



# Oak and Tanoak Pest Issues

Tom Smith

Forest Pest  
Management

California Department  
of Forestry and Fire  
protection

# California Oak Woodlands



# Issues

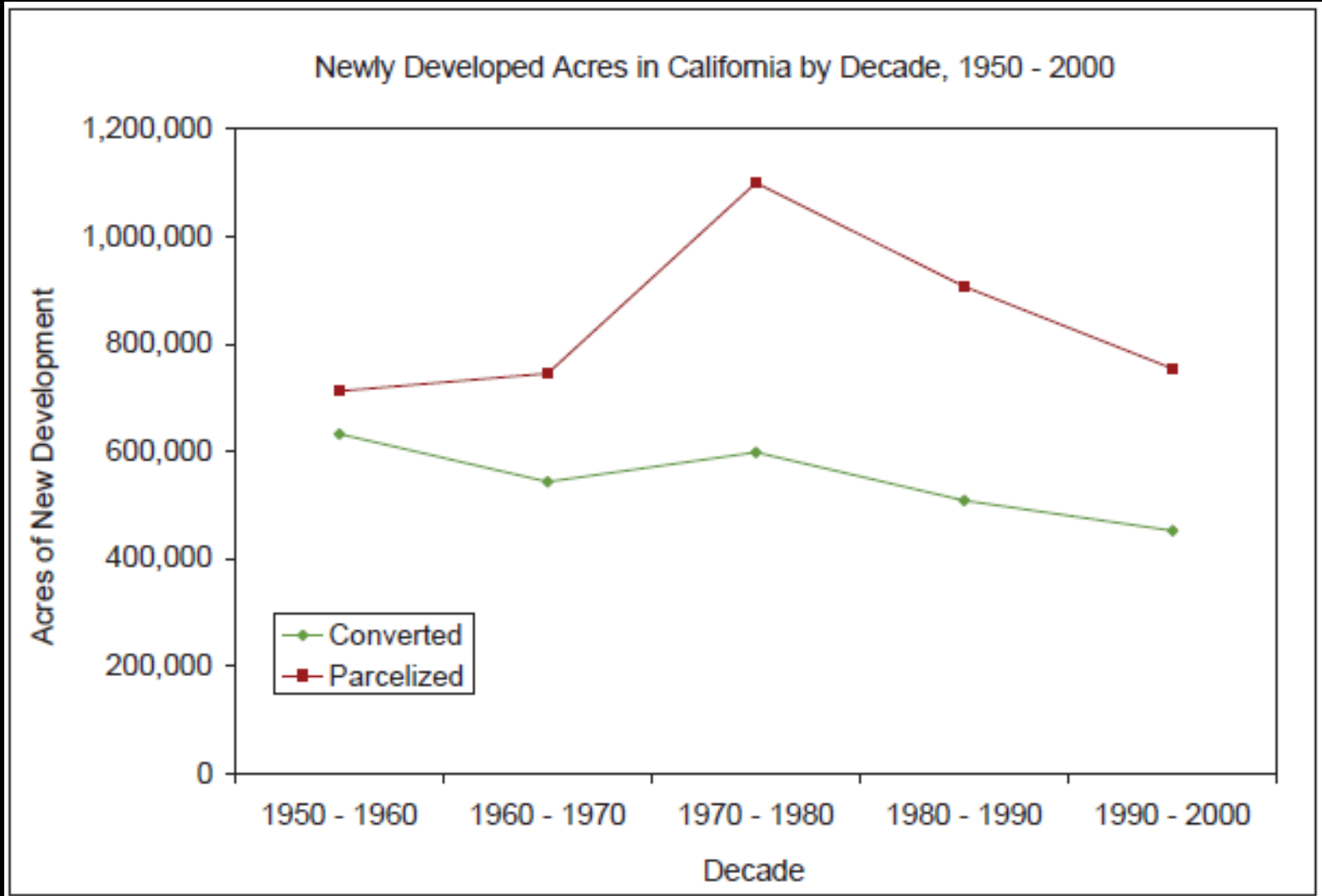
- Urbanization
- Fragmentation
- Fire Regimes
- Stand Structure and Composition
- Weather and Climate
- Invasive Species



