

An aerial photograph of a coastal landscape. The top half shows a hillside covered in dense green forest, likely Pinus radiata, with patches of brownish soil or sand. The bottom half shows a rocky coastline with waves crashing against the shore, creating white foam. The water is a deep blue-green color.

Integrating social & ecological needs when managing endemic species:

A Case Study of Cambria's *Pinus radiata* forest

Dr. Sarah Bisbing, Kevin Hurt, & Matt Terzes

*California Polytechnic State University





The IUCN Red List of Threatened Species™

ISSN 2307-8235 (online)

IUCN 2008: T42408A2977955

Pinus radiata, Monterey Pine

Assessment by: Farjon, A.



AROUND THE NATION

California Races To Protect Its Forests As Fire Season Begins

Updated May 6, 2015 · 11:44 PM ET

NATHAN ROTT



Listen to the Story

All Things Considered

4:38

+ Playlist

Download

<> Embed

Transcript

This week marks the official start to California's fire season. The state's ongoing drought is stressing its forests and trees, making them even more vulnerable.

SHARE



Comment

Transcript

ROBERT SIEGEL, HOST:

California's fire season has officially begun. But ask the state's firefighters, and they'll say fire season started a long time ago. Unusually hot weather has primed California's forests to the Pacific coast and has this report...



78°

Login | Subscribe



THE TRIBUNE



FULL MENU

NEWS

SPORTS

BUSINESS

OBITUARIES



THE CAMBRIAN

MARCH 11, 2015

Cambria's precious stand of Monterey pines fights to survive

Save **\$15** on this pictorial history book about SLO County!



YOU ARE HERE: LAT Home → Collections → Diseases

Advertisement

A LONG-ACTING SCHIZOPHRENIA TREATMENT



INVEGA SUSTENNA®
paliperidone extended-release tablets
30 mg, 60 mg, 90 mg, 120 mg, 180 mg

Watch real people now

Then ask your doctor about INVEGA SUSTENNA®.

See Important Safety Information

Important Safety Information > Important Product Information >

INDICATION

INVEGA SUSTENNA® (in-VEY-guh Sust-TEN-uh)
paliperidone extended-release tablets, USP
is indicated for the treatment of schizophrenia in adults.

FROM THE ARCHIVES

Pine Pitch Canker: Its Spread Can Be Stopped

January 26, 1999

Insect-Borne Fungus Taking Its Toll of Famous Stands of...

September 18, 1994

California and the West

Cambria's Pines Are Doomed, Experts Say

Nature: Fungus known as pine pitch canker could wipe out 80% of the native stand that helps draw visitors to scenic coastal village.

May 26, 1998 | MARCIA MEIER | SPECIAL TO THE TIMES



Email

Share

G+1 0

Tweet

Recommend

1

CAMBRIA, Calif. — A virulent fungus is killing the Monterey pines in this picturesque coastal community, forcing the town long known as "Cambria Pines by the Sea" to consider life without them.

The towering pines that cover the hillsides have been infected with pine pitch canker, and experts say it may wipe out 80% or more of Cambria's native stand of pines within the next three decades. No chemical or biological weapon exists to combat it.

"People come here because of the trees," said Lynda Adelson, a local gallery owner. "I can't imagine it's going to be good for tourism to see a whole standing pine forest decimated. It's not going to be pretty."

The fungus has been detected elsewhere in the state, including pockets in Los Angeles, Riverside and San Diego counties, but it is in Cambria that alarmed state officials are launching an offensive to stop its spread.

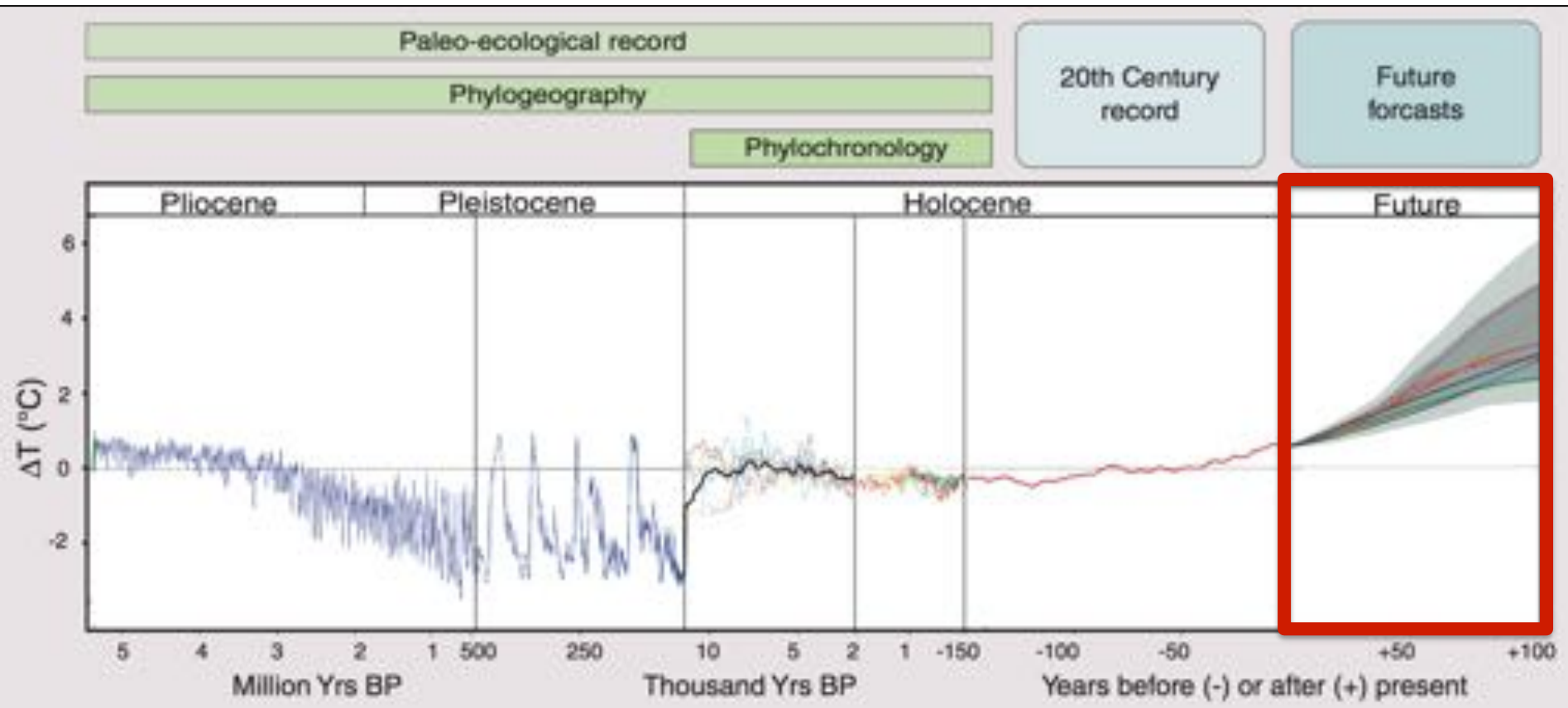
Biologists believe that it's only a matter of time until the pitch canker invades the Sierra Nevada.

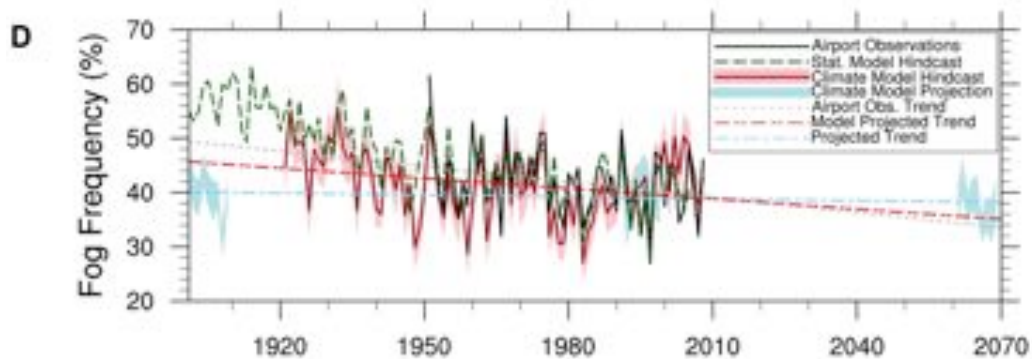
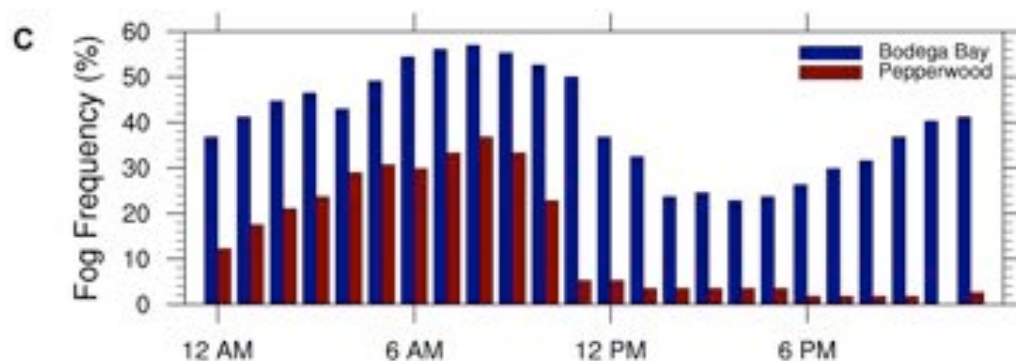
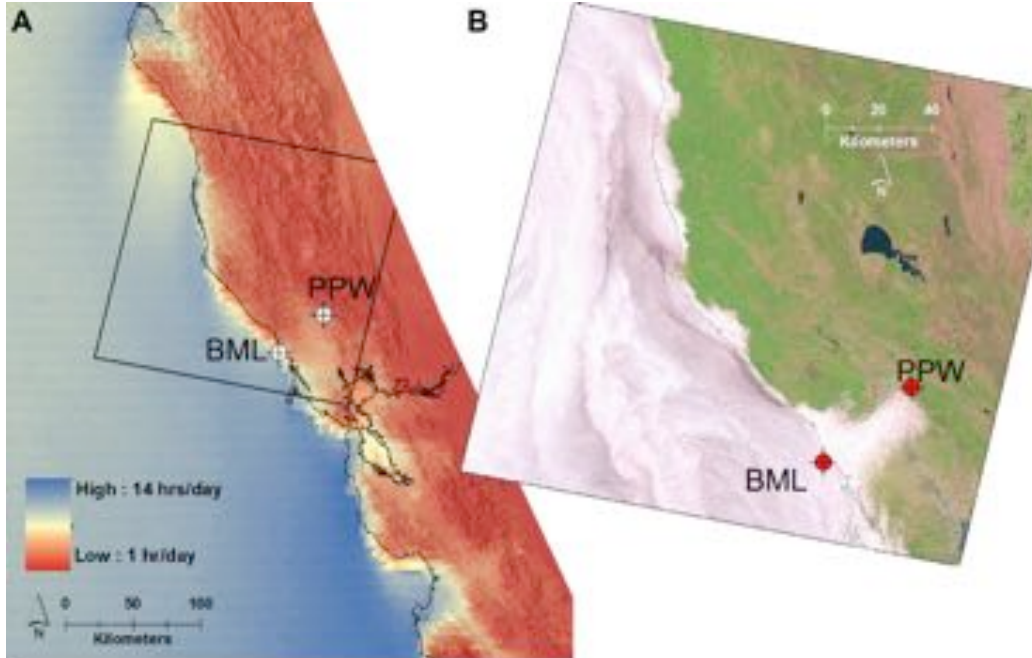
"All the native pines and, with the exception of one pine, all of the introduced pines are susceptible to the fungus too," said Dave Adams, a forest pathologist with the California Department of Forestry in Sacramento. "There's no chance of eradicating it."

