

Santa Cruz Mountains Post-Fire Redwood Defect Study

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CZU Lightning Complex Fire

August 2020



CZU Lightning Complex Fire

- August 2020
- 11,000 lightning strikes in Santa Cruz Mountains became one massive fire
- 86,509 acres burned
- 911 homes destroyed



POST-FIRE CONDITIONS ON THE GROUND



November 2020 (2 months post-fire)





Big Creek Lumber



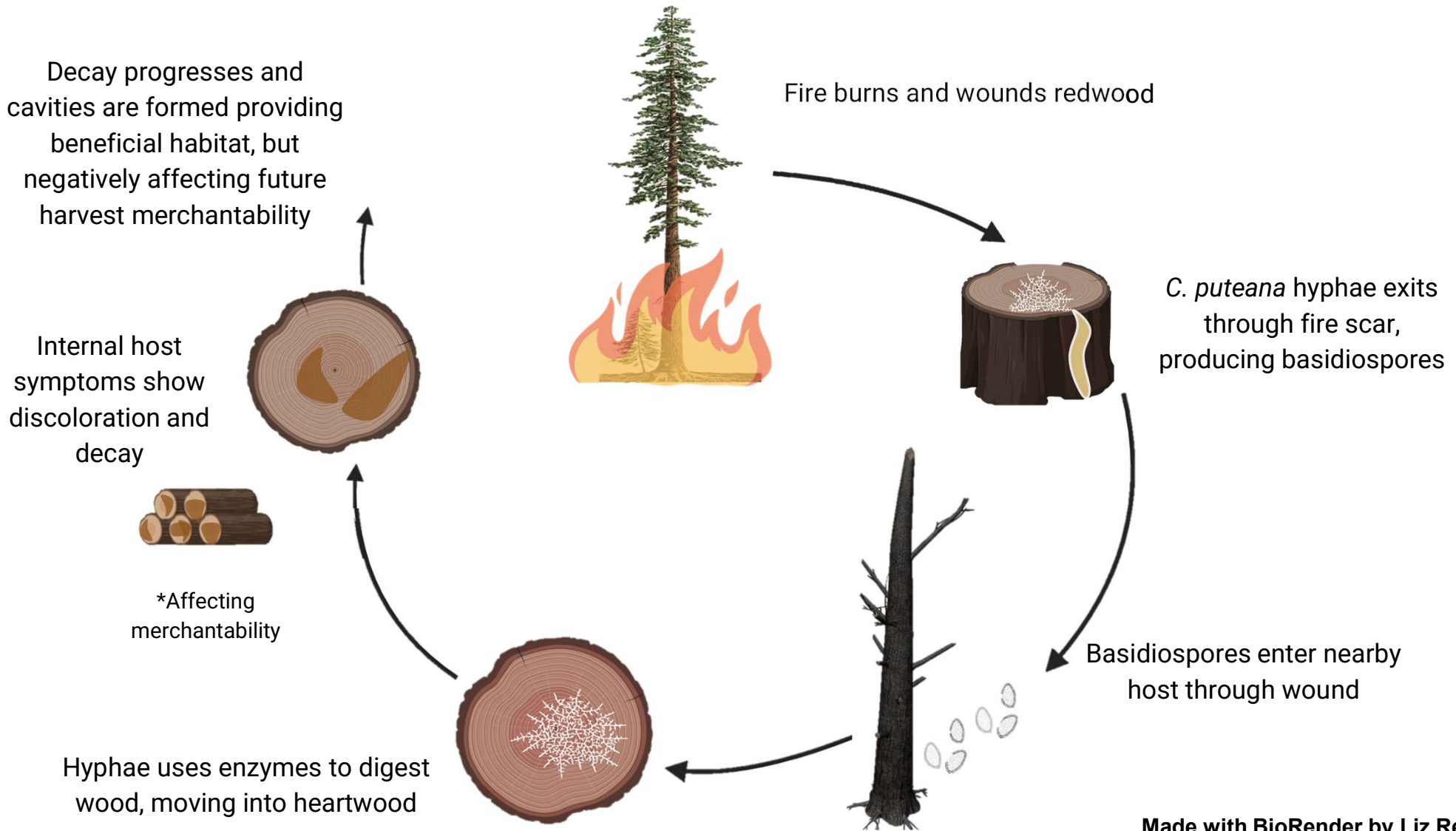
Post-Fire Effects

- Crown Scorch/Crown Torch
- Pre-Fire Live Canopy Retained
- Scorch Height
- Torch Height
- Maximum Height of Bole Char
- Sprouting on Branches and/or Bole
- Sprouts at Base
- Area and Height of wet rot *C. puteana*
- Dead Top? Root damage?

Coniophora puteana, 'wet rot'

- Brown wet rot at base of stem
- Needs high water content (50-60%)
- **Signs:** No external indicators unless host is injured
 - Brown-black Mycelial cords
 - Cream-brown center bounded by white margins