# Urbanization



# Urbanization

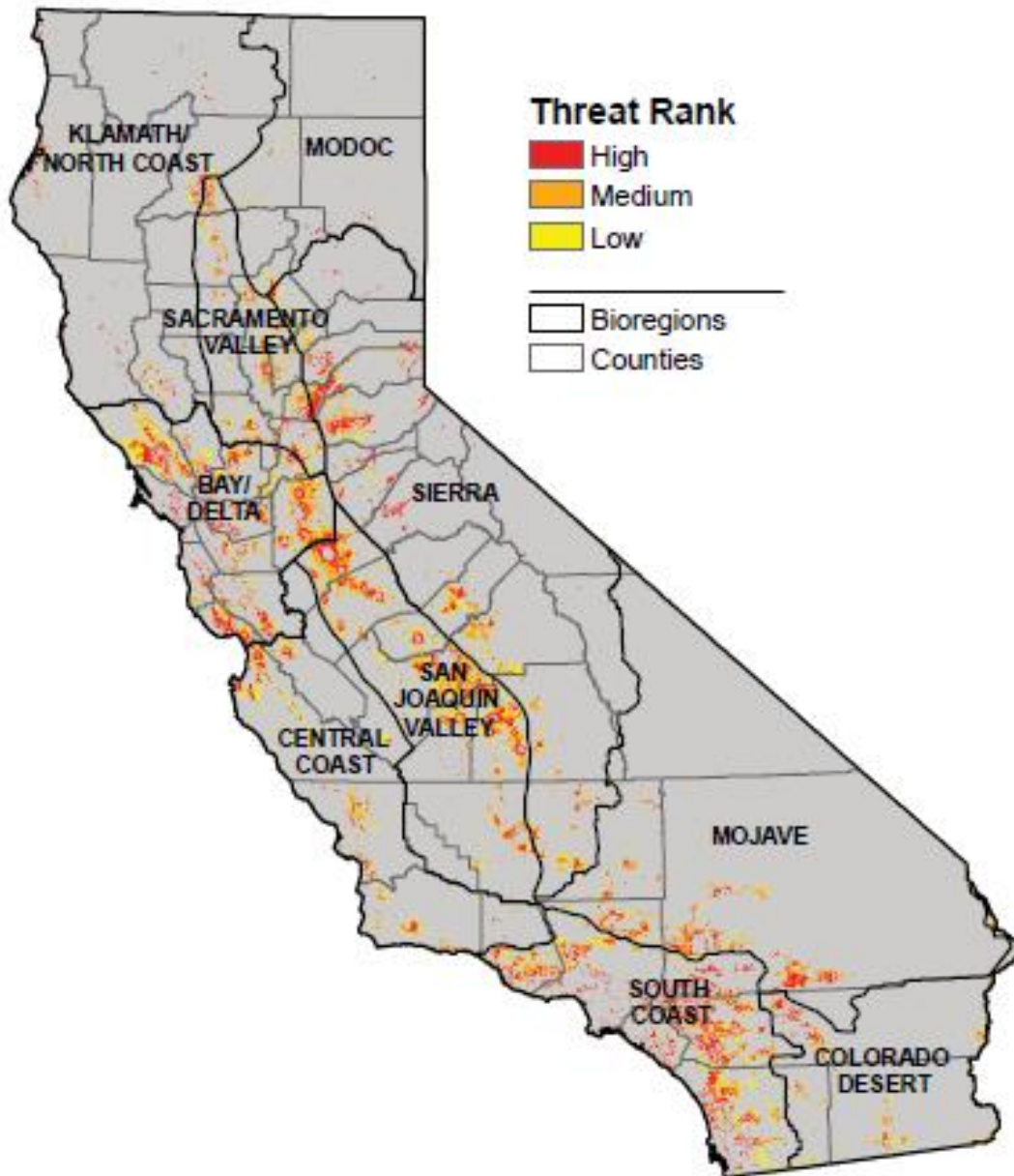


Nearly 40 Million  
People Live in  
California

Almost ½ Million  
Acres of Land  
are Converted  
to Urban Uses  
Every Decade

More People Live  
in the Wild-land  
Urban Interface

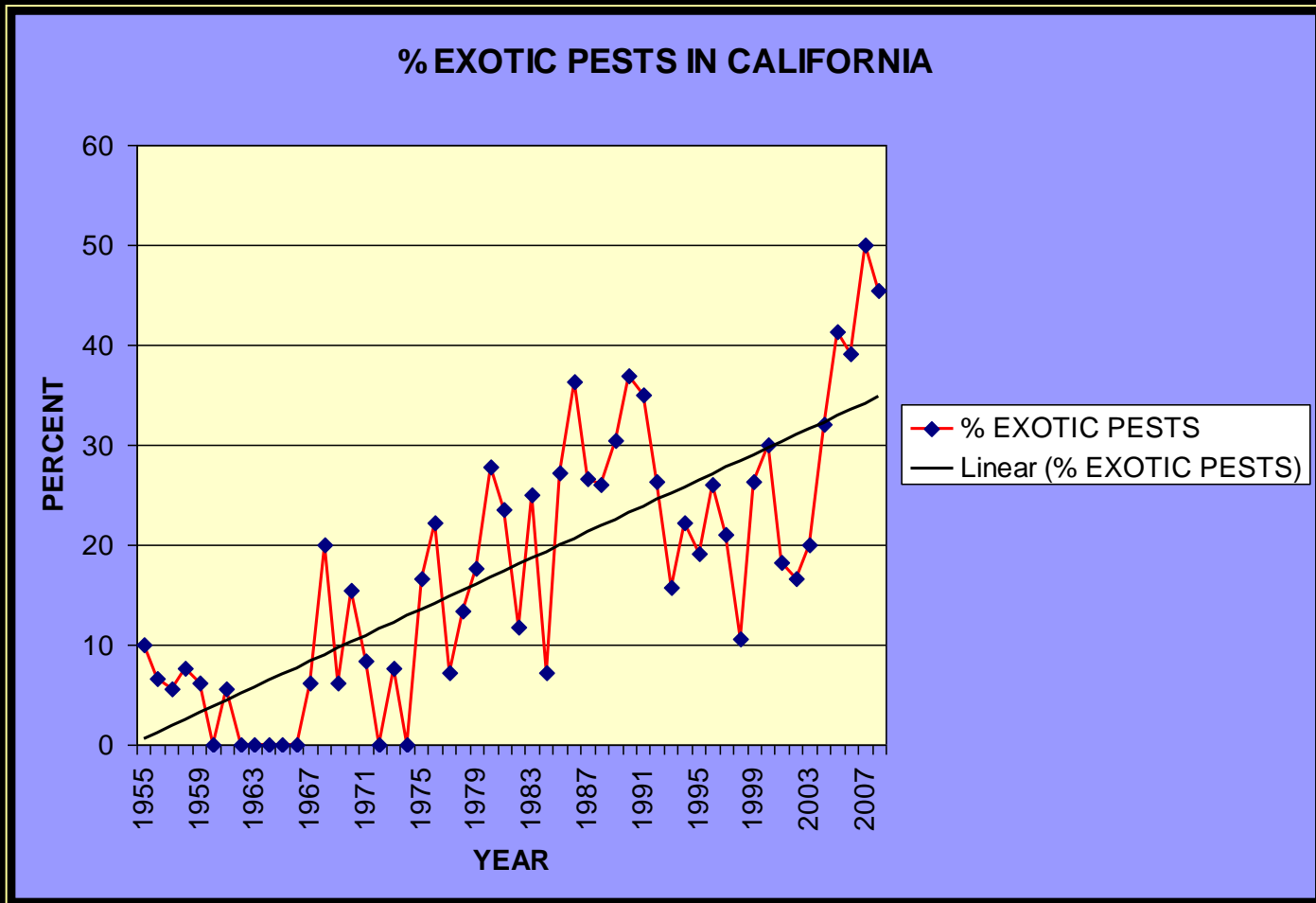
Also Pollution  
Issues



# Invasive Species and Oaks



# Trends in California Pests



# Sudden Oak Death (*Phytophthora ramorum*)



# Sudden Oak Death

## California Oak Mortality Task Force

- <http://www.suddenoakdeath.org/>





# Sudden Oak Death

- New Infestation in the Redwood Valley area in Humboldt County
- New Problems on Larch in Great Britain
- New Infestation in Jackson State Forest
- New Hosts?

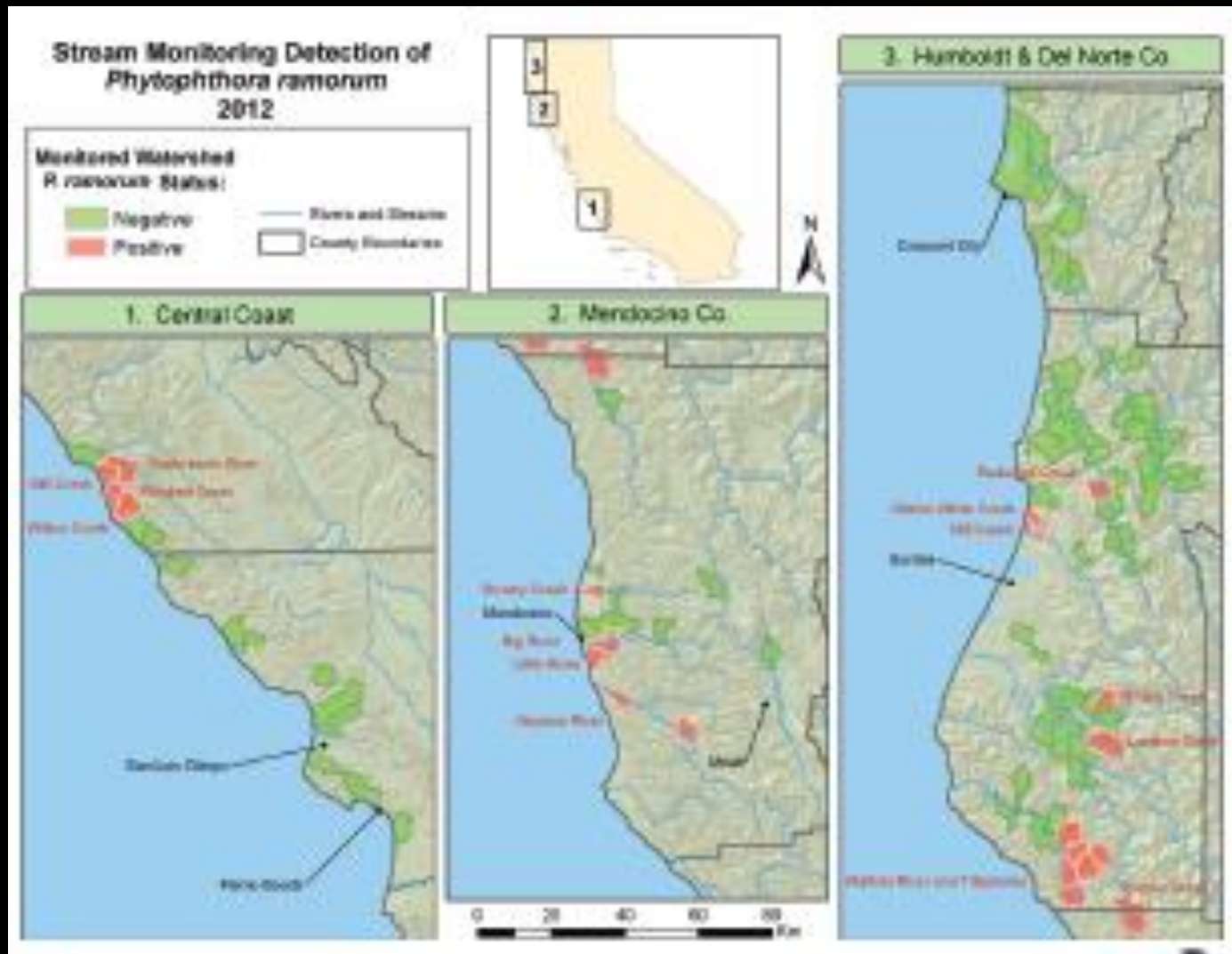
Distribution of Sudden Oak Death as of February 15, 2008