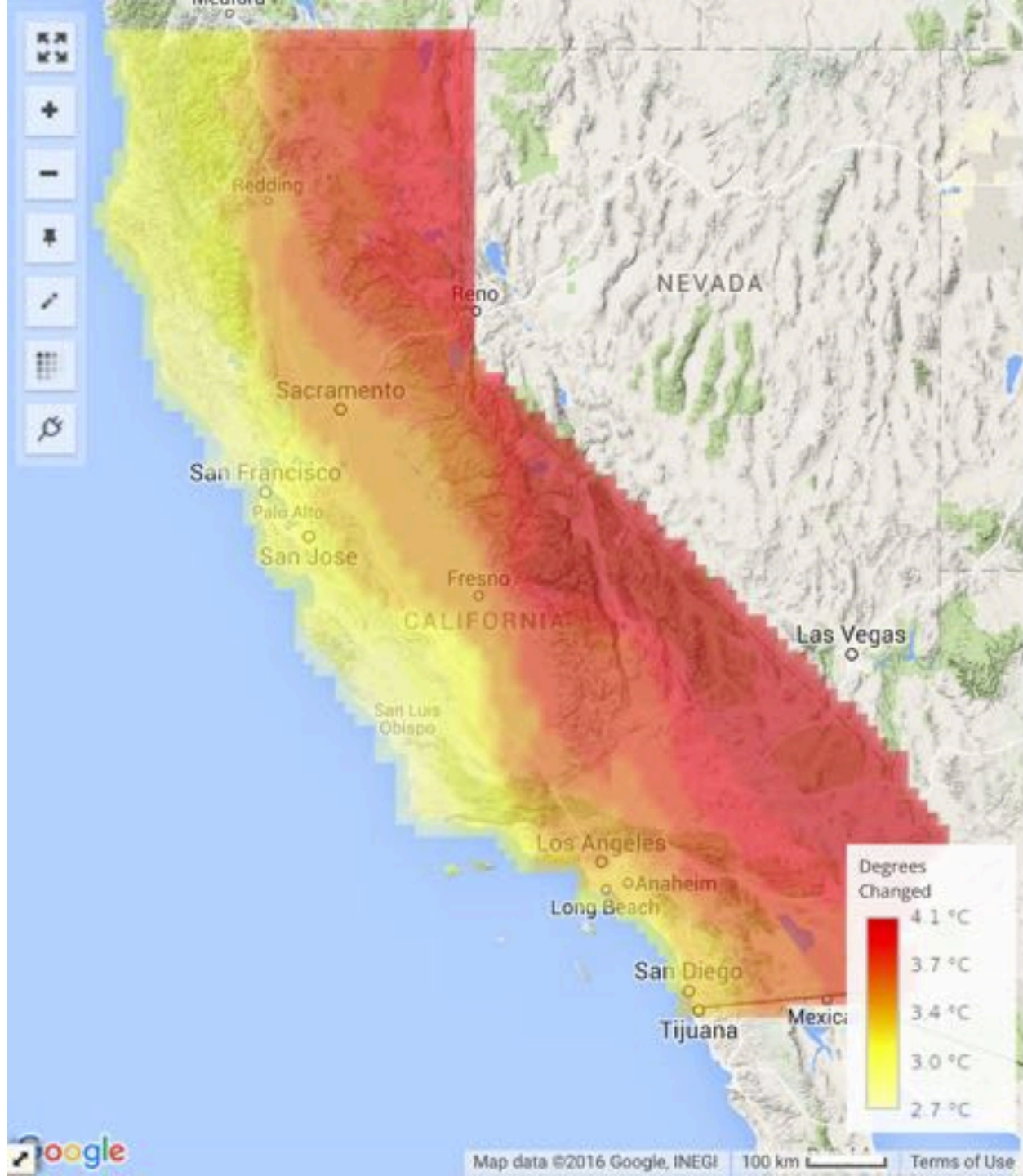
A bill pending in the California Legislature would provide \$2 million for researchers trying to find a resistant strain in the pines of Cambria, a community of 6,000 north of San Luis Obispo. Once found, a

Crate&Barrel

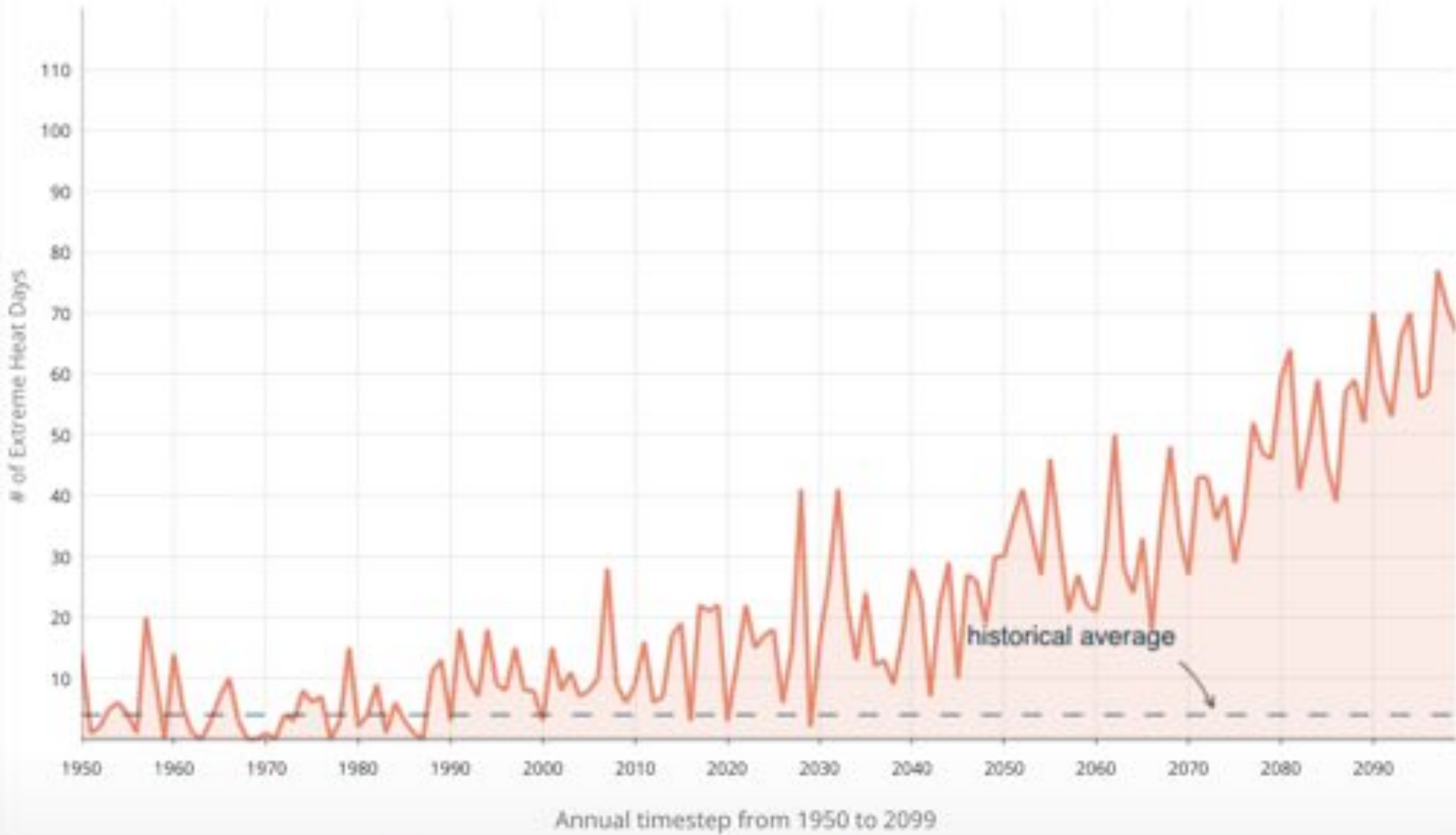
Up to 40% off
Fall ClearanceSave on hundreds of
marked-down items. But







Projected Number of Extreme Heat Days



Historical Avg. # Extreme Heat Days: 4 ⓘ Extreme Heat Day Threshold: 102°F ⓘ All values based on modeled data ⓘ

