BUTTE FIRE: POST-FIRE SEEDING AND MULCHING TREATMENT EFFECTS ON PLANT COVER AND EROSION CONTROL.

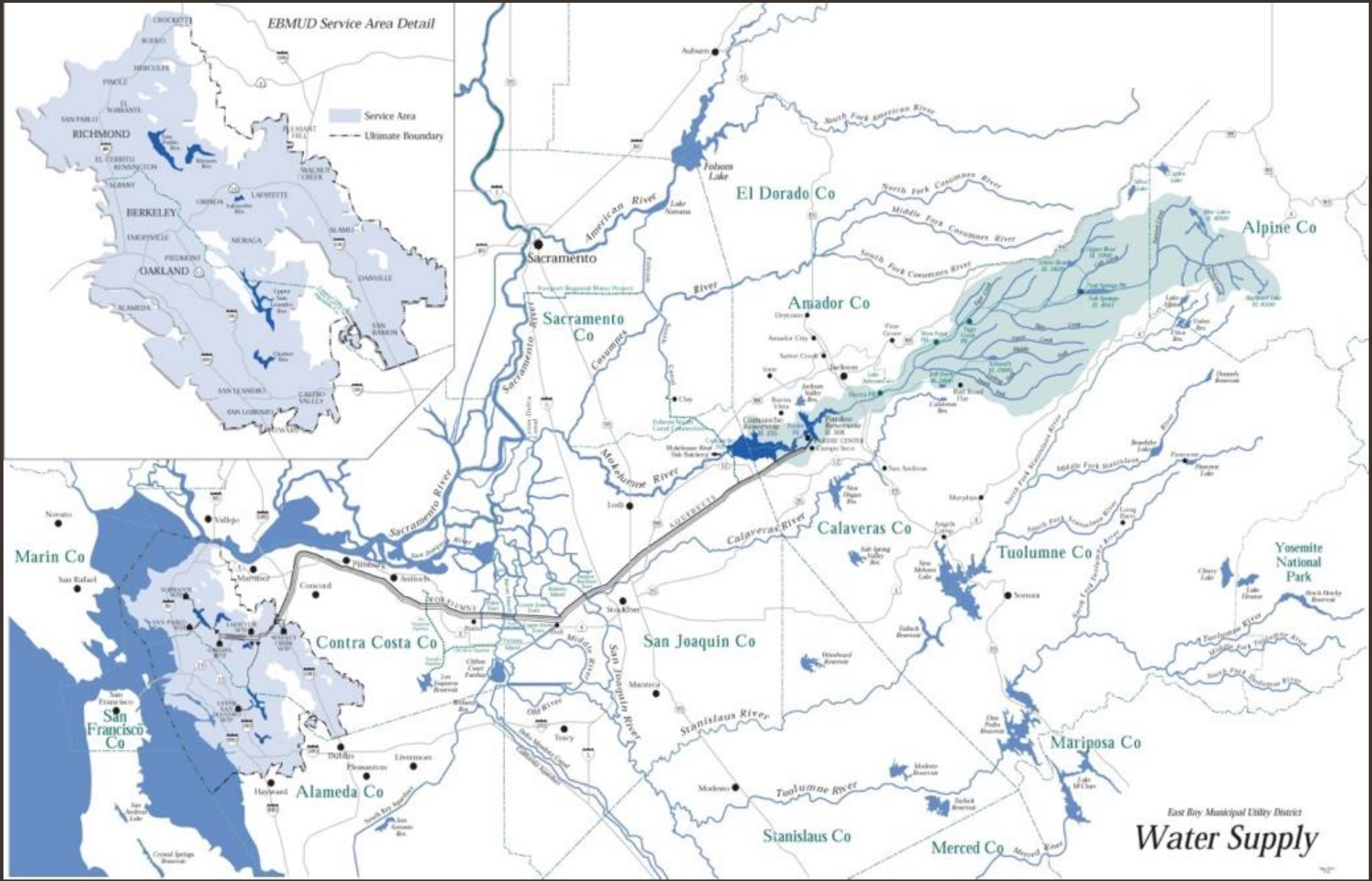
David Gilpin, Bill Agnew, and Chris Swann

