Forest Health Protection

Pacific Southwest Region
Northeastern California Shared Service Area

Danny Cluck

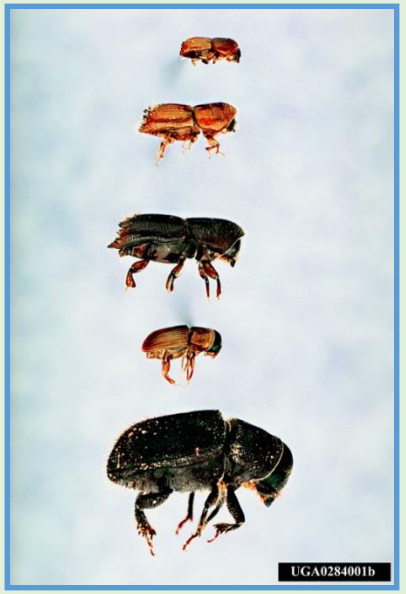
Forest Entomologist

Bark Beetles

Order: Coleoptera (beetles)

Family: Curculionidae (weevils and bark beetles)

Subfamily: Scolytinae



Bark beetles were formerly recognized as a separate family; older literature will refer to the "Scolytidae" as the bark beetle family

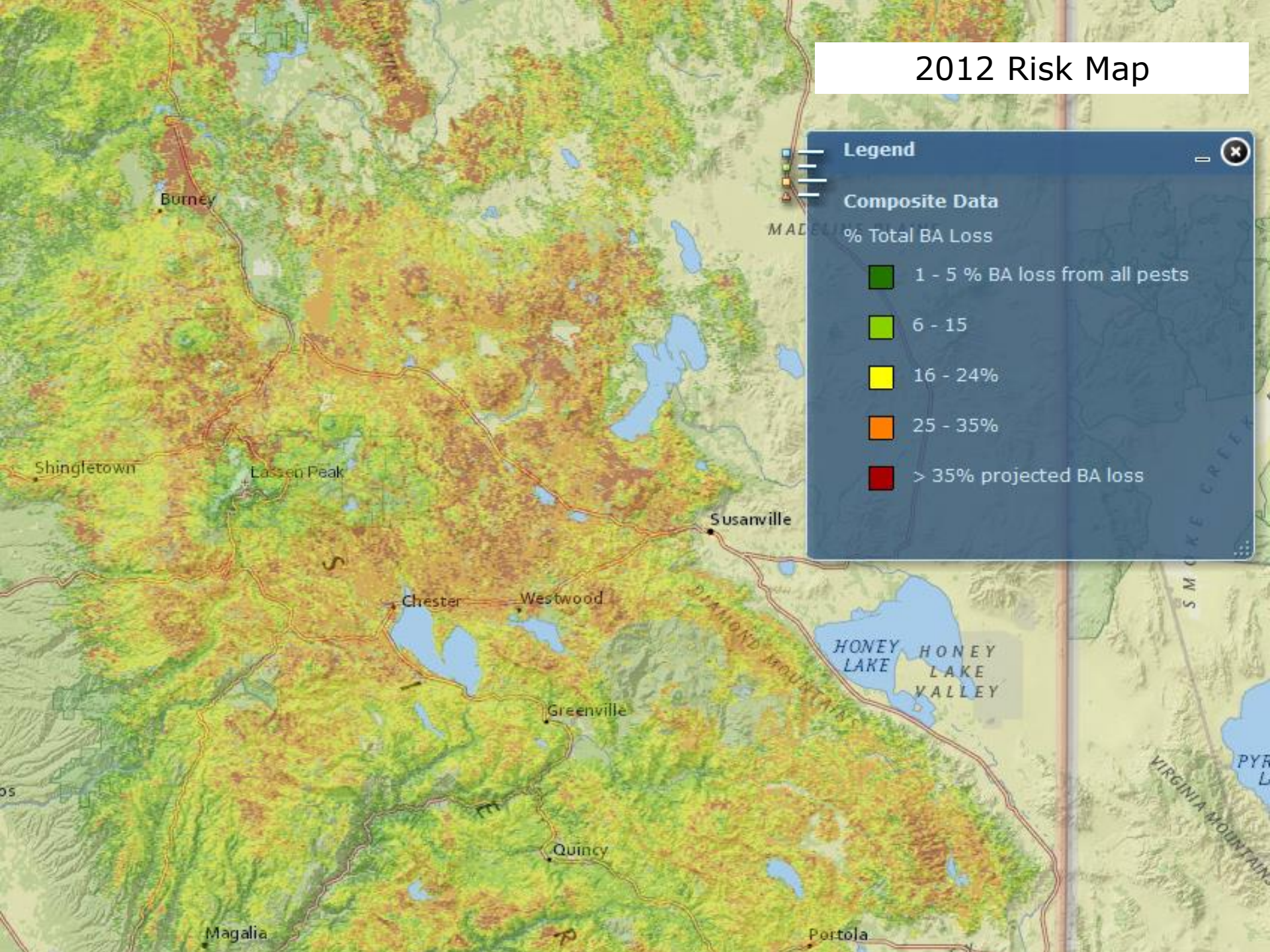
600 species in 78 genera in North America