LOCAL CLIMATE SNAPSHOTS

San Luis Obispo County, CA



Temperature

Projected changes in annual average temperatures for the low emissions scenario



Temperature Rise



Google

Map data ©2015 Google, INEGI 25 km Terms of Use

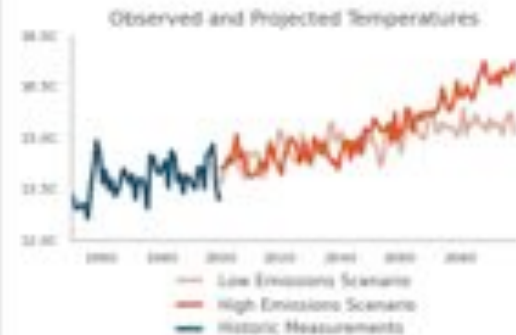
☒ Use Metric Units ☐ Use County Average



CAMBRIA AREA

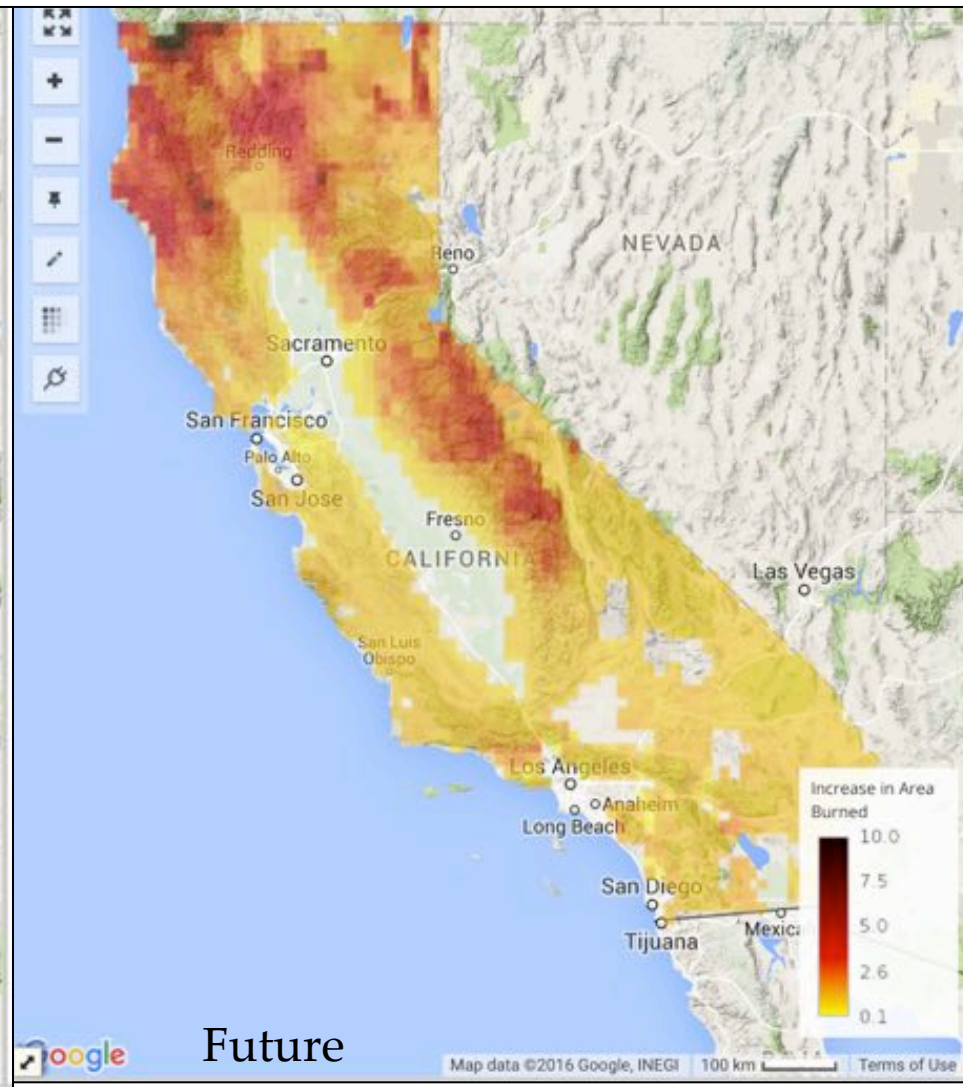
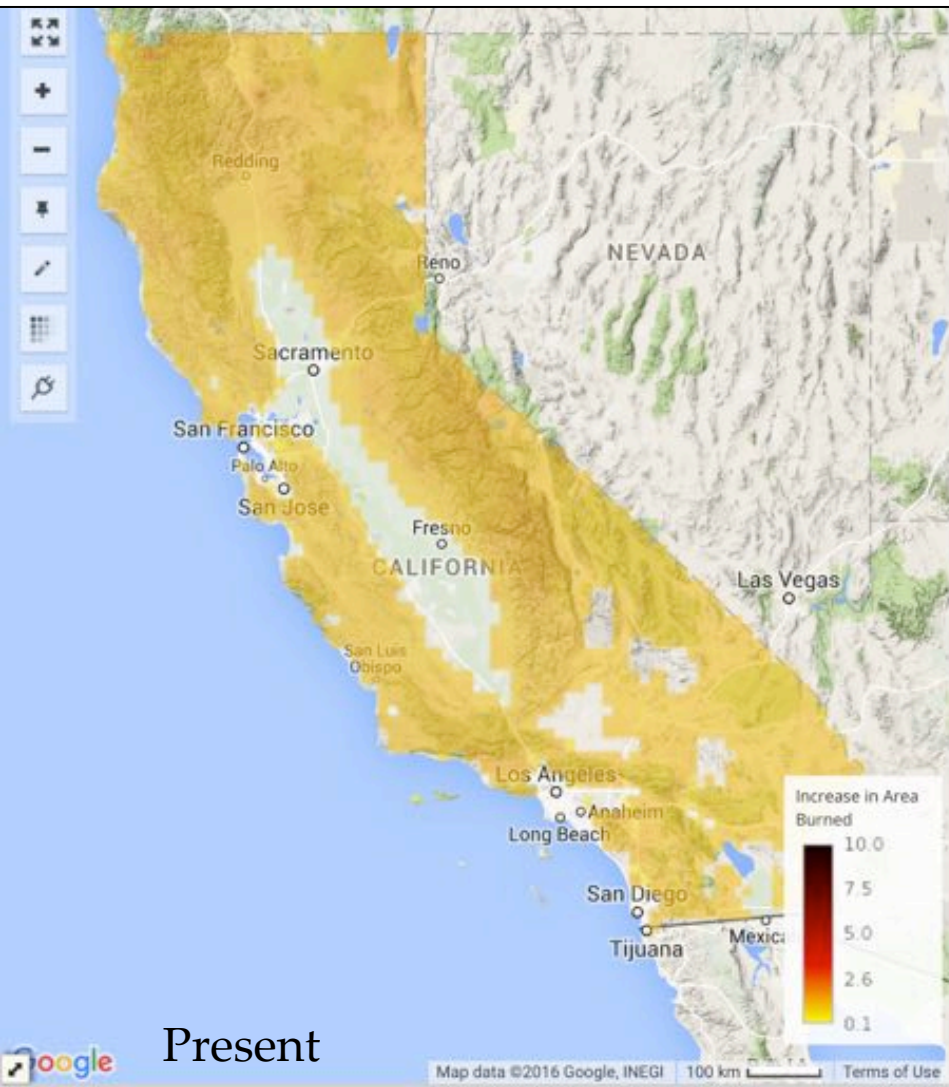
The information in the chart below corresponds to the selected area on the map (outlined in orange).

Historical Average	13.9 °C	
Low-Emissions Scenario:	15.4 °C	+1.5 °C
High-Emissions Scenario:	16.5 °C	+2.6 °C



disclaimer uncertainty

Wildfire Area Increases



5 to 10 x the area by 2100!



Future of Monterey pine?







Photos Courtesy of Don Canestro



2002



2015



Assessing the Path Forward:

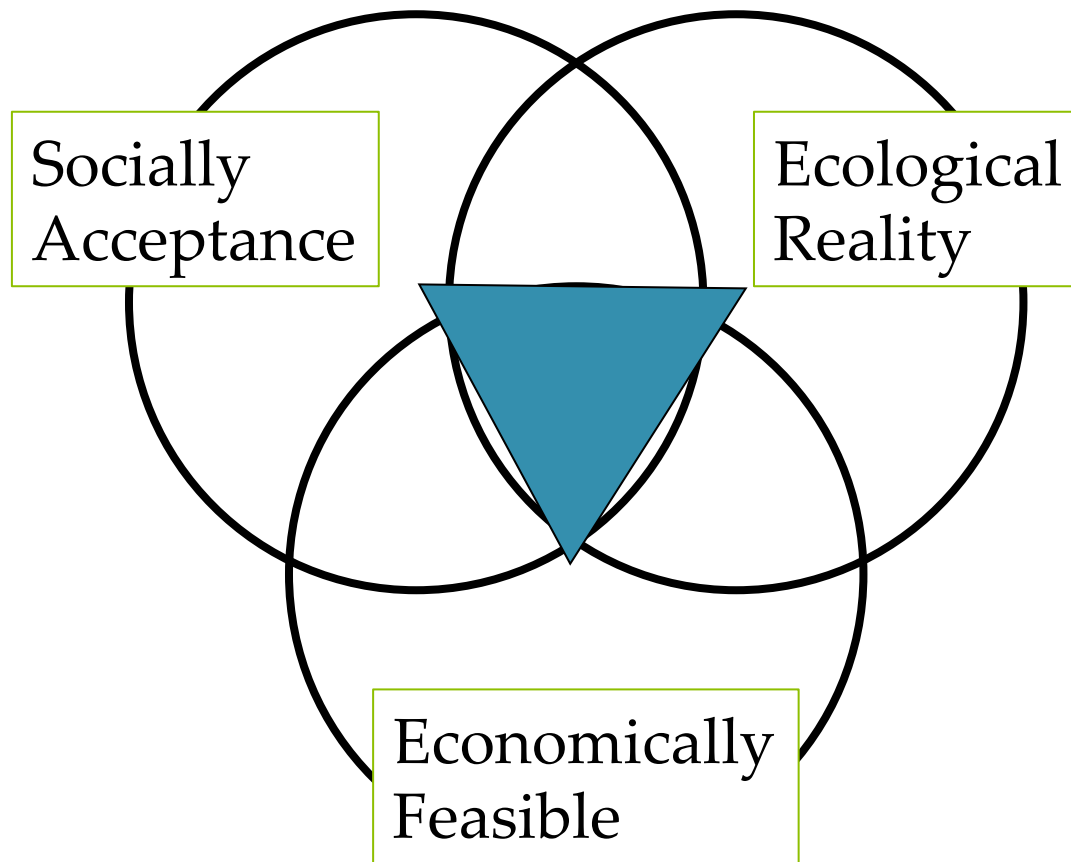
- Primary concerns & objectives of community?
- Wildfire mitigation and safety
- Preservation of unique, endemic conifer
- Increased understanding of understudied species

An aerial photograph of a coastal area. On the left, the blue ocean meets a sandy beach with white surf. To the right of the beach is a dense, green forest covering a hillside. In the upper right, a residential area with houses and roads is visible. The text 'Proposed Treatment:' is overlaid in white on the forest area.