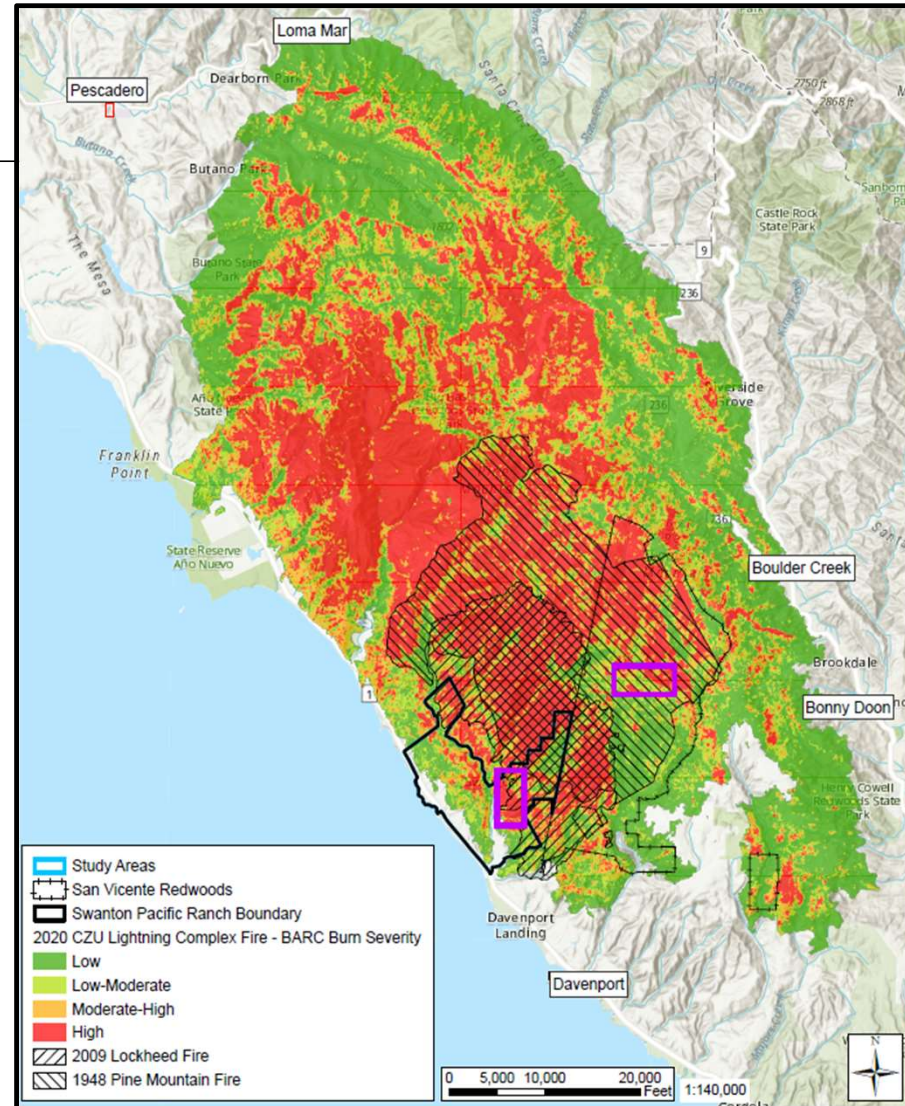


Made with BioRender by Liz Rennie
Select images: National Park Service



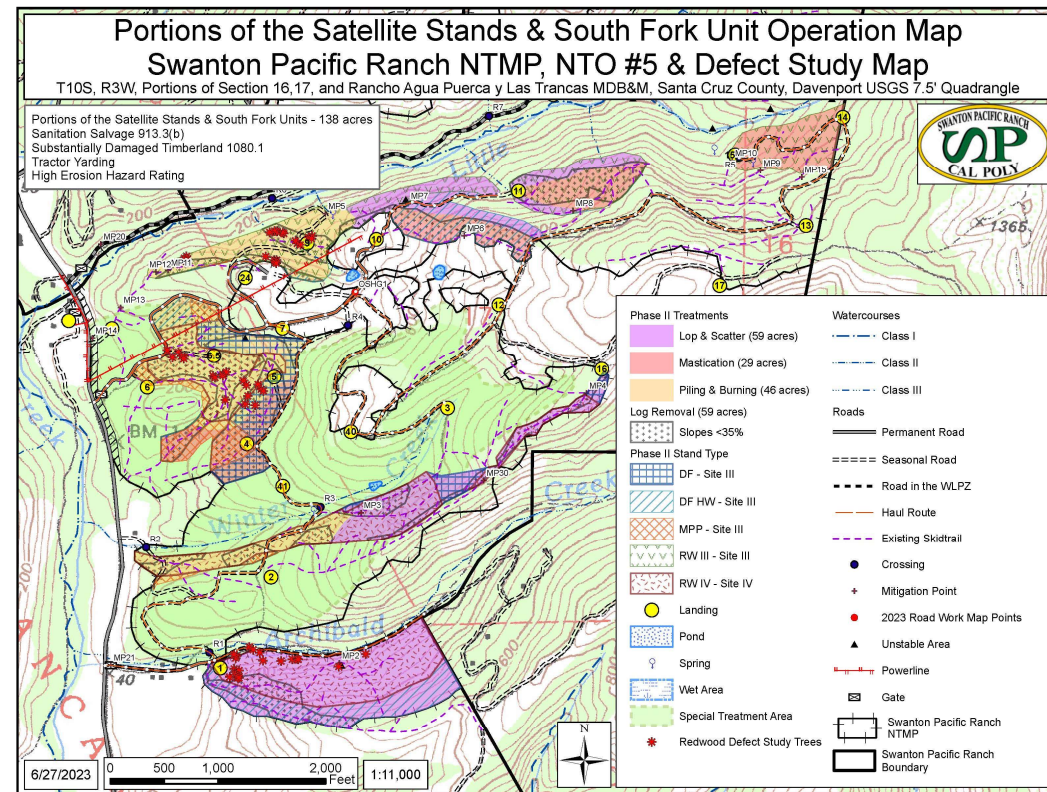
Study Area

- Cal Poly's Swanton Pacific Ranch
- San Vicente Redwoods



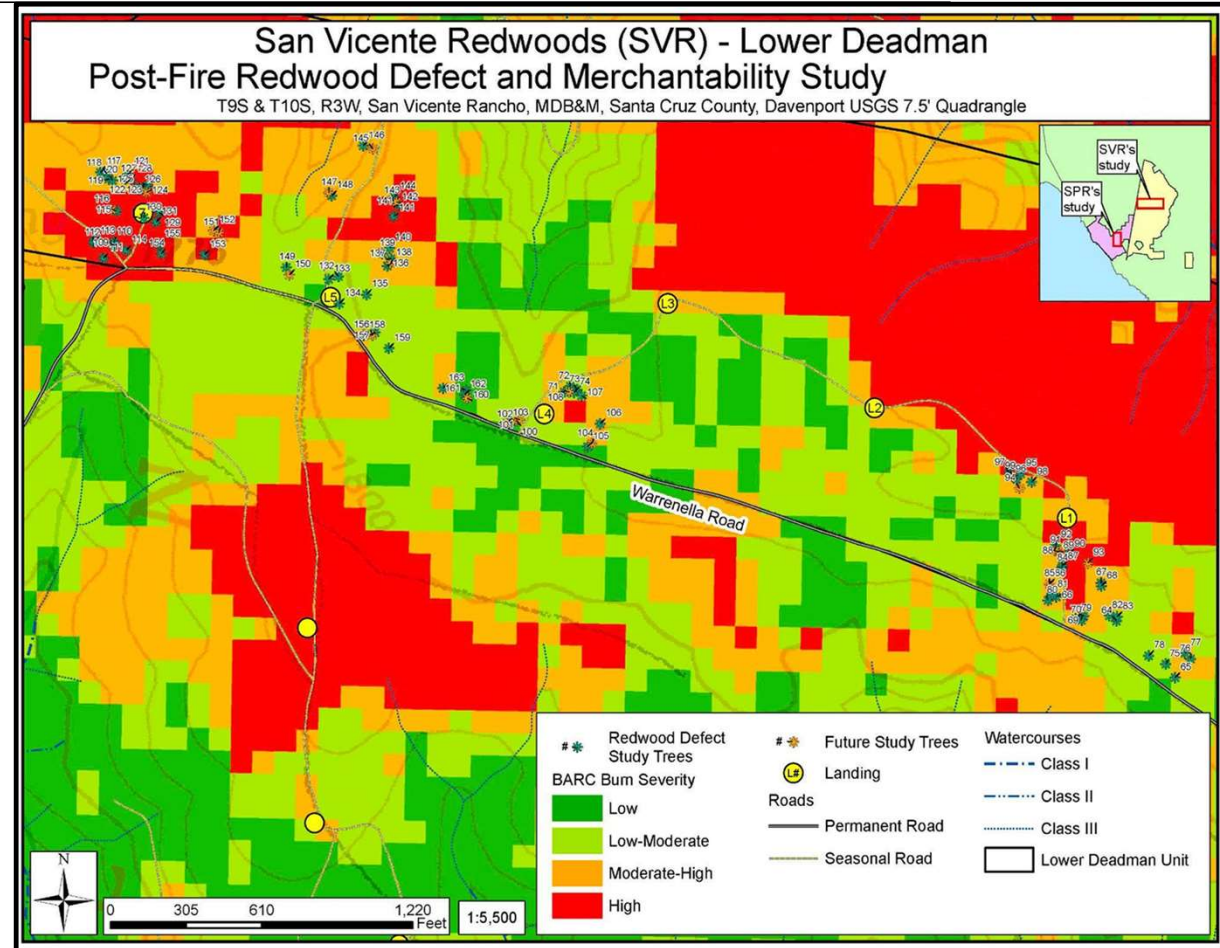
Swanton Pacific Ranch

- Swanton Pacific Ranch NTMP, #1-07NTMP-020-SCR, NTO #5
 - 60 trees tagged and assessed for burn damage



San Vicente Redwoods

- Lower Deadman Emergency Notice, #1-23-EM-0085 SCR
- 100 trees
 - 75 trees harvested
 - 25 trees retained



Visual data collection



- Crown Scorch/Crown Torch
- Pre-Fire Live Canopy Retained
- Scorch Height
- Torch Height
- Maximum Height of Bole Char
- Sprouting on Branches and/or Bole
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Cambium checks