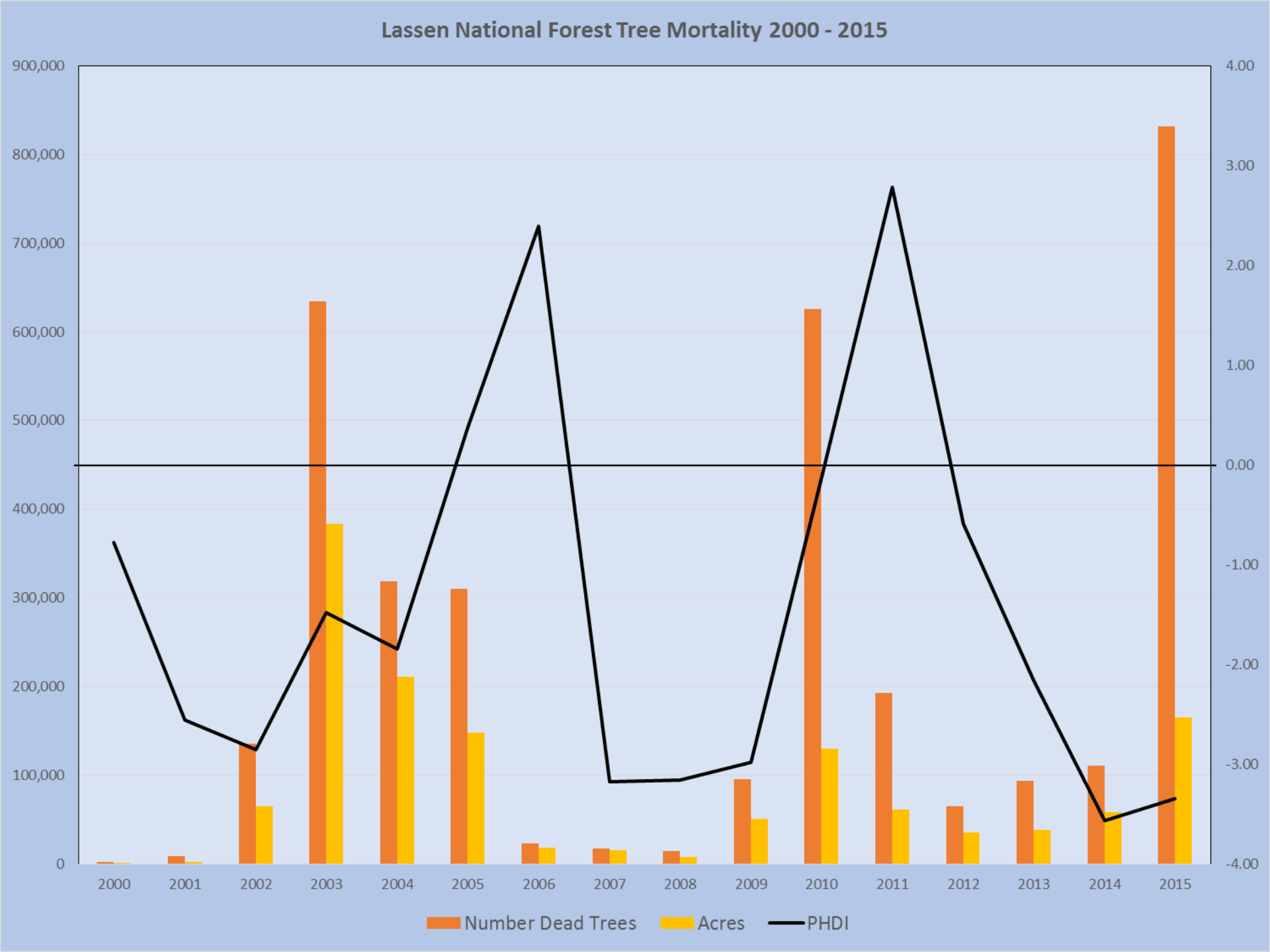
Bark Beetles vs. Wood Boring Beetles

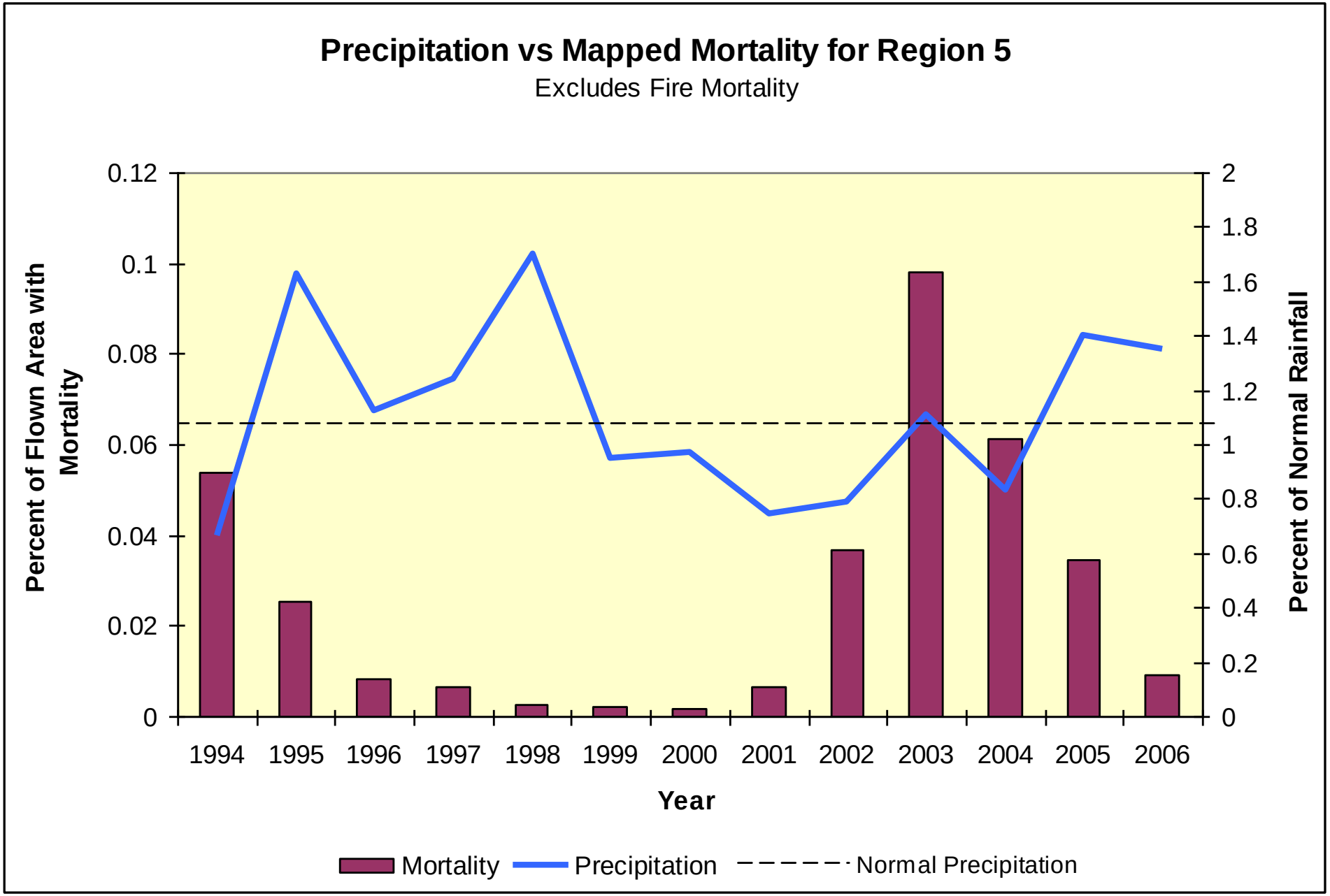
Forest Health Issues

- Too many trees!
- Altered species composition and forest structure
- Excessive fuel loads
- Highly susceptible to wildfires
- Highly susceptible to insects and diseases

