Can we accommodate more smoke in our forest restoration efforts?

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Overview

• Challenges in managing smoke impact when expanding scale of wildland fires
  – Areas-based constraints and policies
  – Some system incentives favor poorly controlled extreme megafires over resource objective fires

• Solutions
  – Use tools and resources for evaluating and communicating impacts and tradeoffs with the public
  – Facilitate use of resource objective fires through policy and planning
Wildfires can be a huge source of PM$_{2.5}$ emissions in California.
Question: Will expanding the scale of burning (more acres) lead to worse air quality for the public?

Answer: Not necessarily, because impacts are largely a function of:

<table>
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<th>1) daily emissions</th>
<th>2) conveyance to downwind communities</th>
<th>3) size and vulnerability of those communities</th>
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<td>![Image of daily emissions]</td>
<td>![Image of conveyance]</td>
<td>![Image of vulnerability]</td>
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Extreme fires can cause impacts over enormous populations.

Rim Fire estimated impact:
7 million person-days of smoke impact
over 5.5 X more impact per unit area
burned as two managed fires in the same airshed.

Rim Fire smoke plume August 31, 2013
Reno-Tahoe
Fresno-Visalia
Area burned is not a proxy for impacts

- Emissions per acre vary by an order of magnitude based upon fuel type
- Emissions per day vary even more based upon rate of spread
Average daily emissions (PM2.5/day) by fire type in our 10 year analysis

- Resource objective wildfire: 22
- Prescribed fire: 44
- Typical wildfire: 99
- Megafire (Rim): 1833
Using the right tactics under favorable dispersion, large areas can be burned with limited smoke impacts on downwind communities.
Align Incentives to Reduce Smoke Impacts Rather than Area Burned

- Flat fees for restorative burning
- Provide for exceptional events exceedances for resource objective fires when needed
- Support landscape-scale efforts with air resource advisors and supplemental monitoring
Monitoring, Modeling, and Messaging Applied Strategically in Time and Space

Monitoring

Wildfire (reactive)

Rx (Proactive)

Need to cast a WIDE net to show where smoke is and is NOT
Implementing the Framework: Monitoring, Modeling, and Messaging, Applied Strategically in Time and Space

Modeling

Wildfire (reactive)

Rx (Proactive)

NEED HI RESOLUTION CANSAC (2 km) FOR THIS!!
Implementing the Framework: Monitoring, Modeling, and Messaging, Applied Strategically in Time and Space
Prioritizing Where To Burn

- Use recent fires as anchors
- Coordinate with fuel reduction thinning treatments
- Apply landscape scale prescribed fires and managed wildfires to fill gaps and maintain treated areas
Monitoring, Modeling, and Messaging Applied Strategically in Time and Space

Prioritizing **When To Burn**

- Dispersion best in spring and fall across California air basins
  - Summer is less favorable
- We have daily-resolution “maps” of best dispersion days, based the seasonal burn day frequency of burn days for all CA air basins
  - (e.g. first few days of October are nearly always good burn days...we can plan for that!)
- Evaluate and address other constraints during these periods:
  - wildlife considerations (e.g., limited operating periods)
  - crew availability
  - public expectations
There is Room in our Airsheds to Burn at Large Scales and Now is the Time

- Daily emissions and impacts from resource objective fires can be managed and mitigated with monitoring, modeling, messaging, strategically applied
- Megafires are **exponentially** worse and need to be limited by using fire proactively in vulnerable areas
- Resource objective fires over 600-1000 acres at ~50 tons/acre fuels could emit ~300-500 tons/day, which could be dispersed without causing major smoke impacts in many areas, if implemented during good dispersion.
- Framework for evaluating and minimizing smoke impacts is documented in Long et al., *Aligning Smoke Management with Ecological and Public Health Goals*, 2017, *J. of Forestry*
- Years with big snowpacks like this season offer valuable opportunities
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