Proposed Treatment:

- Reduce fire hazard
 - Low thinning & fuelbreaks
- Improve forest health
 - Sanitation harvest
- Improve safety
 - Salvage harvest

Prescriptions balancing. . .



... bounded by ecological, social, and economic principles.

Scale of Management

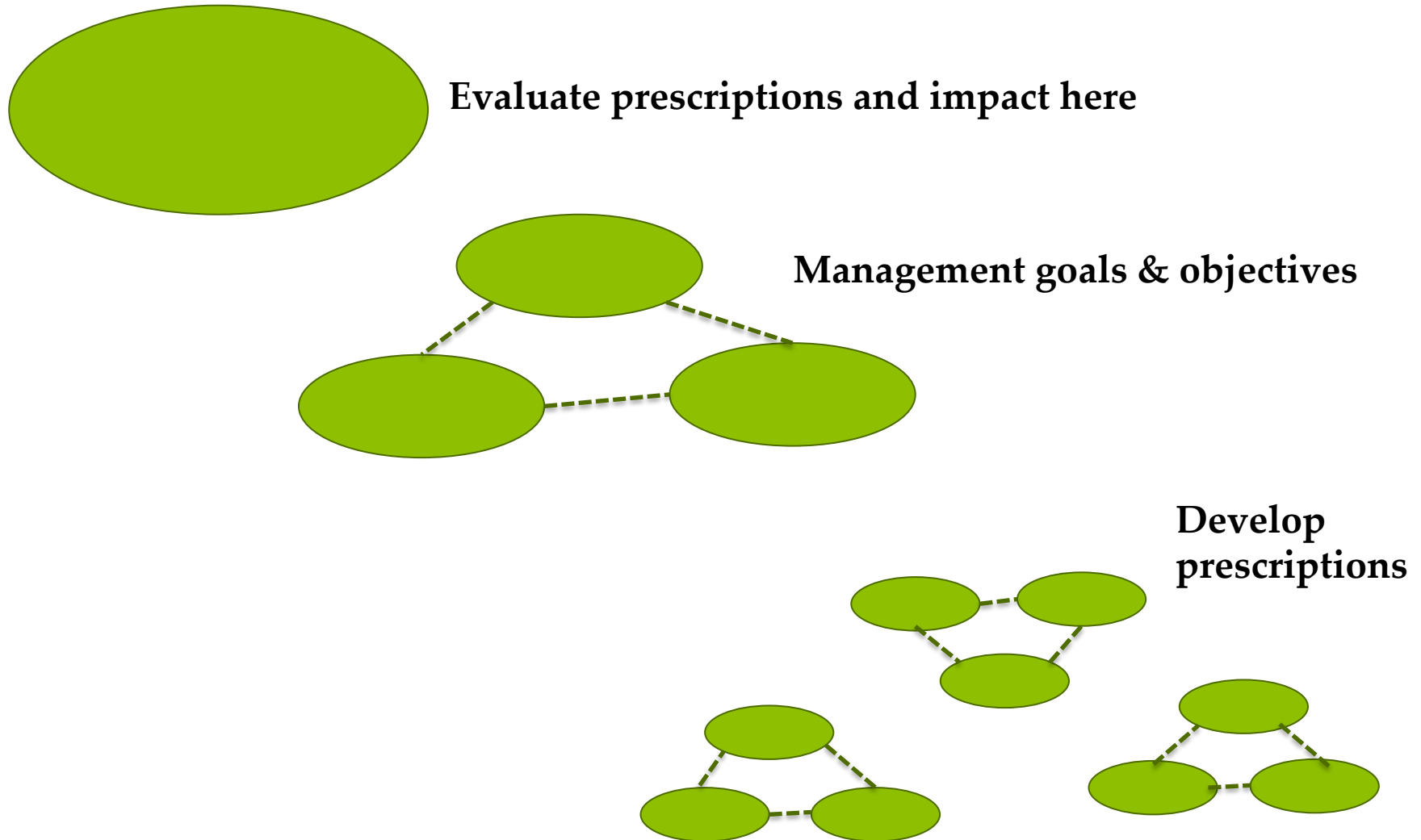


Stand



Landscape Context

Ecological Silviculture



Steps in Silvicultural Planning



