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

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Pacific Coast Seed, Agnew Environmental Consulting, EBMUD
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

<table>
<thead>
<tr>
<th>Species</th>
<th>% Species Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>California brome (<em>Bromus carinatus</em>)</td>
<td>46.3</td>
</tr>
<tr>
<td>Blue wildrye (<em>Elymus glaucus</em>)</td>
<td>18.5</td>
</tr>
<tr>
<td>Pacific fescue (<em>Festuca microstachys</em>)</td>
<td>11.1</td>
</tr>
<tr>
<td>Tomcat clover (<em>Trifolium willdenovii</em>)</td>
<td>7.4</td>
</tr>
<tr>
<td>Purple needlegrass (<em>Stipa pulchra</em>)</td>
<td>8.3</td>
</tr>
<tr>
<td>Sky lupine (<em>Lupinus nanus</em>)</td>
<td>4.2</td>
</tr>
<tr>
<td>Western yarrow (<em>Achillea millefolium var. occidentalis</em>)</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

1Seed applied at a rate of 13.0–15.0 lbs/acre on October 25, 2015 under the rice straw mulch treatment
2Seed applied at a rate of 20.0–22.0 lbs/acre on January 26, 2016 under wood chip mulch treatment
Native Seed Mix

Species included:
- Elymus glaucus
- Achillea millefolium
- Stipa pulchra
- Bromus carinatus
- Festuca microstachys
- Lupinus nanus
- Trifolium vesicaria
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

Wood mulch (4,000 lbs/acre), aerially applied
<table>
<thead>
<tr>
<th>Treatments</th>
<th>Fall Seed &amp; Straw</th>
<th>Winter Seed &amp; Wood Mulch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>October 25, 2015</td>
<td>January 25, 2016</td>
</tr>
<tr>
<td></td>
<td>• Native seed</td>
<td>• Native seed</td>
</tr>
<tr>
<td></td>
<td>• Rice Straw Mulch</td>
<td>• Wood mulch (4,000 lbs/acre)</td>
</tr>
<tr>
<td></td>
<td>(3,000 lbs/acre)</td>
<td>• 28 acres total</td>
</tr>
<tr>
<td></td>
<td>• 36 acres total</td>
<td></td>
</tr>
<tr>
<td>Control-- No Treatment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Does seeding after fire increase vegetation cover?
Fall seed & rice mulch increased herbaceous cover in the spring and the following winter.
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.
All Treatments Spring 2017

- 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*

The error bars represent 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>
<thead>
<tr>
<th>Treatment</th>
<th>Immediate Seeding Plus Rice Straw Mulch</th>
<th>Delayed Seeding Plus Wood Chip Mulch</th>
<th>Untreated Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Grass/Forb Vegetation Seeded 10/25/2015 plus 3,000 lbs Rice Straw Mulch</td>
<td>Grass/Forb Vegetation Seeded 01/25/2016 plus 4,000 lbs Wood Chip Mulch</td>
<td>No Seed or Mulch; Only Volunteer Vegetation Modeled</td>
</tr>
<tr>
<td>Average Annual Soil Loss (tons/acre/year)</td>
<td>3.6</td>
<td>21.0</td>
<td>27.6</td>
</tr>
<tr>
<td>Sediment Delivery (tons/acre/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly</td>
<td>Cumulative</td>
<td>Yearly</td>
<td>Cumulative</td>
</tr>
<tr>
<td>Year 1 (2015–2016)</td>
<td>6.4</td>
<td>50.0</td>
<td>64.0</td>
</tr>
<tr>
<td>Year 2 (2016–2017)</td>
<td>3.9</td>
<td>10.3</td>
<td>43.0</td>
</tr>
<tr>
<td>Year 3 (2017–2018)</td>
<td>2.9</td>
<td>13.2</td>
<td>17.0</td>
</tr>
<tr>
<td>Year 4 (2018–2019)</td>
<td>2.4</td>
<td>15.6</td>
<td>8.5</td>
</tr>
<tr>
<td>Year 5 (2019–2020)</td>
<td>2.4</td>
<td>18.0</td>
<td>4.9</td>
</tr>
</tbody>
</table>

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?
Special Thanks

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