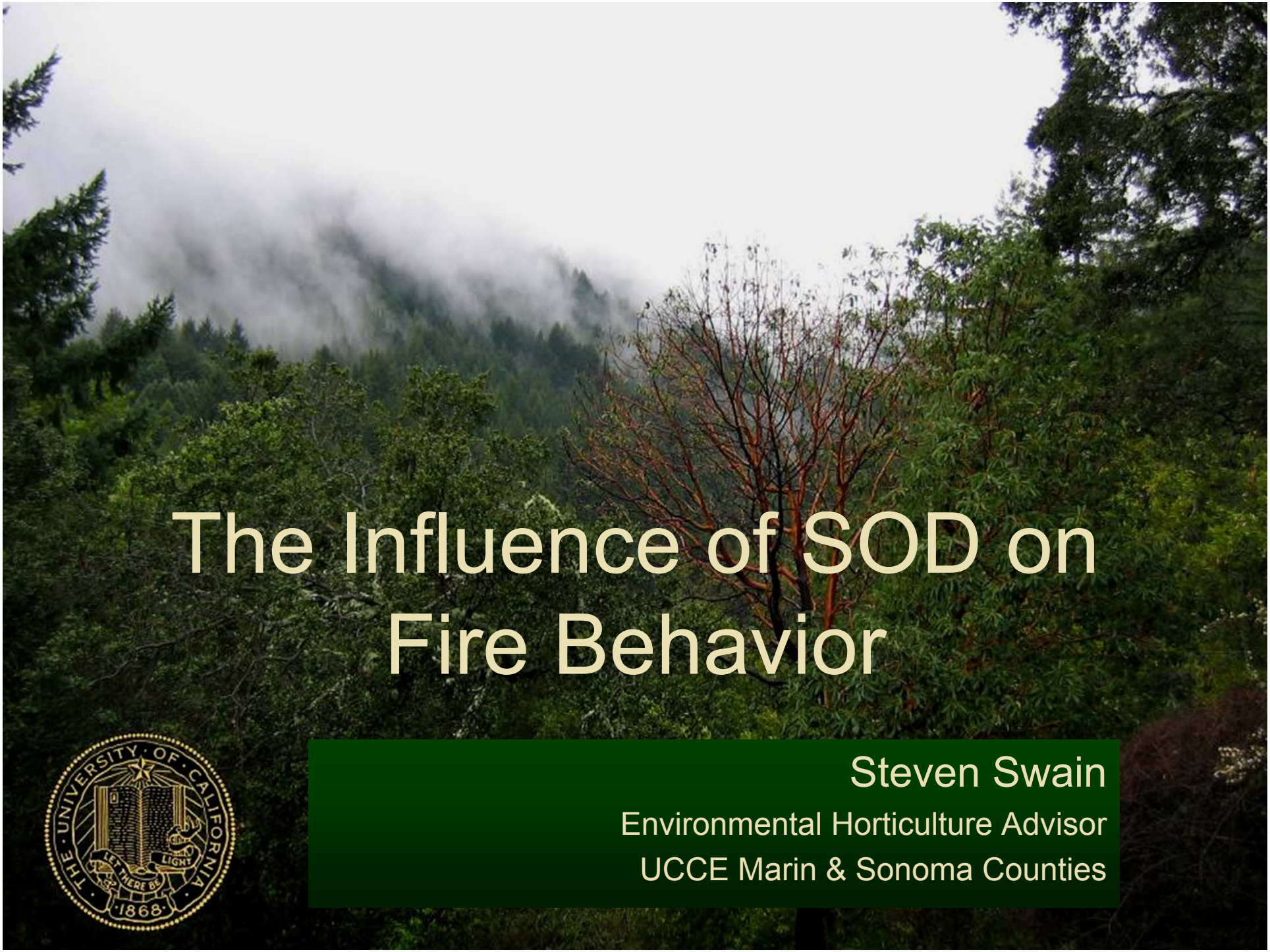


The Influence of SOD on Fire Behavior

Steven Swain
Environmental Horticulture Advisor
UCCE Marin & Sonoma Counties

SOD & Fire

- Natural fires
  - Big Sur
    - Slightly different ecosystems
    - Chalk
    - Big Basin
    - Pfeiffer
- Eradication efforts
  - Clearing and burning
    - Oregon

Reports of SOD-Fire interactions

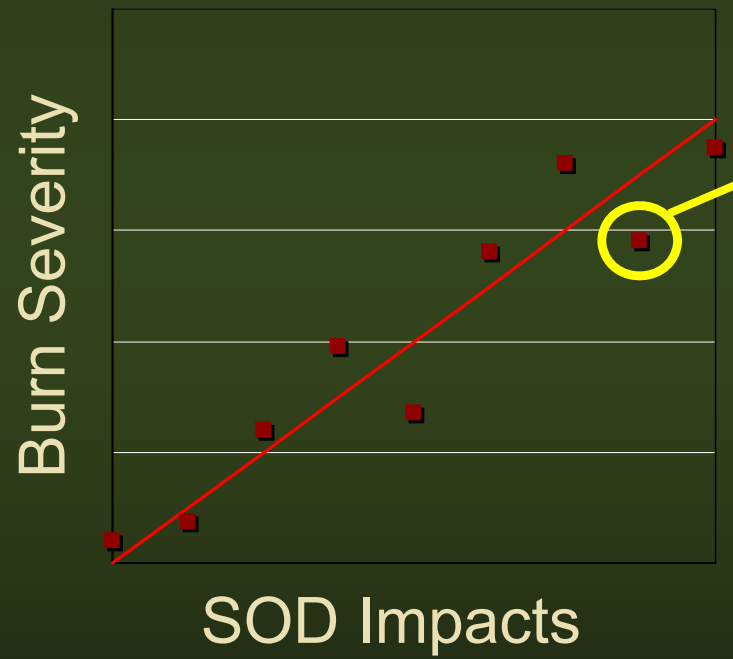
"The oak trees, many of which had been killed by sudden oak death, helped accelerate the spread of the fire…"