1. Determine landowner's objectives

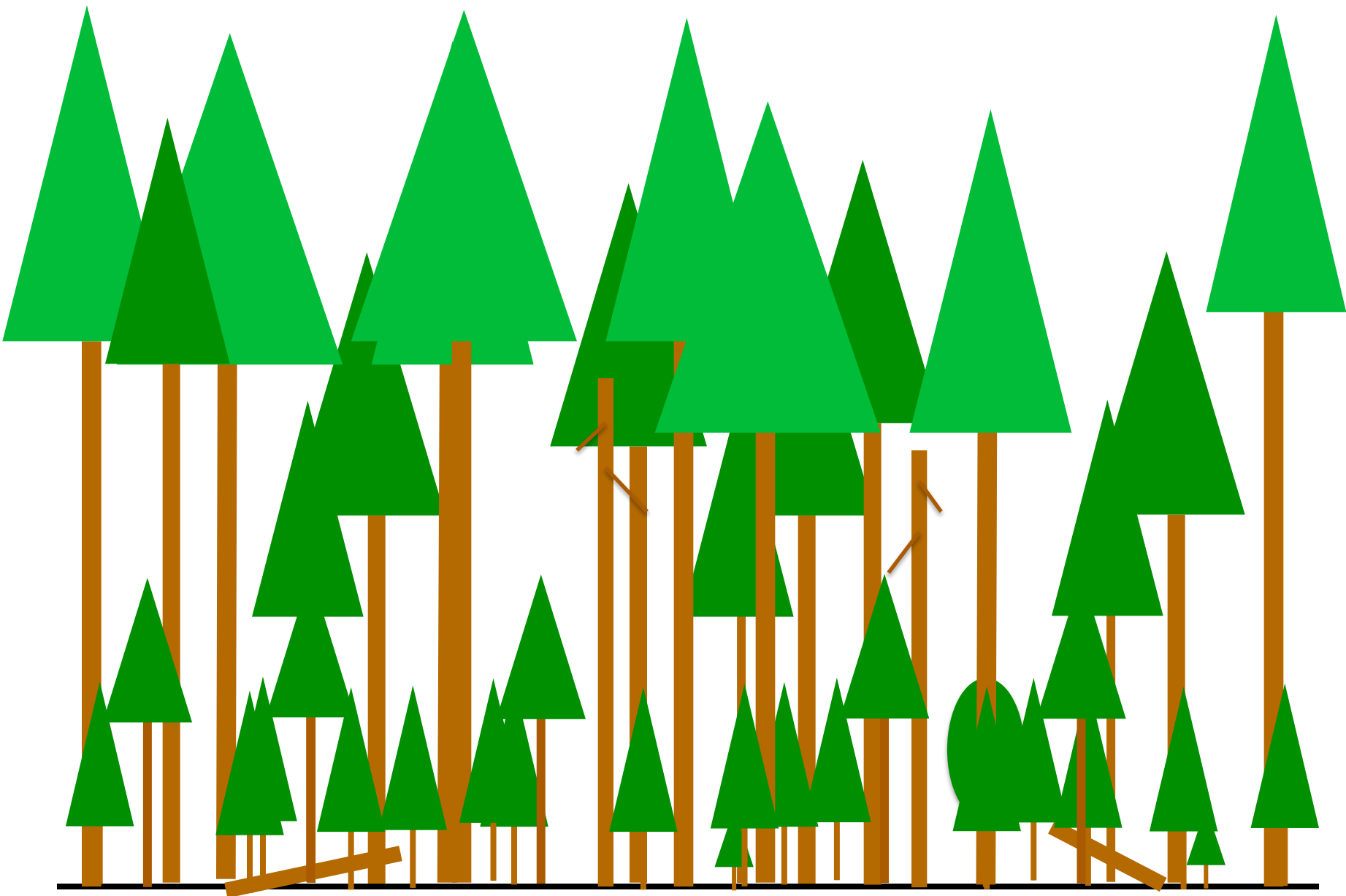
2. Evaluate stand

3. Identify options

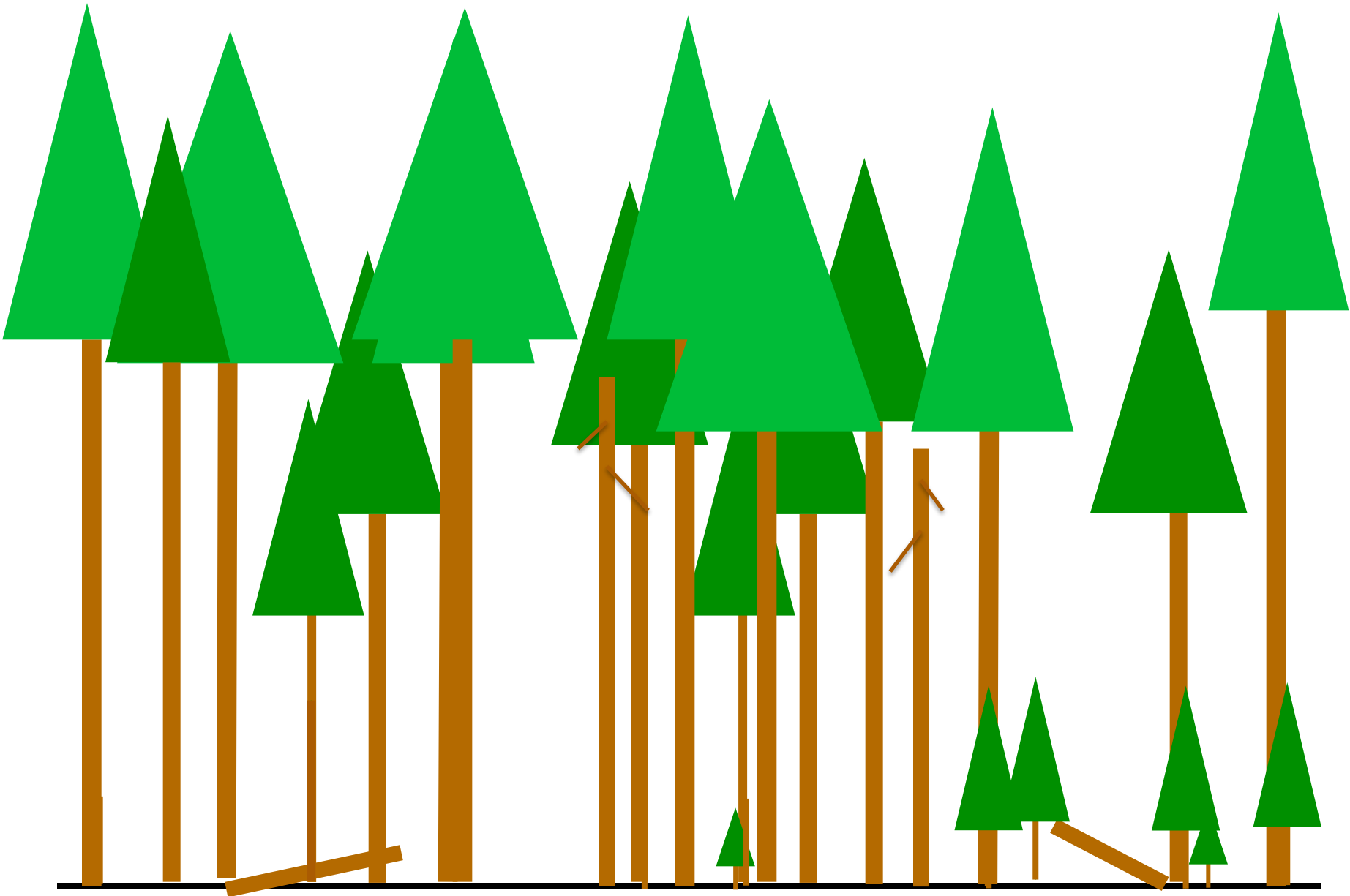
4. Quantify likely outcomes of each

Objectives = Silvicultural Treatment





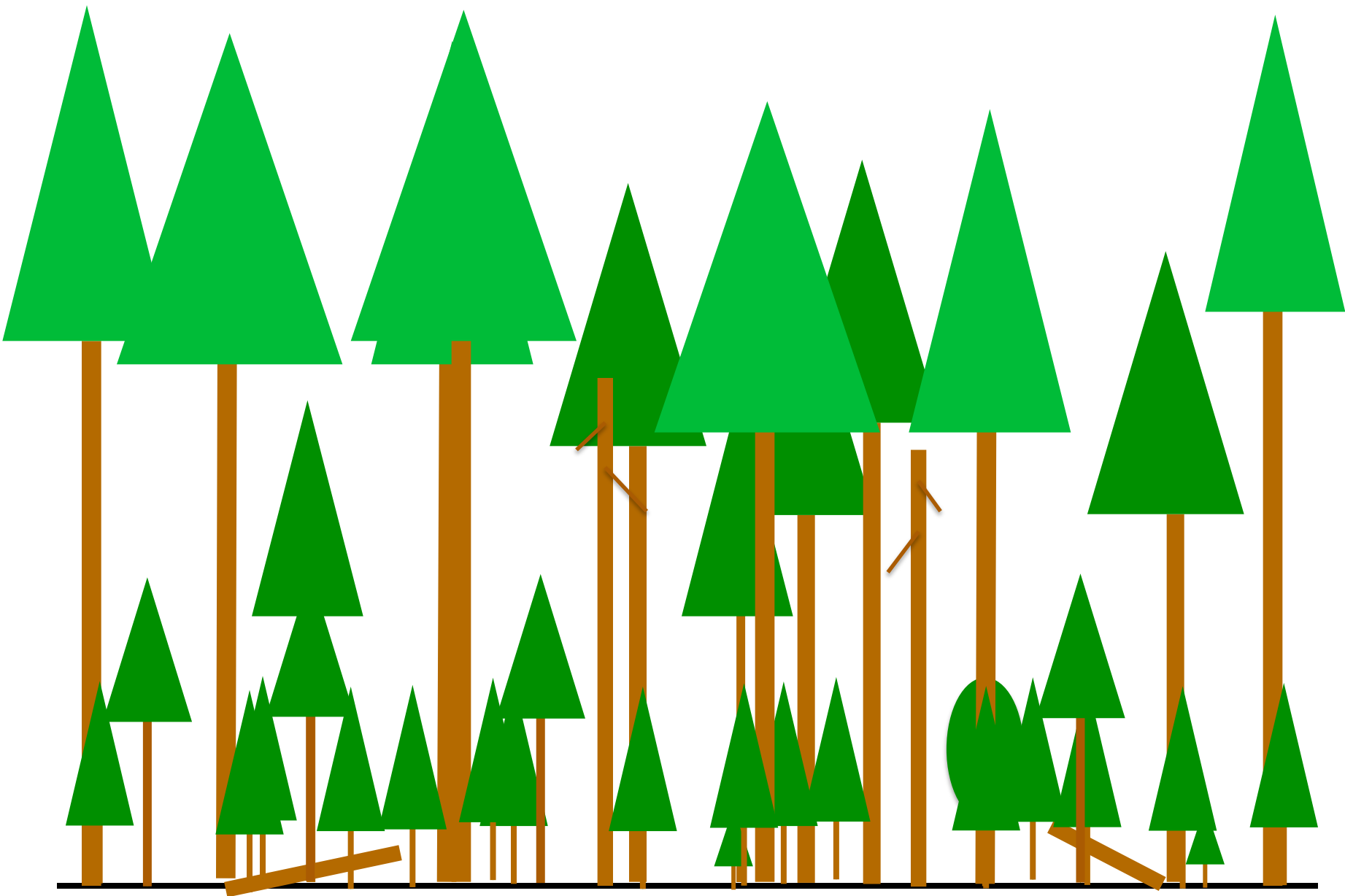
Low Thinning (fire hazard)



Low Thinning (fire hazard)



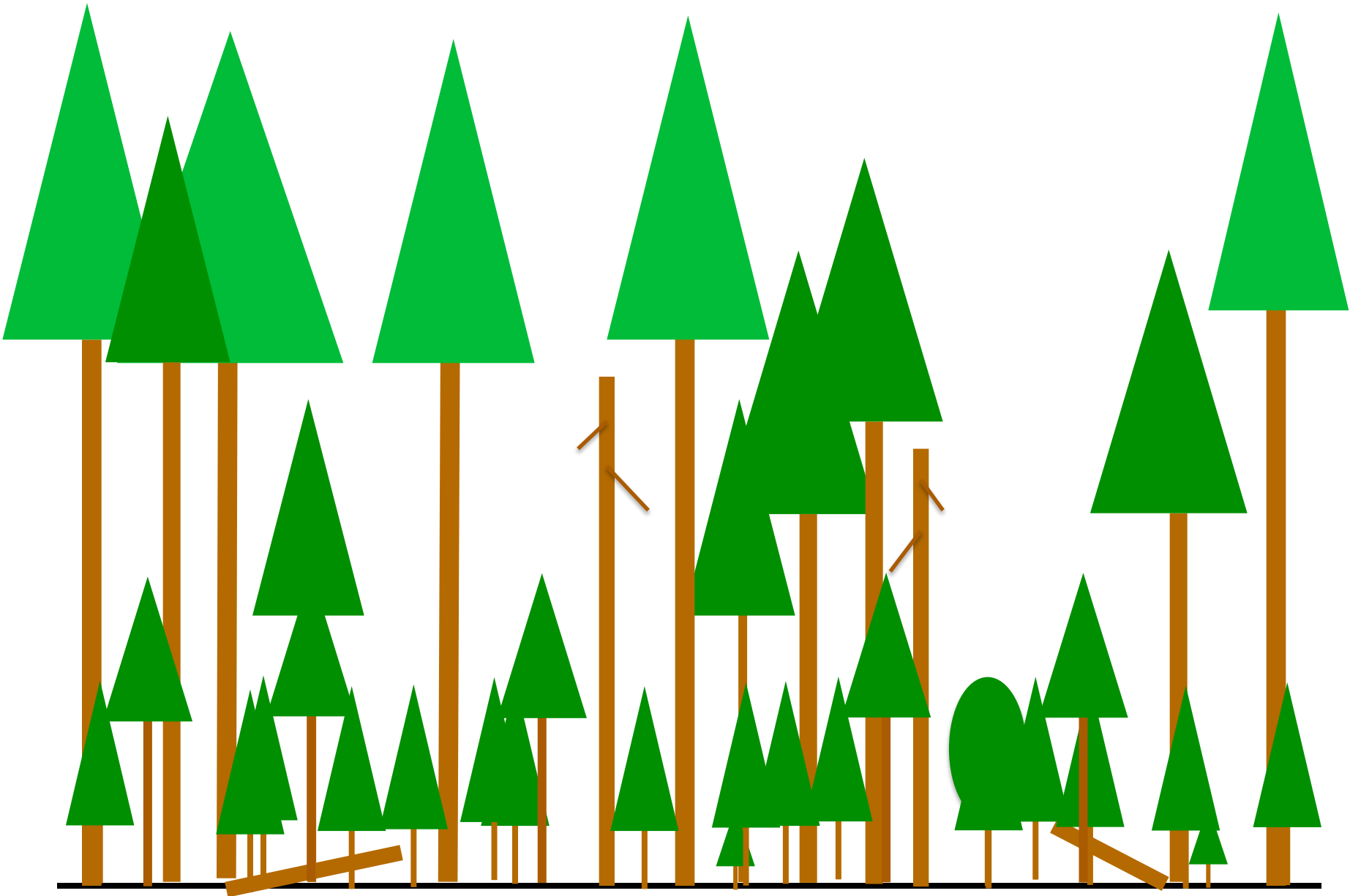
Sanitation (health)



