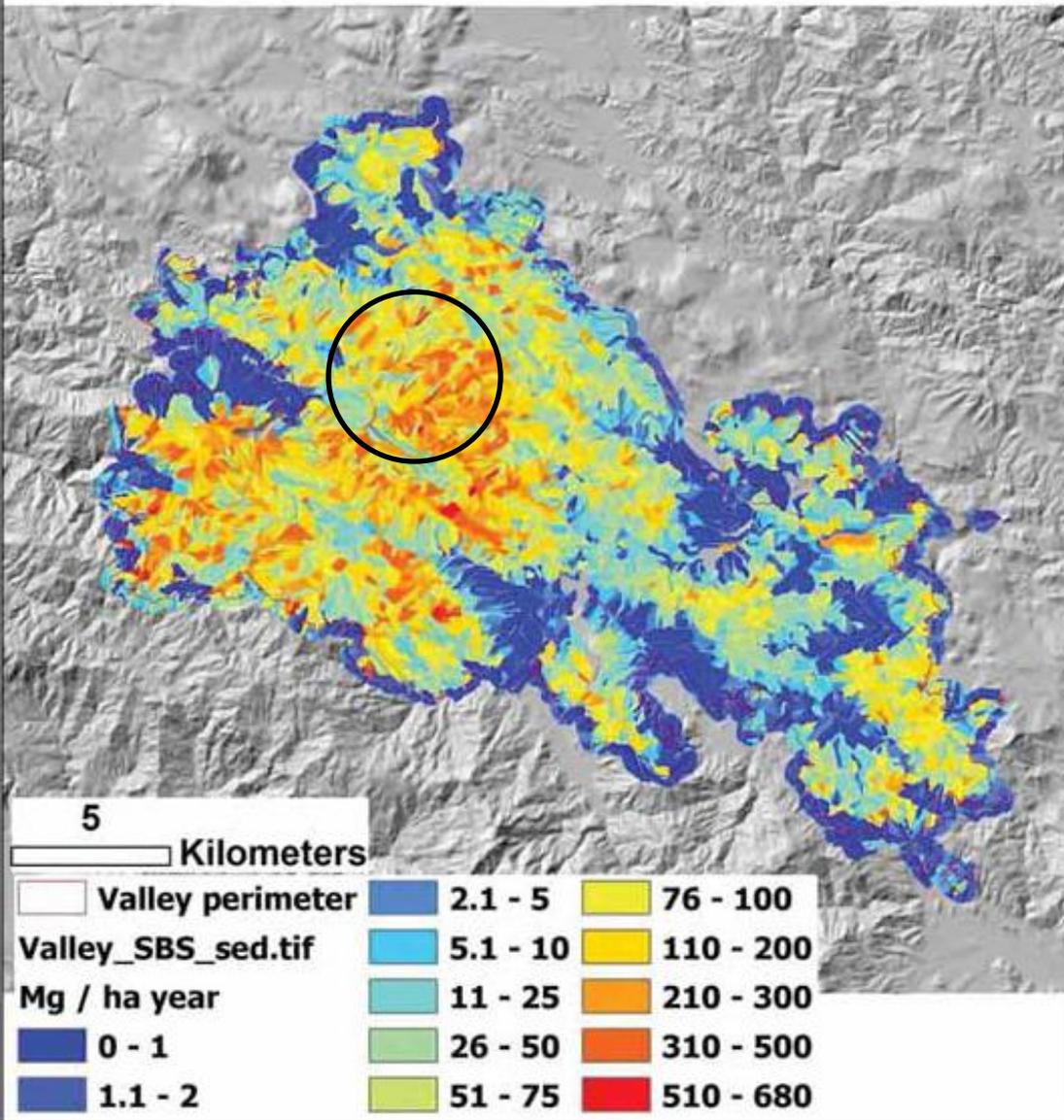
Percent Bare Soil vs. Sediment Production: Pendola fire, Tahoe N.F.