Map produced on 2/15/08 by UCB GIIIF: <http://kellylab.berkeley.edu/SCD/monitoring/>  
 For more information about Sudden Oak Death, please visit the California Oak Mortality Task Force website at <http://www.suddenoakdeath.org/>



# Sudden Oak Death



# Sudden Oak Death Aerial Survey for Mortality 2013



# Sudden Oak Death



# Sudden Oak Death



# Sudden Oak Death

Tree Hosts Include: Tanoak, Coast Live Oak, Shreve Oak, Black Oak, Canyon Live Oak, California Bay Laurel, Madrone, Big Leaf Maple, Coast Redwood, Douglas Fir, Grand Fir, White Fir, Red Fir, California Buckeye, Toyon

Other Major Hosts Include: Rhododendron, Huckleberry, Poison Oak, Honeysuckle, Camellia, Manzanita

# Sudden Oak Death

- Symptoms also Include Leaf Spots and Blotches



Bay Laurel



Big Leaf Maple



Rhododendron

# Sudden Oak Death



Douglas Fir



Coast Redwood

- Symptoms can Also Include Tip Dieback

# Sudden Oak Death

- Disease Spread
- Spores Produced on Foliar Hosts
- Spread by Rainsplash, Wind
- Also Found in Soil and Stream Water
- Human Long Distance Spread (Movement of Infected Plant Material, Soil, Etc.)

# Sudden Oak Death

- Management



Individual Tree vs. Stand  
Suppression vs. Eradication

# Redwood Creek Site

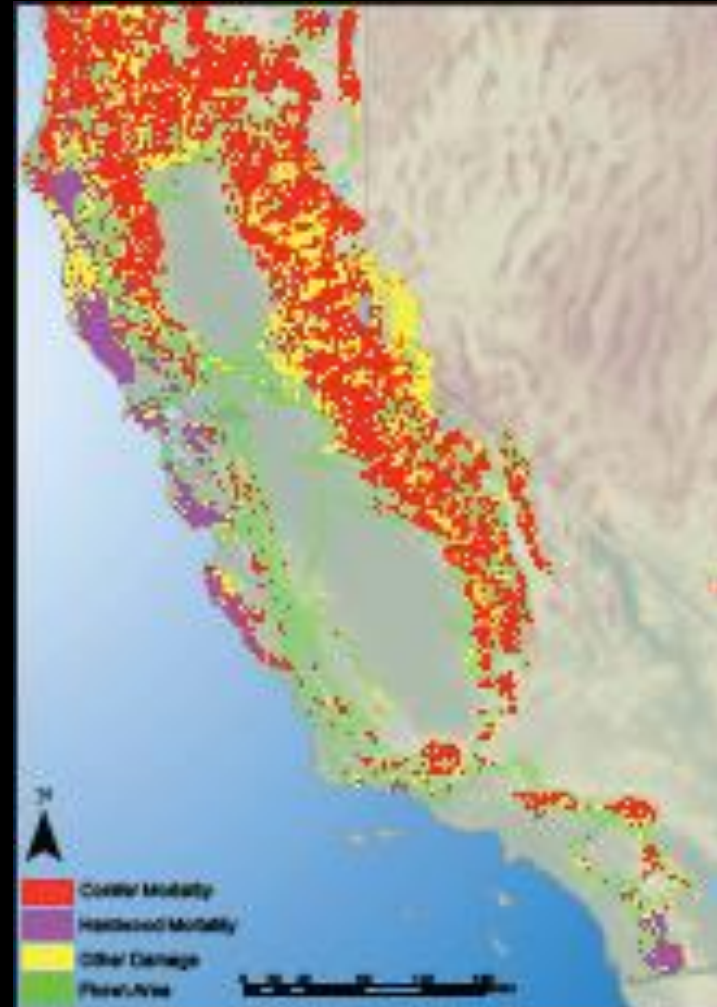


# Fire for SOD Control

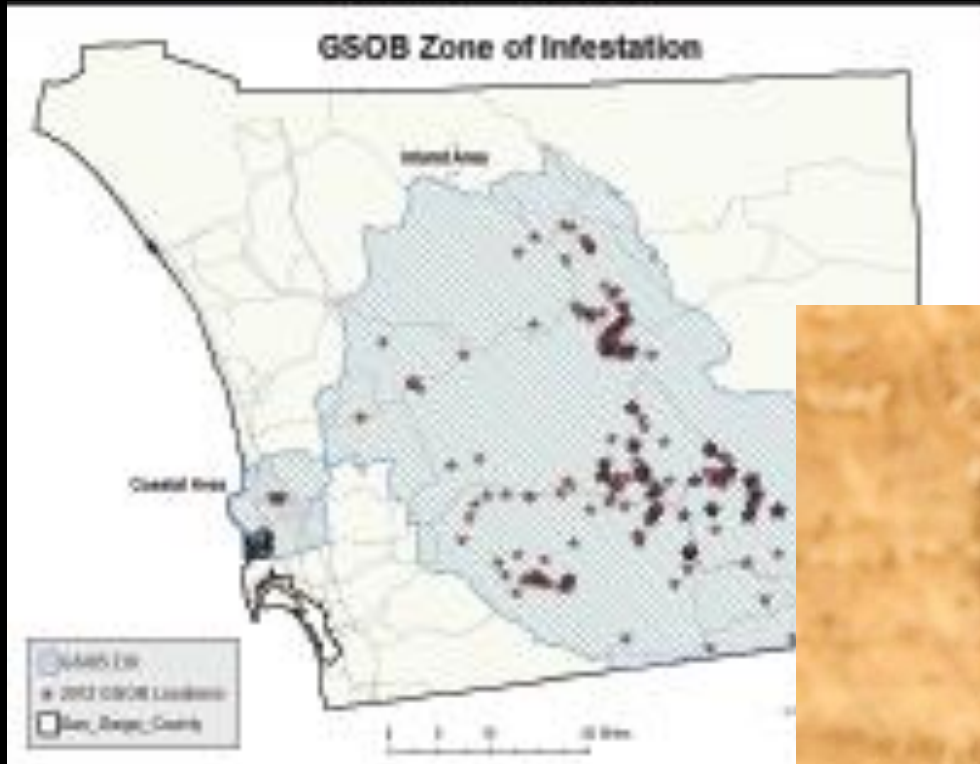


# Aerial Detection Surveys

- Mortality similar to 2011 levels
- 511,000 acres of elevated mortality mapped in 2012
- Estimated 1.78 million trees killed
- Especially noted an increase in mortality due to sudden oak death



# Goldspotted Oak Borer



- Zone of Infestation
- Continuing to Spread
- Infestation in Riverside County

*Agrilus auroguttatus*



# Goldspotted Oak Borer





# Damage





# GSOB life cycle



Healthy and/or stressed Tree

- Eggs laid in bark crevices???

Larvae chew through bark to sapwood surface

Summer



Larvae make galleries along sapwood surface, packed with frass.

