Update from Humboldt County: burn objectives and range management, project costs, and bringing fire back to the people

Jeff Stackhouse
University of California Cooperative Extension
18 broadcast burns since June 2017!
What and when are we burning?

- Late phenology species
- Forest/Wildland-urban interface fuels reduction
- Woody encroachment on rangelands
- Fir removal from oak woodlands
- Other/Training
What does it cost?
HCPBA Participation Cost?

- HCPBA Membership: $25
- Leather Gloves: $0
- Cotton Pants/Shirt/Hat: $0
- Tool: $0
- Lighter: $1

Total Participation Cost: $26

But what about treatment cost?
Chemical Treatment Cost Estimates

**Broadleaf-Herbaceous Plants**

- **Shark @ 1 and 2 oz/acre**
  - ~$6/oz = $6 to $12/acre
- **Milestone @ 3 and 7 oz/acre**
  - ~$2.90/oz = $8.5 to $20/acre
- **Transline @ 3 and 7 oz/acre**
  - ~$1.47/oz = $4.5 to $10.5/acre
- **2, 4-D @ 32 and 64 oz/acre**
  - ~$0.15/oz = $4.5 to $9/acre
- **Triclopyr @ 32 and 64 oz/acre**
  - ~$0.50/oz = $16 to $32/acre
- **Crossbow @ 64 and 128 oz/acre**
  - ~$0.48/oz = $31 to $62/acre

**Woody Plants**

- **2,4-D @ $16.67/gal**
  - Spray (47 gal*5%)= ~$39.17/acre
- **Triclopyr @ $54.82/gal**
  - Spray (47 gal*5%)= ~$128.83/acre
- **Imazapyr @ $49.10/gal**
  - Spray (47 gal*5%)= ~$115.38/acre
- **Glyphosate @ $31.64/gal**
  - Spray (47 gal*5%)= ~$74.35/acre

**Grass Only**

- **Poast @ 16 to 24 oz/acre**
  - ~$0.78/oz = $13 to $19/acre
Mechanical Treatment Cost Estimates

- Cat: $85/hr – $150/hr ($340-$600/acre)
- Hired Saw: $15 - $25/hr ($487-$812/acre)
- Excavator: $125 - $200/hr ($975- $1560/acre)

Hired contractor prices

Table 1: LSD mean frequency and cover reduction of Baccharis and bare ground by treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Plants/M²</th>
<th>Baccharis reduction, %</th>
<th>Bare ground, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exc</td>
<td>0.07⁵</td>
<td>68b</td>
<td>22b</td>
</tr>
<tr>
<td>Cat</td>
<td>0.45⁵</td>
<td>65b</td>
<td>19b</td>
</tr>
<tr>
<td>Saw</td>
<td>1.32⁵</td>
<td>53a</td>
<td>3a</td>
</tr>
</tbody>
</table>

⁵Within a column means with a similar letter do not differ
## Air Quality: Monterey Bay vs North Coast

<table>
<thead>
<tr>
<th>Permit Type</th>
<th>Annual Fee</th>
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</thead>
<tbody>
<tr>
<td>Standard burn permit (4x4)</td>
<td>$20/yr</td>
</tr>
<tr>
<td>Less than 1 acre of material</td>
<td>$40/yr</td>
</tr>
<tr>
<td>1-10 acres</td>
<td>$80/yr</td>
</tr>
<tr>
<td>10-100 acres</td>
<td>$250/yr</td>
</tr>
<tr>
<td>100-300 acres</td>
<td>$500/yr</td>
</tr>
<tr>
<td>Greater than 300 acres</td>
<td>$1,250/yr</td>
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</tbody>
</table>