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

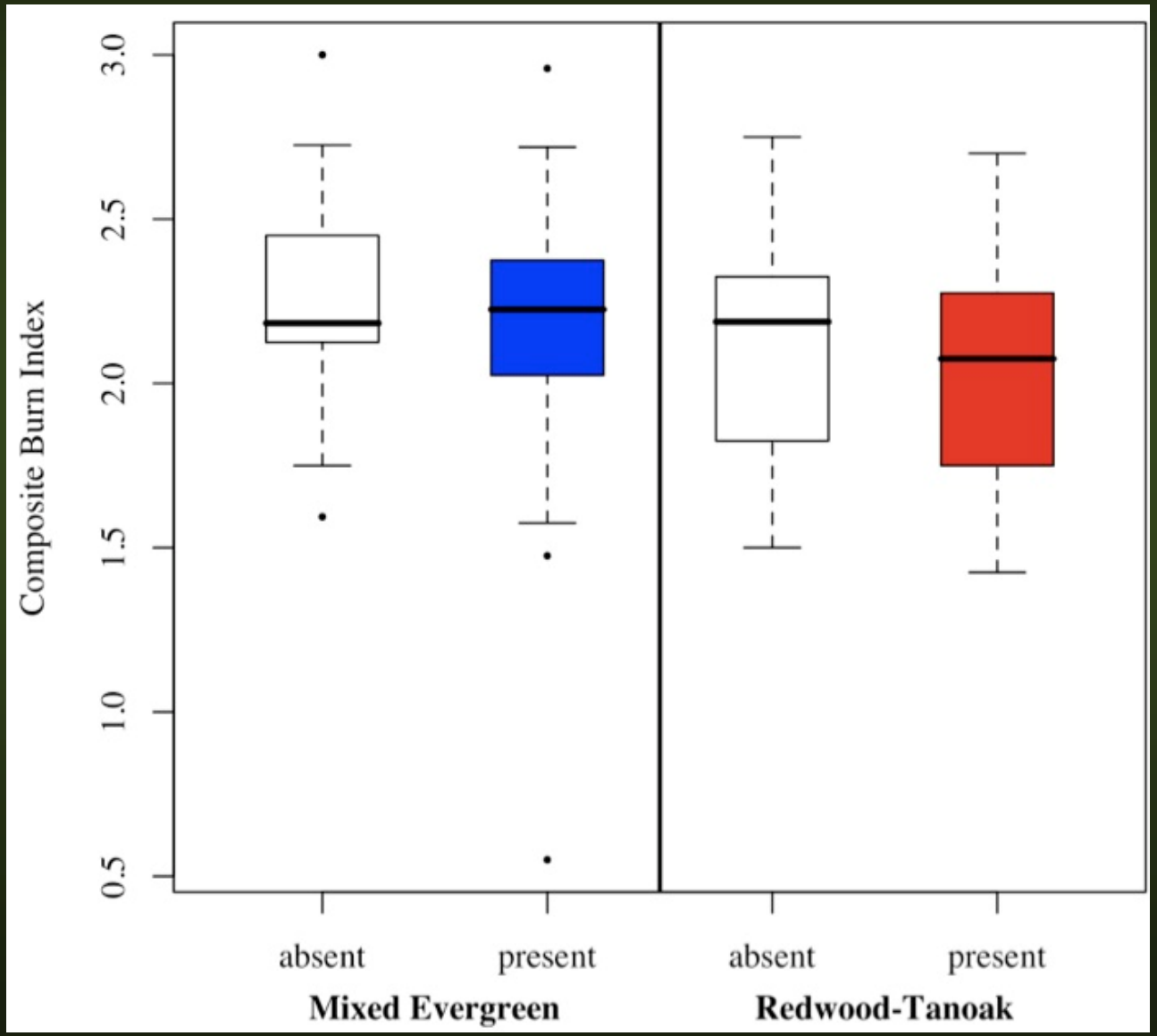
Assumed hypothesis



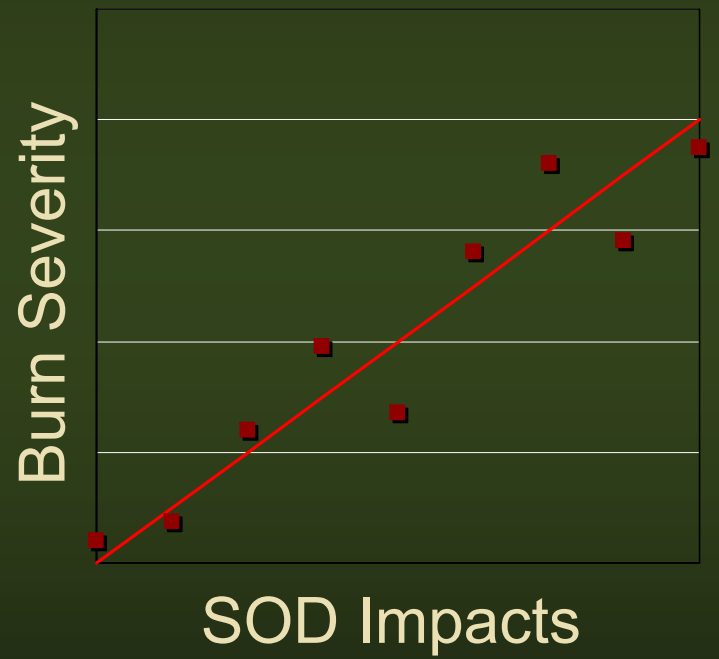
How to evaluate this hypothesis?

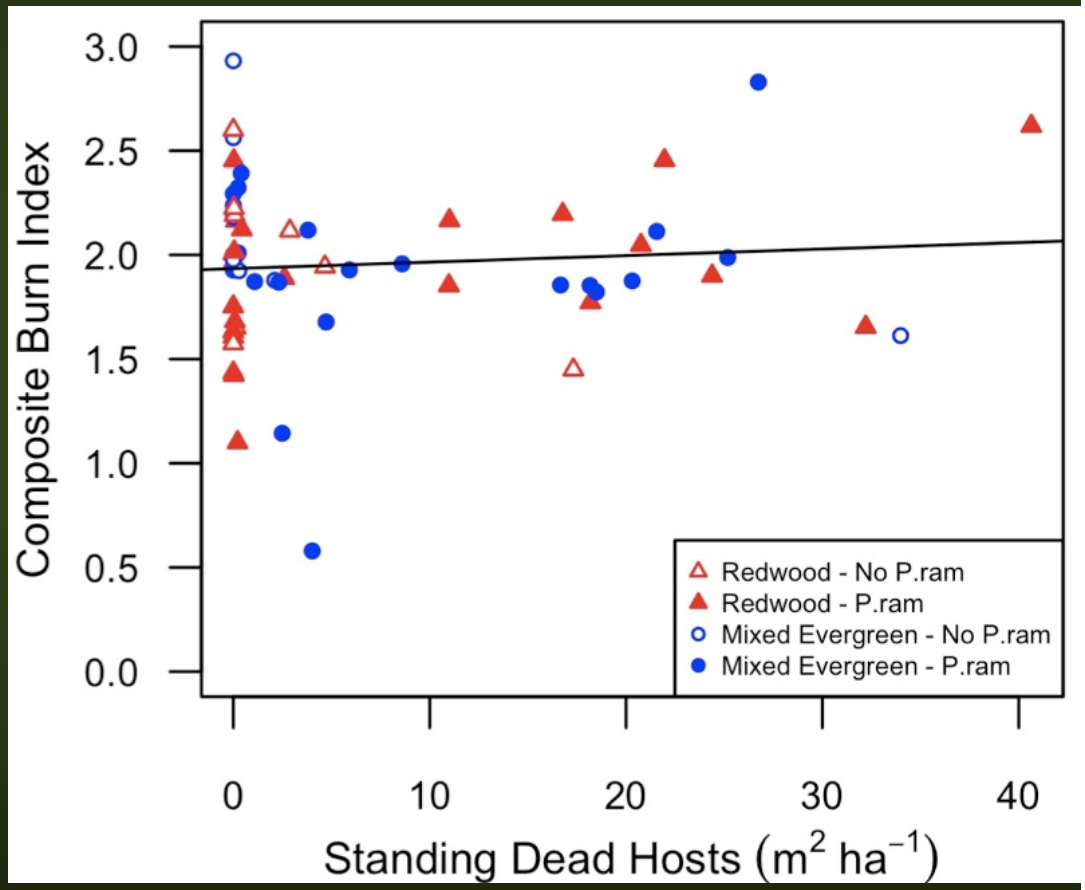
Did disease increase fire severity?

Metz et al. 2011.
Ecological Applications



Did disease increase fire severity?





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?