Post Fire Erosion Modeling for Valley Fire



(GeoWEPP results from Drs. Mary Ellen Miller and William Elliot)

- As of 3/4/16, sediment production ranged from 0 to 5.2 Mg ha⁻¹
- March storm events likely doubled or tripled the maximum sediment production to approximately 10 - 15 Mg ha⁻¹

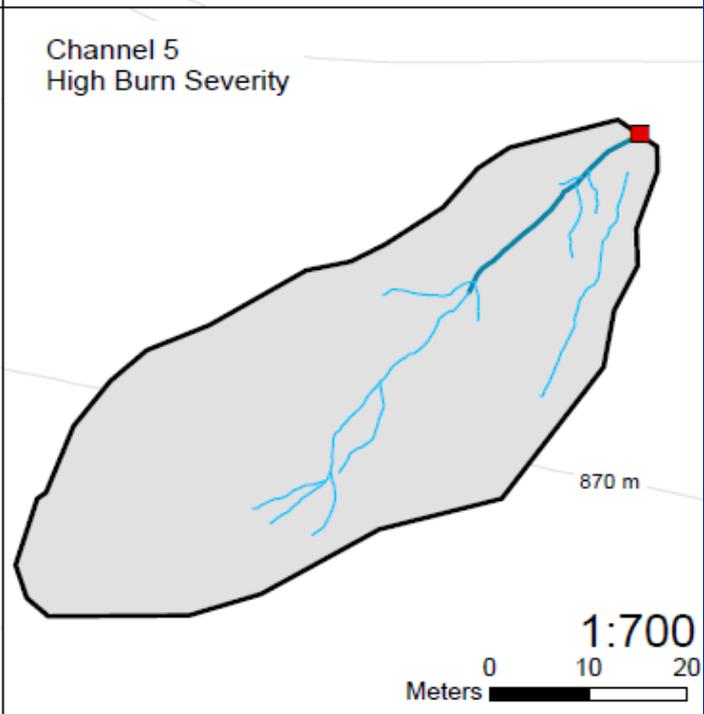
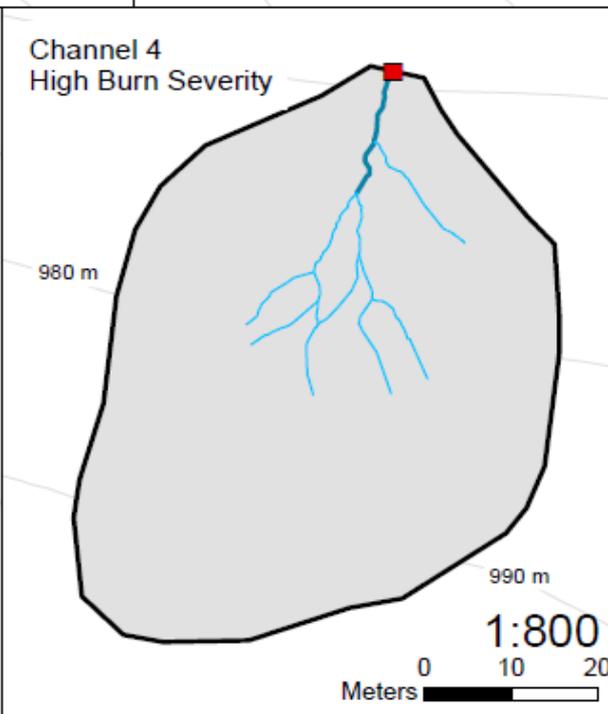
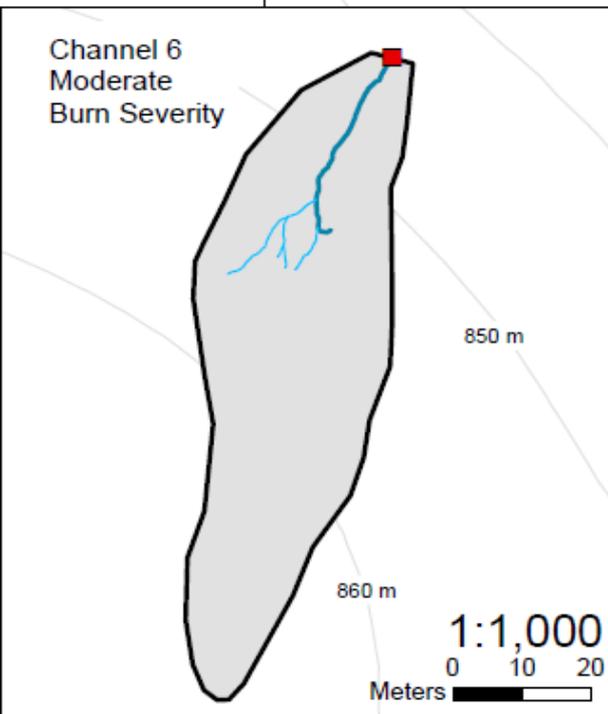
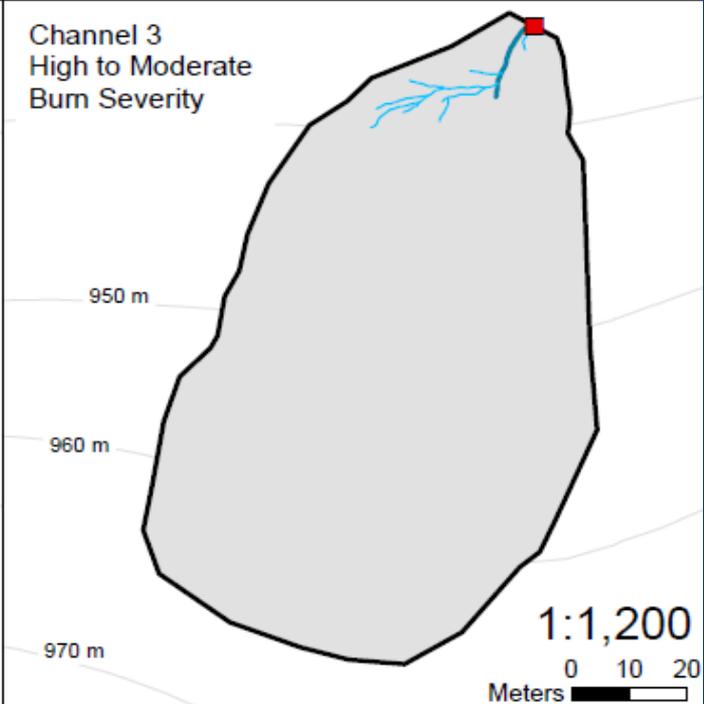
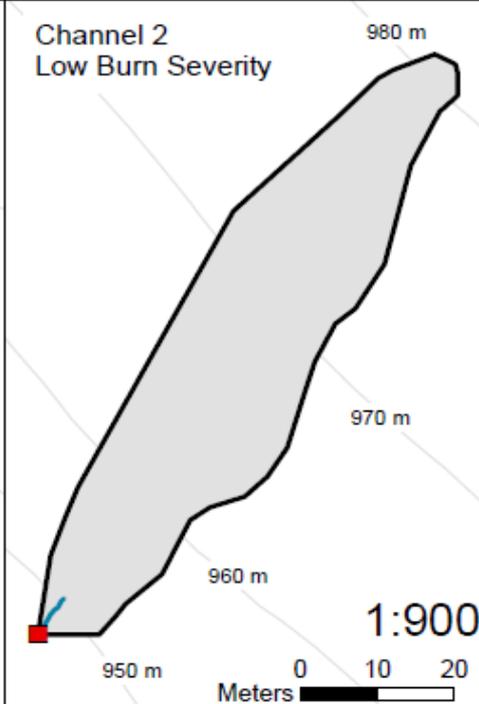
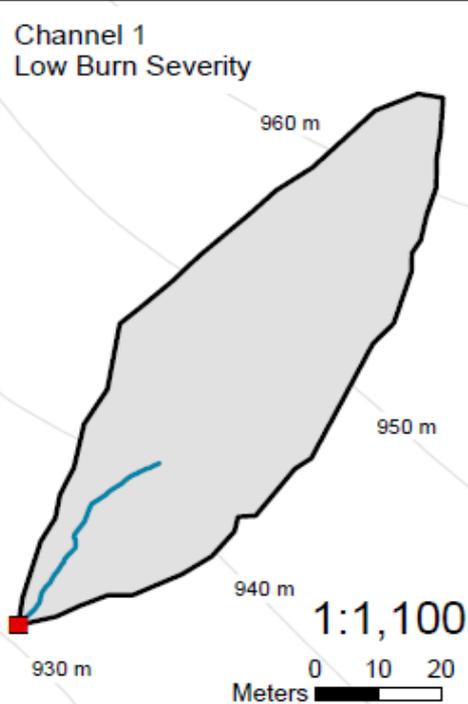
Channel and Rill Networks