+$65/Bi-annually for SMP for all non-standard permits
<table>
<thead>
<tr>
<th>Objective</th>
<th>Acres</th>
<th>Burn plan</th>
<th>Burn Boss</th>
<th>VFD stipend</th>
<th>Air quality</th>
<th>Crew size</th>
<th>Total cost</th>
<th>Cost/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medusahead control/training</td>
<td>18</td>
<td>$500</td>
<td>$1,500</td>
<td>$600</td>
<td>$100</td>
<td>30</td>
<td>$2,700</td>
<td>$152</td>
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<tr>
<td>Coyote brush control/training</td>
<td>140</td>
<td>$500</td>
<td>$1,000</td>
<td>$600</td>
<td>$200</td>
<td>25</td>
<td>$2,300</td>
<td>$17</td>
</tr>
<tr>
<td>Oak woodland restoration/training</td>
<td>20</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
<td>$100</td>
<td>12</td>
<td>$100</td>
<td>$6</td>
</tr>
<tr>
<td>Oak woodland restoration</td>
<td>15</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$100</td>
<td>3</td>
<td>$100</td>
<td>$7</td>
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<tr>
<td>Oak woodland restoration</td>
<td>13</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$0*</td>
<td>6</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Blackberry control</td>
<td>5</td>
<td>$500</td>
<td>$1,500</td>
<td>N/A</td>
<td>$145</td>
<td>10</td>
<td>$2,145</td>
<td>$431</td>
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<tr>
<td>Grasshopper control/medusahead control/training</td>
<td>6</td>
<td>$0</td>
<td>$1,500</td>
<td>$600</td>
<td>$145</td>
<td>25</td>
<td>$2,245</td>
<td>$378</td>
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<tr>
<td>Coyote brush control/training</td>
<td>215</td>
<td>$500</td>
<td>$1,000</td>
<td>$750</td>
<td>$565</td>
<td>35</td>
<td>$2,815</td>
<td>$13</td>
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<tr>
<td>Coyote brush control/training</td>
<td>145</td>
<td>$0*</td>
<td>$1,000</td>
<td>$750</td>
<td>$565</td>
<td>30</td>
<td>$2,315</td>
<td>$16</td>
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<td>Native grass seeding trial</td>
<td>0.25</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$145</td>
<td>3</td>
<td>$145</td>
<td>$592</td>
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<tr>
<td>Coyote brush control/training</td>
<td>130</td>
<td>$0*</td>
<td>$1,000</td>
<td>$750</td>
<td>$0*</td>
<td>30</td>
<td>$1,750</td>
<td>$14</td>
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<tr>
<td>Understory fuels reduction/training</td>
<td>3</td>
<td>$1,000</td>
<td>$1,500</td>
<td>$600</td>
<td>$145</td>
<td>25</td>
<td>$3,245</td>
<td>$1,090</td>
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<tr>
<td>Oak woodland restoration</td>
<td>163</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$565</td>
<td>2</td>
<td>$565</td>
<td>$3</td>
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<tr>
<td>Oak woodland restoration</td>
<td>22</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$315</td>
<td>9</td>
<td>$315</td>
<td>$15</td>
</tr>
<tr>
<td>Blackberry control</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$145</td>
<td>3</td>
<td>$145</td>
<td>$74</td>
</tr>
<tr>
<td>Understory fuels reduction/training</td>
<td>5</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$145</td>
<td>20</td>
<td>$145</td>
<td>$33</td>
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</tbody>
</table>
Medusahead  Starthistle  Barbed goatgrass
<table>
<thead>
<tr>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natives &amp; forage</td>
<td><strong>Growth</strong></td>
<td>Senescence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medusahead, goatgrass, starthistle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Growth**
- **Senescence**

*University of California*  
*Agriculture and Natural Resources*
<table>
<thead>
<tr>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
</tr>
</thead>
</table>

Natives & forage **Growth**  

Medusahead, goatgrass, starthistle

Late Phenology  
Invasive
Late-season annual weeds

Photos by: Guy Kyser
• Hunt: June 29, 2017
  – 18 acres: Medusahead
  – $500: Burn Plan
  – $1500: Burn Boss
  – $600: VFD Stipends
  – $100: Air Quality + other
  • $150/acre + ~30 people