2012 Risk Map

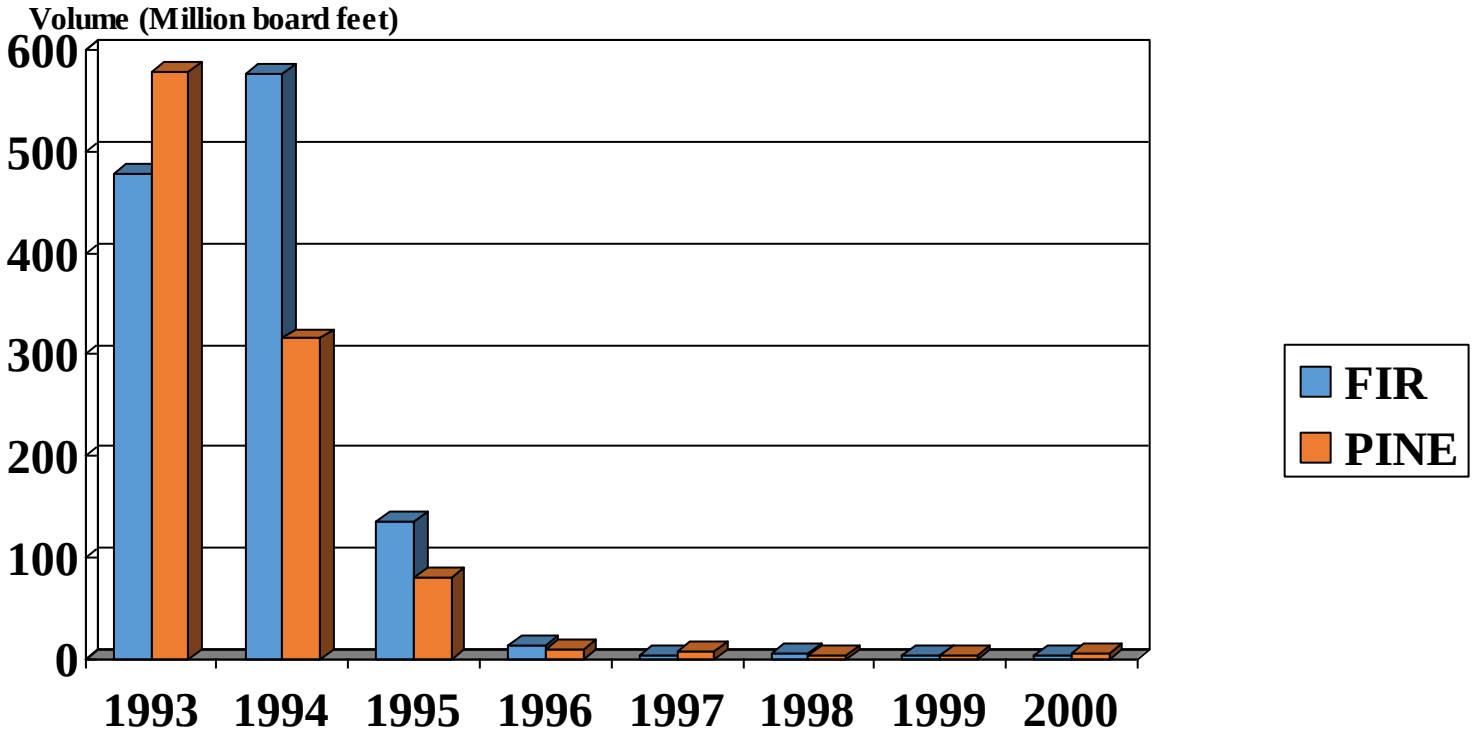



Lassen National Forest Tree Mortality 2000 - 2015
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Number Dead Trees
Acres
PHDI

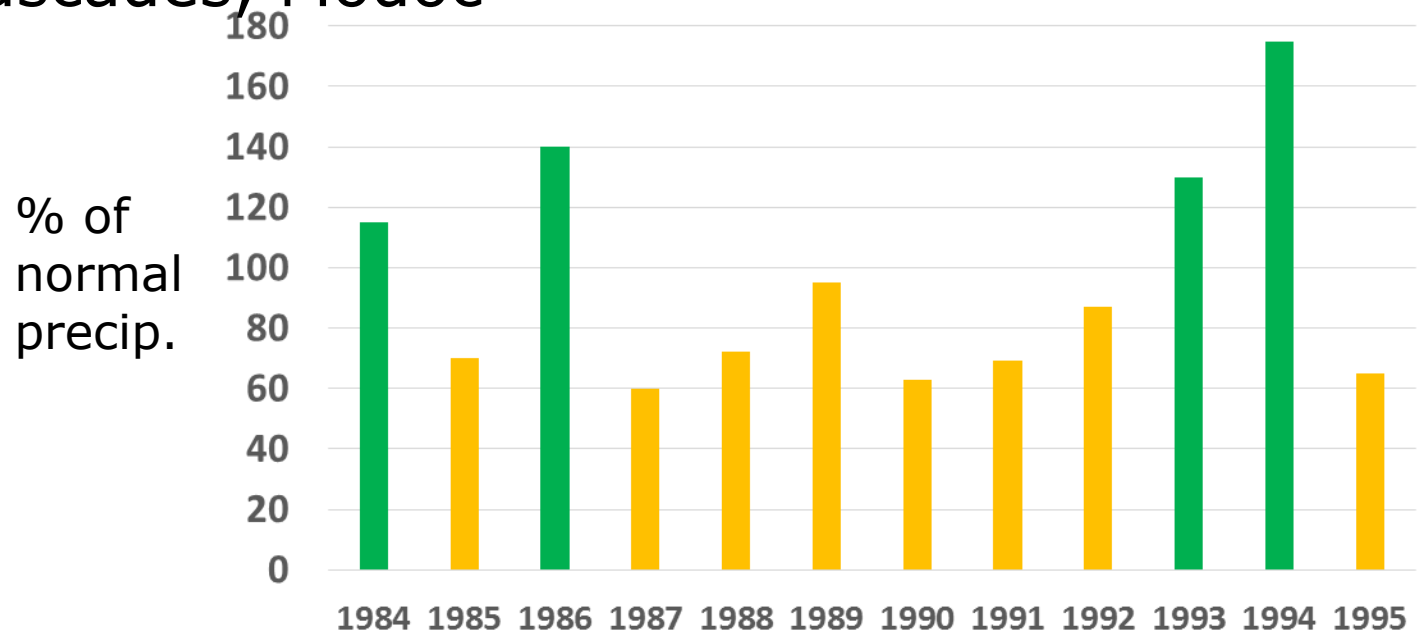

Precipitation vs Mapped Mortality for Region 5
Excludes Fire Mortality
Percent of Flown Area with Mortality
0.12
0.1
0.08
0.06
0.04
0.02
0
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Percent of Normal Rainfall
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Mortality
Precipitation
Normal Precipitation