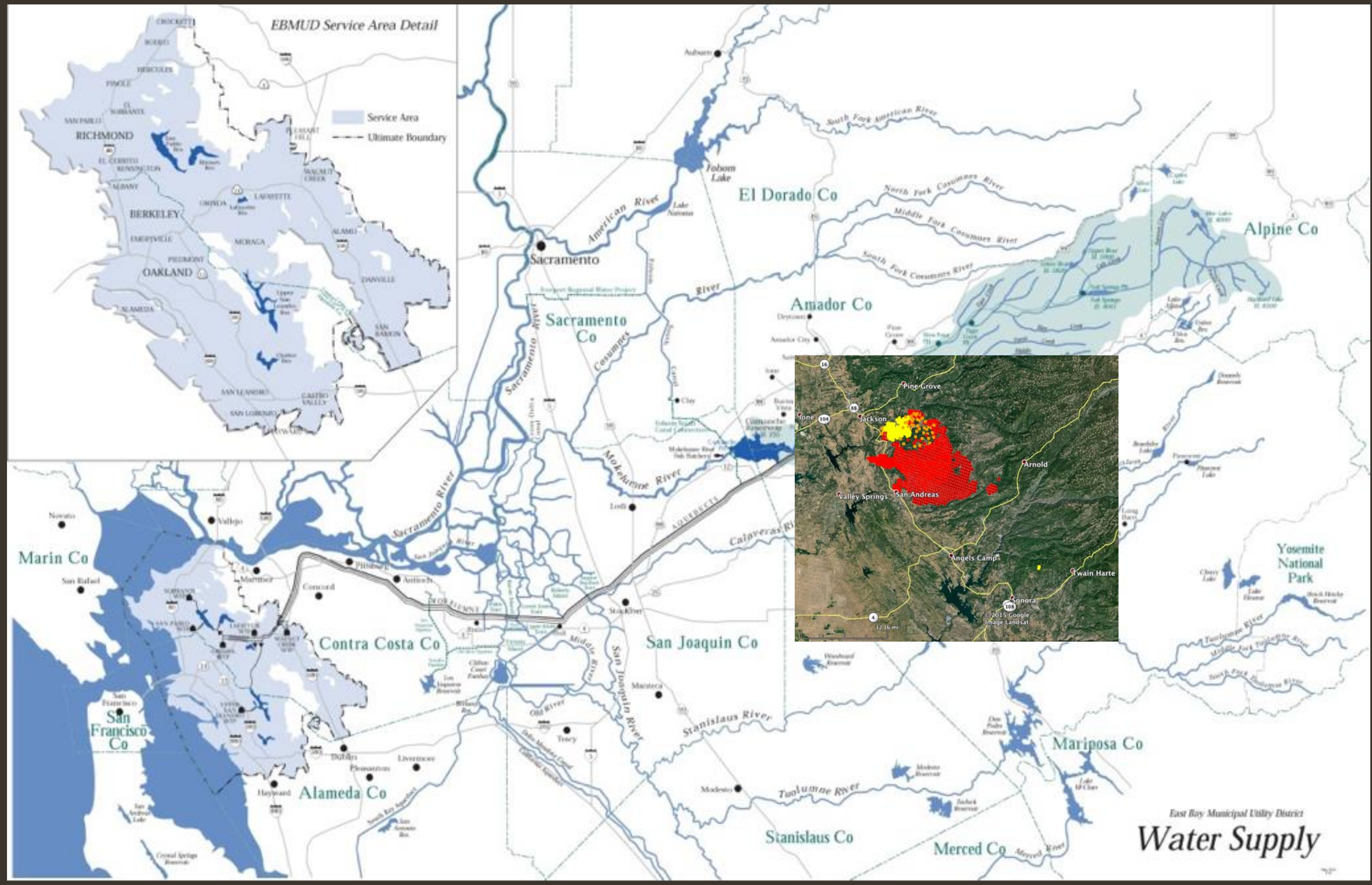
Pacific Coast Seed, Agnew Environmental Consulting, EBMUD

Butte Fire

September 9, 2015

Amador County


EBMUD Service Area Detail
Service Area
Ultimate Boundary
RICHMOND
BERKELEY
OAKLAND
El Dorado Co
Alpine Co
Amador Co
Sacramento Co
Sacramento
Folsom Lake
American River
North Fork Cosumnes River
Middle Fork Cosumnes River
South Fork Cosumnes River
South Fork American River
Mokelumne River
Sacramento River
San Joaquin River
Calaveras River
Calaveras Co
Tuolumne Co
Yosemite National Park
Marin Co
Contra Costa Co
San Joaquin Co
San Francisco Co
Alameda Co
Stanislaus Co
Merced Co
Mariposa Co
Stanislaus River
Tuolumne River
Merced River
Old River
Middle River
East Bay Municipal Utility District
Water Supply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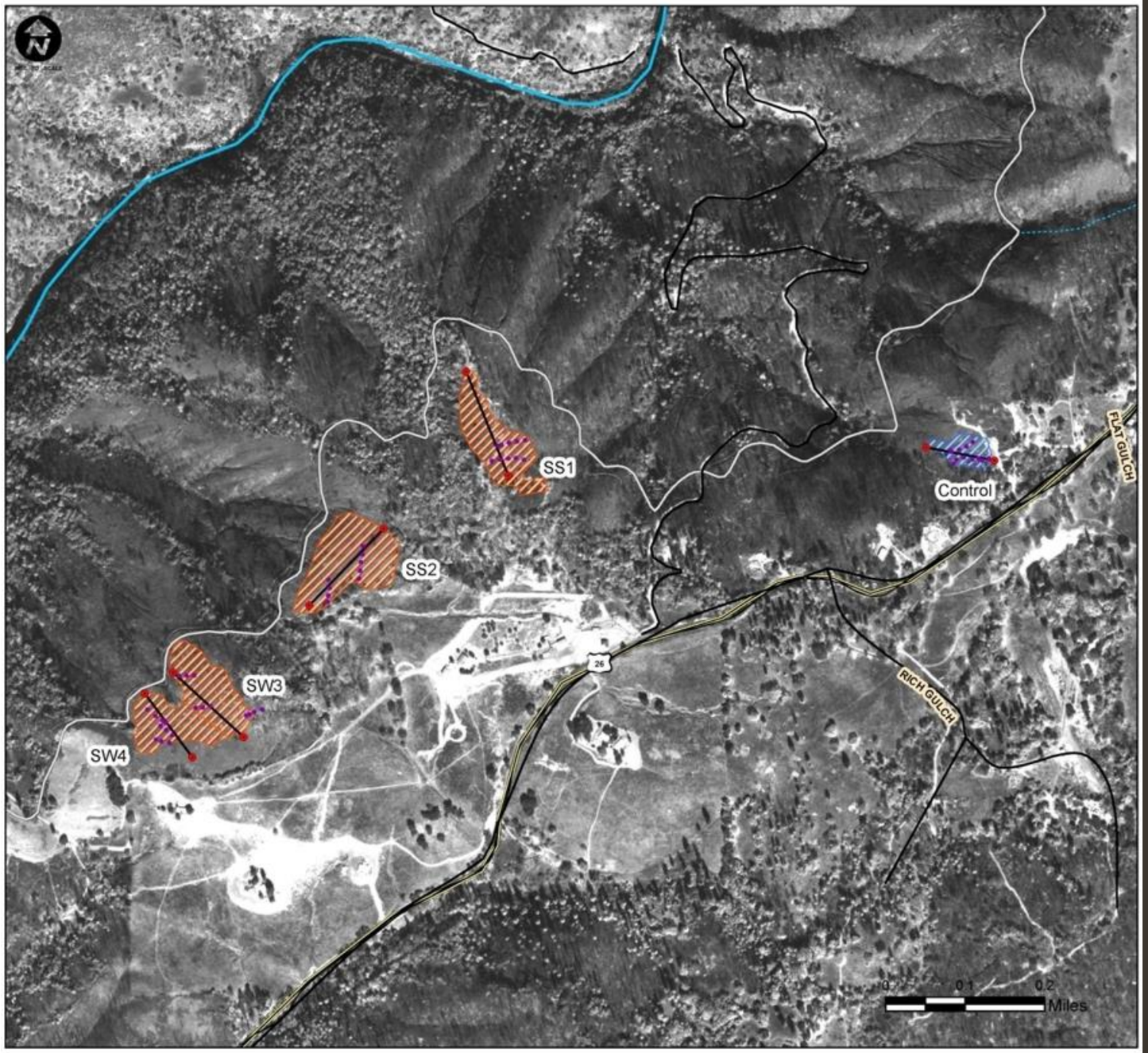
Merced Co
Mariposa Co
Yosemite National Park
Pine Grove
Jackson
Arnold
Valley Springs
San Andreas
Angels Camp
Twain Harte
Sonora
2015 Google
Image Landsat
East Bay Municipal Utility District
Water Supply

