Bark Beetle Update

- Around 130 million trees killed by drought and bark beetles since the beginning of the record drought
- Pine bark beetles populations are down since the rains returned
- Fir engraver populations are increasing
- Should drought conditions return so could the bark beetles since populations are still high
Why Was There The Bark Beetle Epidemic?
Other Stresses
Root Diseases
Illegal Forest Stand Alteration
Changes in Fire Regimes
Drought

• Previous significant droughts have happened in California and resulted in large amounts of mortality
  • 1930’s
  • Early 1970’s
  • Early 2000’s in southern California

• The severity of this drought and the amount of mortality was unprecedented
Bark Beetles
Small cylindrical insects
Brown or reddish brown to black in color
Clubbed antennae
How Bark Beetles Cause Tree Mortality

• Invade the bark of living trees – in mass
• Colonize, mate, and reproduce in nutrient-rich phloem tissues
• Feeding by larvae girdles the tree
• Introduce fungi
• Fungi Possibly help overcome tree defenses
Crown Symptoms
Symptoms
Mass Attack
Western Pine Bark Beetle - *Dendroctonus brevicomis*

- Two generations per year in northern part of range; sometimes three generations in southern portion of the range.
Western Pine Beetle

Outbreaks often develop during droughts. Trees are typically killed in groups. Endemic populations attack diseased, damaged, or otherwise stressed trees.
Western Pine Bark Beetle
Behavioral Chemicals

exo-brevicomin
frontalin
myricetin
WPBB Control

- Return of Normal Rainfall
- Pesticide Sprays
- Fell, Peel and Burn
- Irrigation
- Behavioral Chemicals
- Cut and Remove Infested Trees

**Thinning!**
Fir Engraver Beetle – *Scolytus dendroctonus*
Fir Engraver Beetle
Mountain Pine Beetle

*Dendroctonus ponderosae*
Jeffrey Pine Beetle

Dendroctonus jeffreyi
Ips Engraver Beetles

Ips spp.

Ips paraconfusus
Increased Fire Danger
Residential Hazards
Danger to Powerlines and Roadways
Environmental Hazards

The loss of trees due to drought can also impact air quality and water quality and quantity.
Loss of Carbon Sequestration

- Trees killed by drought and bark beetles become a carbon source instead of a carbon sink.
Loss of Carbon Sequestration

Forests can sequester carbon to fight climate change.

Dead trees release carbon back into the environment and no longer sequester carbon.
Invasive Pests
Sudden Oak Death – *Phytophthora ramorum*
Expansion of SOD Range

- Trinity County Situation
- San Luis Obispo Situation
- Interior California
- Oregon and Washington State Infections
- Nursery Situations
Sudden Oak Death Mating Types

- North American vs. European Mating Types
- Different Host Ranges
- European Mating Type Becoming Common in British Larch Plantations
- Greater Diversity if Mating Occurs
Pitch Canker Disease – *Fusarium cirkinatum*

- Still a problem along the coast in California
- Appears to be moving north into Mendocino County
- Hosts include Monterey, Bishop and Shore Pines and Douglas Fir
- All other native and exotic pines are susceptible to some degree or another
Pitch Canker Disease
Pitch Canker in Point Reyes
Pitch Canker
Pitch Canker in Grass Species
Gold Spotted Oak Borer – *Agrilus auroguttatus*
GSOB Symptoms
GSOB Host Trees
Distribution of Oaks Susceptible to GSOB

Coastal Live Oak
*Quercus agrifolia*

Canyon Live Oak
*Quercus chrysolepis*

California Black Oak
*Quercus kelloggii*
**GSOB life cycle**

**Healthy and/or stressed Tree**
- Eggs laid in bark crevices???

**Summer**

**Larvae chew through bark to sapwood surface**

**Larvae make galleries along sapwood surface, packed with frass.**
- Destructive phase of insect
- Tree health declines

**Summer through Late Fall**
May - October

**Adults emerge**
- D shaped exit holes.
- Feed on oak leaves.

**Summer – Late Fall**
June - October

**Pupae bore out to outer bark and resemble adults**
- White in color

**Summer - Late Fall**
June - October
GSOB Control

Don't Move Oak Firewood

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

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

For more information, visit the following websites:
• fs.fed.us/infestations/
• www.fs.fed.us/infestation/
GSOB Control
GSOB Management
Invasive Shot Hole Borers - *Euwallacea* spp.
Invasive Shot Hole Borers

- Two Species – Polyphagous Shot Hole Borer (Vietnam) and Kuroshio Shot Hole Borer (Taiwan)
- Two Separate Invasions
- Both Have Multiple Host Trees
- Both Carry Similar Fungi That The Adults And Young Feed On And That Can Kill The Host Tree
Host Trees

- The known host range is huge, including 207 species in 58 plant families
- It includes native species (11), many riparian species, urban shade trees (1/4 of all trees planted along Los Angeles streets), invasive plants (castor bean) and important agricultural crops (13).
- Some are reproductive hosts while many trees are also attacked but do not support the full development of the insect and the associated fungi

Hosts include:
- Maples
- Oaks
- Willows
- Olives
- Avocado
- Sycamore
- Many native and introduced urban shade trees, riparian and woodland trees and agricultural crops
Distribution 2012
Distribution 2013
Distribution 2014
Distribution 2015
Distribution 2016
Distribution 2016
Questions?