Mortality from Bark Beetles

National Forest System
Southern Cascades/
Sierra Nevada



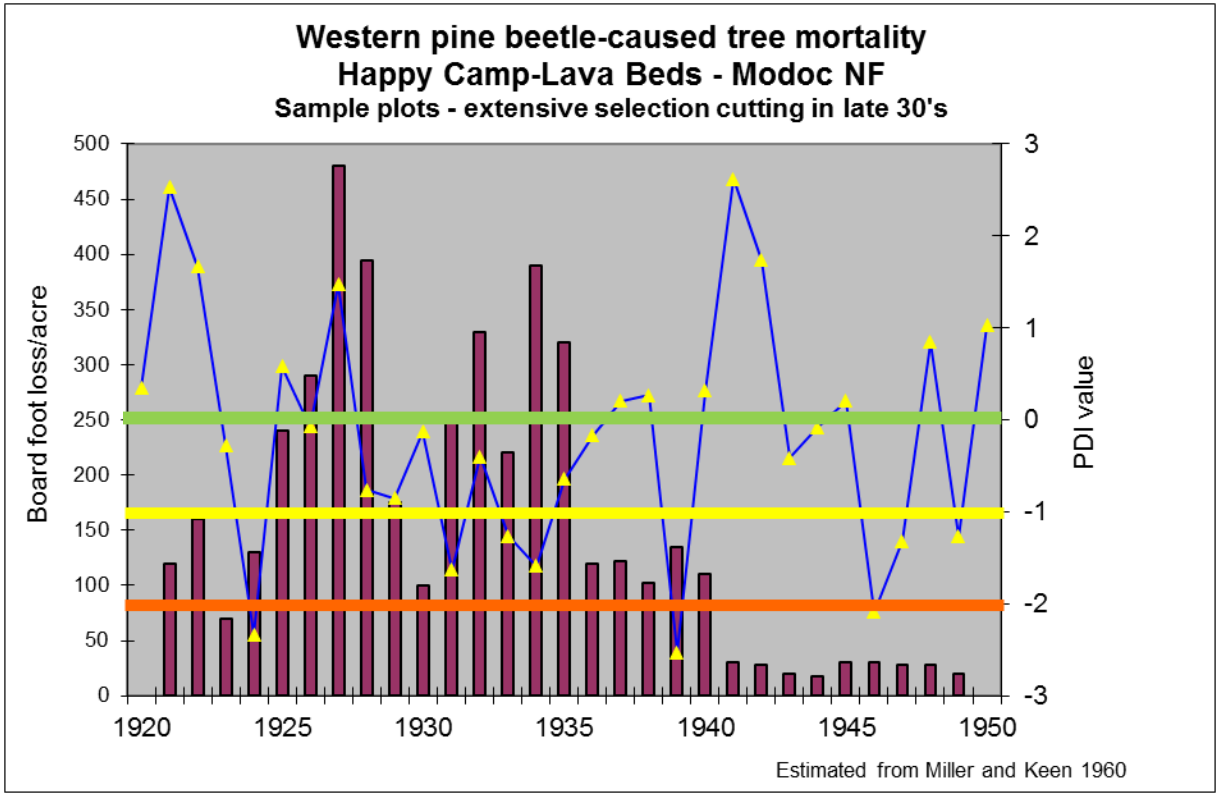
Protracted drought period: Sierra Nevada, southern Cascades, Modoc