West
Alive,
Fungus



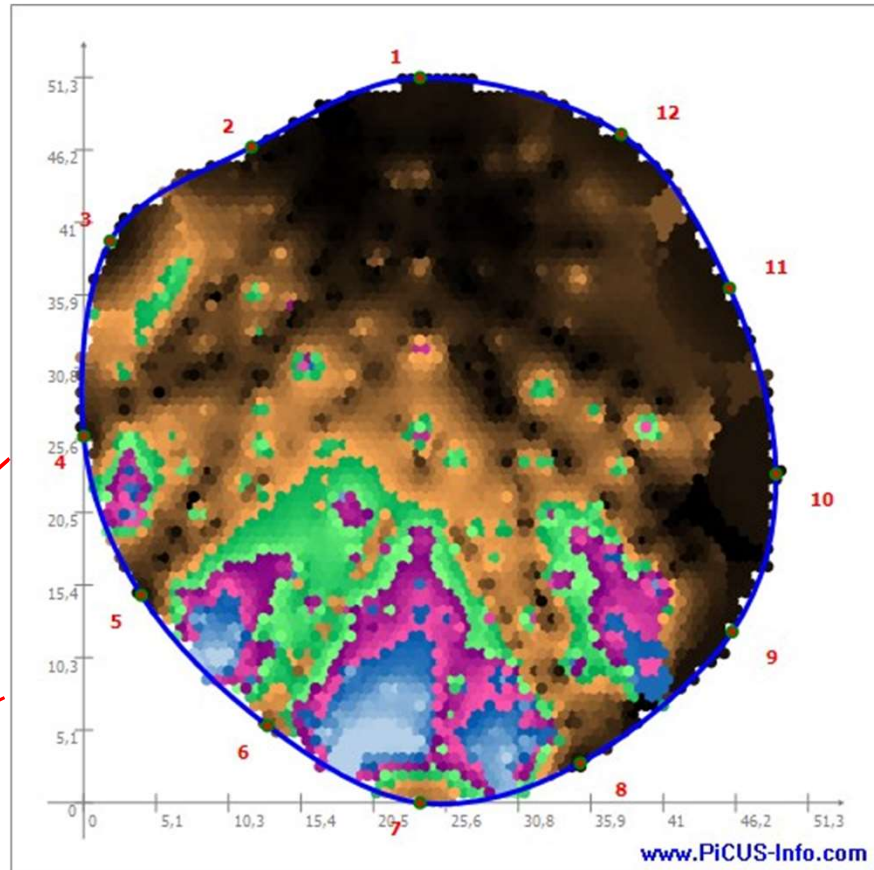
North
Dead,
Fungus



East
Dead,
No fungus



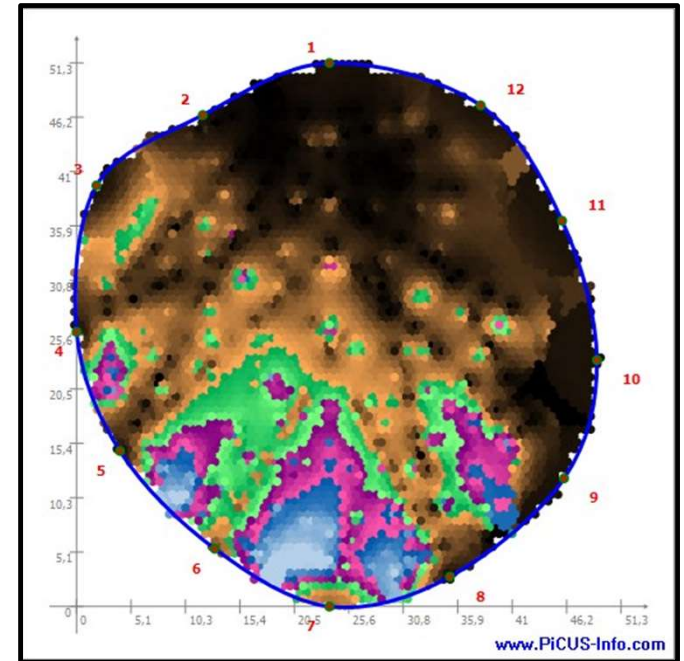
South
Alive,
No fungus



 = Decay  = Healthy
 = Severe Decay

Sonic tomography

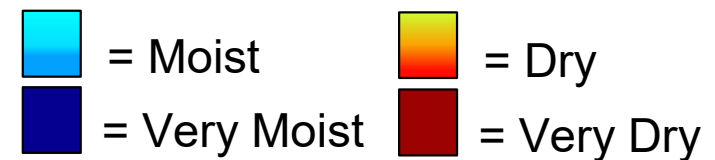
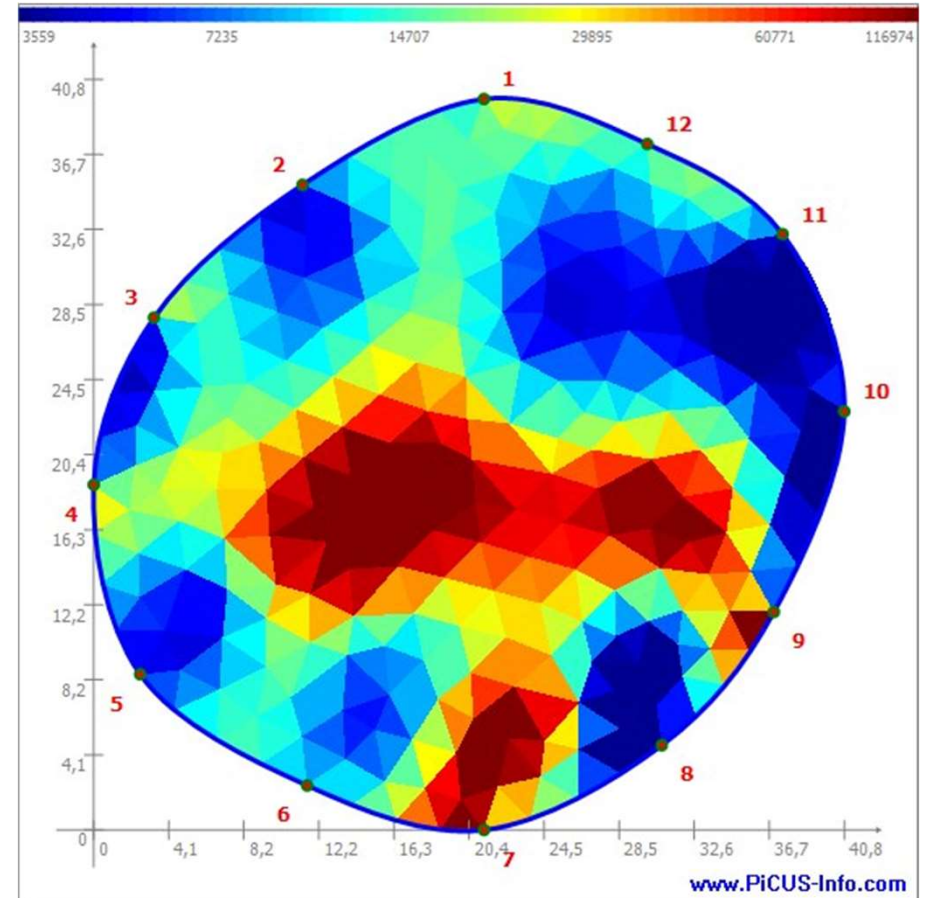
- Noninvasive technology, PiCUS 3 Sonic Tomograph
- Structural integrity at 1m from base
- Measures velocity of sound
- Sound travels faster in solid wood



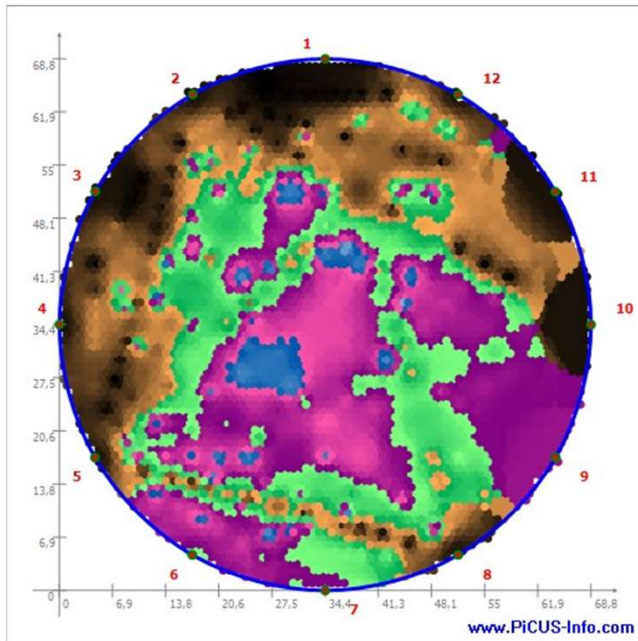
■ = Decay ■ = Healthy
■ = Severe Decay

Electrical impedance

- Noninvasive technology, PiCUS tree-tronic
- Scan shows the water content of the same cross section
- Develop electrical conductivity 'map'