Does seeding after fire increase vegetation cover?

Does seeding after fire reduce sediment loss?

Post-Fire Management:

- Seed vs. No Seed?
- Straw vs. Mulch?
- Fall vs. Winter Application?



3 Treatments

Fall Seed & Straw

Winter Seed & Wood Mulch

Control-- No Treatment

Post-Fire Management:

- Seed vs. No Seed?
- Straw vs. Mulch?
- Fall vs. Winter Application?

  - Can't disentangle with this study design
  - Challenges of conducting research in real-world management contexts

Native Seed Mix

Table 1. Seed Mixtures

Species	% Species Composition	
	Fall Mix[1]	Winter Mix[2]
California brome (*Bromus carinatus*)	46.3	53.3
Blue wildrye (*Elymus glaucus*)	18.5	20.0
Pacific fescue (*Festuca microstachys*)	11.1	13.3
Tomcat clover (*Trifolium willdenovii*)	7.4	8.9
Purple needlegrass (*Stipa pulchra*)	8.3	4.5
Sky lupine (*Lupinus nanus*)	4.2	0
Western yarrow (*Achillea millifolium* var. *occidentalis*)	4.2	0
Total	100.0	100.0

[1]Seed applied at a rate of 13.0–15.0 lbs/acre on October 25, 2015 under the rice straw mulch treatment

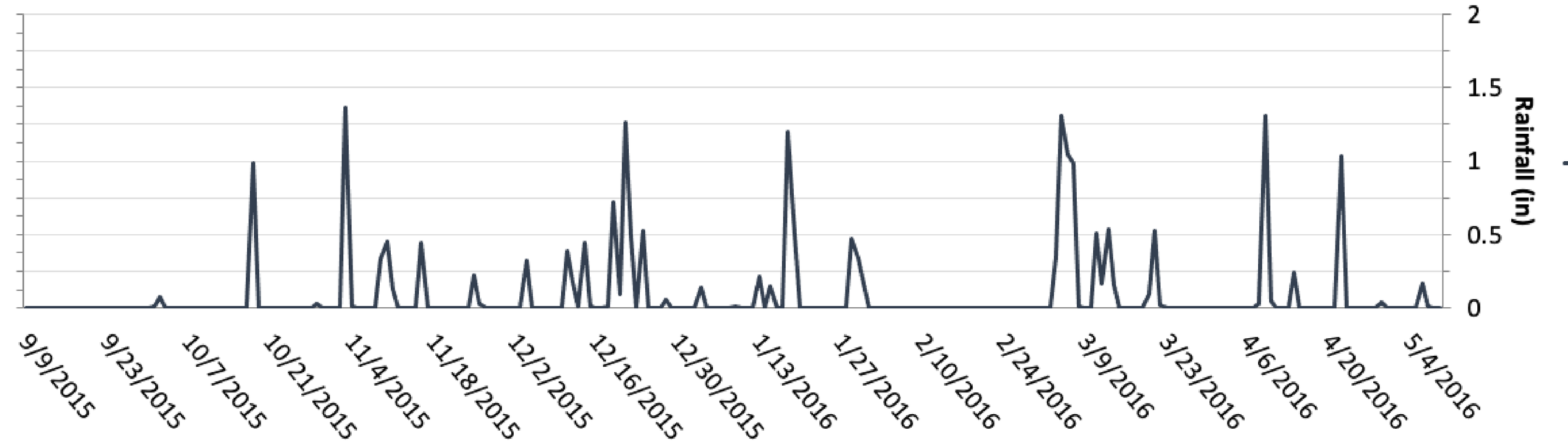
[2]Seed applied at a rate of 20.0–22.0 lbs/acre on January 26, 2016 under wood chip mulch treatment

Native Seed Mix

Native Seed Mix

how was it applied?