• Phelps Burn: June 26, 2018
  – 3 acres: Vineyard Edge
  – 3 acres: Medusahead
  – No Burn Plan
  – $1500 Burn Boss
  – $100: Air Quality + other
  • $267/acre + ~25 people
Cow Lactating 1st 90 days – % CP

- Early Vegetative
- Late Vegetative
- Early Flowering
- Late Flowering
- Mature
- Dry
- Dry, Leached

- Annual Grass
- Filaree
- Bur Clover
- Cow

University of California
Agriculture and Natural Resources
Fir encroachment into oak woodlands
- Chalk Mt: Dec 14, 2017
  - 20 acres: Oak Woodland
  - No Burn Plan
  - No Burn Boss
  - $100: Air Quality + other
    - $5/acre + 12 people

- Rice #1: Dec 17, 2017
  - 15 acres: Oak Woodland
  - No Burn Plan
  - No Burn Boss
  - $100: Air Quality + other
    - $7/acre + 3 people

- Hunt #2: Dec 19, 2017
  - 13 acres: Oak Woodland
  - No Burn Plan
  - No Burn Boss
  - $100: Air Quality + other
    - $8/acre + 6 people

- Rice #2: Jan 2, 2019
  - 163 acres: Oak Woodland
  - No Burn Plan
  - No Burn Boss
  - $250 Air Quality
    - $1.5/acre + 2 people

- Hunt #3: Jan 3, 2019
  - 22 acres: Grass/Oaks
  - No Burn Plan
  - No Burn Boss
  - $300 Air Quality + other
    - $13/acre + 9 people
Coyote brush in coastal grasslands

- October 2017
- September & October 2018
California’s largest NRCS-funded burn
• McBride #1: Sept 26, 2018
  – 215 acres: Coyote Brush
  – $500: Burn Plan
  – $1000: Burn Boss
  – $1000: Air Quality + other
    • $5/acre + ~35 people

• Mazeppa #1: October 31, 2017
  – 140 acres: Coyote Brush
  – $500: Burn Plan
  – $1000: Burn Boss
  – $200: Air Quality + other
    • $12/acre + ~25 people

• Mazeppa #2: Sept 27, 2018
  – 145 acres: Coyote Brush
  – Reused Burn Plan
  – $1000 Burn Boss
  – $800: Air Quality + other
    • $12/acre + ~30 people

• McBride #2: Oct 17, 2018
  – 130 acres: Coastal shrub
  – Reused Burn Plan
  – $1000 Burn Boss
  – $200: Reused Air Quality + other
    • $9/acre + ~30 people
Fuels reduction projects

• Cocking, October 2018
Ostrow: April 29, 2019
  - 4 acres: Understory
  - No Official Burn Plan
  - No Official Burn Boss
  - $145 Air Quality + other
    - $36/acre + 20 people

Cocking: October 20, 2018
  - 3 acres: Forest/Urban
  - $1000 Burn Plan
  - $1500 Burn Boss
  - $830 Air Quality + other
    - $1110/acre + 25 people
Blackberry control

- April 2018 & 2019
- Any burnt blackberry is good blackberry.
Moore Burns: April 25, 2018
- 5 acres (over 2k acres):
  - Scattered Blackberry
- $500: Burn Plan
- $1500: Burn Boss
  - (NRCS Requirement)
- $100: Air Quality + other
  - $420/acre + 10 people

Westfall: April 25, 2019
- 2 acres: Snow/Blackberry
- No Burn Plan
- No Burn Boss
- $145 Air Quality + other
  - $72/acre + 3 people
Research trial: seeding and fire

- Evenson Grass Seeding Trial: Oct 15, 2018
  - 1.5 acres: Clover + CA Brome Trial
  - $100: Air Quality + other
    - $66/acre + 3 people
Finally: Developing *Search Images*

- What is a search image?
  - Predator/Prey
  - Selecting seed trees
  - Selecting real estate
Rx Fire Search Images:

- See the problem
- See the burn unit
- See the opportunity
We need to rethink burn windows: drive by objective not just by expert knowledge... remember, CA’s fire experts are wildfire experts.
17/18 HumCo Windows

Kneeland California
Daily Data run on 4/26/2019 11:32 PST.