- Destructive phase of insect
- Tree health declines



Summer through Late Fall  
May - October

Pupae bore out to outer bark and resemble adults

- white in color

Summer- Late Fall  
June - October



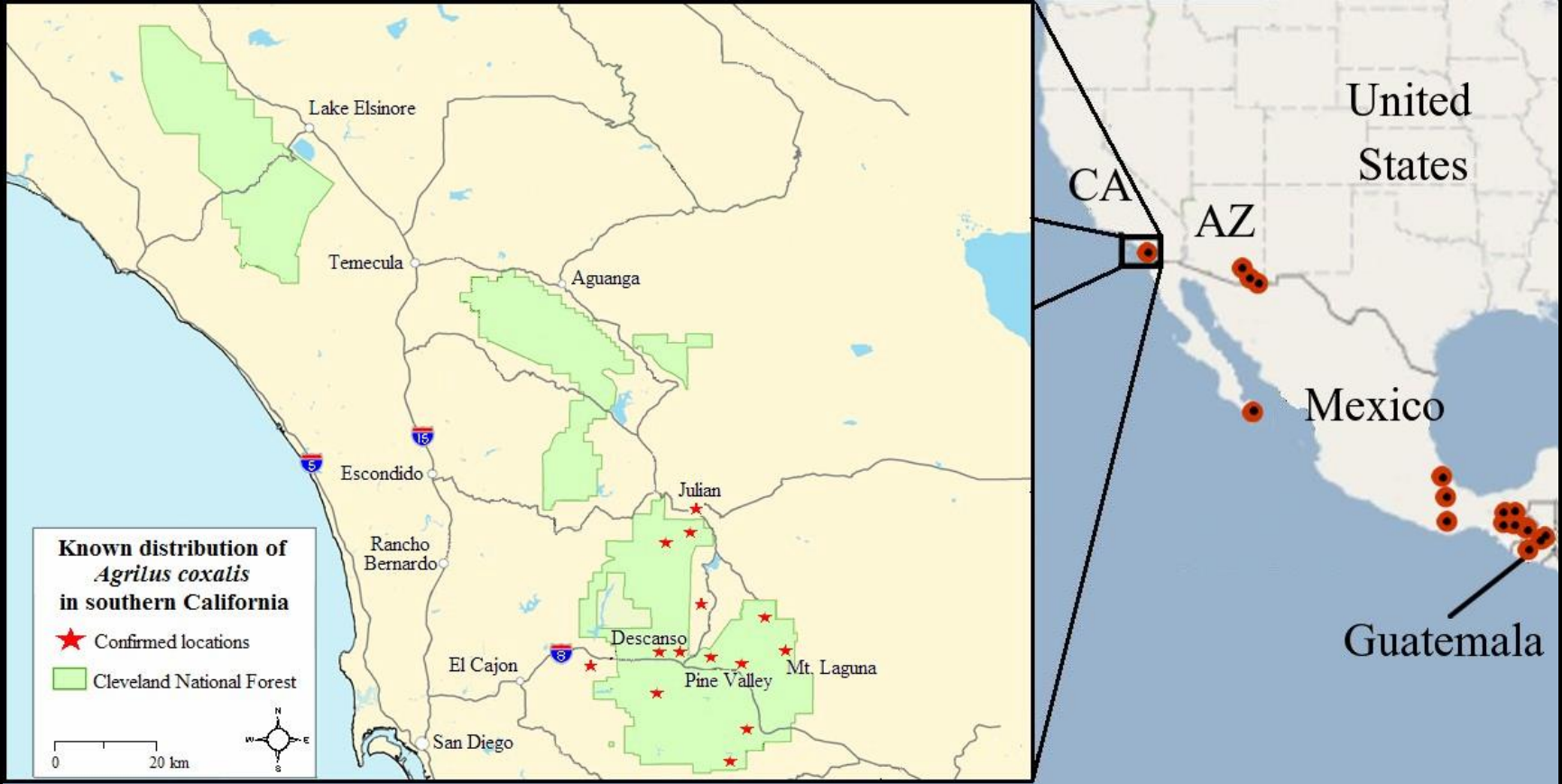
Adults emerge

- D shaped exit holes.
- feed on oak leaves.

Summer - Late Fall  
June - October



# GSOB



# GSOB Hosts



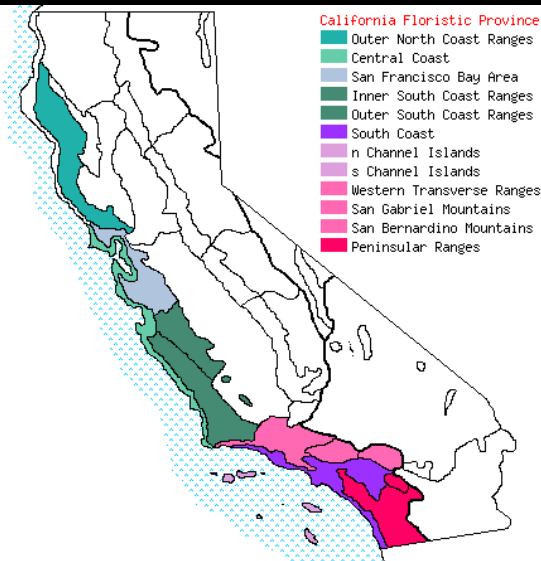
# GSOB Symptoms



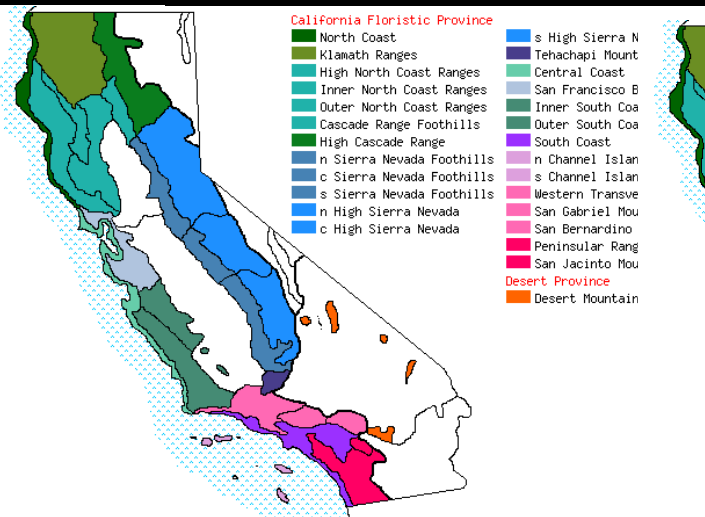
# GSOB Exit Holes



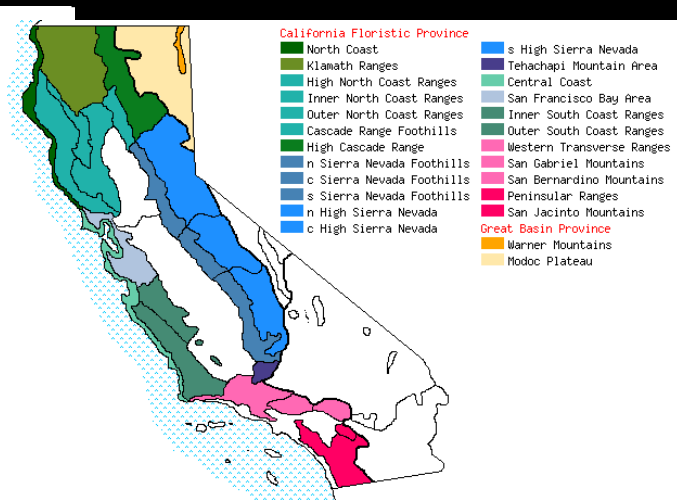
# Distribution of Oaks Susceptible to GSOB



**Coastal Live Oak**  
*Quercus agrifolia*



**Canyon Live Oak**  
*Quercus chrysolepis*



**California Black Oak**  
*Quercus kelloggii*



# Monitoring



Purple Panel Traps

# GSOB Control



## DON'T MOVE **OAK FIREWOOD**



Transporting oak firewood can spread dangerous forest pests and pathogens. The goldspotted oak borer is a new, non-native pest in southern California. It is killing several oak species in San Diego County on private, tribal, state, and federal lands. Moving oak firewood from infested areas could establish this new pest in additional areas and increase the oak mortality. We must prevent the spread of this insect to protect our forests and trees!

### How you can help:

- Do not transport firewood into or out of campgrounds or parks
- Leave firewood at home and use local sources of firewood
- If you have local firewood, burn all of it before leaving

## HELP PREVENT THE MOVEMENT OF **INVASIVE PESTS**



Larvae (A) and adult (B) of the goldspotted oak borer beetle.



