Caples Fire
First Order Fire Effects
Preliminary Estimate of Burn Severity, Tree Mortality, and Fuel Consumption
Scott Dailey, USFS Enterprise Program
Fire Behavior Assessment Team (FBAT) was requested by the Eldorado NF in late October 2019 to collect first-order fire effects data on the Caples Fire.

Data was collected first 2 weeks of November.
FBAT Objectives

Key Question:

Were conditions moved towards improved ecological state?
- Changes in tree density / tree mortality
- Burn severity (soils, understory veg, shrubs, trees)
- Fuel consumption (Ground, surface, canopy)
Approach

46 plots total: 38 forest plots, 8 chaparral plots
Data collected

Pre/Post Photos
Data collected

Pre/Post Photos
Data collected

Pre/Post Photos
Data collected

Pre/Post Photos
Data collected

Burn Severity

• NPS Burn Severity Measures
  • Substrate
  • Understory Veg

• Tree Burn Severity
  • Char Ht.
  • Scorch Ht.
  • Torch Ht.
Data collected

Tree Status

• Data collected on all trees >3 inches DBH)
• Typical Common Stand Exam Measures
Data collected

Fuels Data

• Ground fuels (litter and duff depths)
• Surface fuels (Brown’s planar methods)
Analysis

• Simple statistical analysis performed for mean values per plot for the various metrics measured post-fire

• Post-fire results were analyzed along side pre-fire data to show change

• Data was stratified to compare fire effects by:
  • Vegetation type (forest vs shrub)
  • Fire type (prescribed burn vs wildfire)

• Results were also compared to Natural Range of Variability for certain metrics, primarily tree density and burn severity fraction as a measure of success in meeting restoration objectives.
Results

Overall Burn Severity: (Substrate + Understory Vegetation + Trees)

![Overall Burn Severity as Percent of Total Plots Sampled](chart)

- **Forest**: Low (45%), Mod (47%), High (8%)
- **Shrub**: Low (45%), Mod (25%), High (38%)
- **All Veg (F+S)**: Low (43%), Mod (43%), High (13%)
Results

Burn Severity: Comparison of Prescribed burn vs. Wildfire
Results

Overall Burn Severity in Forest Plots, Prescribed burn (Sept30-Oct9) vs Wildfire (Oct 10 -Oct25)

<table>
<thead>
<tr>
<th></th>
<th>RxBurn</th>
<th>Wildfire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>60%</td>
<td>43%</td>
</tr>
<tr>
<td>Mod</td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>High</td>
<td>10%</td>
<td>7%</td>
</tr>
</tbody>
</table>
Results

Comparison of Burn Severity Fraction, Caples Prescribed Fire & Resource Benefit Fires

- **CAPLES - RXBURN**: Low 60, Mod 30, High 10
- **YNP-RB**: Low 54, Mod 37, High 9
- **YNP/KCNP-RB**: Low 56, Mod 33, High 11
- **S.SierraNev-RB**: Low 57, Mod 32, High 10
Results

Comparison of Burn Severity Fraction of Caples Wildfire & Other Sierra Wildfires, including 2014 King Fire (ENF)

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Mod</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPLES - WILDFIRE</td>
<td>43</td>
<td>50</td>
<td>7</td>
</tr>
<tr>
<td>Red Fir - Wildfire</td>
<td>60</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>YNP-Wildfire</td>
<td>37</td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td>NorthSierra - Wildfire</td>
<td>46</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Mixed Con - Wildfire</td>
<td>36</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>King Fire - ENF 2014</td>
<td>28</td>
<td>18</td>
<td>53</td>
</tr>
</tbody>
</table>
Results

Overall Burn Severity: Caples Fire compared to the King Fire

- Caples Wildfire: 7% High Severity
- King Fire: 53% High Severity
Results

Large Tree Mortality: Were Caples Prescribed Burn Plan Objectives Met?

- Burn Plan Objective: Tree mortality for trees >30in DBH was 5%
- Prescribed burn areas: 0%
- Wildfire areas: 23%
Results

Tree density: Prescribed burn and Wildfire Compared to the Historic NRV

**Prescribed Burn** Tree Density by Size Class, Forested Plots
Pre-fire and Post-fire, vs. Historical Natural Range of Variability

**Wildfire** Tree Density by Size Class, Forested Plots
Pre-fire and Post-fire, vs. Historical Natural Range of Variability
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Tree density: Prescribed burn and Wildfire Compared to the Historic NRV
Results

Shrub Cover Reduction:

• Burn Plan Objective: 70% reduction
• Estimated reduction: 73%
• Objective met
Fuel Load Reduction: Are conditions closer to the mean historic NRV?

Capes, Plot8, facing S, Pre-fire

Capes, Plot8, facing S, Post-fire
Results

Fuel Load Reduction: Are conditions closer to the mean historic NRV?

Surface Fuel Reduction Relative to the NRV, Pre-fire and Post-fire and RxBurn vs Wildfire Plots

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>NRV</th>
<th>%Diff NRV</th>
</tr>
</thead>
<tbody>
<tr>
<td>RxBurn 1 to 100hr</td>
<td>3.7 (+164%)</td>
<td>0.9 (-36%)</td>
<td>1.4</td>
<td>-36%</td>
</tr>
<tr>
<td>Wildfire</td>
<td>3.2 (+129%)</td>
<td>0.8 (-43%)</td>
<td>1.4</td>
<td>-43%</td>
</tr>
</tbody>
</table>
Results

Fuel Load Reduction: Are conditions closer to the mean historic NRV?

![Surface Fuel Reduction Relative to the NRV, Pre-fire and Post-fire and RxBurn vs Wildfire Plots](chart.png)

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<tr>
<th></th>
<th>RxBurn</th>
<th>1000hr</th>
<th>Wildfire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>21.7</td>
<td>26.7</td>
<td>26.7</td>
</tr>
<tr>
<td>Post</td>
<td>10.6</td>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>NRV</td>
<td>6.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>%Diff NRV</td>
<td>68%</td>
<td></td>
<td>-19%</td>
</tr>
</tbody>
</table>

(+244%) (+68%) (+324%) (-19%)
Results

Reduction of ground fuels (litter and duff):  
Are conditions closer to the Historic Mean NRV?
Results

Reduction of ground fuels (litter and duff):
Are conditions closer to the historic mean NRV?

• Mean NRV for litter+duff depth is 0.6”
• Pre-fire mean depth was 2.2” (267% above mean NRV)
• Post-fire, mean depth is 0.2” (67% below mean NRV)
• YES, closer to mean NRV