Weather Pardee Station



Fall Seed & rice straw

Winter Seed & wood mulch

Fall Seeding & Straw

Rice Straw Mulch (3,000 lbs/acre, hand applied)

Winter Seeding & Wood Mulch

*CO fire recovery Credit: Kevin J. Beaty/Denverite

Wood mulch (4,000 lbs/acre), aerially applied

Treatments

Fall Seed & Straw

October 25, 2015

- Native seed
- Rice Straw Mulch (3,000 lbs/acre)
- 36 acres total

Winter Seed & Wood Mulch

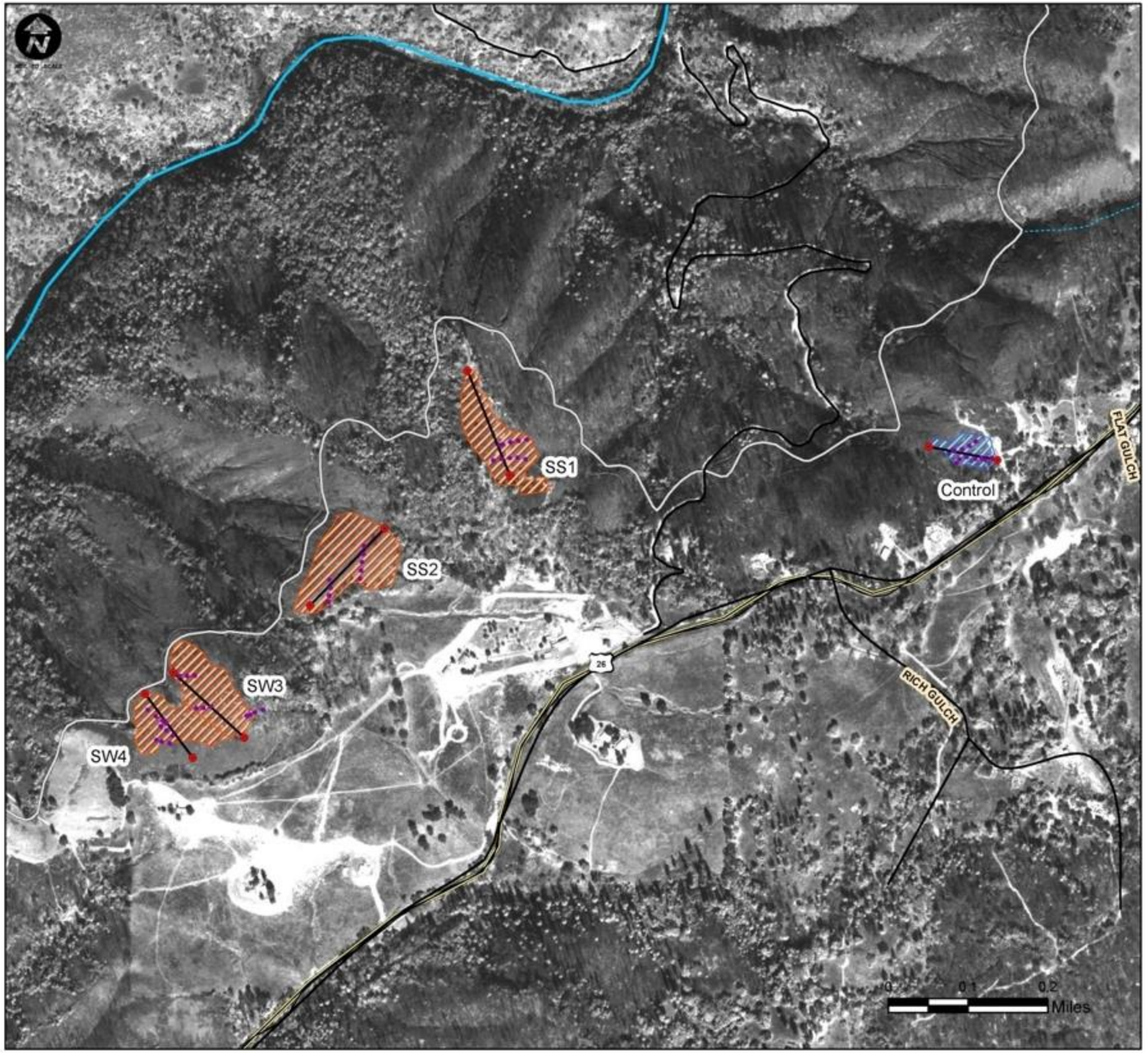
January 25, 2016

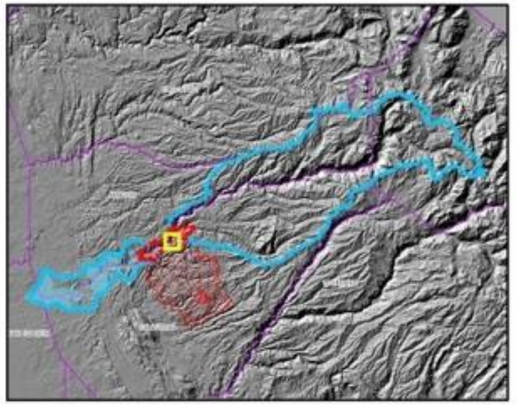
- Native seed
- Wood mulch (4,000 lbs/acre
- 28 acres total