Sanitation (health)



Salvage (safety & fire)



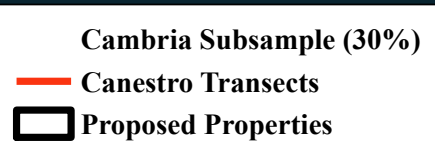
Salvage (safety & fire)



Assessing Knowledge Gaps:

- What are the primary drivers of mortality?
- How does climate influence patterns of mortality and regeneration?
- How will treatment influence forest dynamics, regeneration, and health?

Cambria Monterey Pine Mortality Assessment



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, Gmapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

30% Sampling:

Covell – 75 plots

Fiscalini – 19 plots

Rancho Marino – 26 plots

Cambria Forest Health Long-term Plots

FRP for saplings & seedlings
8m radius

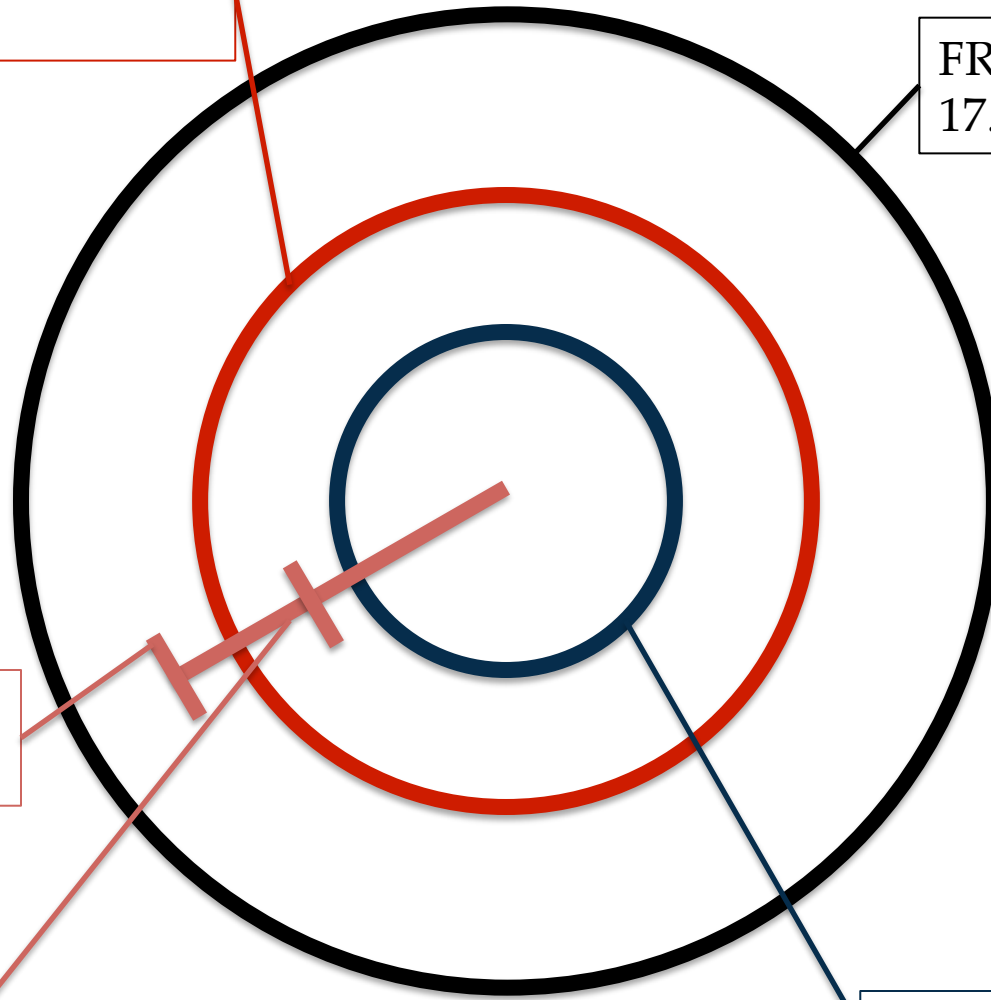
FRP for Large Trees
17.8m radius

Duff Depth at
4.5m and 9m

Brown's Fuels & Canopy Transect
Random Compass Direction at 9m

Nested Veg Plot – 3.6m

****Tag ALL respective trees in each FRP**



Piece sizes

Dead woody class			Piece diameter
			<i>inches (cm)</i>
DWD	FWD	1-hr	0–0.25 (0–0.6)
		10-hr	0.25–1.0 (0.6–2.5)
		100-hr	1.0–3.0 (2.5–8.0)
	CWD	1,000-hr and greater	3.0 and greater (8.0 and greater)

CWD decay class

Decay class	Description
1	All bark is intact. All but the smallest twigs are present. Old needles probably still present. Hard when kicked.
2	Some bark is missing, as are many of the smaller branches. No old needles still on branches. Hard when kicked.
3	Most of the bark is missing and most of the branches less than 1 inch in diameter also missing. Still hard when kicked.
4	Looks like a class 3 log but the sapwood is rotten. Sounds hollow when kicked and you can probably remove wood from the outside with your boot. Pronounced sagging if suspended for even moderate distances.
5	Entire log is in contact with the ground. Easy to kick apart but most of the piece is above the general level of the adjacent ground. If the central axis of the piece lies in or below the duff layer then it should not be included in the CWD sampling, as these pieces act more like duff than wood when burned.

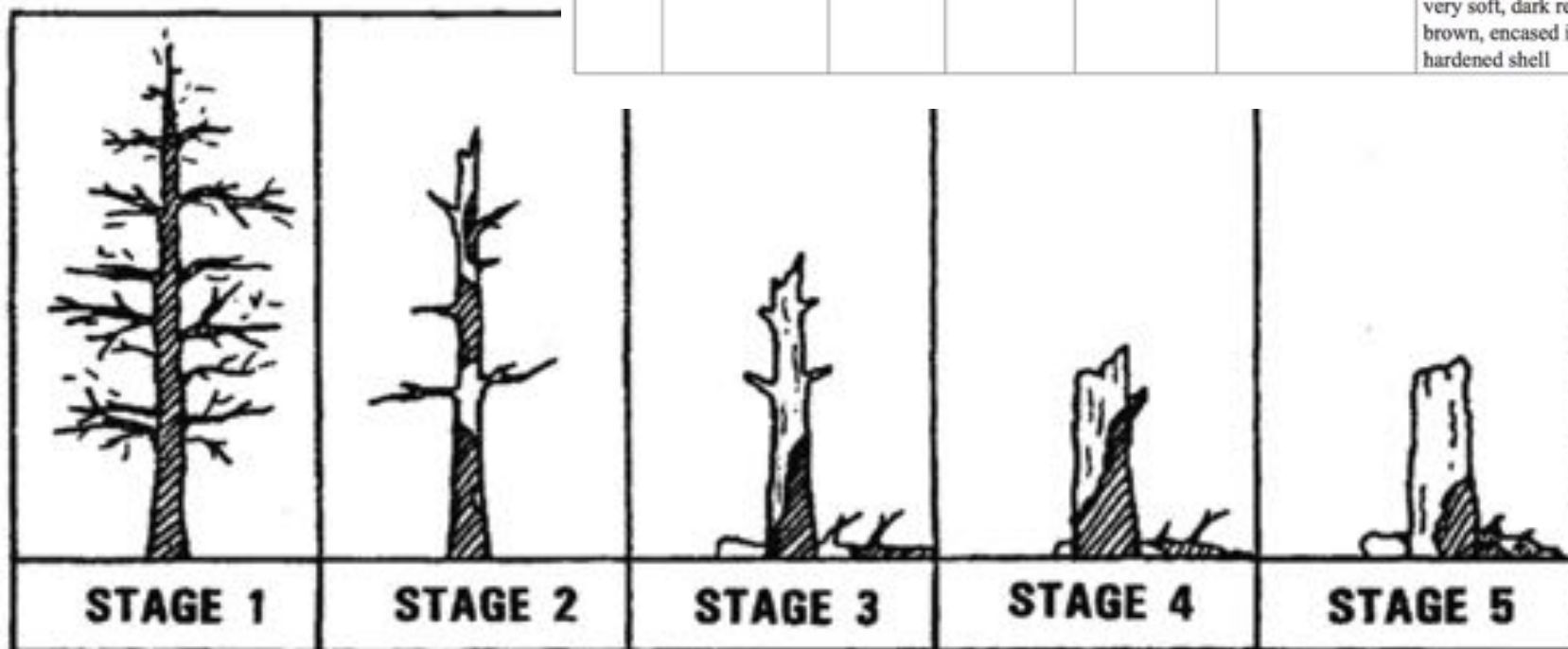
Tree Status	Stage
Green Phase	1
Flagging	1.5
Red Phase	2
Grey Phase	3
Tree Fall Phase	4