Goldspotted oak borer larvae feeding under the bark stress and kill trees.



A mature larva from the bark of cut firewood.

For more information, visit the following Web sites:

[www.fs.fed.us/r5/sp/ftp/](http://www.fs.fed.us/r5/sp/ftp/) or [www.fs.fed.us/r5/cleveland/](http://www.fs.fed.us/r5/cleveland/)



USDA is an equal opportunity employer

# Management - Chipping



# Management - Tarping



# Management Debarking and Drying



- Best if all bark is removed
- Wood that is left for two years is free of any live stages of the insect

# Insecticide trials



# Management - Removal





# Biological control

UCR is conducting most of this work



Surveys in AZ and MX have been conducted, and more surveys will happen

Parasitoids have been found and we continue to look for more

In 2010, effort was made by UCR to establish GSOB populations in the lab

Danger of Firewood Movement



# Polyphagous Shot Hole Borer

Newest invasive pest  
in California

Also carries a new  
invasive species of  
*Fusarium* fungus



*Euwallacea* sp.



# Polyphagous Shot Hole Borer



- Small ambrosia beetle
- Beetle and fungus together kill avocado, oak, maple and castor bean
- Also attacks sycamore, willow, bay laurel, olive, grape and numerous other native and exotic trees

# Polyphagous Shot Hole Borer

Beetle



Bore Holes Infested with  
Fusarium

# Polyphagous Shot Hole Borer



Entrance Holes



Oozing from entrance hole

# Polyphagous Shot Hole Borer

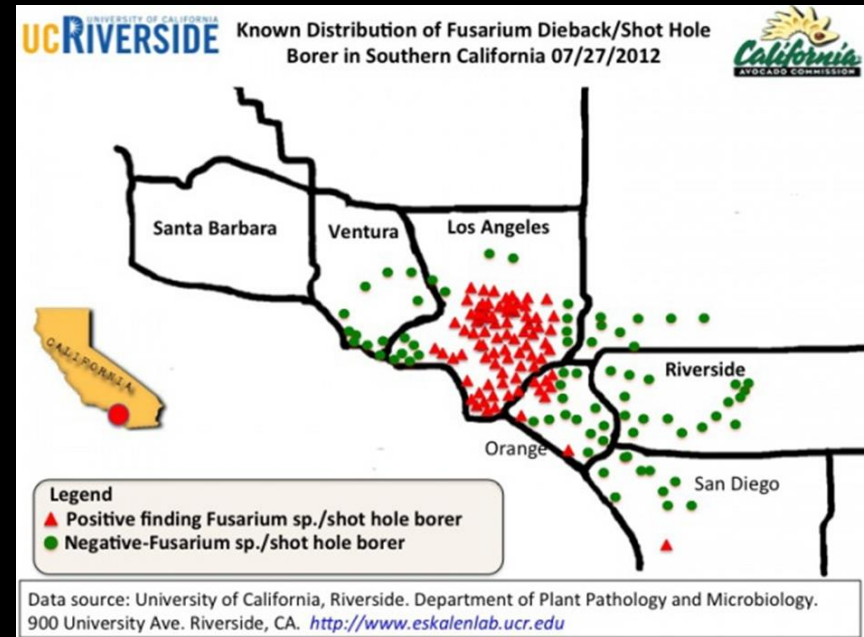
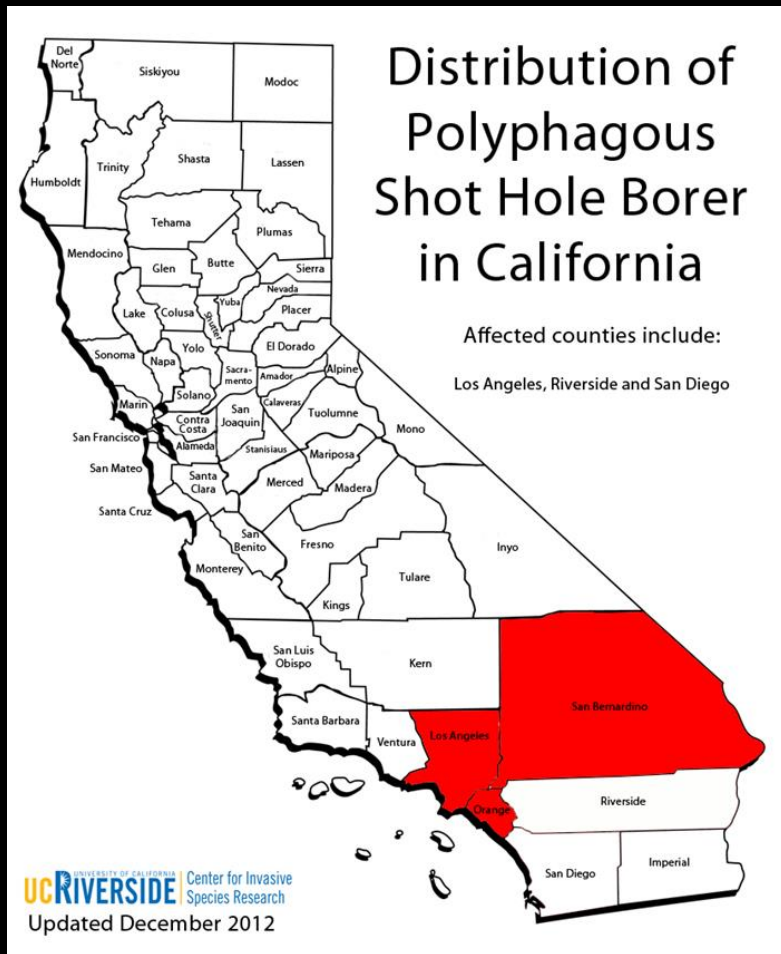


Stained Wood  
under bark



“Sugar  
Volcnoes”

# Polyphagous Shot Hole Borer



# Polyphagous Shot Hole Borer



# Light Brown Apple Moth



# Timber Species Affected by LBAM

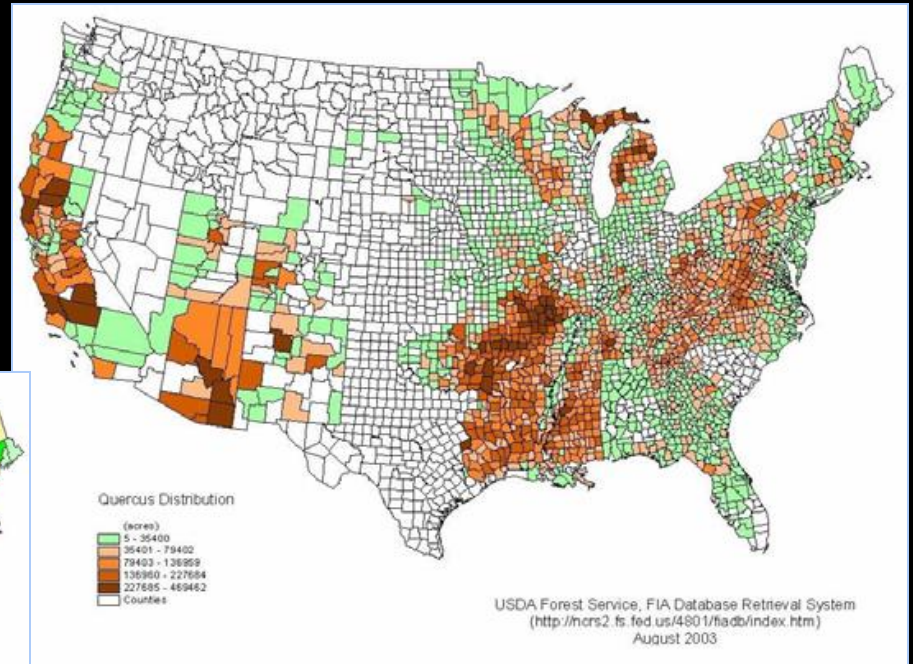
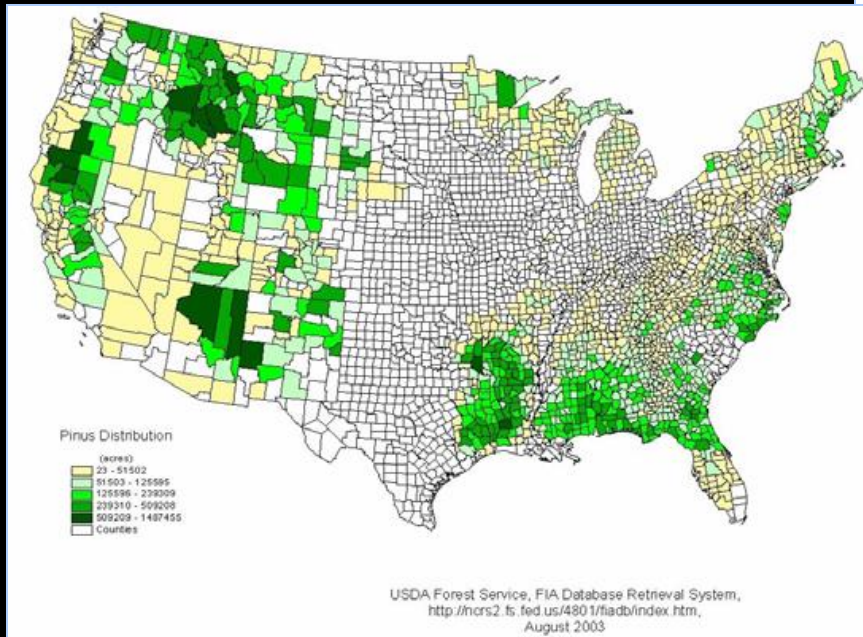
- Monterey Pine
- Other Pines
- Douglas Fir
- True Firs
- Spruce
- Oaks
- Maple
- Coast Redwood