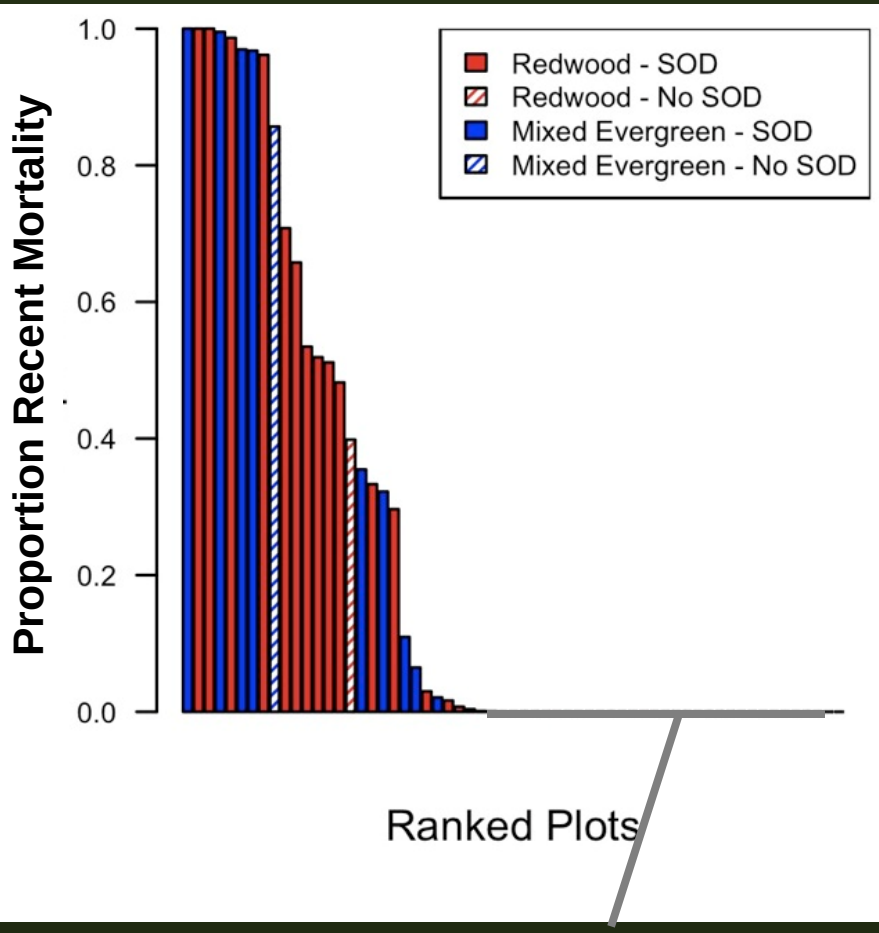
Fuels vary with disease stage

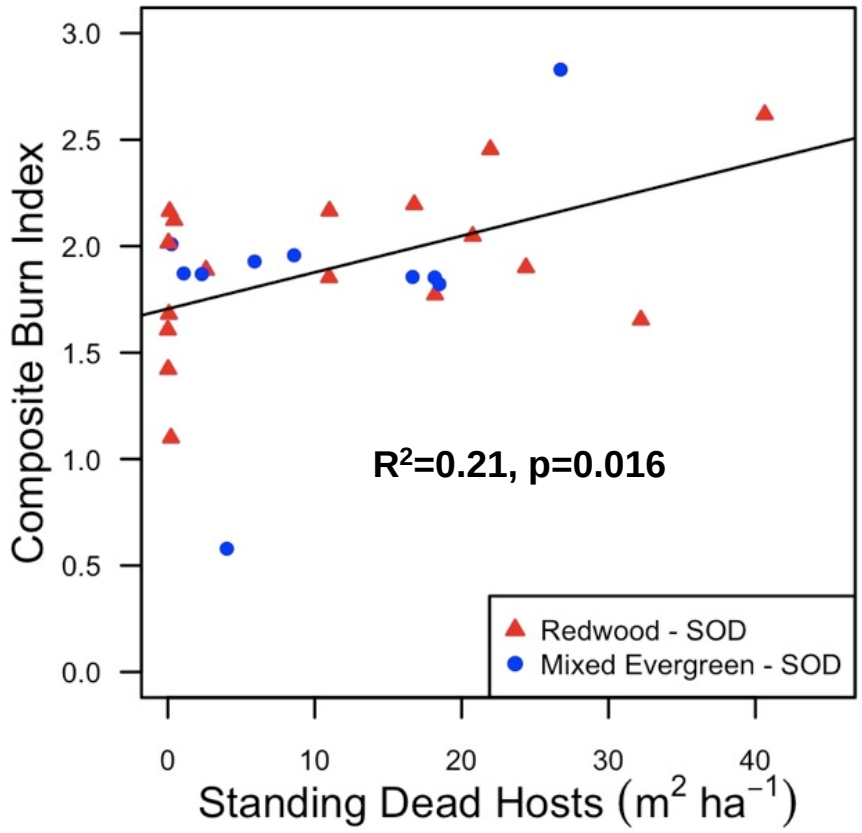
Early… **…Late**



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

Early stage disease:
More crown fires, scorching, torching

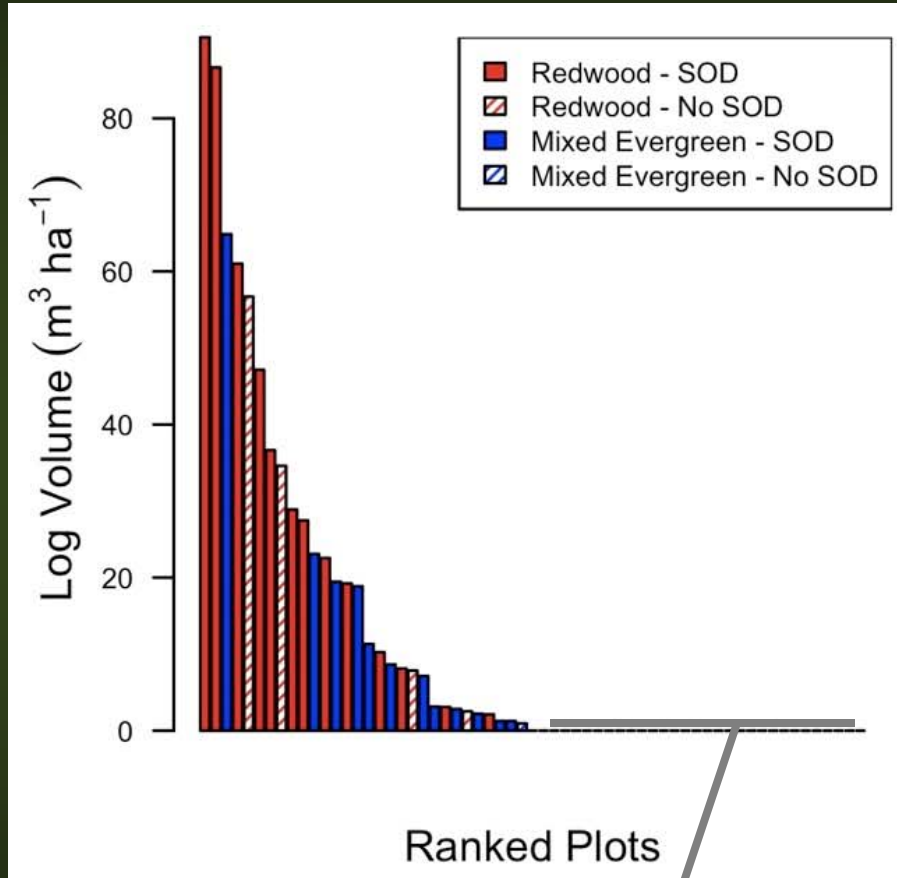


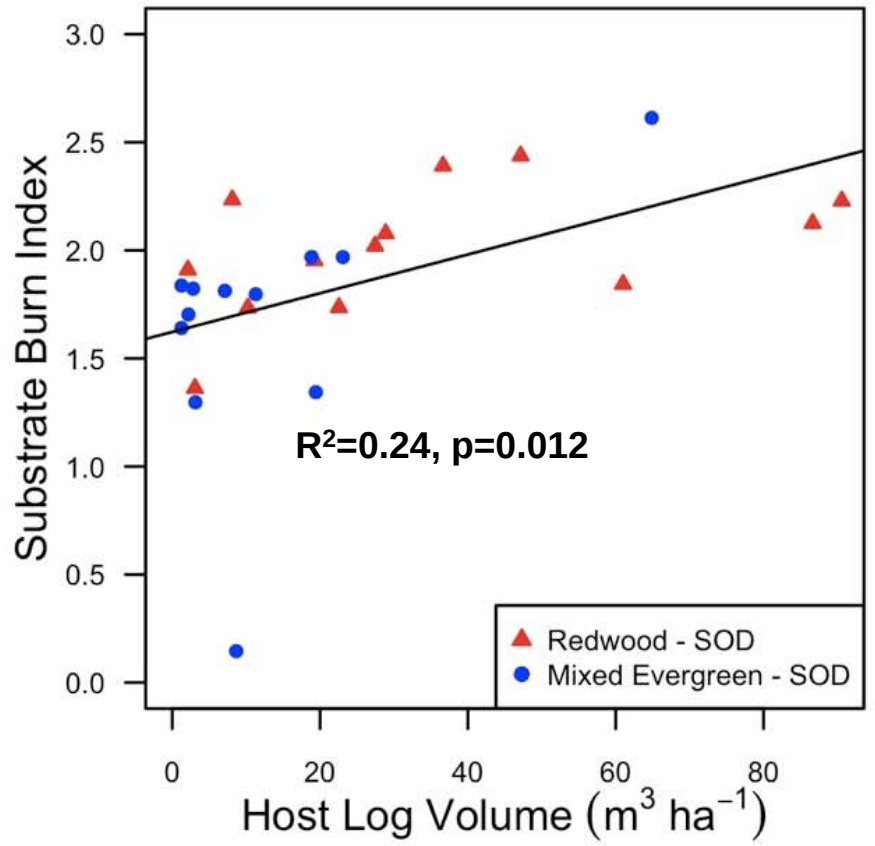