January 2016



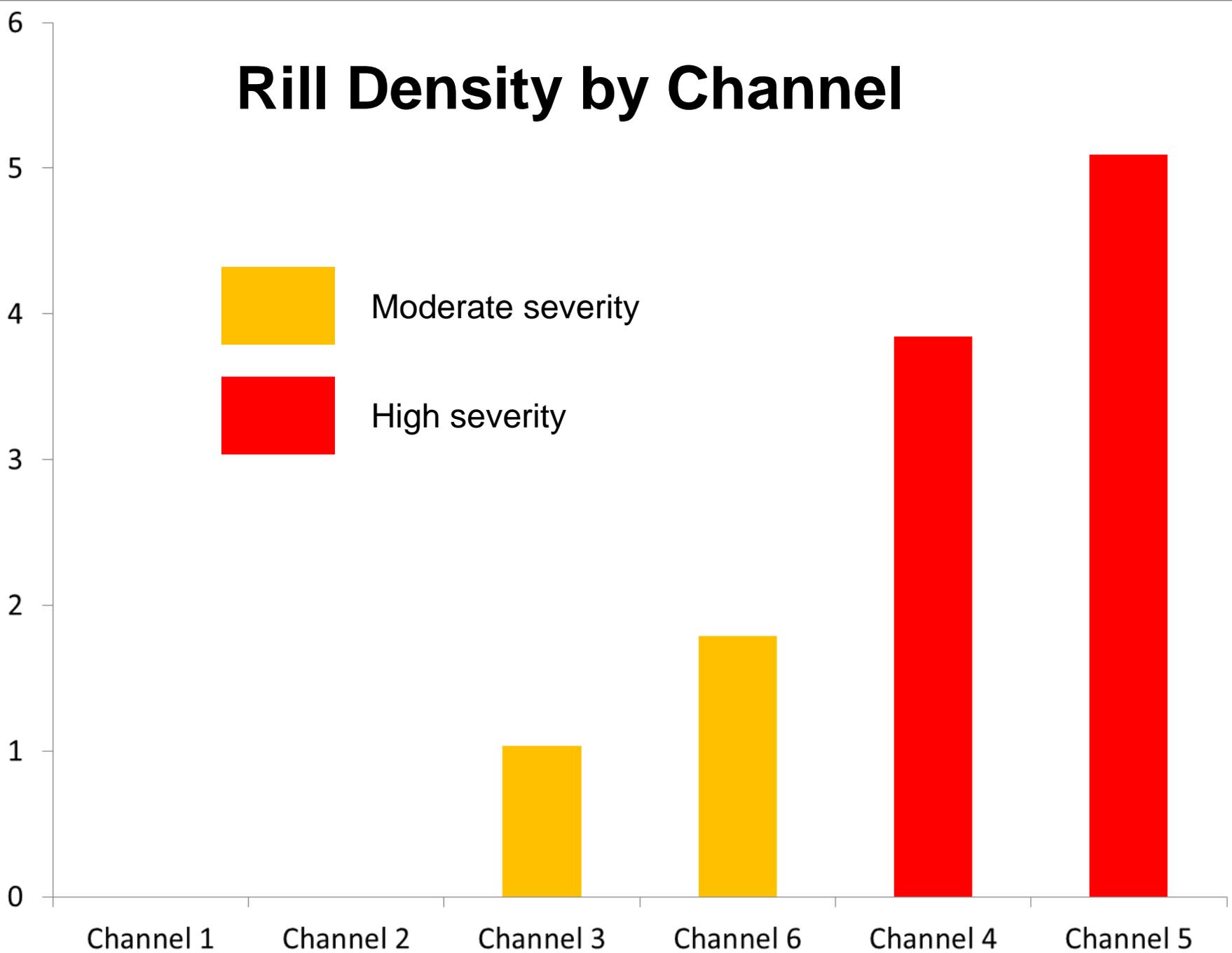
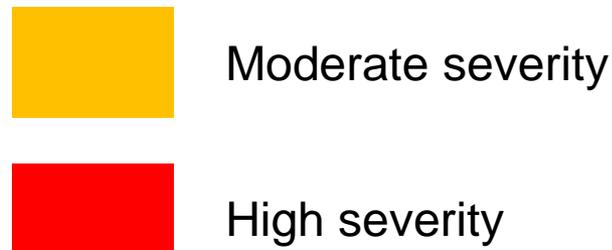
Legend