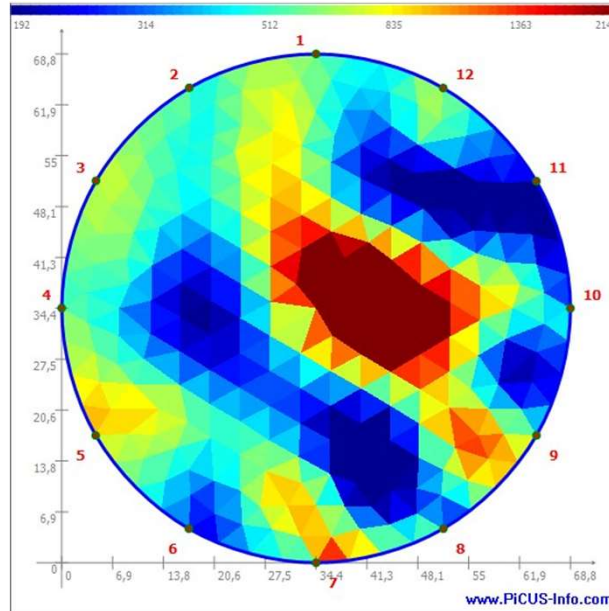
Sonic Tomography



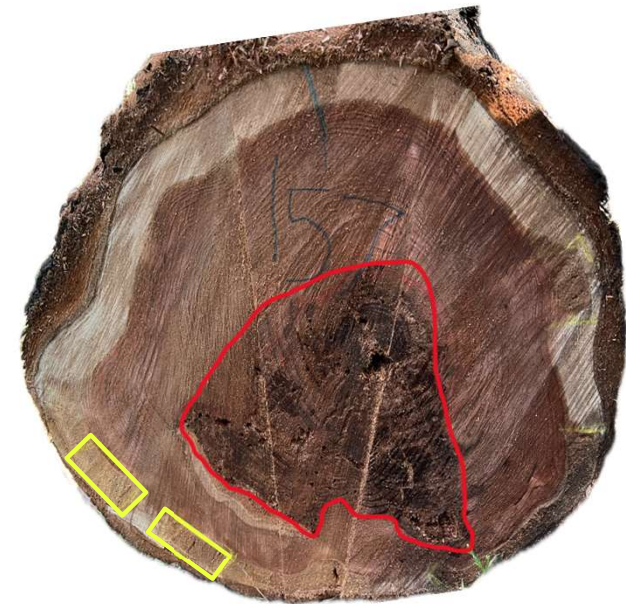
62% Decay



35% Severe Decay

Electrical Impedance



Cross-section



 = Sapwood Rot
 = Heartwood Rot

Research questions

- 1) *How much decay is out there? Can we predict the level of defect caused by a fire by looking at post-fire effects of Coast redwood?*
- 2) *Is sonic tomography and electrical impedance an accurate method to detect decay and water content when compared to a cross section of Coast redwood?*

Logging



Tree #64



Alive/Fungus



Dead/No Fungus



Alive/No Fungus



Alive/No Fungus



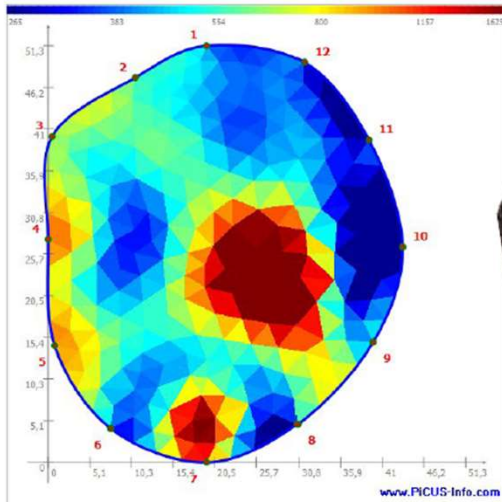
Full Tree and Fungus Photos

- ~64 sq. in of white rot
- ¼ quadrants of fungus
- ¼ quadrants of dead cambium
- Branch & Bole Sprouting
- Low-Moderate Burn Severity Zone



Cambium Checks at North, East, South, and West Quadrants

Electrical Impedance Tomography Scan



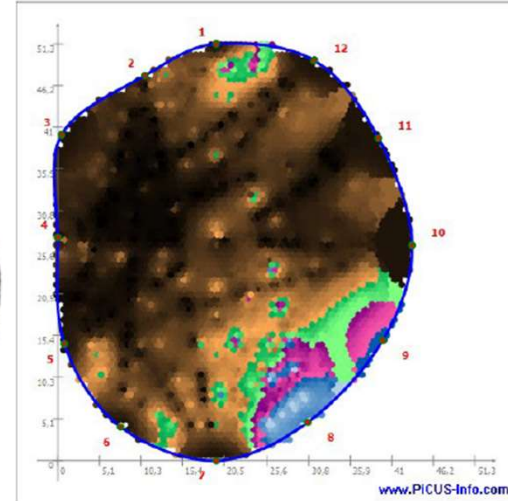
Tree #64



Log #1- Big End:

I = North [] = Sapwood rot

Sonic Tomography Scan



Log #1 Small End/ Log #2 Big End



Log #2 Small End

Log #1 Big End

- 17" Inside Bark (IB) before deductions
- 1-2" of sapwood rot around 45% circumference to the edge of heartwood
- Yellowing sapwood