high levels of mortality: white fir (east side), ponderosa pine, Jeffrey pine

Variety of precipitation/temperature/et data available

- % of average for seasonal precipitation
- PSDI
- US Drought monitor
- others



Palmer Drought Severity Index

0 to 4: normal to extreme moist period

-1 to -1.9: mild drought

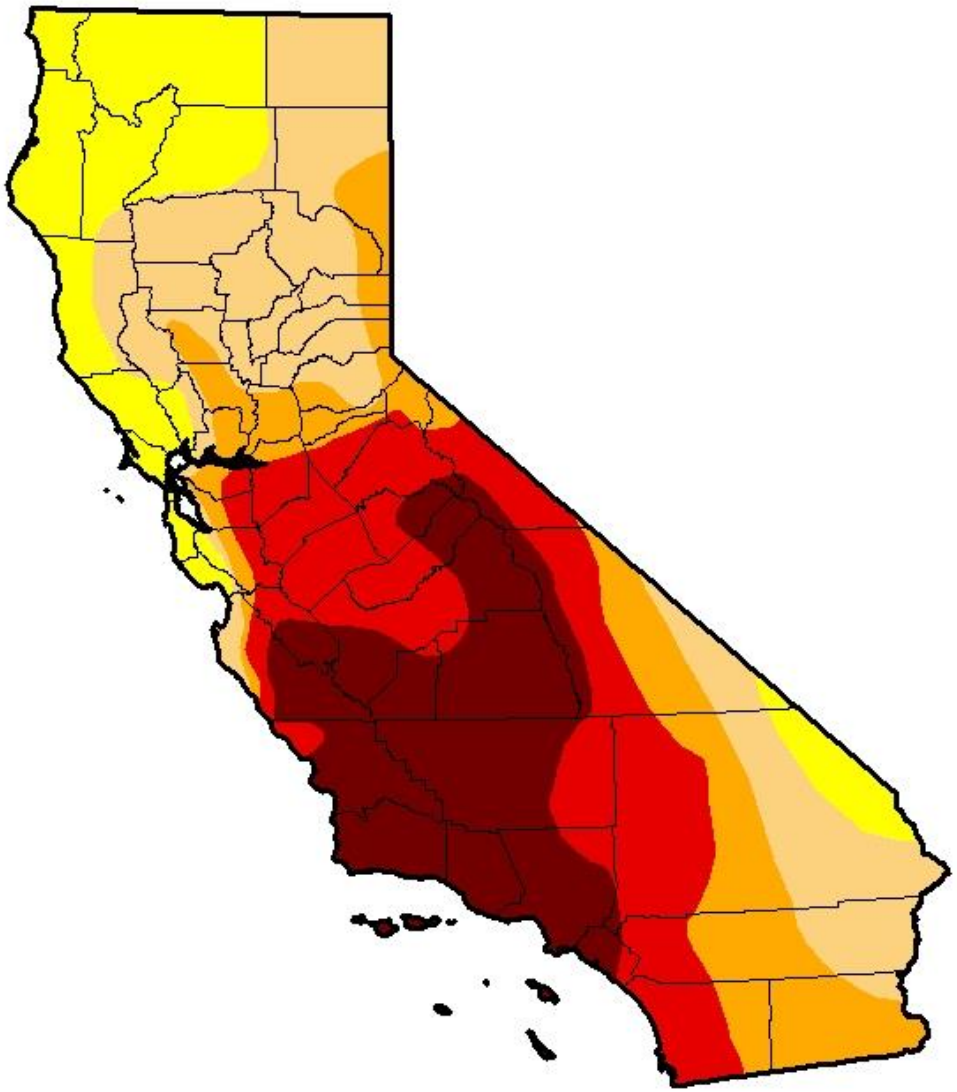
-2 to -2.9: moderate drought

-3 to -3.9: severe drought

Below -4: extreme drought

U.S. Drought Monitor

California



July 26, 2016

(Released Thursday, Jul. 28, 2016)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	83.59	59.02	42.80	21.04
Last Week *7/19/2016*	0.00	100.00	83.59	59.02	42.80	21.04
3 Months Ago *4/26/2016*	4.24	95.76	90.09	74.37	49.15	21.04
Start of Calendar Year *12/29/2015*	0.00	100.00	97.33	87.55	69.07	44.84
Start of Water Year *9/29/2015*	0.14	99.86	97.33	92.36	71.08	46.00
One Year Ago *7/28/2015*	0.14	99.86	97.35	94.59	71.08	46.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