Control-- No Treatment

Upper Mokelumne Watershed Fire Recovery Seed Treatment Study Sites

Prepared: February 2017





Location: Upper Mokelumne Watershed
Detailed View: Upper Mokelumne Watershed Fire Recovery Zone

- Slope Survey Points
- Benchmarks
- Baseline

Study Sites

- Control
- Surface Treatments

- Secondary Roads
- Primary Roads
- Highway
- Utility Ditch / Canals
- Mokelumne River
- Creeks

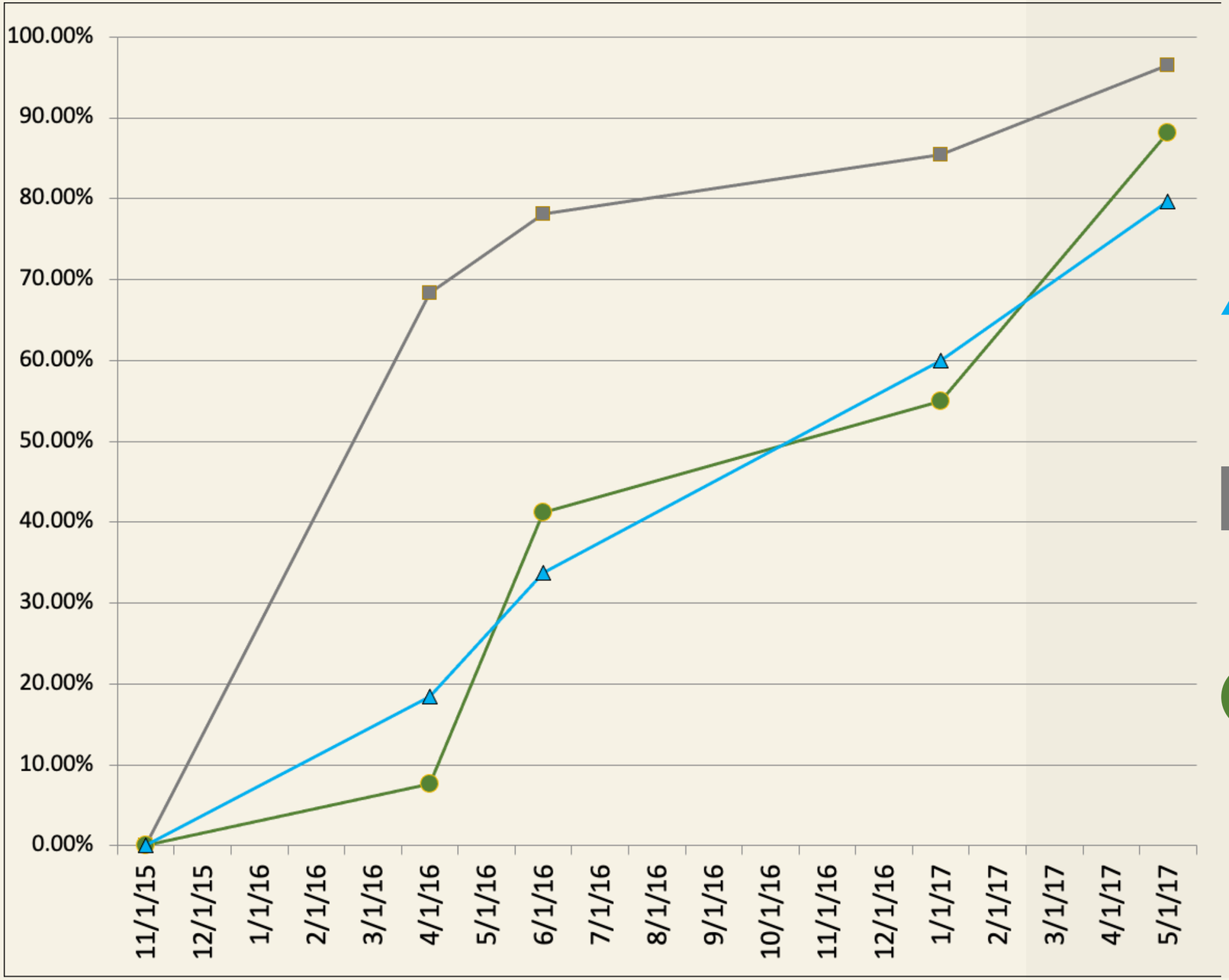
- Mokelumne Watershed Fire Recovery
- Mokelumne Watershed
- Butte Fire
- EBMUD
- Counties

Absolute Scale: 1:8,000
Relative Scale: 1 inch equals 0.13 miles

Vanessa Stevens
Resource Analyst
2017

Does seeding after fire increase vegetation cover?