# Potential Nationwide Impacts

## Spread Potential in US Forestry

### Pine Forest Type in USA



### Oak Forest Type in USA

# Forest Management

- A Pest of Regeneration and Young Plantations in New Zealand
- Records of Several Hectares of Eucalypts Defoliated in Australia
- Quarantine Regulations
- Christmas Trees
- Cumulative Impacts of Pesticides
- Fire Danger
- Endangered Species
- Riparian Areas



# LBAM Control



**Twist Tie Placement**





# Gypsy Moth



## Severe Defoliation



Courtesy of  
Shandonale & Beyond  
Gypsy Moth Committee

# Gypsy Moth

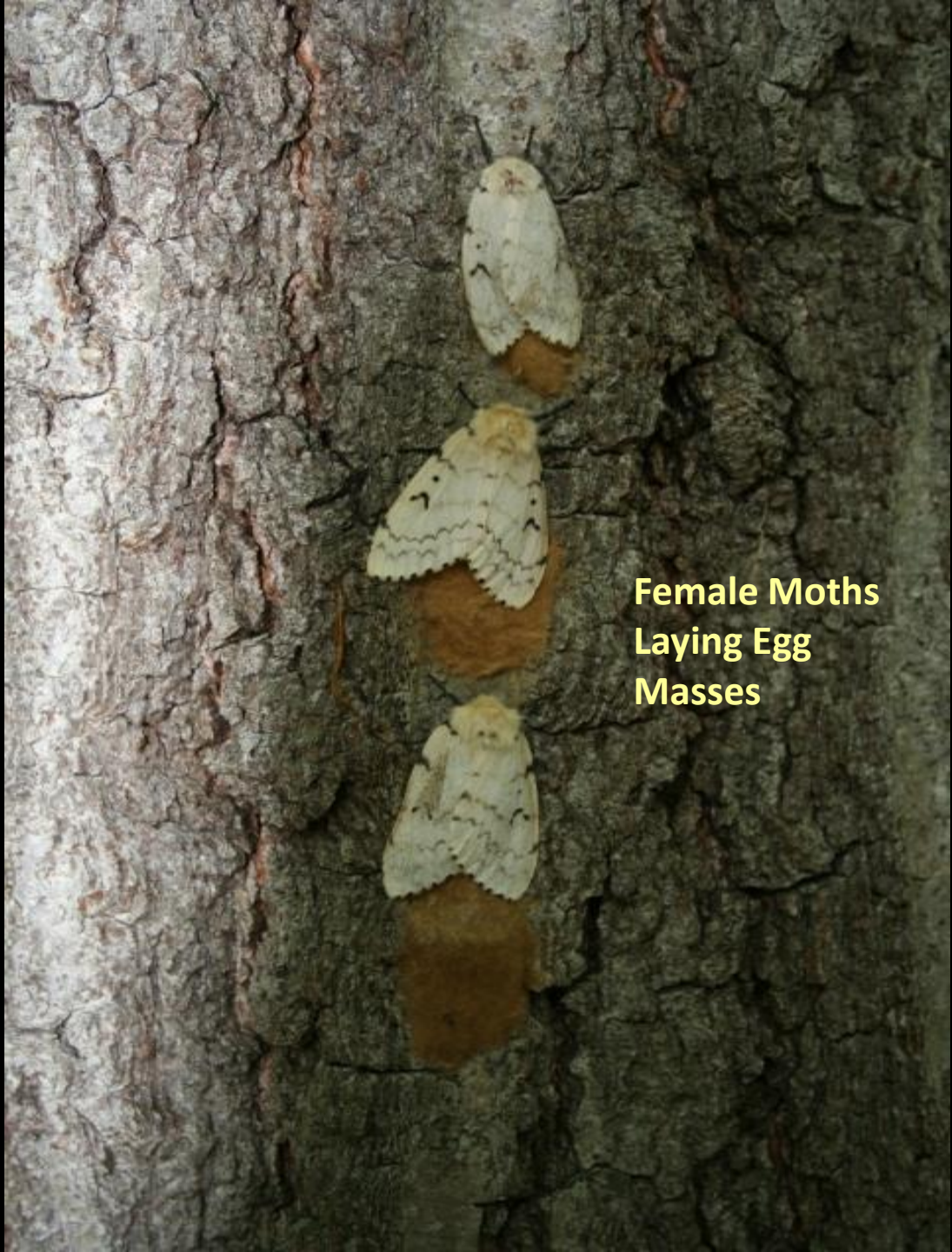


