The Influence of SOD on Fire Behavior

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SOD & Fire

• Natural fires
  – Big Sur
    • Slightly different ecosystems
    • Chalk
    • Big Basin
    • Pfeiffer

• Eradication efforts
  – Clearing and burning
    • Oregon

Photo: Rani Sanderson
“The oak trees, many of which had been killed by sudden oak death, helped accelerate the spread of the fire…”

New York Times, July 8, 2008, in “Gains Reported on 2 California Blazes, but Worries Persist” by Felicity Barringer

“…Hundreds of thousands of oak trees in the area have been killed in recent years by a disease known as sudden oak death, producing fuel that allows flames to spread more quickly through redwoods and other evergreens, [forest experts] said.”

Los Angeles Times, July 7, 2008, in “Fungus-killed oaks make Basin Complex fire hotter, harder to fight” by Deborah Schoch
Assumed hypothesis

How to evaluate this hypothesis?
Did disease increase fire severity?

Metz et al. 2011. *Ecological Applications*
Did disease increase fire severity?

**SOD Impacts**

**Burn Severity**

**Composite Burn Index**

Metz et al. 2011. *Ecological Applications*
What is the disconnect?

• “Forest experts” just seeing what they expect?
  – Maybe …

• Or is SOD & Fire more complex than the regression (or press) accounts for?
Fuels vary with disease stage

Early...

Surface, ladder and aerial fuels
Various stages of fragmentation and decay

...Late
Early stage disease:
More crown fires, scorching, torching

15 plots with *P. ramorum* have no recent mortality

Metz et al. 2011.
*Ecological Applications*
Late stage disease:
More (dead) logs, greater soil burn severity

17 plots with *P. ramorum* have no logs

Metz et al. 2011.
*Ecological Applications*
Fire & SOD in redwood forests

Tanoak
*Notholithocarpus densiflorus*

Coast redwood
*Sequoia sempervirens*

California bay laurel
*Umbellularia californica*
Species differ in susceptibility

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<td>Sensitive</td>
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<td>Redwood</td>
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Are *joint* impacts of fire and SOD additive or synergistic?
Fire & SOD in redwood forests

Synergistic increase in redwood death

Metz et al. 2013. Ecology
Fuels vary with disease stage

Early... Surface, ladder and aerial fuels

...Late Various stages of fragmentation and decay
Disease stage affects redwood risk

- Mid stage SOD = higher damage to redwoods
- Late stage SOD = lower damage to redwoods

Metz et al. 2013. Ecology
Disease stage affects redwood risk

Mortality of 35 cm trees
Without SOD = 20%
With SOD = 75%

Mortality Risk

5% Mortality Risk
Without SOD, ≥ 48 cm
With SOD, ≥ 72 cm

Metz et al. 2013, Ecology
Dead tanoaks carried flames upwards
Does SOD increase fire risk?

• The Goldilocks story
  – If it does, conditions have to be *just right*
  – Otherwise, the answer is “no” …
    • … and even if it is just right, the number of plots this occurs on is relatively few.

• Who’s risk?
  – Pfeiffer fire Dec 2013
  – Fire department saved all homes
  – 30 burned when it doubled and tripled back
    • Long “residence times”
  – No lives lost
What about the potential for positive effects?

• California has been managed with fire for thousands of years
  – California forests are adapted to periodic low intensity fires
• Can fire be used to eliminate *P. ramorum* from forest stands?
Eradication Effort

• Decade long study
  – Now abandoned
• Total host removal
• Burning of slash and landscape
Success?
Could natural fires succeed?
Pathogen recovery post-fire

- *P. ramorum* found in previously positive sites
  - 20% in 2009
  - 40% in 2010

Beh, Metz et al. 2012.
*New Phytologist.*
Pathogen recovery post-fire

- *P. ramorum* found in previously positive sites
  - 20% in 2009
  - 40% in 2010
- Surviving key hosts as pathogen reservoir in patchily burned landscape

Conclusions

- On the whole, SOD doesn’t significantly alter fire behavior
  - The devil’s in the details
- Mid stage damage from SOD increases fire severity in a brief window of time
  - Within it, they interact in surprising ways
    - Increased redwood mortality
- SOD isn’t eradicated by fire
Management Recommendations

- Reduce the amount of *standing* fuels
  - Homes
    - CalFire clearances
  - Redwoods
- Lop downed fuels to below knee height
- Risk to who?
  - Increased fuels may have real consequence for homeowners
  - Fire ecologists and fire fighters: two disciplines divided by a common language
Resources

• www.suddenoakdeath.org
• This presentation is on line at: [http://ucanr.edu/MarinIPM](http://ucanr.edu/MarinIPM)
• Steven Swain: svswain@ucanr.edu
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