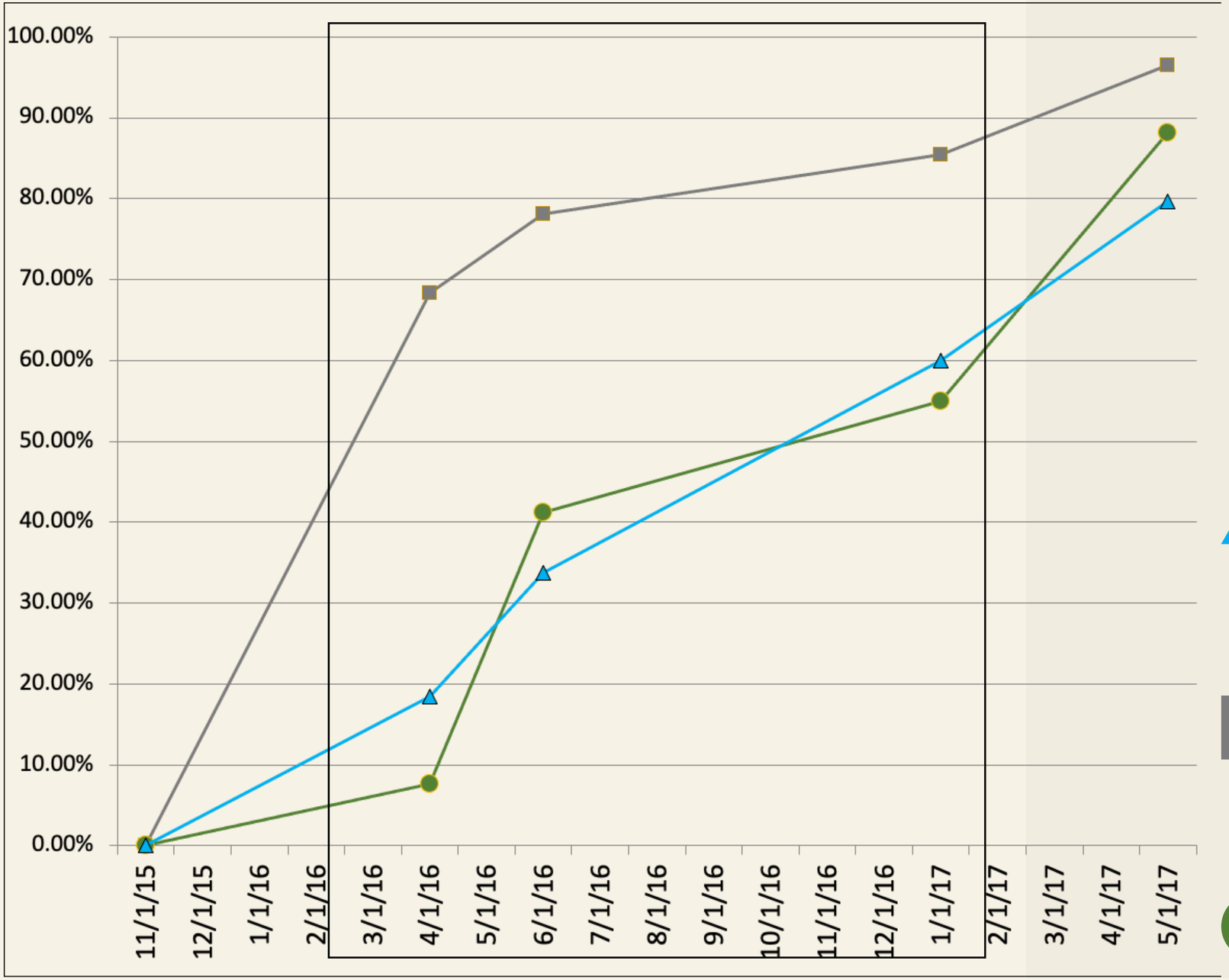
% Herbaceous cover 2015-2017



Control

Fall Seed/Rice Mulch

Winter Seed/Wood Mulch



Fall seed & rice mulch increased herbaceous cover in the spring and the following winter