Log #1 Small End/ Log #2 Big End

- 11" IB
- Healthy sapwood and heartwood

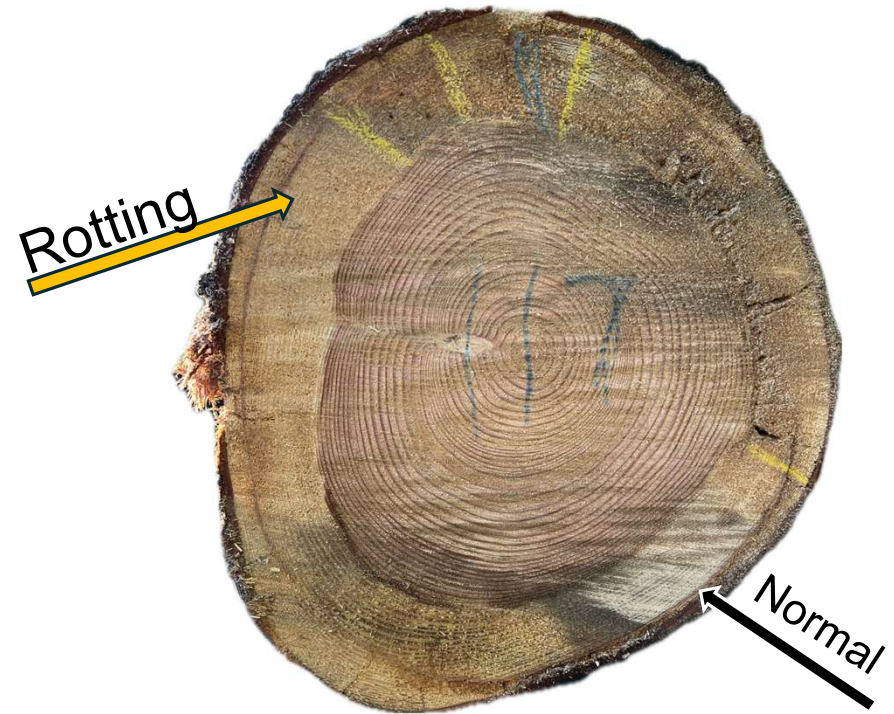
Log #2 Small End

- 9" IB
- Healthy sapwood and heartwood
- Slight mechanical damage

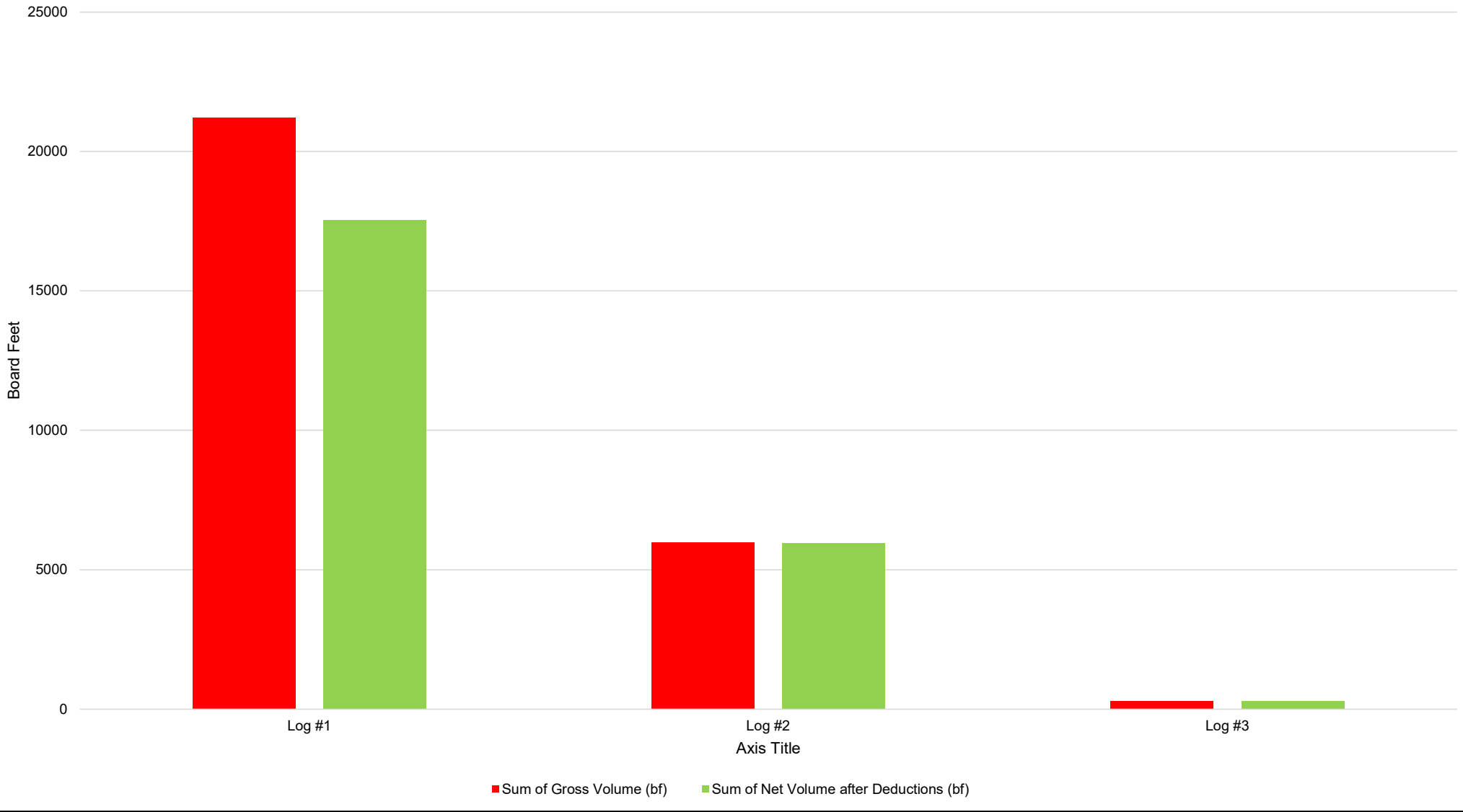
	Volume	Volume After Deductions
Log #1	220 bf	110 bf
Log #2	80 bf	80 bf

Preliminary Results

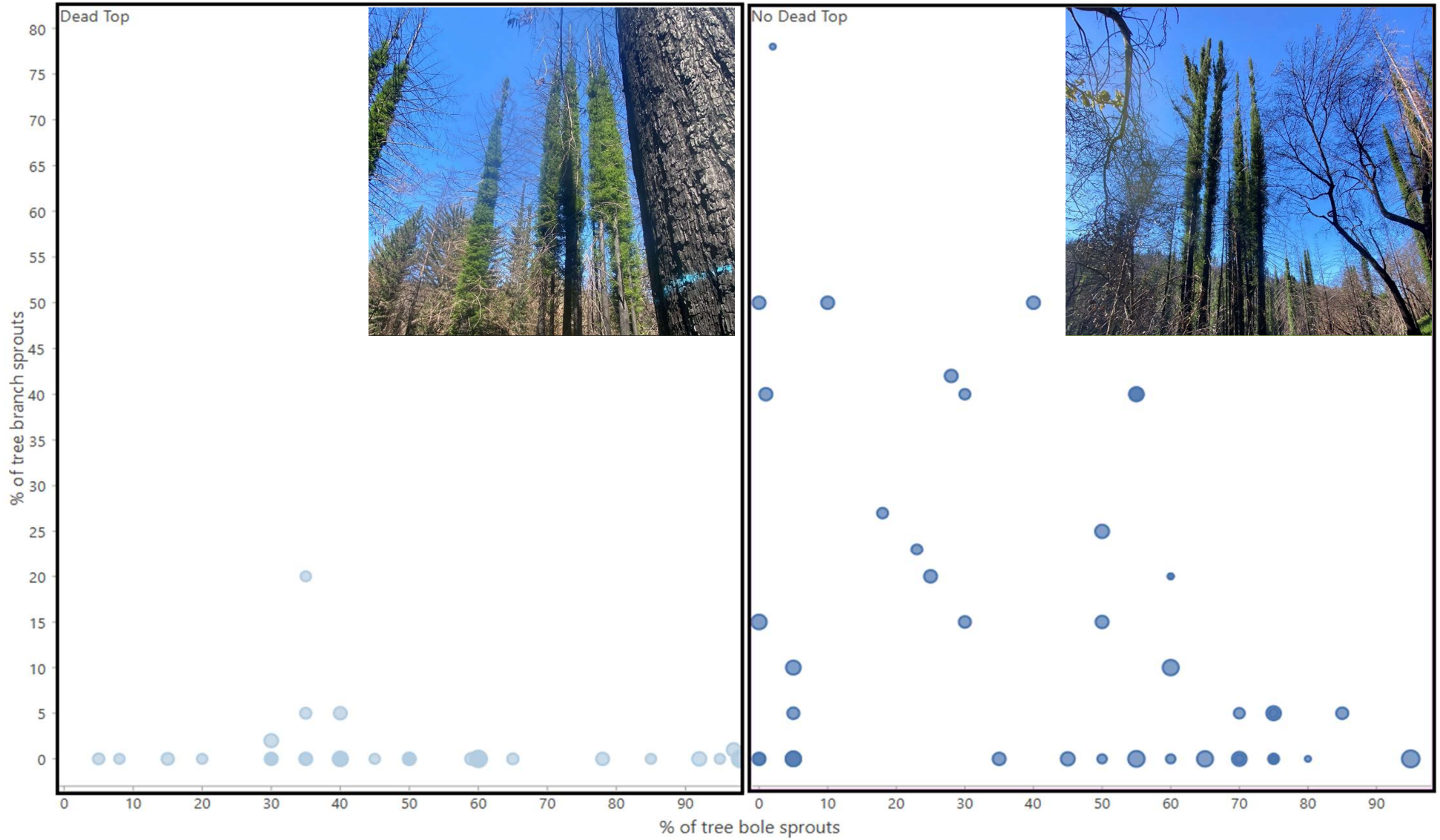
- Majority of logs showed discoloration of the sapwood
- The big end of the first log had an average circumference decay of **34%**
- The average % volume deduction in the first log was **21%**