15 plots with *P. ramorum* have *no* recent mortality

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

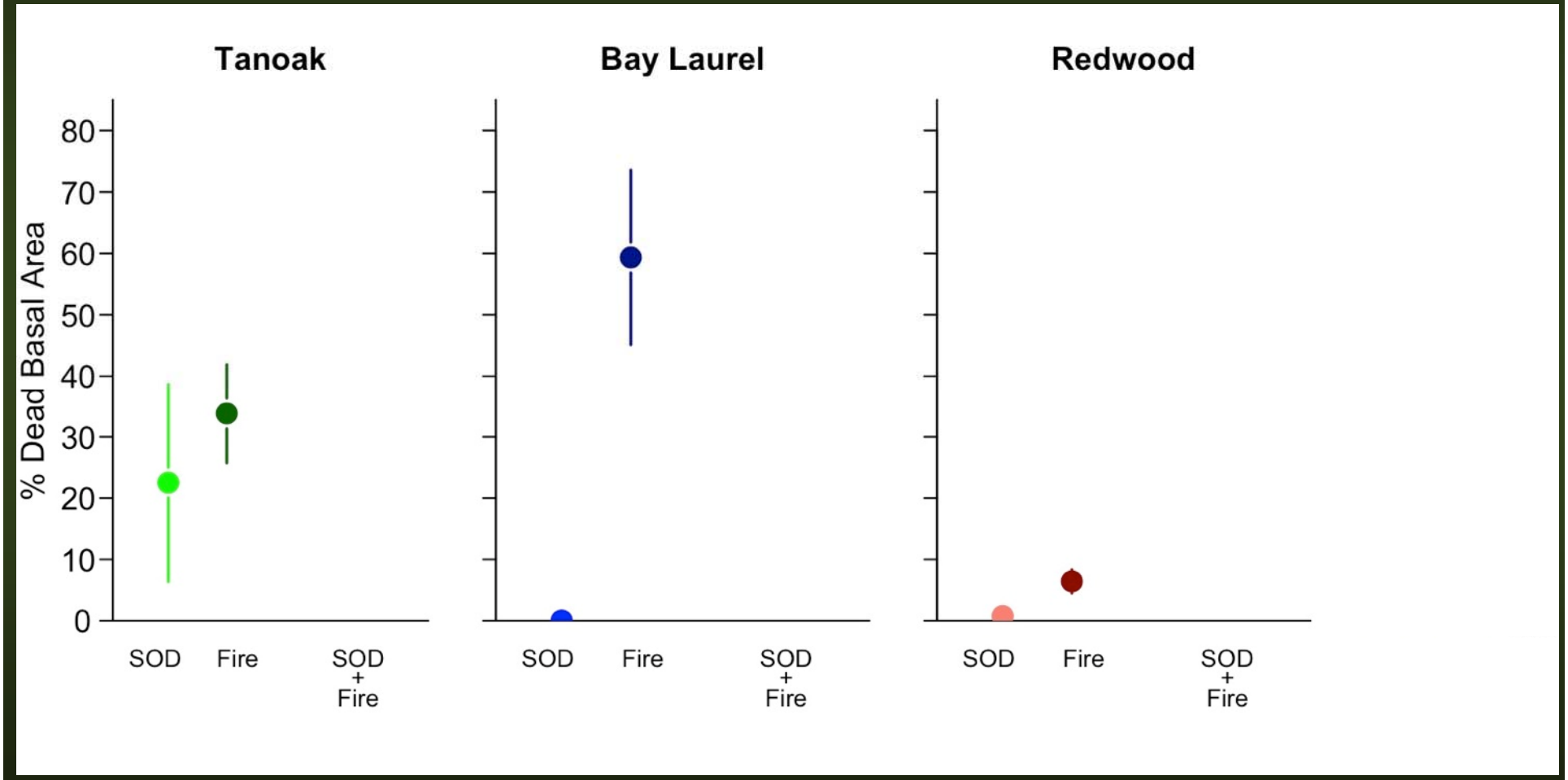
California bay laurel
Umbellularia californica

Species differ in susceptibility

	Fire	SOD
Tanoak	Sensitive	High mortality
Bay Laurel	Sensitive	Negligible impacts
Redwood	Resilient	Negligible impacts