Control

Fall Seed/Rice Mulch

Winter Seed/Wood Mulch

Control- Year 1

October 23, 2015

November 12, 2015

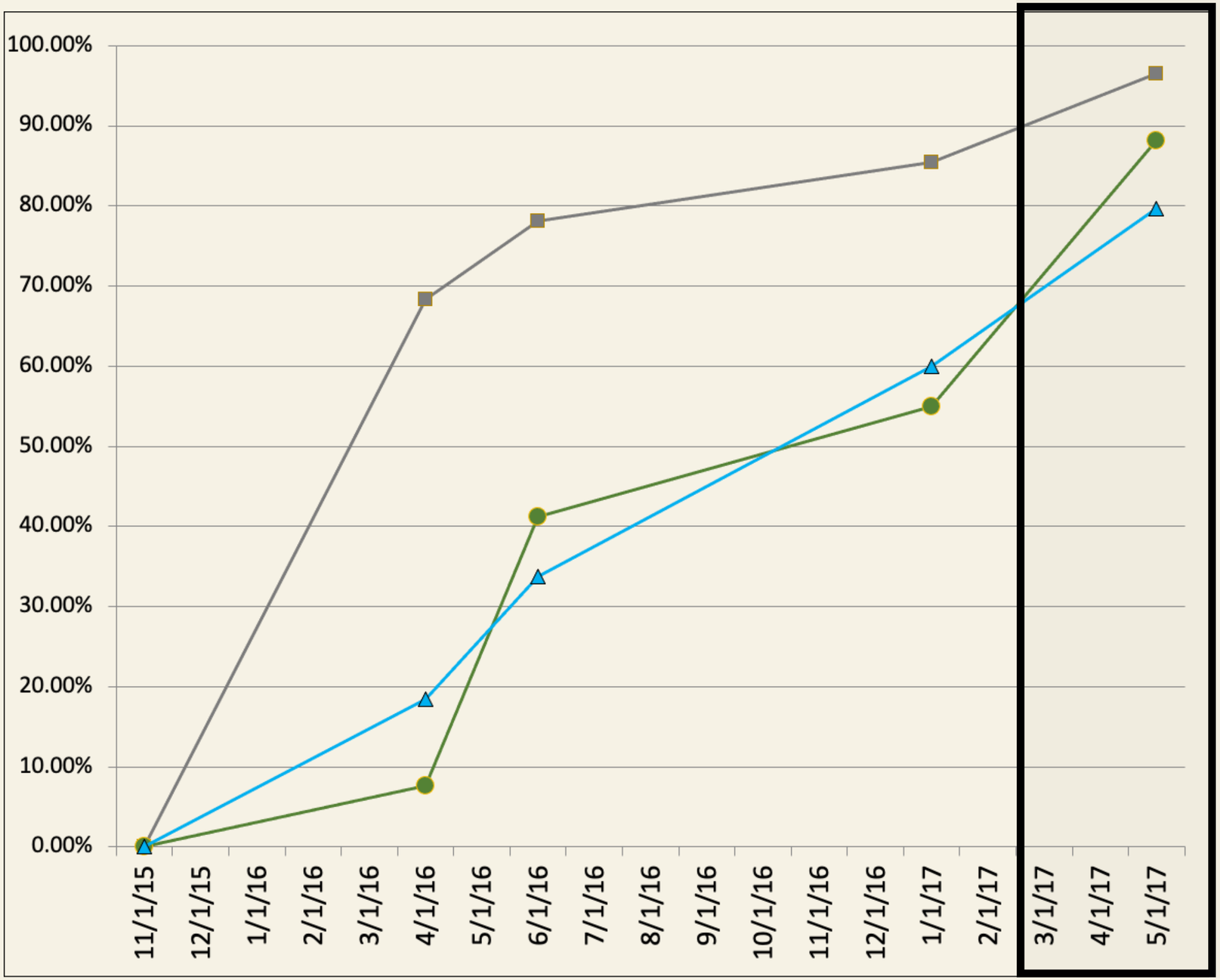
April 8, 2016

Seed and Straw-Year 1

October 23, 2015

November 12, 2015

April 8, 2016



By spring 2017 herbaceous cover was similar in all treatments

Control

Fall Seed/Rice Mulch

Winter Seed/Wood Mulch

All Treatments Spring 2017

Control

Fall Seed & Rice Straw

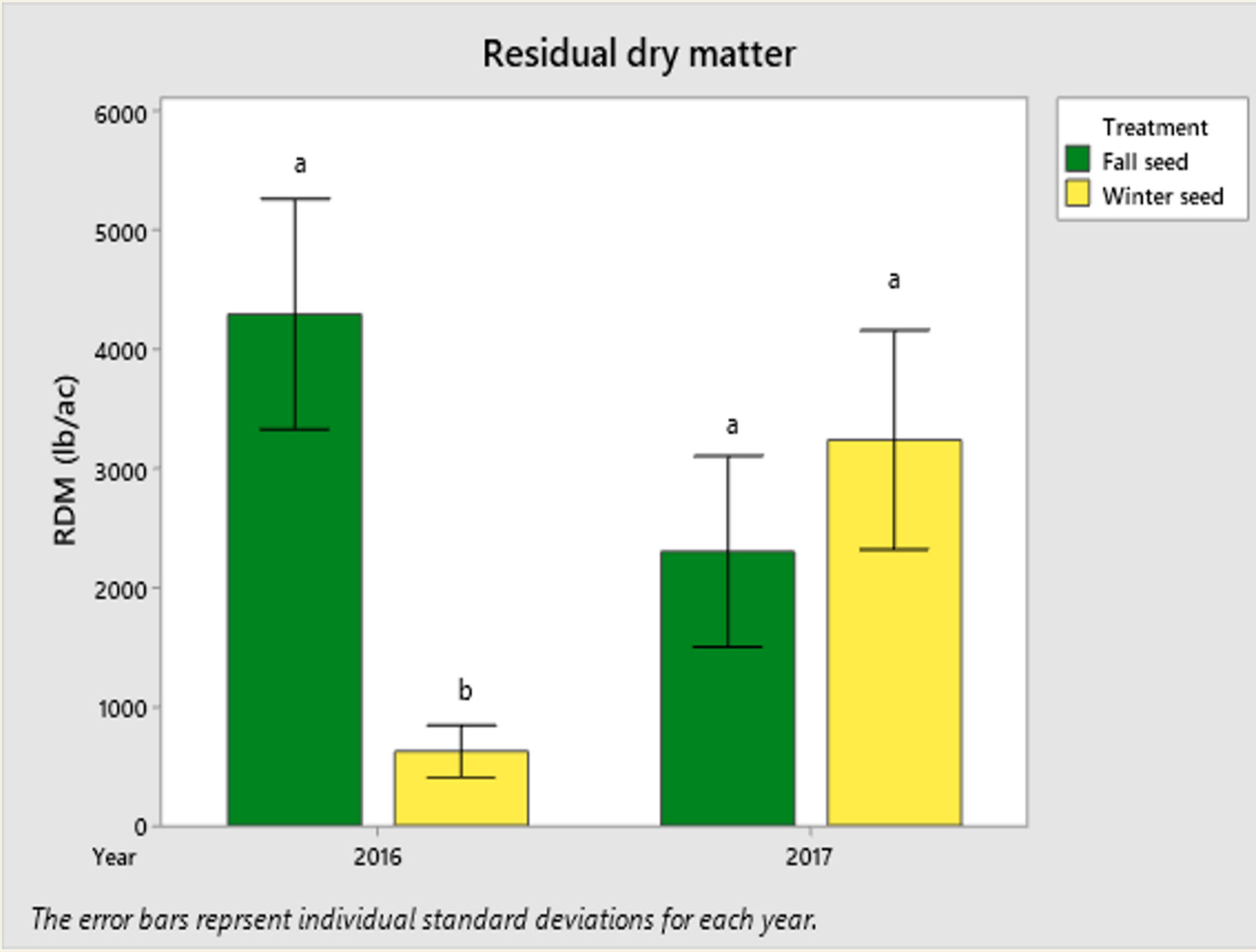
Winter Seed & Wood Mulch

- Perennial grasses regenerating
- Bromus carinatus, Elymus glaucus

Does seeding after fire increase Residual Dry Matter (RDM)?