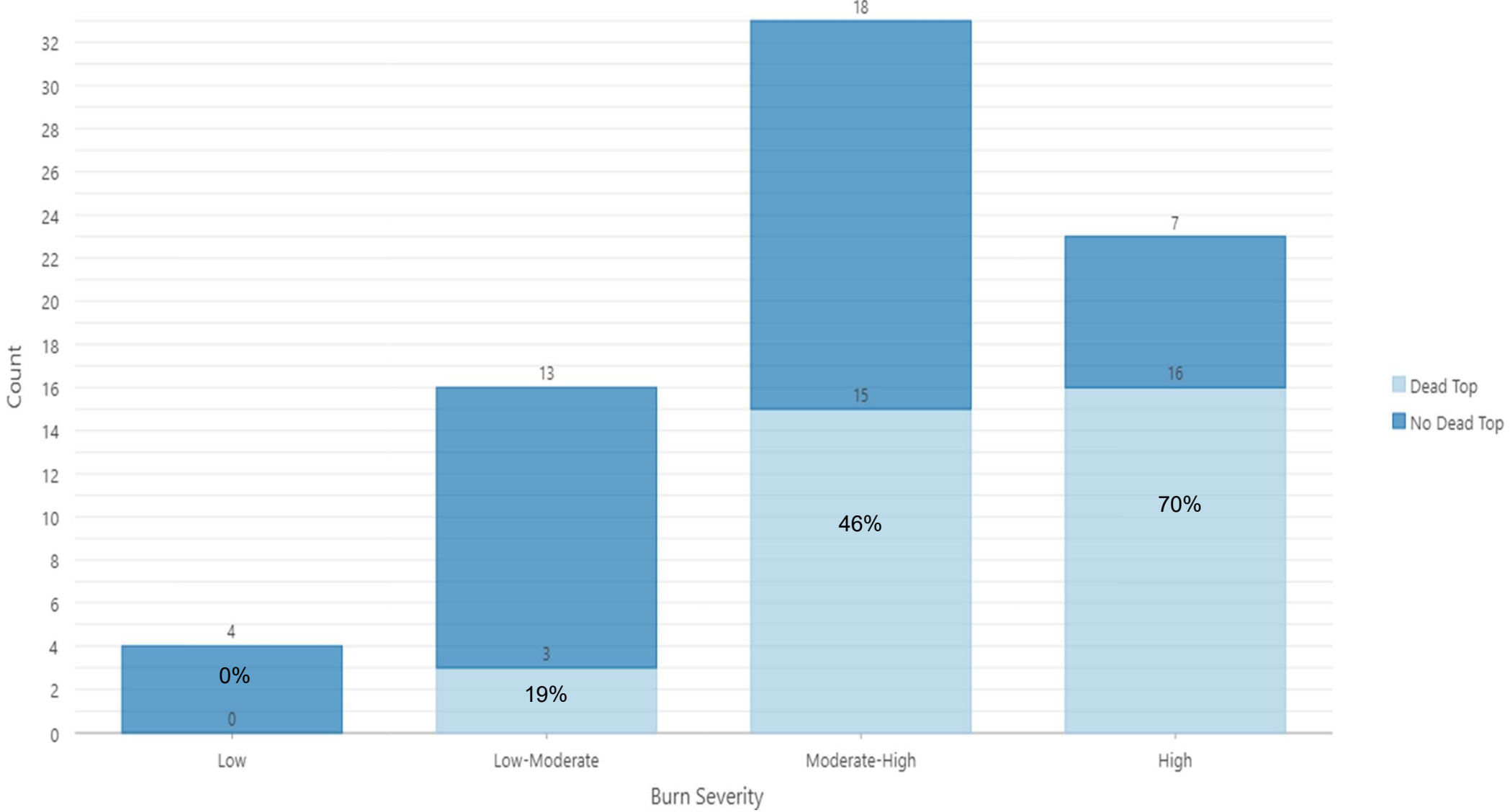
Gross and Net Volume of Logs After Deductions (Board Feet)



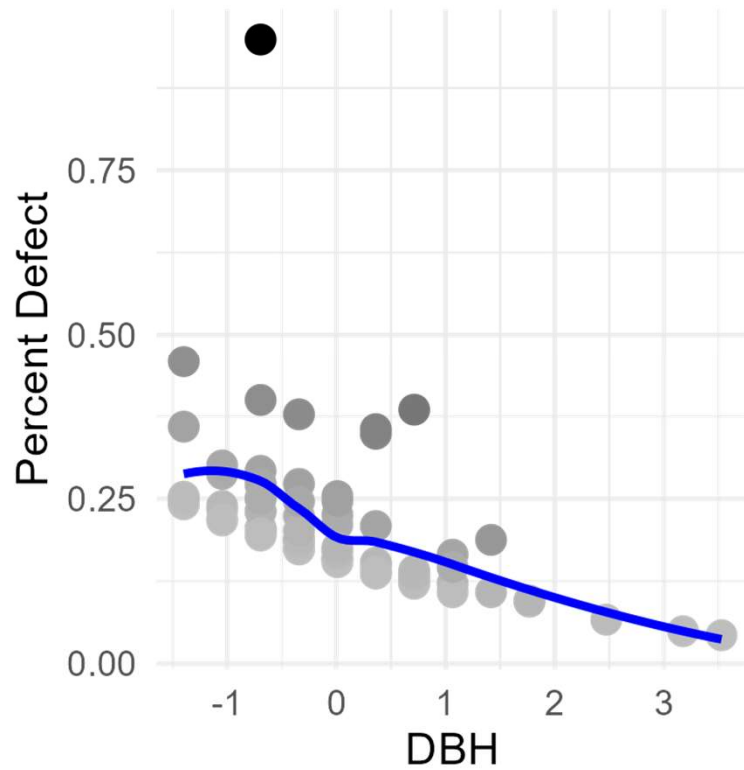
Relationship between % of tree bole sprouts and % of tree branch sprouts by Dead Top