Relative Humidity (%)

Day of Year
Daily Humidity (Average and Range)

University of California
Agriculture and Natural Resources
17/18 HumCo Windows

Kneeland, California
Daily Data run on 4/26/2019 11:32 PST.

Relative Humidity (%)

Day of Year
Daily Humidity (Average and Range)
17/18 HumCo Windows

Kneeland California
Daily Data run on 4/26/2019 11:32 PST.

13 days with average Humidity below 30
- \( \frac{1}{13} = 7.7\% \) capture rate
18/19 HumCo Windows

6 days with average Humidity below 30
- 0/6 = 0% capture rate
Questions?

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Lenya Quinn-Davidson
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• Hunt: June 29, 2017
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  – $500: Burn Plan
  – $1500: Burn Boss
  – $600: VFD Stipends
  – $100: Air Quality + other
    • $150/acre +~30 people

***Prep/Cleanup costs not included in any example!***
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  – 140 acres: Coyote Brush
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  – $1000: Burn Boss
  – $200: Air Quality + other
    • $12/acre + ~25 people
• Chalk Mt: Dec 14, 2017
  – 20 acres: Restored Oak Woodland
  – No Burn Plan
  – No Burn Boss
  – $100: Air Quality + other
    • $5/acre + 12 people
• Rice: Dec 17, 2017
  - 15 acres: Restored Oak Woodland
  - No Burn Plan
  - No Burn Boss
  - $100: Air Quality + other
    • $7/acre + 3 people
Hunt #2: Dec 19, 2017
- 13 acres: Restored Oak Woodland
- No Burn Plan
- No Burn Boss
- $100: Air Quality + other
  - $8/acre + 6 people
• Moore Burns: April 25, 2018
  – 5 acres (over 2k acres):
    Scattered Blackberry
  – $500: Burn Plan
  – $1500: Burn Boss
    • (NRCS Requirement)
  – $100: Air Quality + other
    • $420/acre + 10 people
• Phelps Burn: June 26, 2018
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  – 3 acres: Medusahead
  – No Burn Plan
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  – $1000: Air Quality + other
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Mazeppa #2: Sept 27, 2018
- 150 acres: Coyote Brush
- Reused Burn Plan
- $1000 Burn Boss
- $1050: Air Quality + other
  - $14/acre + ~30 people
• Evenson Trial: Oct 15, 2018
  – 1.5 acres: Clover Trial
  – No Burn Boss
  – No Burn Plan
  – $100: Air Quality + other
  • $66/acre + 3 people
• McBride #2: Oct 17, 2018
  – 130 acres: Coastal shrub
  – Reused Burn Plan
  – $1000 Burn Boss
  – $1000: Reused Air Quality
    + other
  • $15/acre + ~30 people
Cocking: October 20, 2018
- 3 acres: Wildland Urban Interface
- $1000 Burn Plan
- $1500 Burn Boss
- $830 Air Quality + other
  - $1110/acre + 25 people
Rice #2: Jan 2, 2019
- 163 acres: Oak understory
- No Burn Plan
- No Burn Boss
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  - $1.5/acre + 3 people
• Hunt #3: Jan 3, 2019
  – 22 acres: Grass and oak understory
  – No Burn Plan
  – No Burn Boss
  – $300 Air Quality + other
    • $13/acre + 9 people
• Westfall: April 25, 2019
  – 2 acres: Snow/Blackberry
  – No Burn Plan
  – No Burn Boss
  – $145 Air Quality + other
    • $72/acre + 3 people