- Important component of erosion control
- Recommended RDM for 0-30% Slopes: 600 lbs/ac*

**ANR Publication: 8191 Bartolome, Frost, McDougald. 2002, 2006.*



The error bars reprsent individual standard deviations for each year.

Does seeding after fire increase vegetation cover?

- Yes, initially, and prompt (Fall) reseeding had the strongest impact

Does seeding after fire reduce sediment loss?

Modeling Sediment Loss

Revised Universal Soil Loss Equation 2 (RUSLE2) used to compute sediment loss from erosion from 2015-2020

Modeling Sediment Loss

RUSLE2 software:

Location-specific data:

- climate (R),
- soil (K)
- slope steepness (S)
- slope length (L)
- compaction/tillage
- practices (P)
- vegetative or mulch cover (C)

User-input data

- Topography,
- Yield (production level),
- Rock cover,
- Type (e.g. mulch, rice-straw) and amount of mulch

Table 2. RUSLE 2 calculated sediment delivery rates (tons/acre/year) over 5-year period all treatments

Treatment	Immediate Seeding Plus Rice Straw Mulch		Delayed Seeding Plus Wood Chip Mulch		Untreated Control	
Description	Grass/Forb Vegetation Seeded 10/25/2015 plus 3,000 lbs Rice Straw Mulch		Grass/Forb Vegetation Seeded 01/25/2016 plus 4,000 lbs Wood Chip Mulch		No Seed or Mulch; Only Volunteer Vegetation Modeled	
Average Annual Soil Loss (tons/acre/year)	3.6		21.0		27.6	
Sediment Delivery (tons/acre/year)	Yearly	Cumulative	Yearly	Cumulative	Yearly	Cumulative
Year 1 (2015–2016)	6.4		50.0		64.0	
Year 2 (2016–2017)	3.9	10.3	28.0	78.0	43.0	107.0
Year 3 (2017–2018)	2.9	13.2	15.0	93.0	17.0	124.0
Year 4 (2018–2019)	2.4	15.6	7.4	100.4	8.5	132.5
Year 5 (2019–2020)	2.4	18.0	4.0	104.4	4.9	137.4

Note: Yearly sediment delivery is from September 15 to September 14 of next year

Does seeding after fire increase vegetation cover?

- Yes, initially (first year and 1/2)
- Prompt (Fall) reseeding with rice mulch had the strongest impact

Does seeding after fire reduce sediment loss?

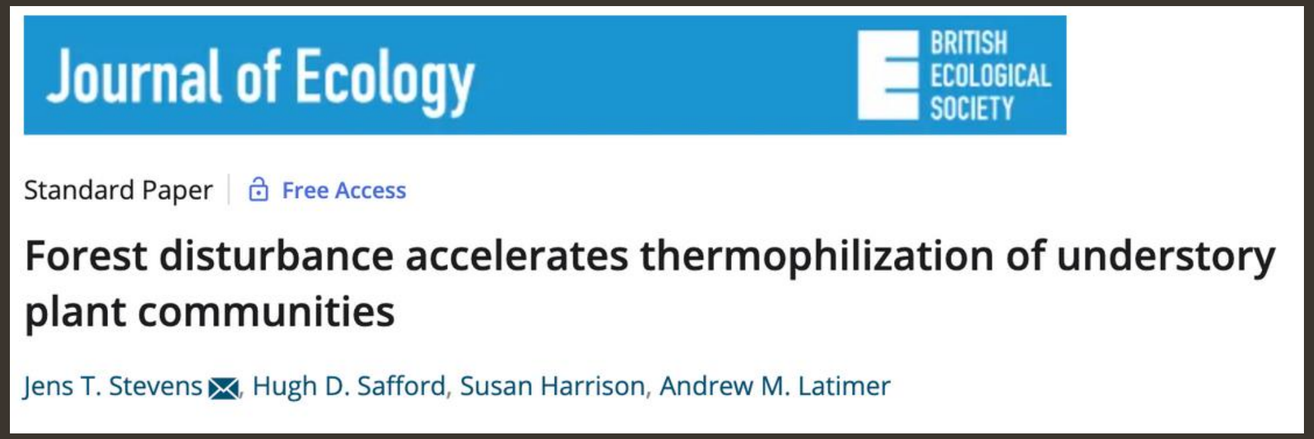
- Yes, both treatments had strong effects lasting 5 years
- Prompt (Fall) reseeding with rice mulch had the strongest impact

Remaining questions:

- Did treatments impact the community composition of the understory?
  - Native vs. nonnative?
  - Shifts in native plant ranges?

Remaining questions:

- Did treatments impact the community composition of the understory?



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Forest disturbance accelerates thermophilization of understory plant communities

Jens T. Stevens, Hugh D. Safford, Susan Harrison, Andrew M. Latimer

As wildfires burn, southern plants move north

A UC Davis study has found that forest disturbance has led to species from drier, warmer areas taking over.

August 12, 2015

Special Thanks

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