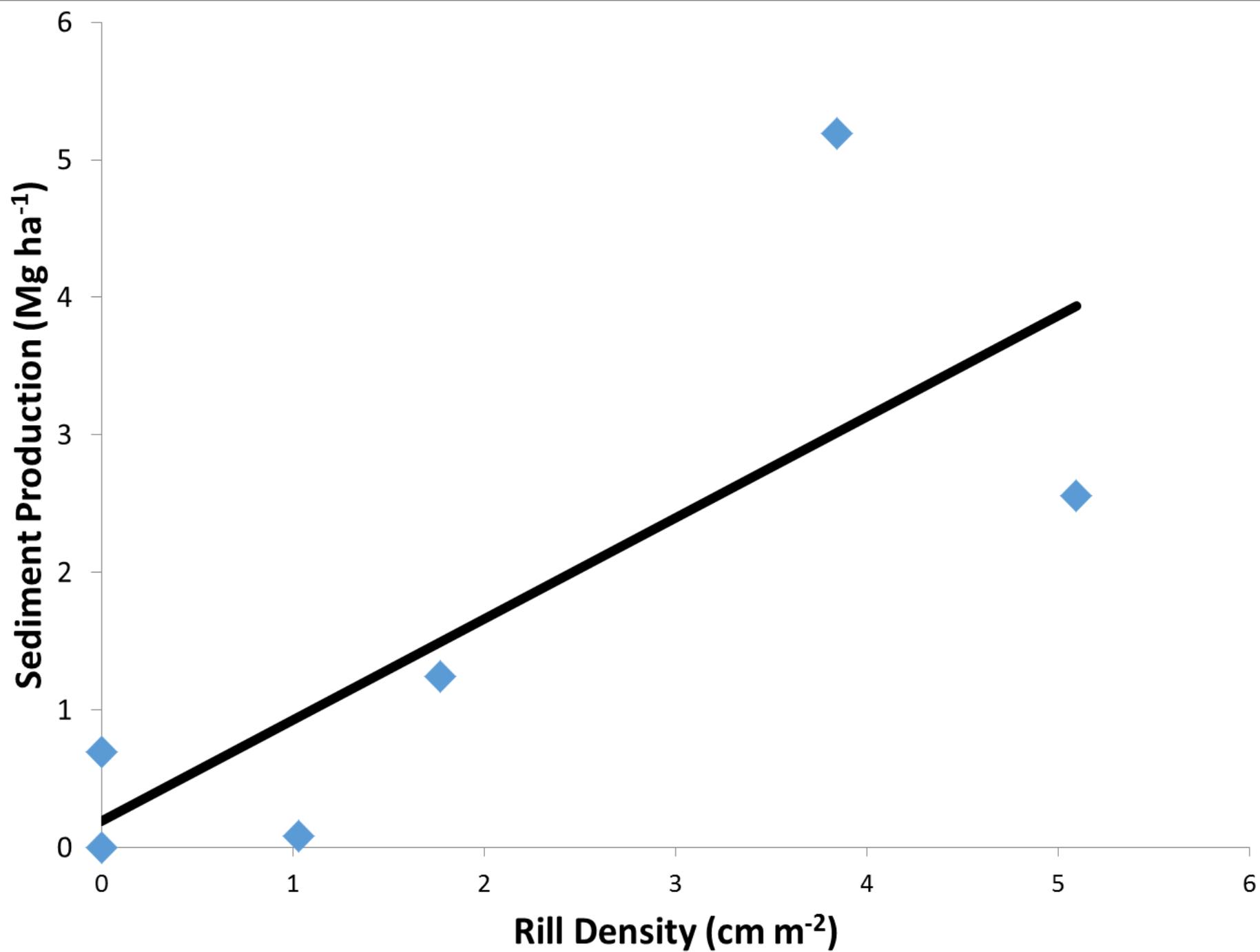
-  Silt Fence
-  Contributing Area
-  Channel
-  Rill
-  10m Contour



Rill Density by Channel

Rill Density (cm m^{-2})





Effects of Post-Fire Management on Sediment Production



- Comparing combinations of different mechanical and herbicide treatments on sediment production for high severity sites
- Bounded plots (5 m by 15 m)
- 5 replicates per treatment; 1 weir per treatment; 25-30 plots total





BMP Demonstration



- Implement different BMPs to control runoff and sediment delivery from skid trails
- Look at changes in rill density and rill connectivity
- Hillslope scale

Preliminary Conclusions

- Sediment delivery rates ranges from 0 to 5.2 Mg ha⁻¹ until early March
 - Upper rate is likely 10-15 Mg ha⁻¹ after March storm events
 - Rates varied percent bare soil and rill density
 - Percent organics ranges from 11 to 25%
- Spatially variable, with high small scale sediment production rates not manifesting into larger scale sediment delivery
- Rates much lower than those predicted by GeoWEPP

Acknowledgements

- Dave Loveless – State Forests Program Manager
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