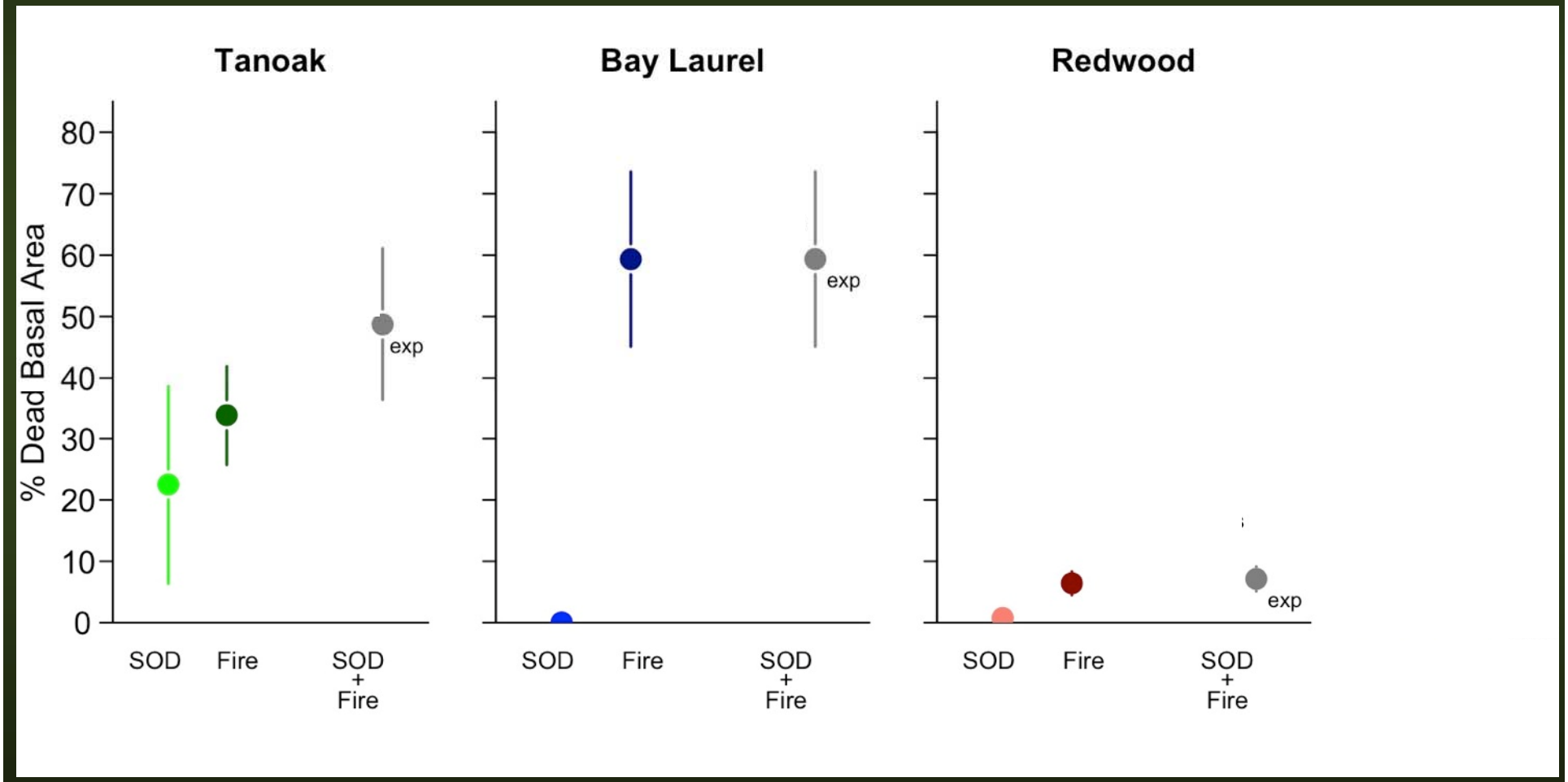
Are *joint* impacts of fire and SOD additive or synergistic?