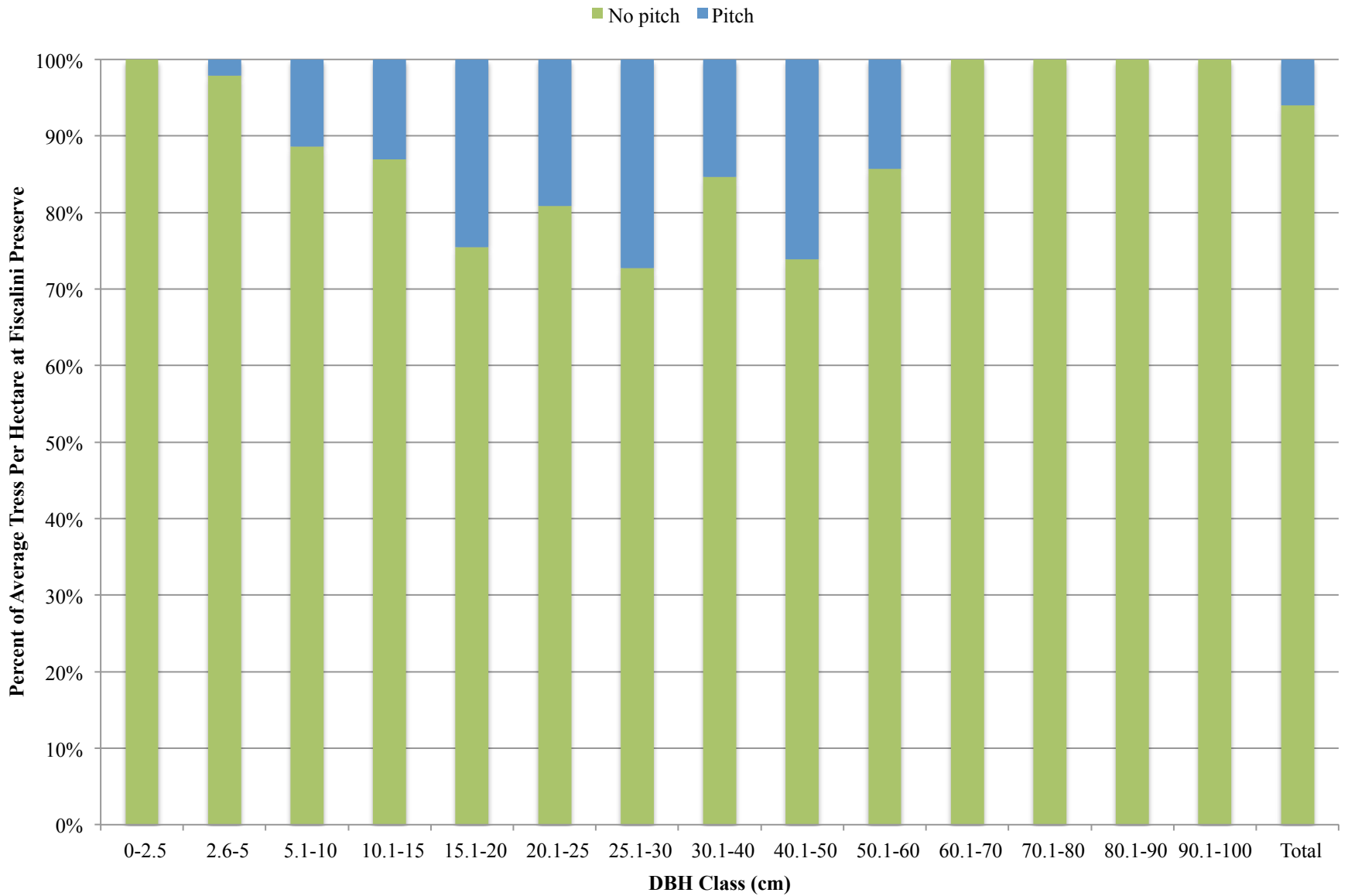
Live Crown	Code
Healthy (0-10% dieback)	1
Moderate (11-50%)	2
High (50+%)	3
Dead	4

Table 13.5. Snag decay class codes and descriptions.

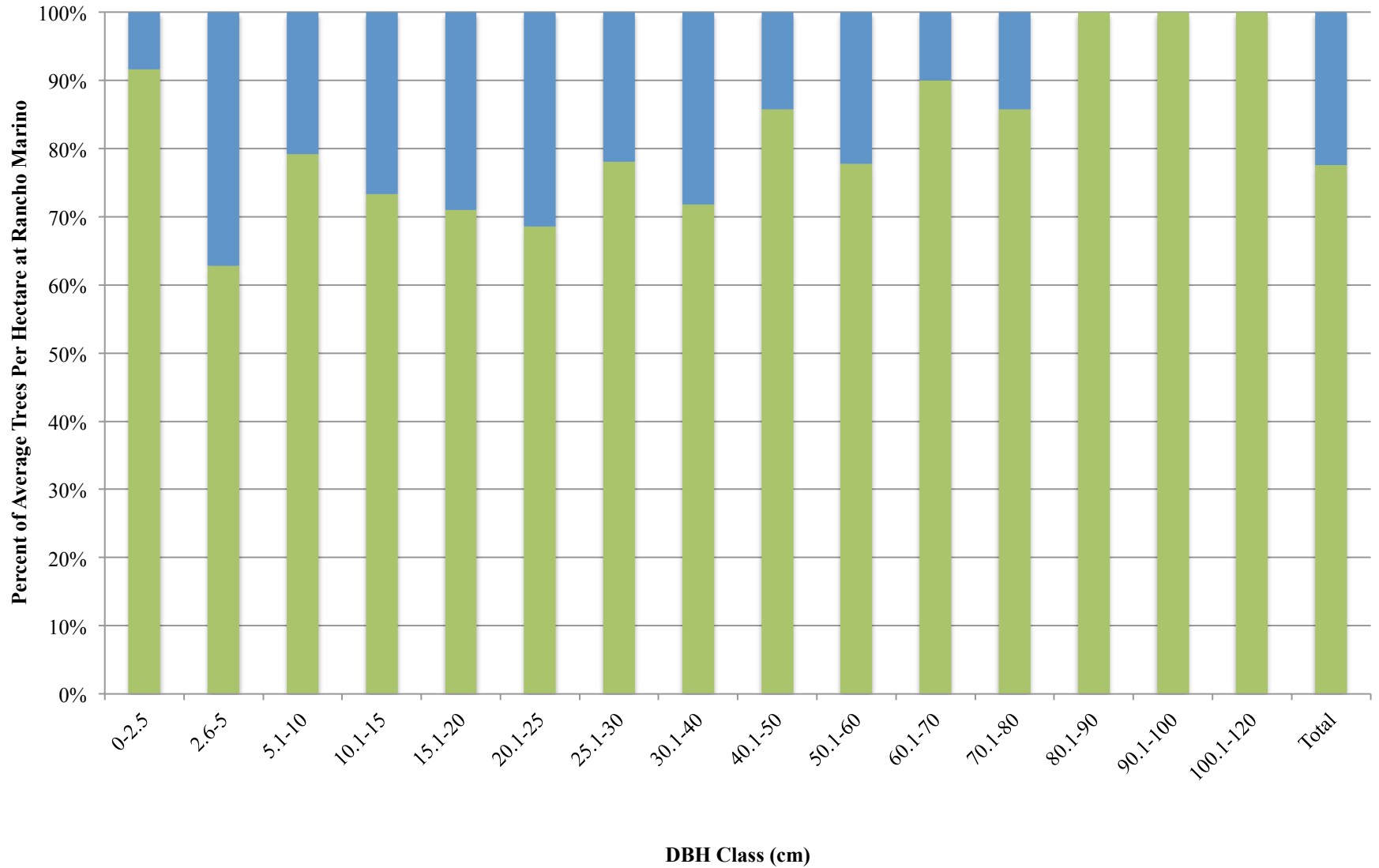
Code	Limbs and branches	Top	Percentage of bark remaining	Sapwood presence	Sapwood condition	Heartwood condition
1	All present	Pointed	100	Intact	Sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	Broken	Variable	Sloughing	Advanced decay, fibrous, firm to soft, light brown	Sound at base, incipient decay in outer edge of upper bole, hard, light to red brown
3	Limb stubs	Broken	Variable	Sloughing	Fibrous, soft, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing	Cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	< 20%	Gone	Gone	Sloughing, cubical, soft, dark brown, OR fibrous, very soft, dark reddish brown, encased in hardened shell