Counts by Burn Severity and Dead Top



Percent defect across a scaled gradient of DBH



Area of Fungus

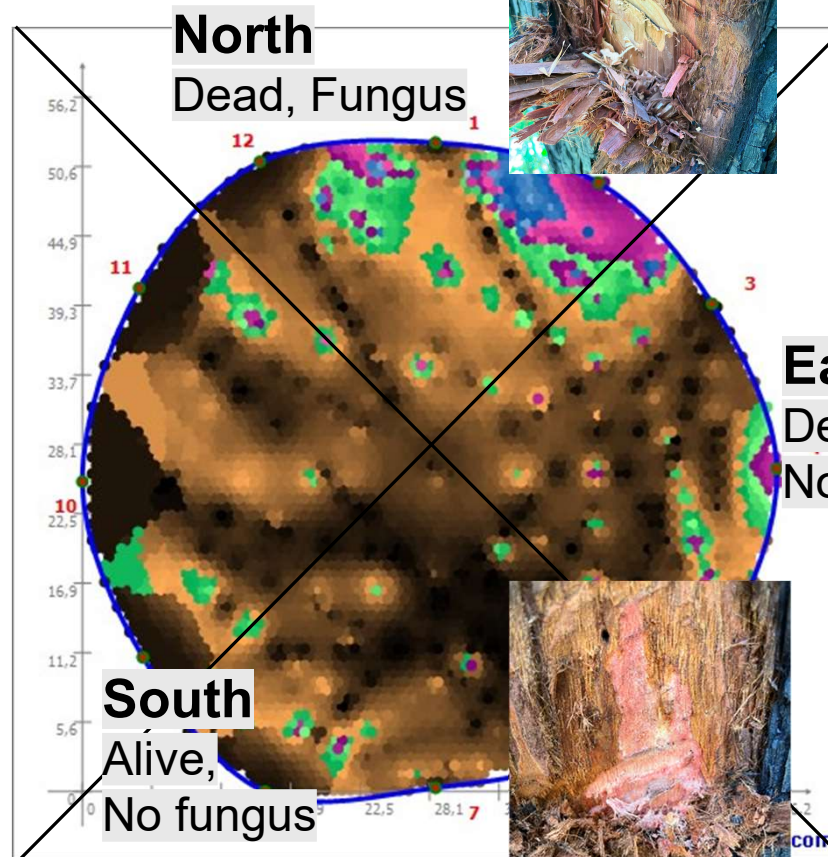


Greyscale indicates surface area of fungus

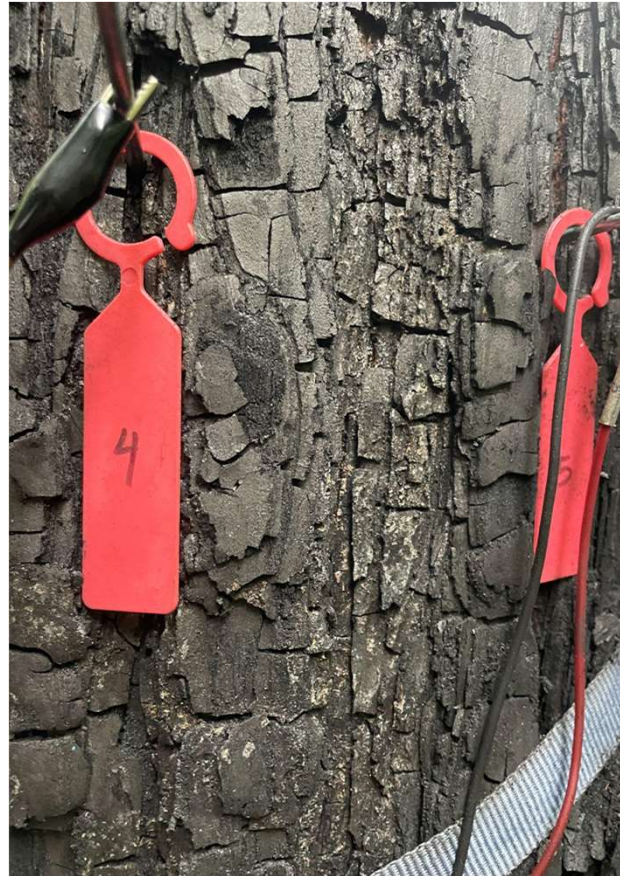
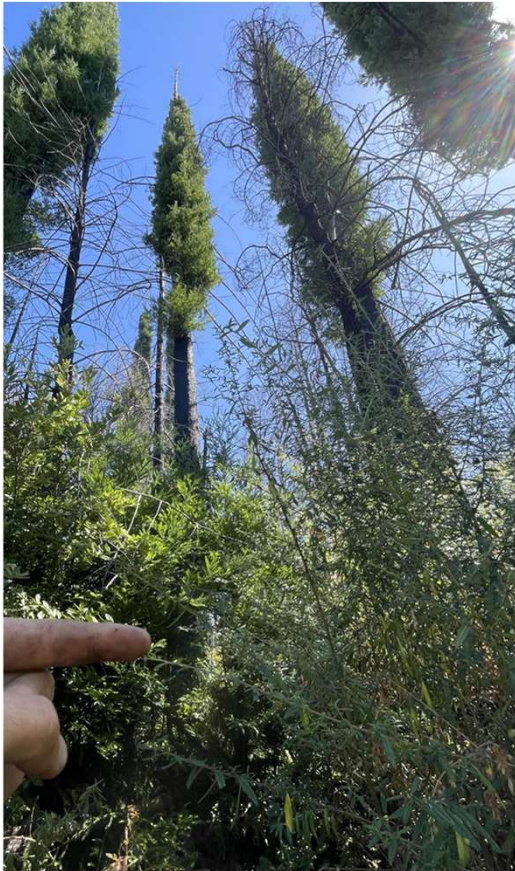
Cambium check



West
Alive,
Fungus



Data collection for the future



Acknowledgments

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Monitoring Committee

Hamey Woods

Nadia Hamey
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