Fire & SOD in redwood forests



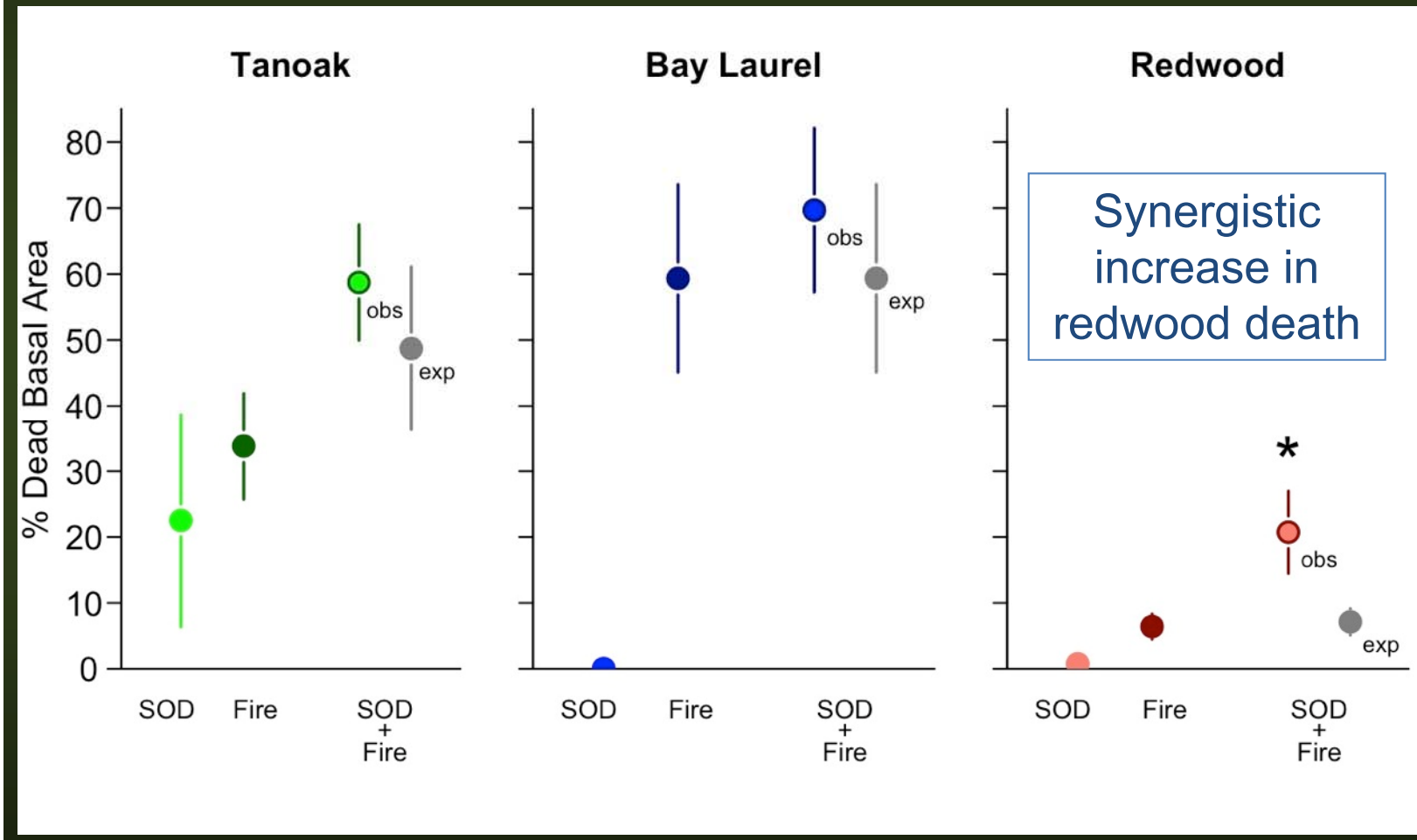
Metz et al. 2013. Ecology

Fire & SOD in redwood forests



Metz et al. 2013. Ecology

Fire & SOD in redwood forests



Metz et al. 2013. Ecology

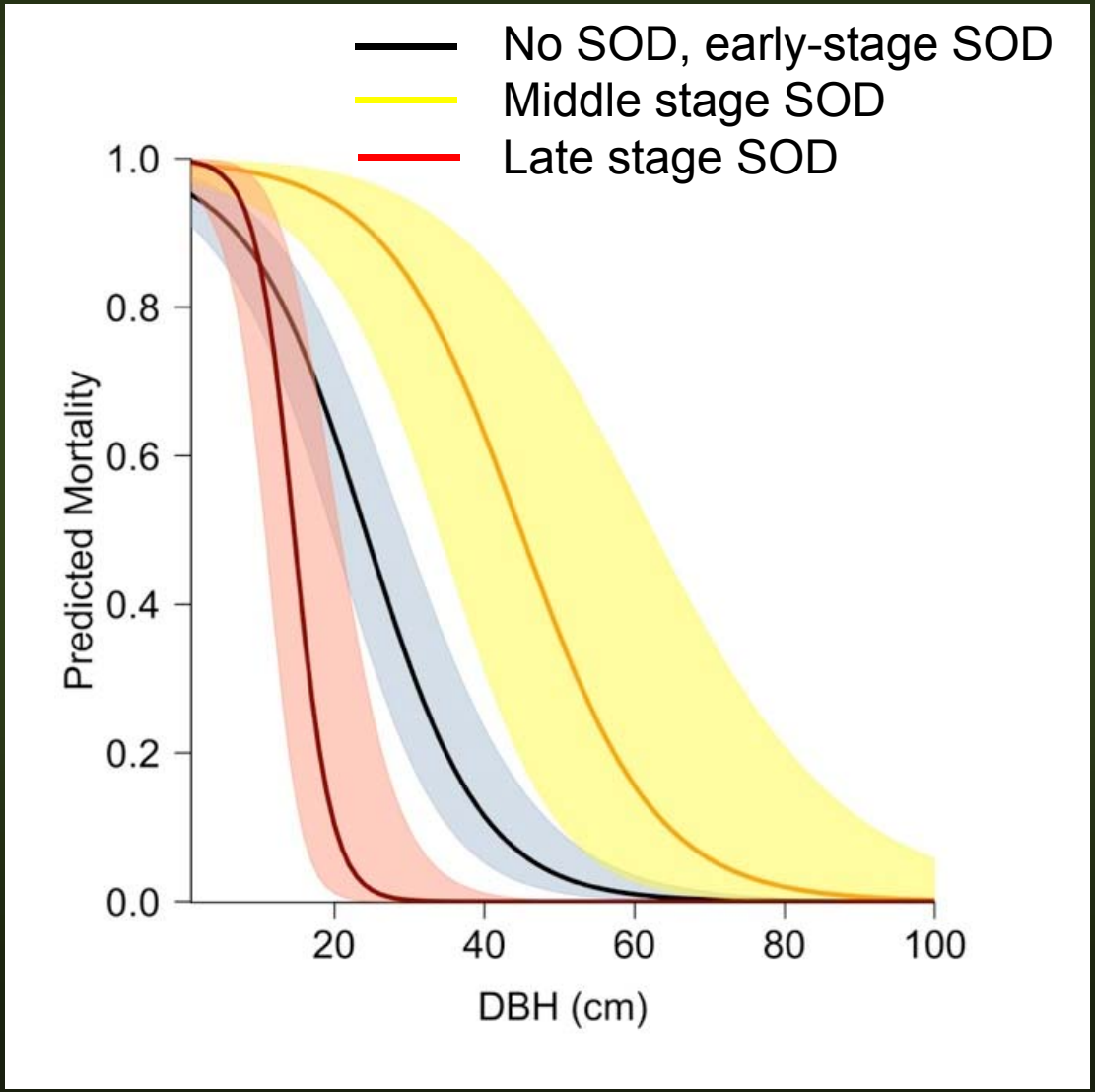
Fuels vary with disease stage

Early… **…Late**



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

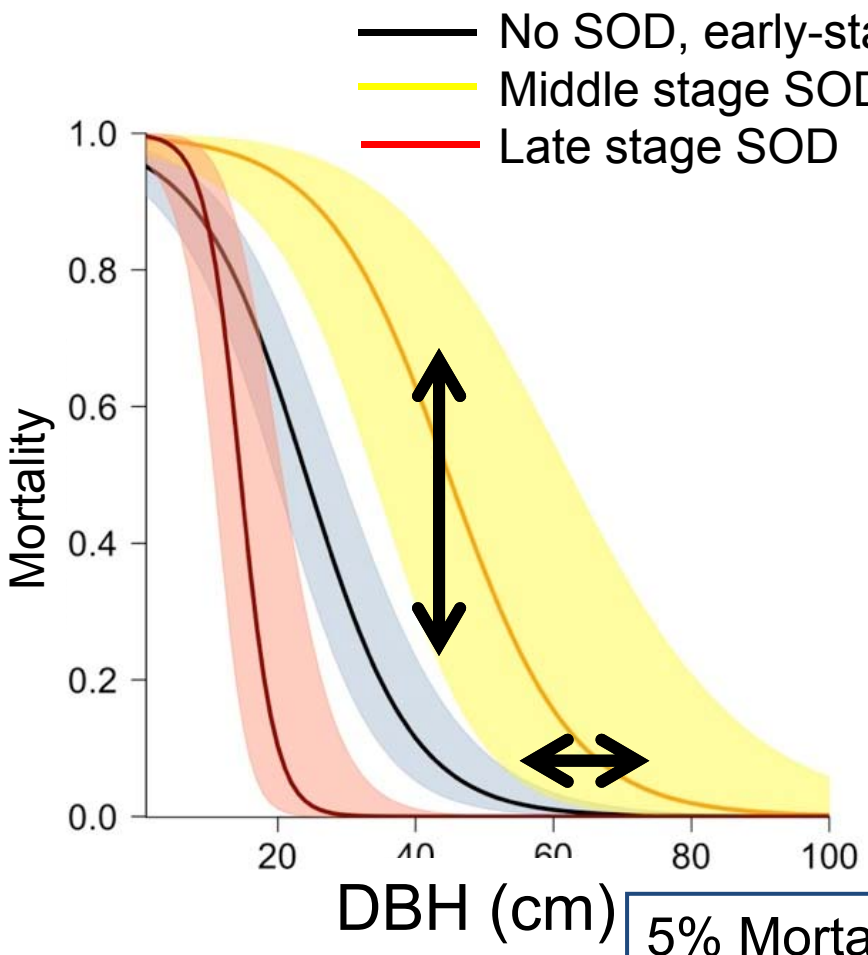
Disease stage affects redwood risk

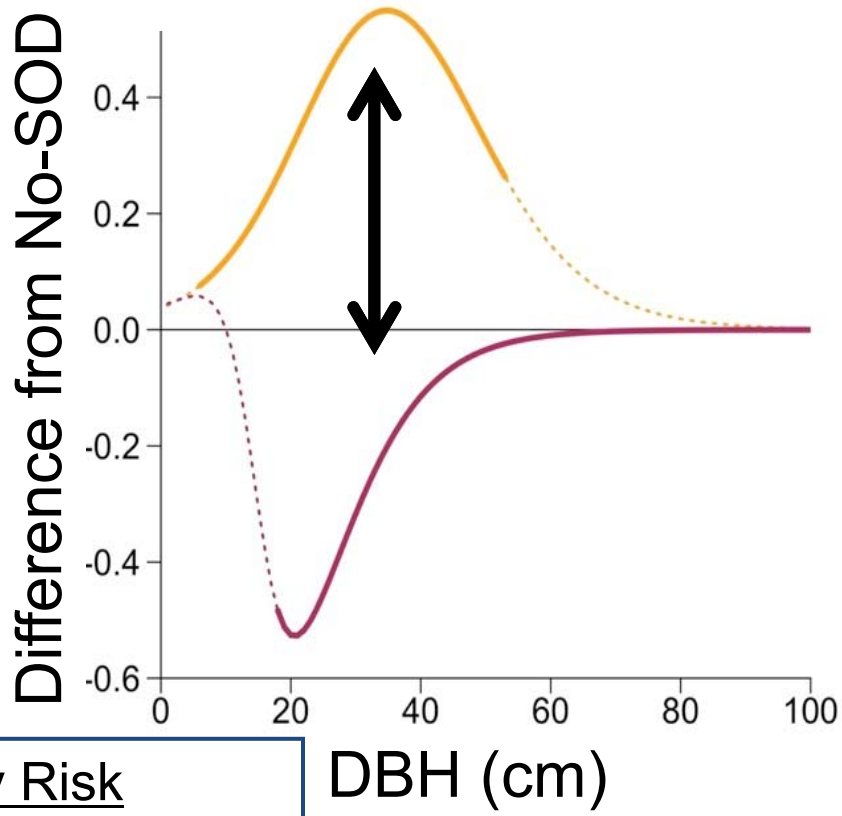


- Mid stage SOD = higher damage to redwoods
- Late stage SOD = lower damage to redwoods