Caterpillar Feeding on Oak





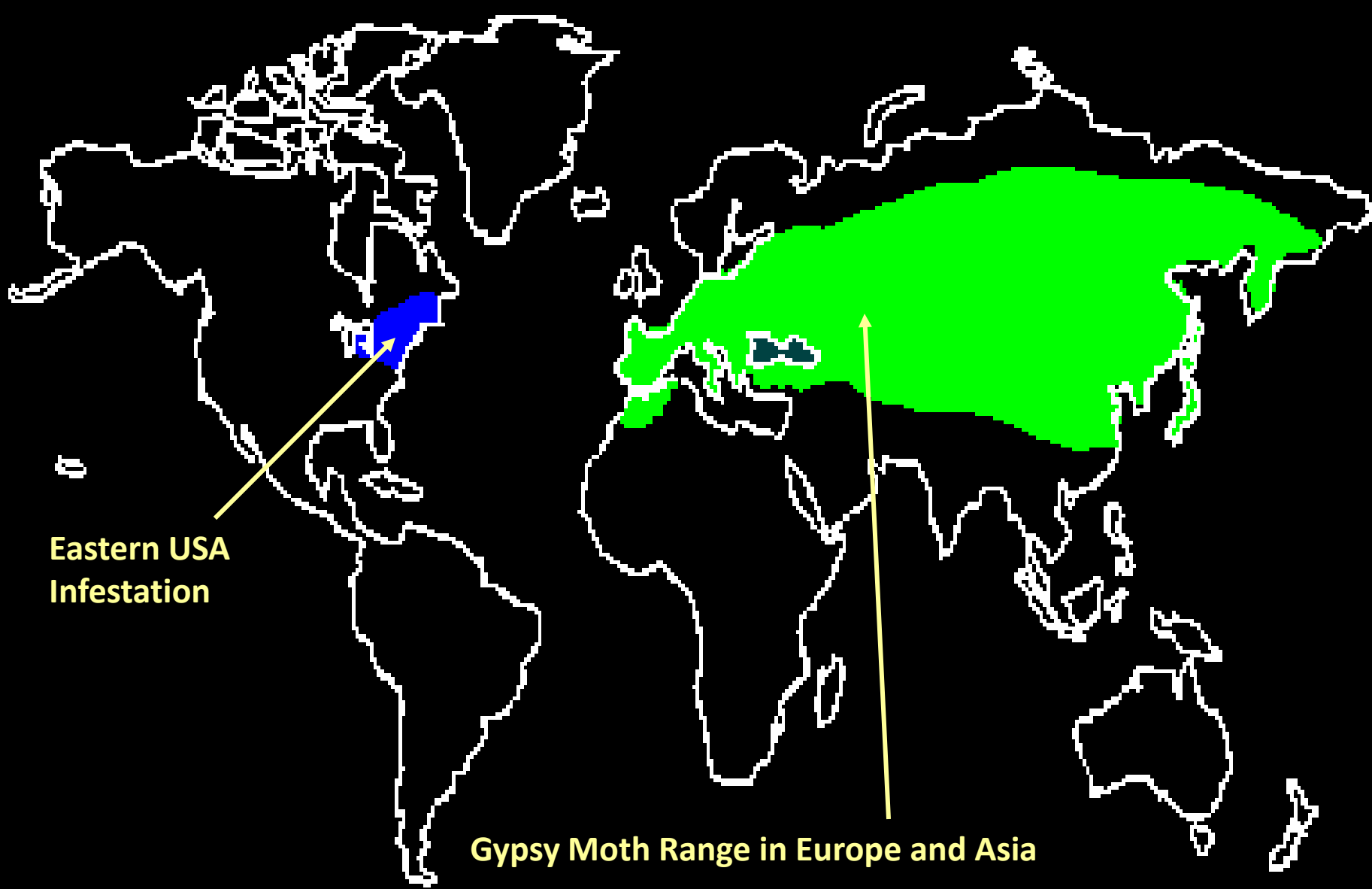
**Male and  
Female Moths  
on an Egg Mass**



**Female Moths  
Laying Egg  
Masses**

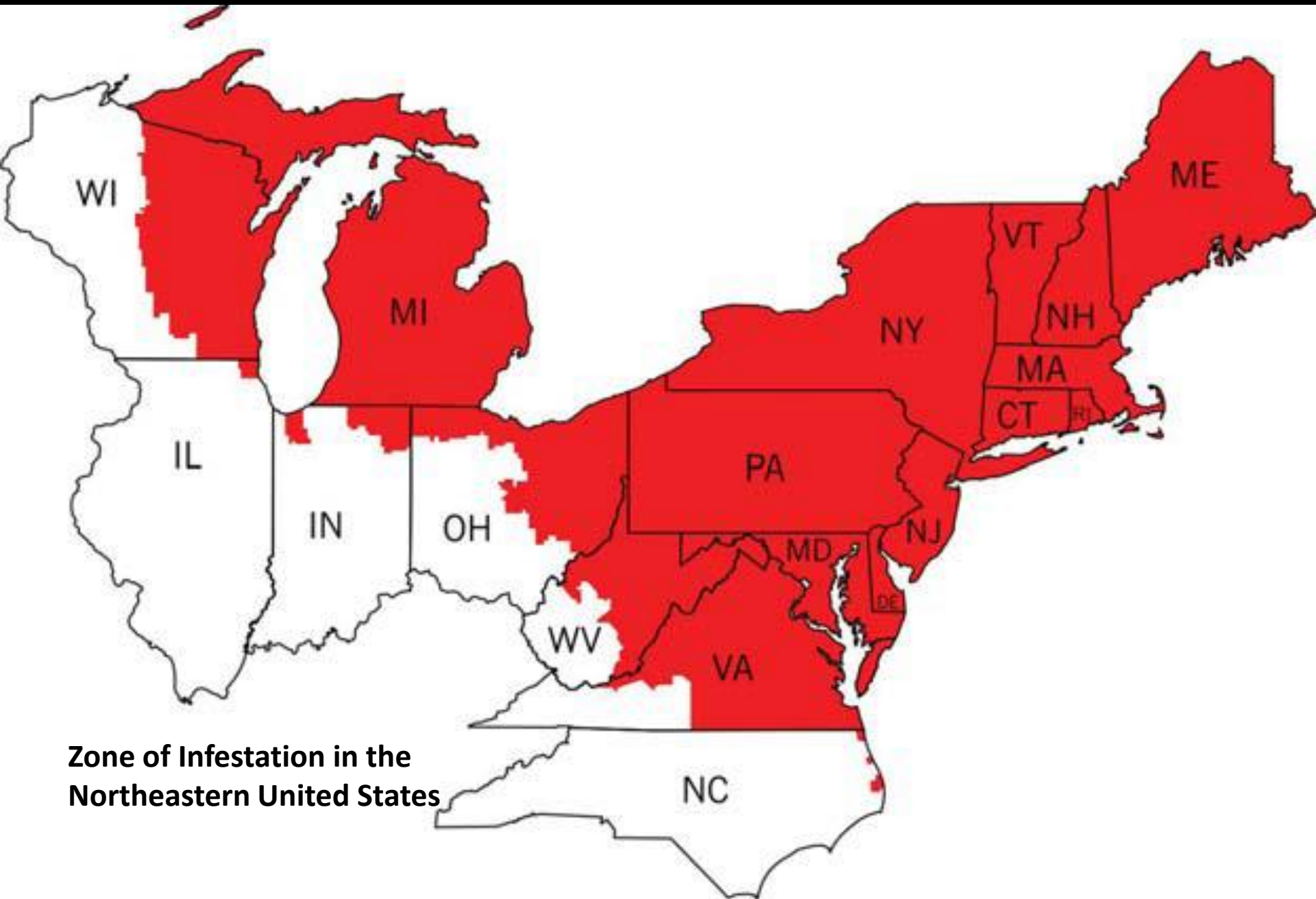
# GM Damage





**Eastern USA  
Infestation**

**Gypsy Moth Range in Europe and Asia**



**Zone of Infestation in the  
Northeastern United States**



# Host List

## Hardwoods

Oak

Aspen

Birch

Willow

Alder

## Conifers\*

Pine

Spruce

Fir

## CA Hosts\*\*

Live Oak

Douglas Fir

Manzanita

Other Oaks

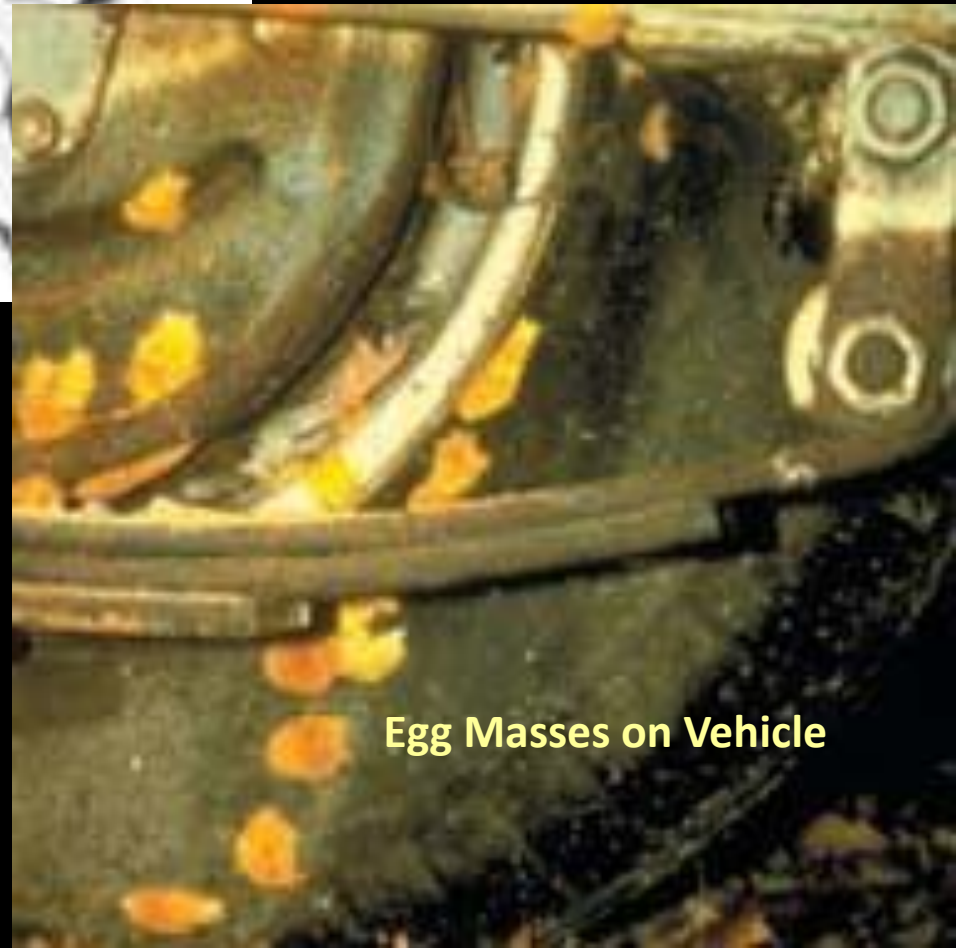
Others?