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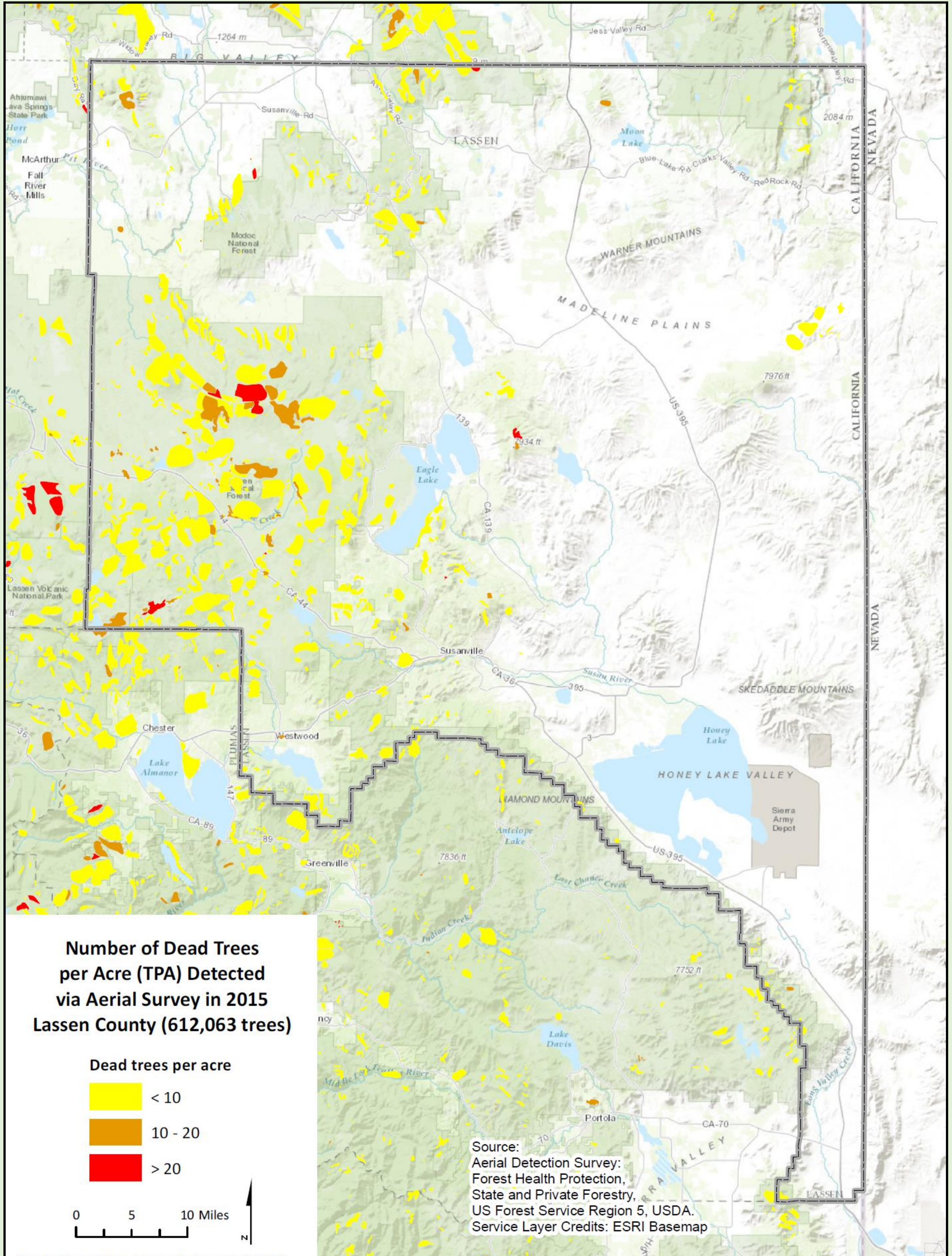
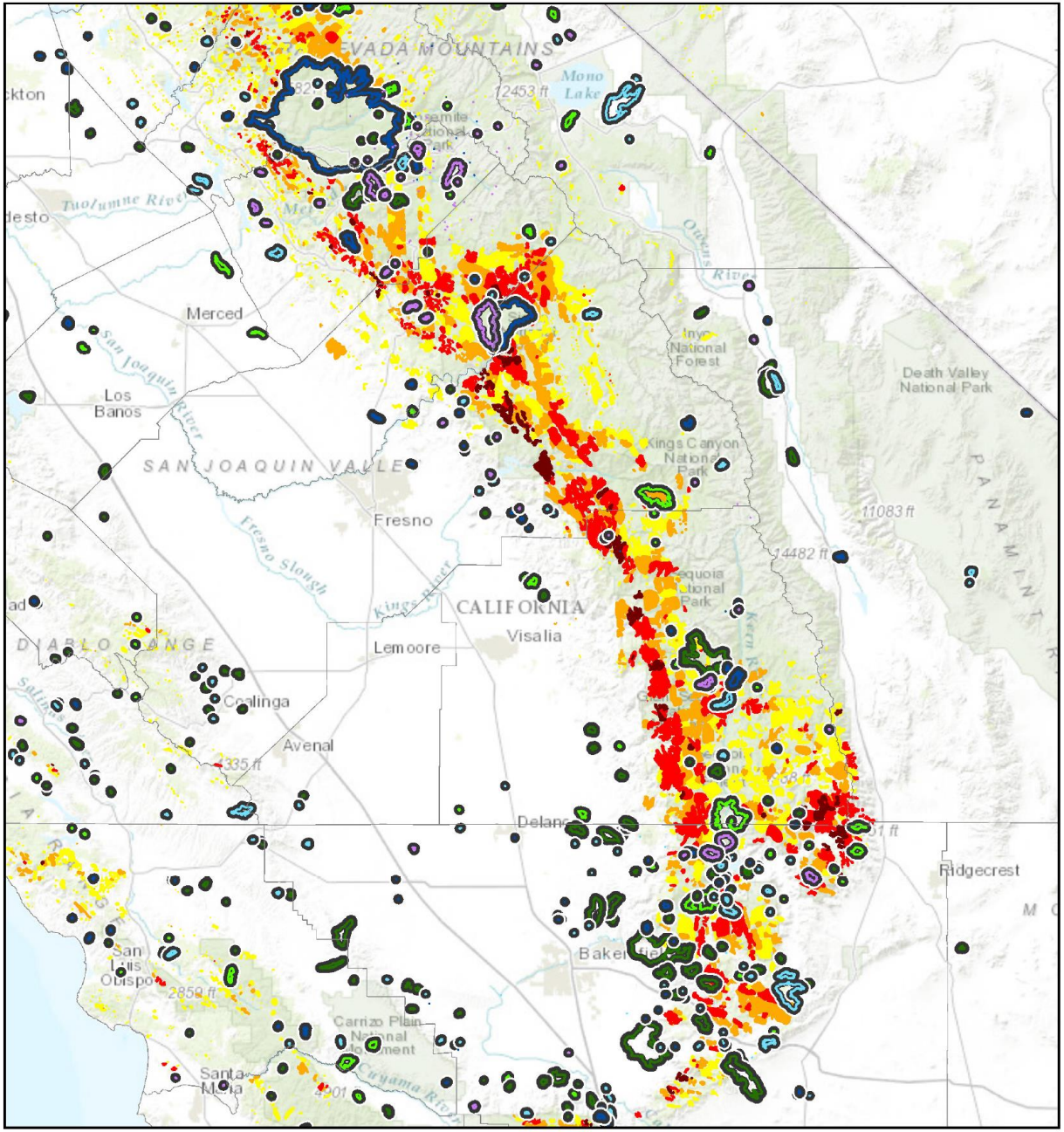
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/


