Fire and Fuels Management: What Works Where?
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Crown Fire versus Frequent Fire

Adapted Forests

- Frequent fire forests are adapted to frequent disturbances and can be treated to better incorporate drought, insects, and fire without experiencing mortality outside of a desired range

- Crown fire adapted forests such as Rocky Mountain lodgepole pine are adapted to infrequent, high severity fire
  - Not adapted to frequent fire and should not receive fuel treatments except to protect infrastructure
  - These ecosystems are more susceptible to the impacts of altered fire regimes from climate change (Westerling et al. 2011, Stephens et al. 2014)

- Example of forest with changing fire regime
2004/2014 Fires in Northwest Territories, Canada

Wood Buffalo National Park

Jack pine, closed cone species similar to lodgepole pine

Infrequent high severity fire every 70-150 years

With climate change now seeing fires at frequencies rarely seen before
## Current versus 1911 Sierra Nevada mixed conifer forest conditions in the Stanislaus National Forest

<table>
<thead>
<tr>
<th>Year</th>
<th>Total basal area $m^2 ha^{-1}$ [ft$^2$ ac$^{-1}$]</th>
<th>Number of trees $&gt; 15$ cm [6 inches] $ha^{-1}$ [acre$^{-1}$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911</td>
<td>13 [59]</td>
<td>47 [19]</td>
</tr>
<tr>
<td>2013</td>
<td>57 [248]</td>
<td>553 [224]</td>
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</table>

Don’t use this data for specific targets but can inform desired conditions

Data in Collins et al. (2015)
Early Fire and Fuels Researchers

• Begins in Longleaf Pine in the Southeast
  – Chapman, Stoddard, Komarek
  – Most successful US program
    • Frequent fire adapted forest
    • 75% of US prescribed fire today
    • Strong cultural history
    • Must keep this program going

• USFS: Grisborne, Kutok, Mutch, Wade, Heinselman
• NPS: Kilgore, van Wagtendonk
• University: Biswell, Cooper, Agee, Covington
• BIA: Weaver - What did Weaver accomplish?

L. Kobzier picture
Harold Weaver

• Burned 684,890 acres of ponderosa pine forests in the Colville Reservation in eastern Washington from 1945-1955 (Weaver 1957)

• Prescribed fires significantly reduced wildfire damage by 87% and cost of fire control by 54% when compared to adjacent areas that had not been burned

• “This is the presentation of a management system – not just prescribed burning” – Harold Weaver
  – Weaver left, program shut down – need intuitional support
  – San Carlos Apache Reservation – institutional support – yes
    • Alternative fire suppression strategies – new research

• What do common fuels treatments look like?
  – US Joint Fire Sciences Fire and Fire Surrogates Study in Sierra
Fire Alone vs. Thinning + Fire: Mixed Conifer

Pre 2002

Fuels Treatments

- Forest fuel treatments implemented to reduce fire hazards and fire effects in frequent fire forests
  - Reduction of *Surface and Ladder Fuels Critical* (Agee and Skinner 2005)
    - Treatments can increase the vigor/resistance/resilience of remaining trees to improve adaptation to climate change
  - Fuel Treatments: Most ecosystem components exhibit very subtle effects or no measurable effects at all (soils, small mammals and birds, vegetation, bark beetles, carbon sequestration) (Stephens et al. 2012)
    - Longevity of treatments 5-20 years
    - Treatments never end – lightning fire maintenance in some areas (Region 3)

- Research has determined fuel treatments in frequent fire adapted forests are effective when burned by wildfires (Safford et al. 2012, Martinson and Omi 2013)
  - But scale of treatments continues to be relatively low
Managed Lighting Fire

40 years of fire use
15,000 ha (38,000 acres) watershed

If fire has burn < 9 yr old: Goes out 90%

High Severity Patch with Forest Recovery
Forest Change Significant
Vegetation Change from Fire Use

Fires Reduced Forest Area by 22%


Wet meadows increased by 200%
Dry meadows increased by 200%
Shrublands increased by 30%

Less beetle killed trees in drought
Steam water stable or increased

(Biosrame et al. 2016)
Conclusion

• Frequent fire forests changed greatly in western US
  – Climate change makes this worse but not main problem
  – Fuel treatments work and ecologically appropriate
    • Southeast continues today and other areas trying to move forward
    • Treatments can increase tree vigor/resistance/resilience – assist in adaption to climate change

• Crown fire adapted forests less management options

• Need budget outside suppression, longer employment for seasonal workers, strategies for more lightning fire use, make forest resilience a stand-alone top land management priority (Stephens et al. 2016)

• Next 1-3 decades absolutely critical
• USFS forest management plans being revised
• NPS needs more ecological fire, moved away from this
• Leave options available for future managers, optimistic
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