\*Feeding by older larvae

\*\*Known from previous outbreaks in CA



**Spread of the Insect to New Areas**

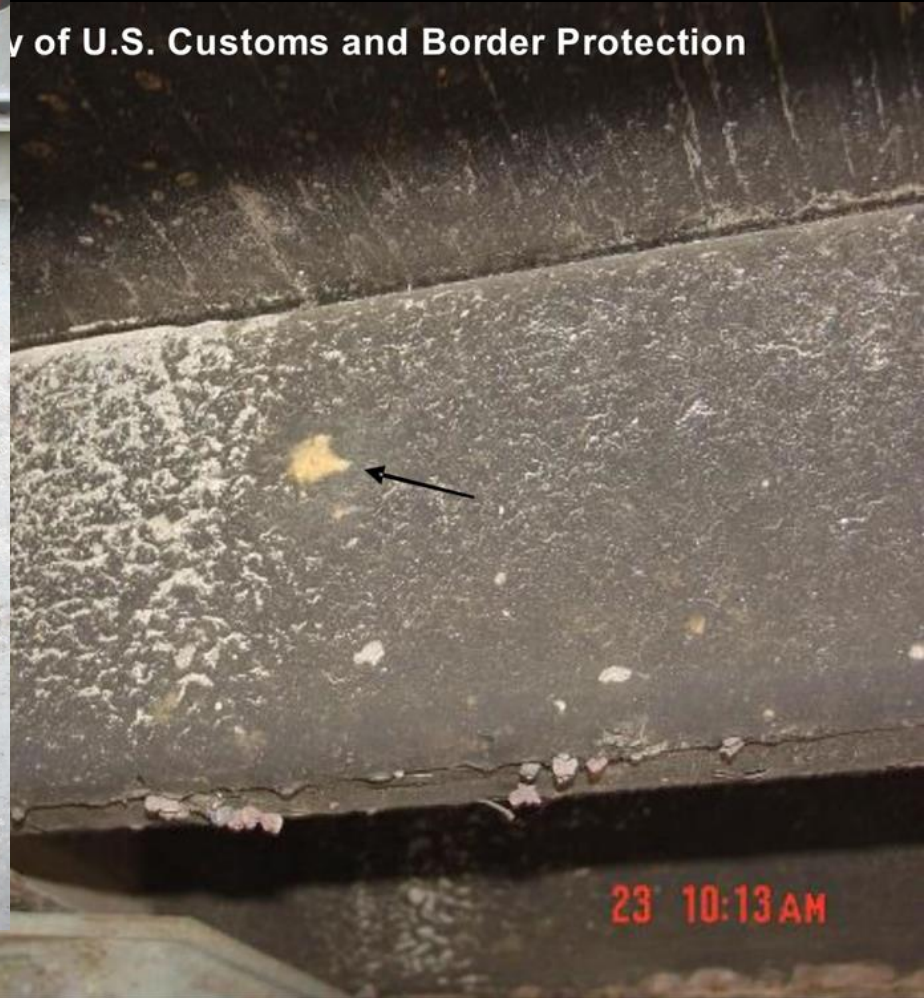


**Egg Masses on Vehicle**

# Management



# Asian Gypsy Moth



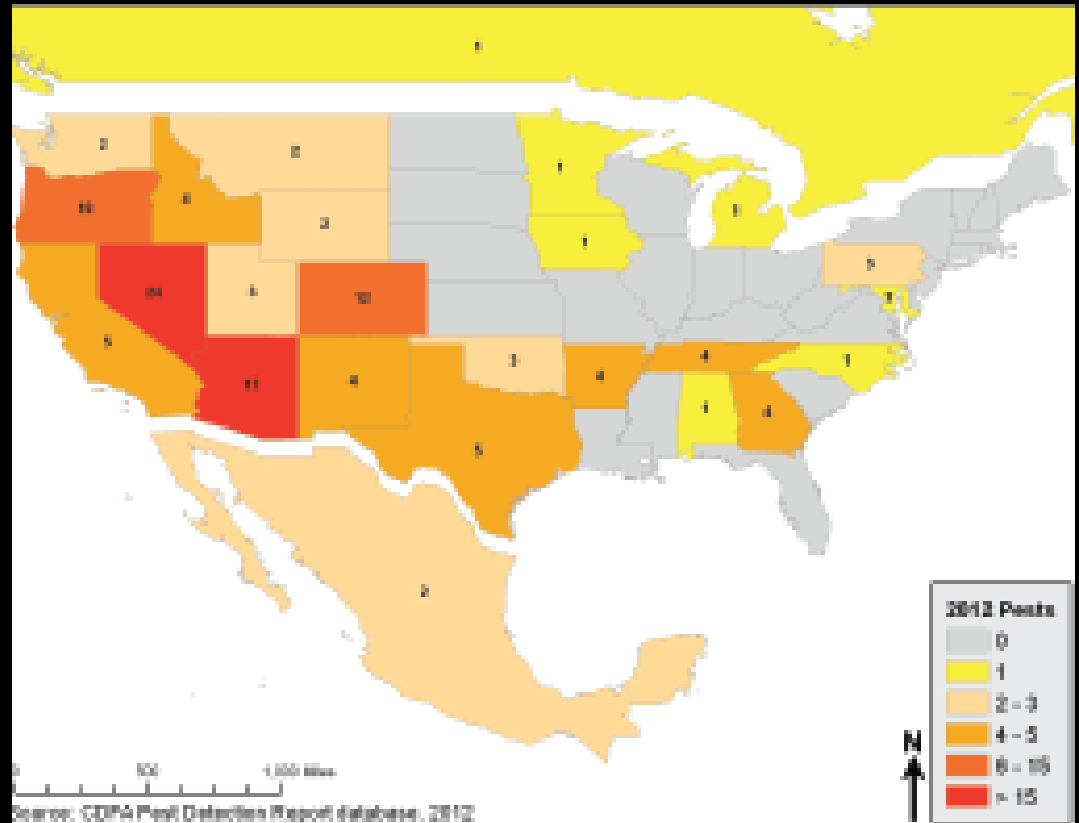
# Firewood Task Force

- <http://firewood.ca.gov/>



# Firewood Movement

- In first 10 months of 2012 12.5 million pounds of firewood entered CA at the border stations
- Firewood came from 43 states
- 122 potential forest pests were intercepted



# Firewood Concerns



- A Major Source of Movement of Insects and Diseases Between States and Within California
- Examples Include Gypsy Moth, SOD, Pitch Canker, Asian Longhorn Beetle, Emerald Ash Borer

# Questions?