Metz et al. 2013. Ecology

Disease stage affects redwood risk



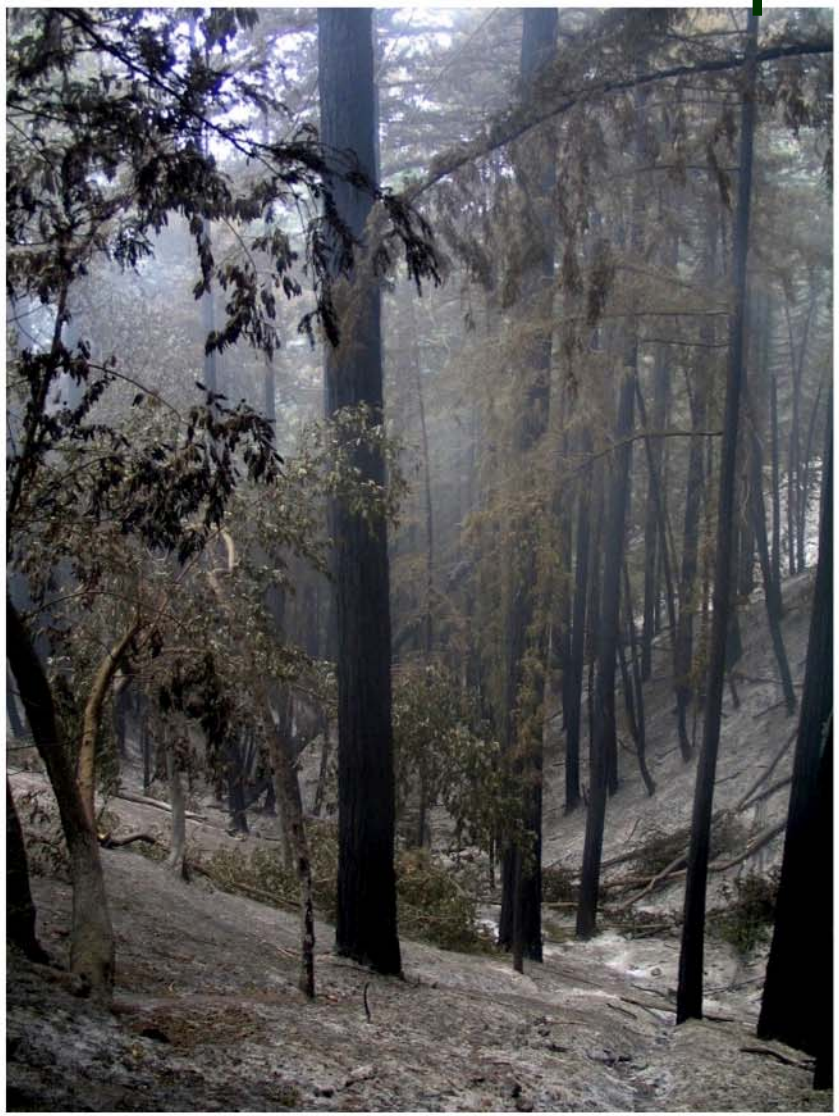


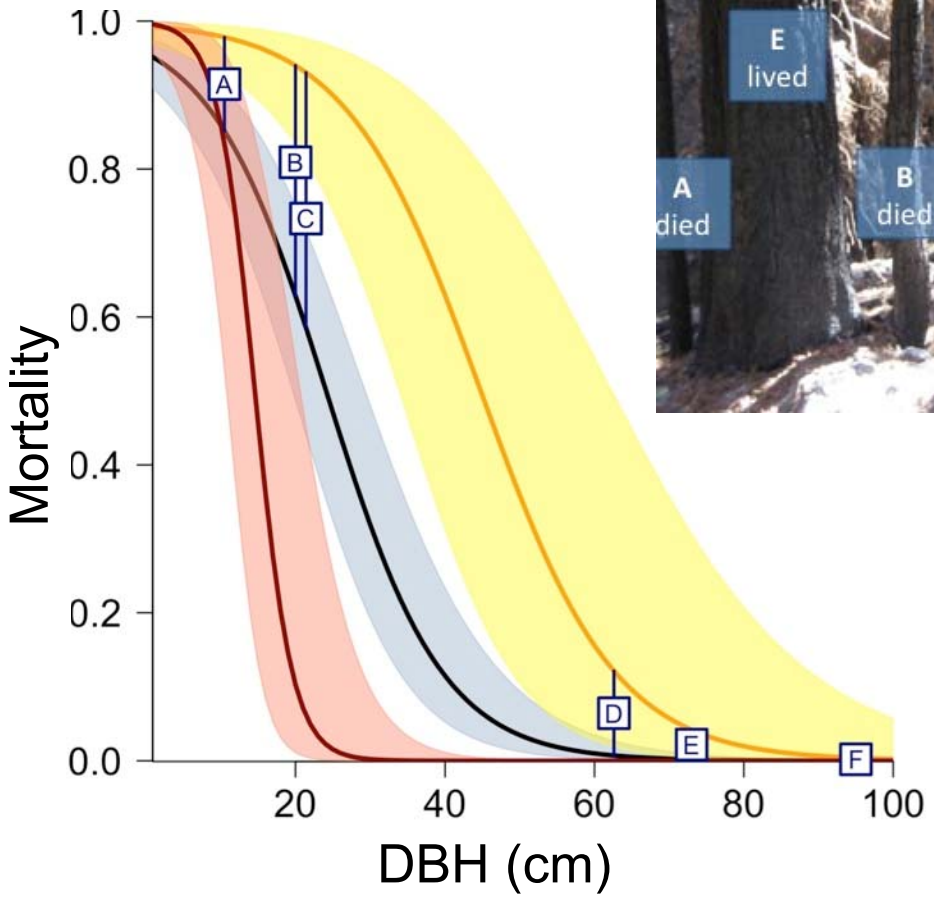
Mortality of 35 cm trees
Without SOD = 20%
With SOD = 75%

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

Metz et al. 2013. Ecology

Dead tanoaks carried flames upwards





No SOD, early-stage SOD
Middle stage SOD
Late stage SOD

Metz et al. 2013. Ecology

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?