Number of Dead Trees
per Acre (TPA) Detected
via Aerial Survey in 2015
Lassen County (612,063 trees)
Dead trees per acre
< 10
10 - 20
> 20
0
5
10 Miles
N
Source:
Aerial Detection Survey:
Forest Health Protection,
State and Private Forestry,
US Forest Service Region 5, USDA.
Service Layer Credits: ESRI Basemap
Susanville
Eagle Lake
Honey Lake
HONEY LAKE VALLEY
Chester
Westwood
Lake Almanor
Greenville
Portola
Lake Davis
MADELINE PLAINS
WARNER MOUNTAINS
SKEDADDLE MOUNTAINS
Sierra Army Depot
CALIFORNIA
NEVADA
LASSEN

Fire, Insects and Disease South Sierra



April 14, 2016

1:2,311,162

Bass Lake, Sierra NF 2015

Site 1 - 3679' elevation, central Sierra Nevada

March 2014

200 TPA
180.7 ft^2 BAA
65% PIPO
30% CADE
5% QUCH

March 2016

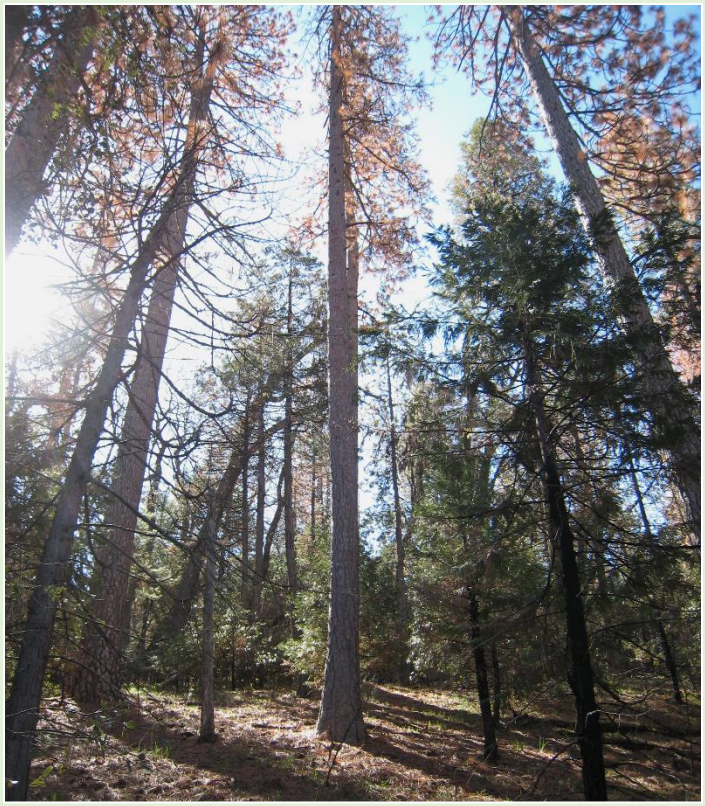
60 TPA
13.0 ft^2 BAA
83% CADE
17% QUCH

In a period of two years, 70% of trees and 93% of basal area were killed. A forest once dominated by medium-diameter (14.5 in. mean dbh) PIPO is now dominated by small-diameter (6.4 in. mean dbh) CADE. All PIPO were colonized by western pine beetle, most in 2015.

Site 2 - 3800' elevation, central Sierra Nevada

March 2014

360 TPA
500.1 ft^2 BAA
50% PIPO
39% CADE
11% QUCH



March 2016

230 TPA
73.1 ft^2 BAA
74% CADE
17% QUCH
9% PIPO*

In a period of <u>two</u> years, 36% of trees and 85% of basal area were killed. A forest once dominated by large-diameter (23.6 in. mean dbh) PIPO is now dominated by small-diameter (6.0 in. mean dbh) CADE. All PIPO were colonized by western pine beetle in 2015, but two trees have yet to exhibit crown fade.*


N.W. Harvey
PP4 185'

TREE MORTALITY 2000-2015
Thinned stand (BA = ~80 sq.ft./acre) vs. Unthinned stand (BA = ~150 sq.ft./acre)

THINNED (dead trees/acre)		
	0-6" DBH	6+" DBH
PP/JP	3	2
WF	1	0

UNTHINNED (dead trees/acre)		
	0-6" DBH	6+" DBH
PP/JP	24	6
WF	286	44

Priority Areas for Treatment

Untreated eastside pine areas that receive less than 30” of average annual precipitation with high white fir component; especially areas with large tree component

- At a very high risk of bark beetle-caused mortality to white fir component and high risk to bark beetle-caused mortality of Jeffrey and ponderosa pine during droughts
- Very high risk of stand replacing wildfire (e.g. Corral, Bald, Straylor)
- Need to reduce density to low levels, remove white fir

Priority Areas for Treatment

Untreated dry mixed conifer forests with a high pine component; especially areas with large tree component

- At high risk for western pine beetle, fir engraver beetle, flat-headed fir borer, and mountain pine beetle-caused mortality
- At a very high risk for high severity wildfire (e.g. Moonlight, Eiler, Reading)
- Need to reduce density to appropriate levels for the pine component

STAND DENSITY MATTERS!!!