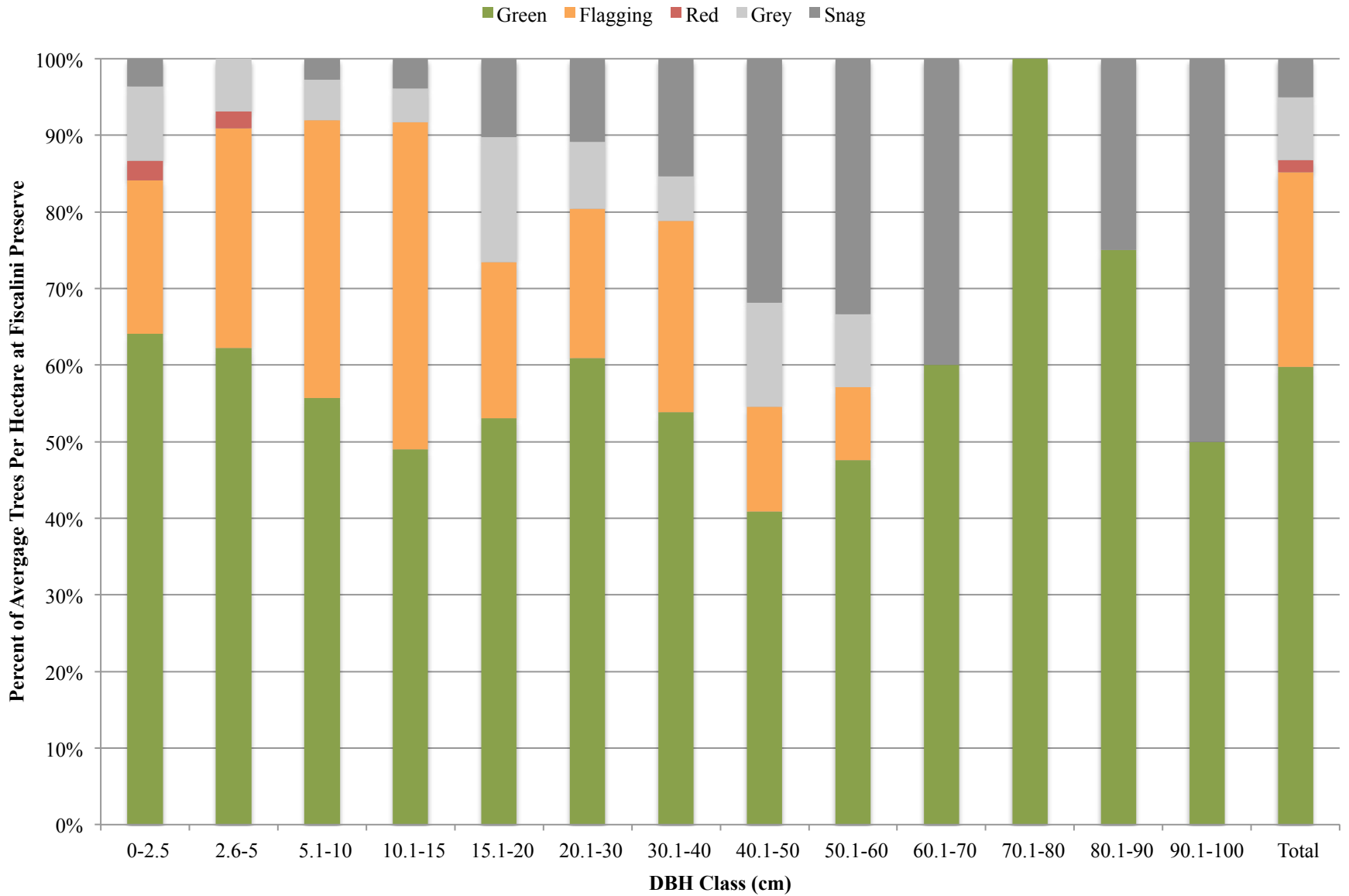
Damage Agent	Code
Beetles	01
Dwarf Mistletoe	02
Western Gall Rust	41
Pitch Canker	46

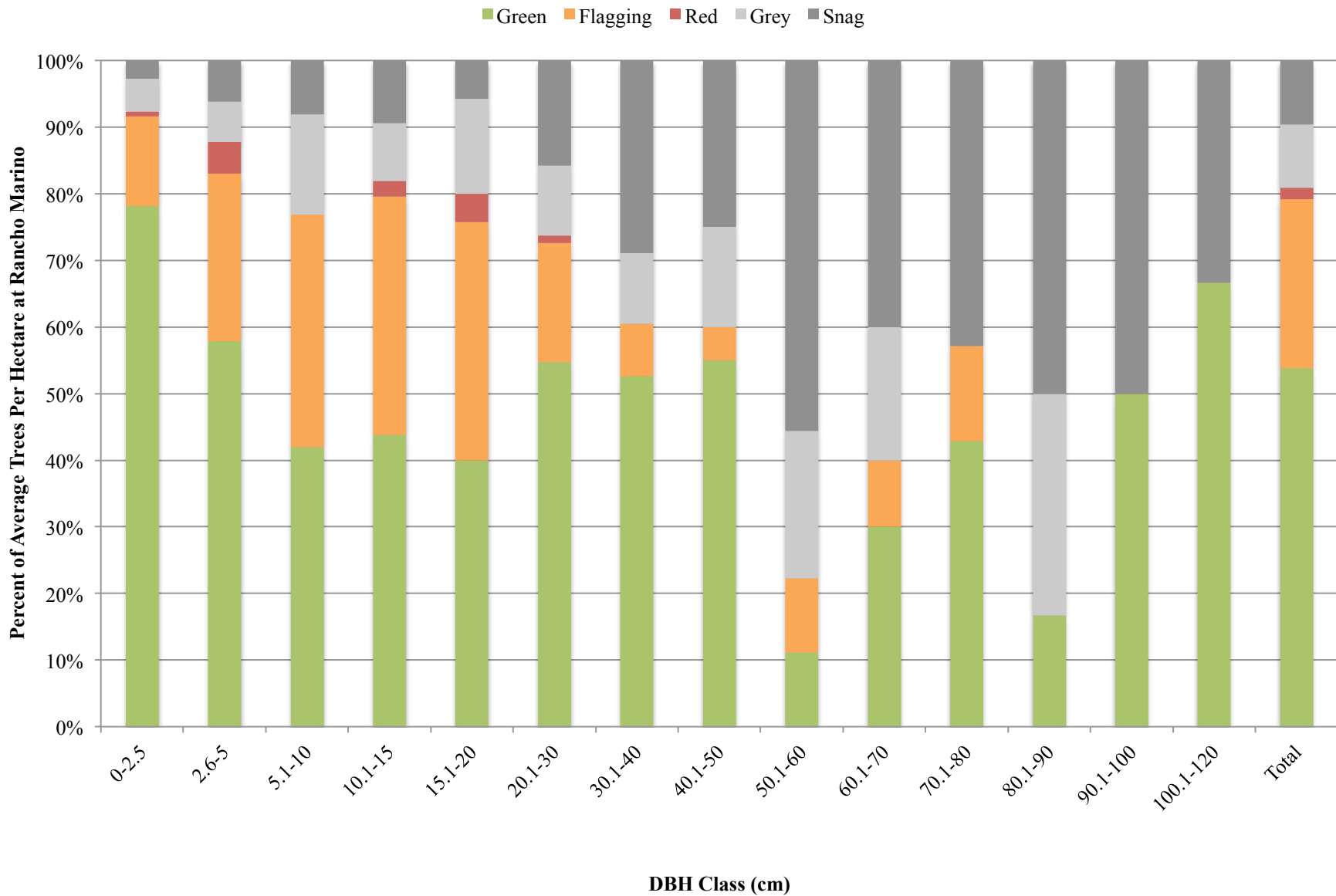




No pitch Pitch

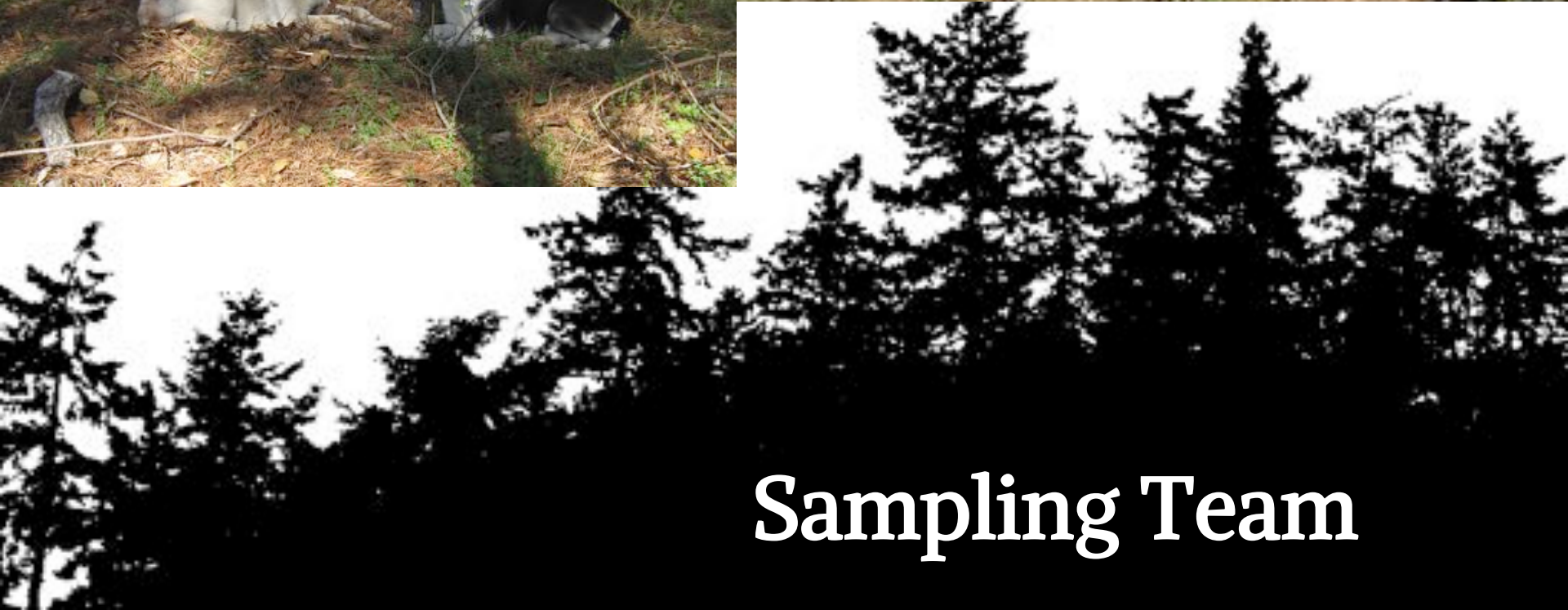






Property	Pitch Canker		Mortality (63cm/25in ⁺)		Mortality (All classes)	
	2015	2016	2015	2016	2015	2016
Covell Ranch	18%	-	56%	-	28%	-
Rancho Marino	22%	22%	56%	64%	21%	30%
Fiscalini Preserve	9%	8%	27%	30%	15%	17%*

*Trees removed in 2016



Sampling Team



CAL POLY

SAN LUIS OBISPO



The Nature Conservancy



Collaborations & Support

Questions?

Email: sbisbing@calpoly.edu

Twitter: [@SarahBisbing](https://twitter.com/SarahBisbing)

Website: sarahbisbing.com