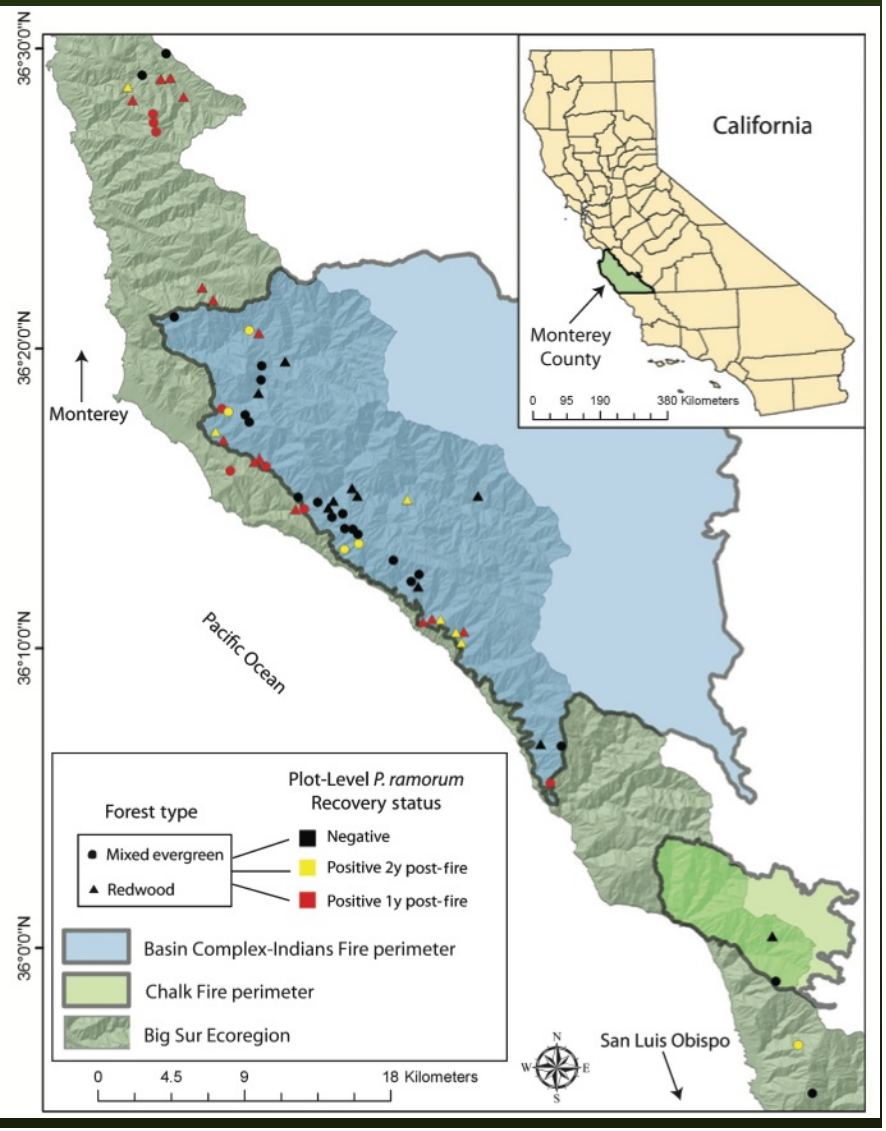
Eradication Effort

- Decade long study
  - Now abandoned
- Total host removal
- Burning of slash and landscape


Success?
Could natural fires succeed?

Pathogen recovery post-fire

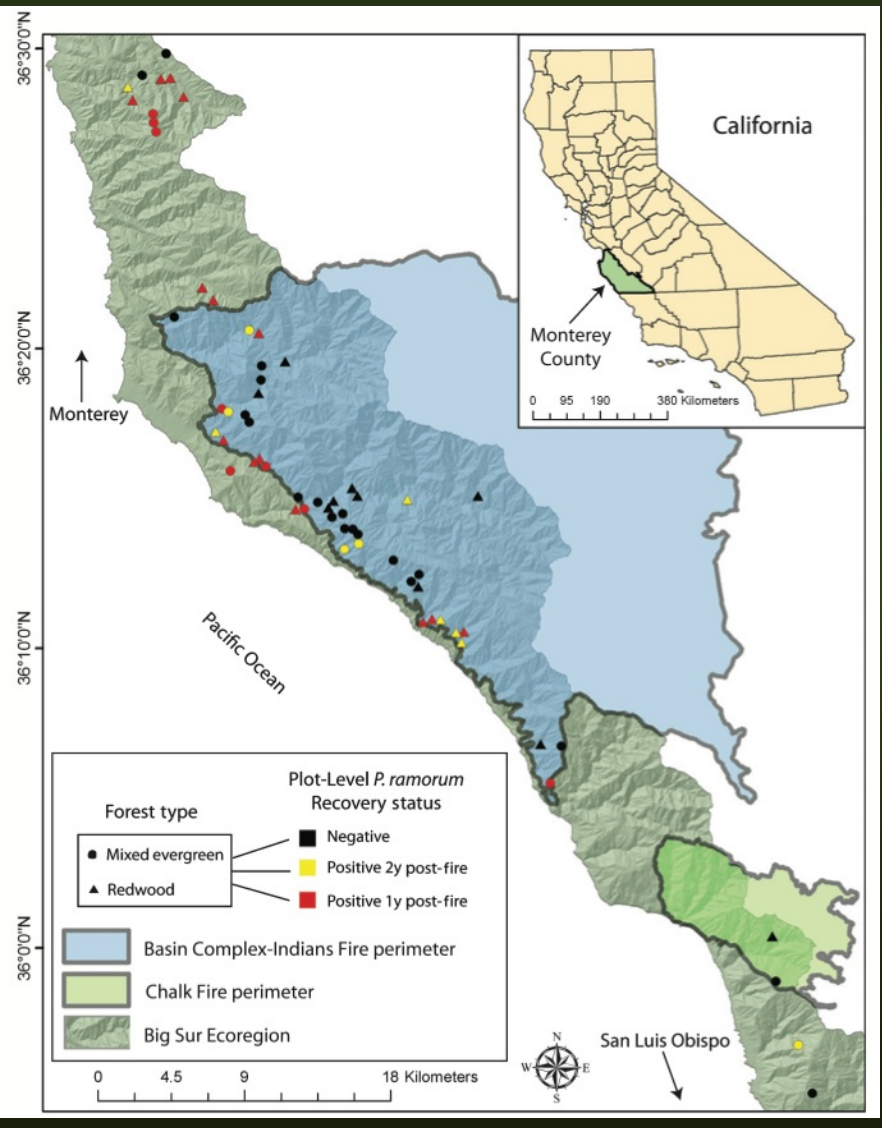
- *P. ramorum* found in previously positive sites
  - 20% in 2009
  - 40% in 2010



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



Beh, Metz et al. 2012.
New Phytologist.

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
- Metz, M. et al. (2013) Unexpected Redwood Mortality from Synergies Between Wildfire and Emerging Infectious Disease. *Ecology* 94:2152–2159 http://dx.doi.org/10.1890/13-0915.1
- Metz, M. et al. (2011) Interacting Disturbances: Wildfire Severity Affected by Stage of Forest Disease Invasion. *Ecological Applications* 21(2):313-320 http://www.esajournals.org/doi/pdf/10.1890/10-0419.1
- Beh, M. et al. (2012) The Key Host for an Invasive Forest Pathogen Also Facilitates the Pathogen's Survival of Wildfire in California Forests http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8137.2012.04352.x/abstract
- CalFire clearances: http://www.calfire.ca.gov/communications/downloads/fact_sheets/DefensibleSpaceFlyer.pdf

- This presentation is on line at: http://ucanr.edu/MarinIPM
- Steven Swain: svswain@ucanr.edu
  415 473 4226