



Forest Pest Update 2018

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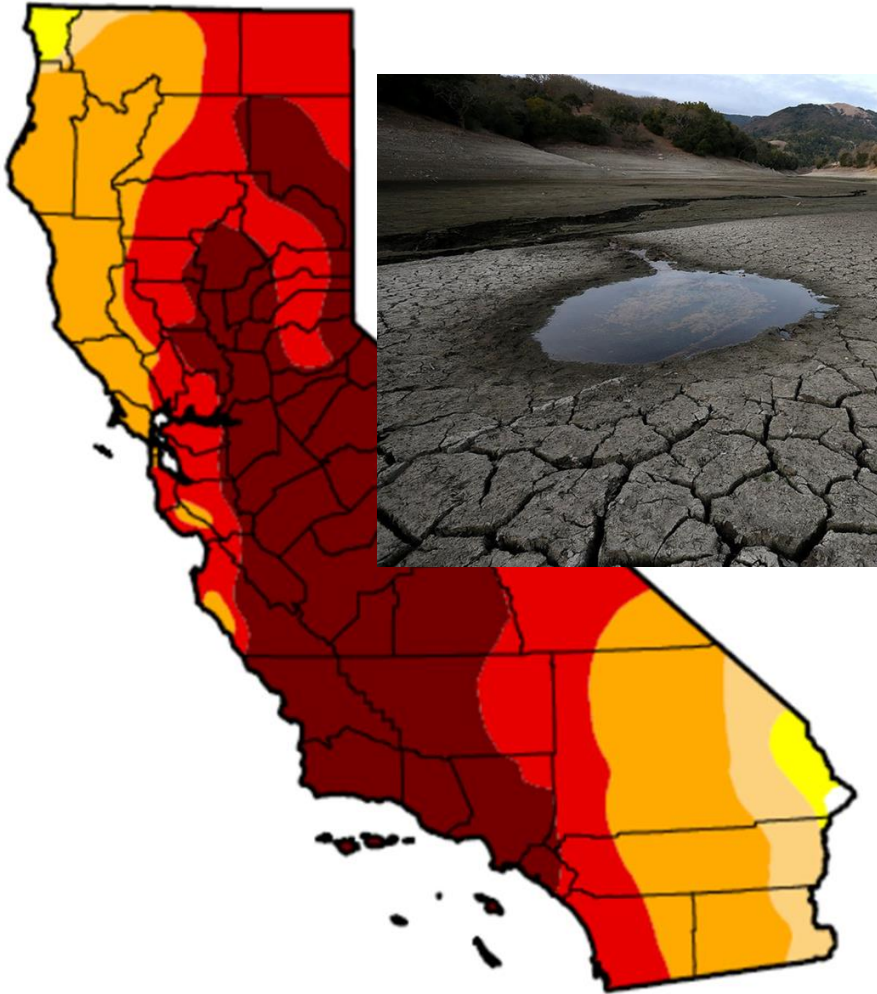


Bark Beetle Update



- 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?



1909



1938

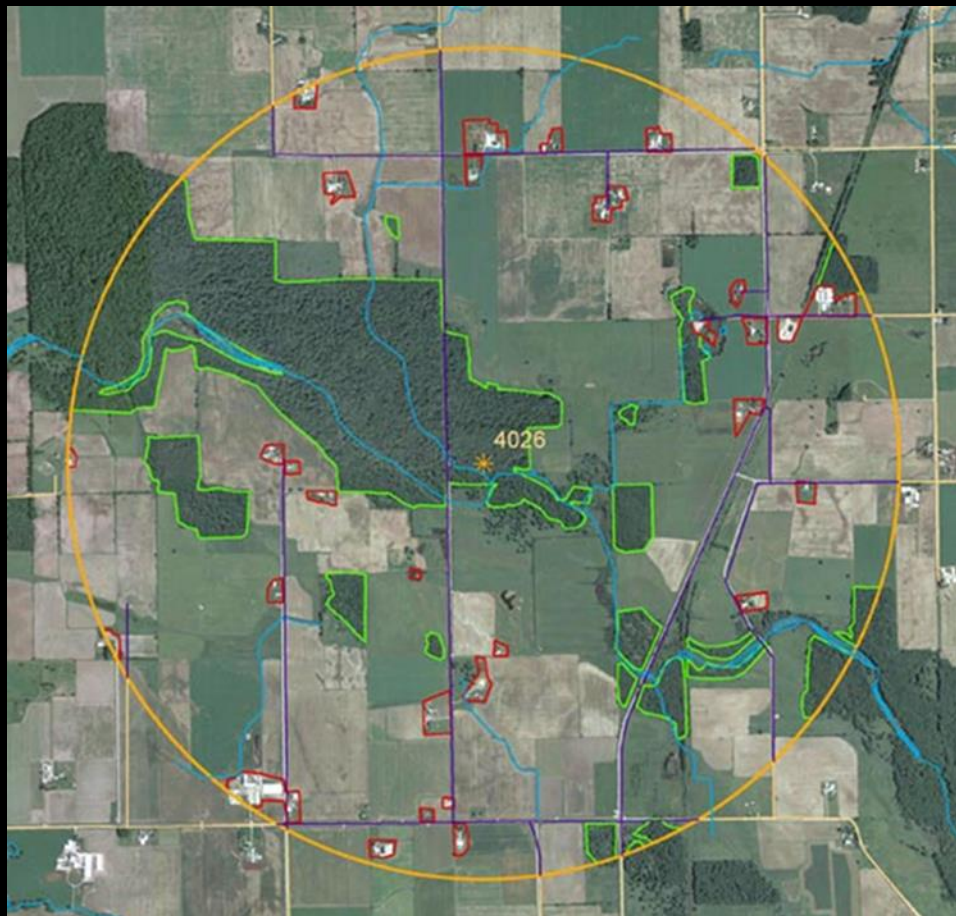


1958



1979

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









2009



2014

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

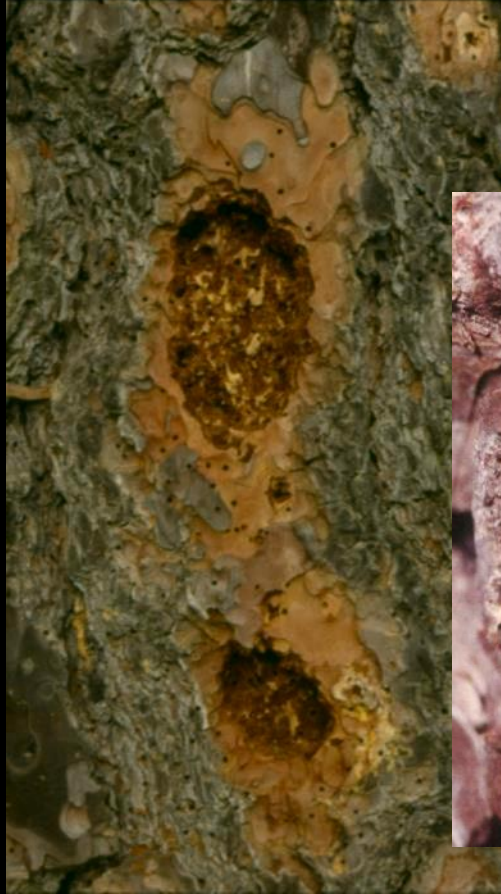
Crown Symptoms



Symptoms



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



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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



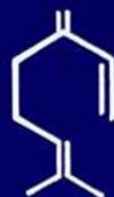
Behavioral Chemicals



exo-brevicomín



frontalin



myr



WPBB Control

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



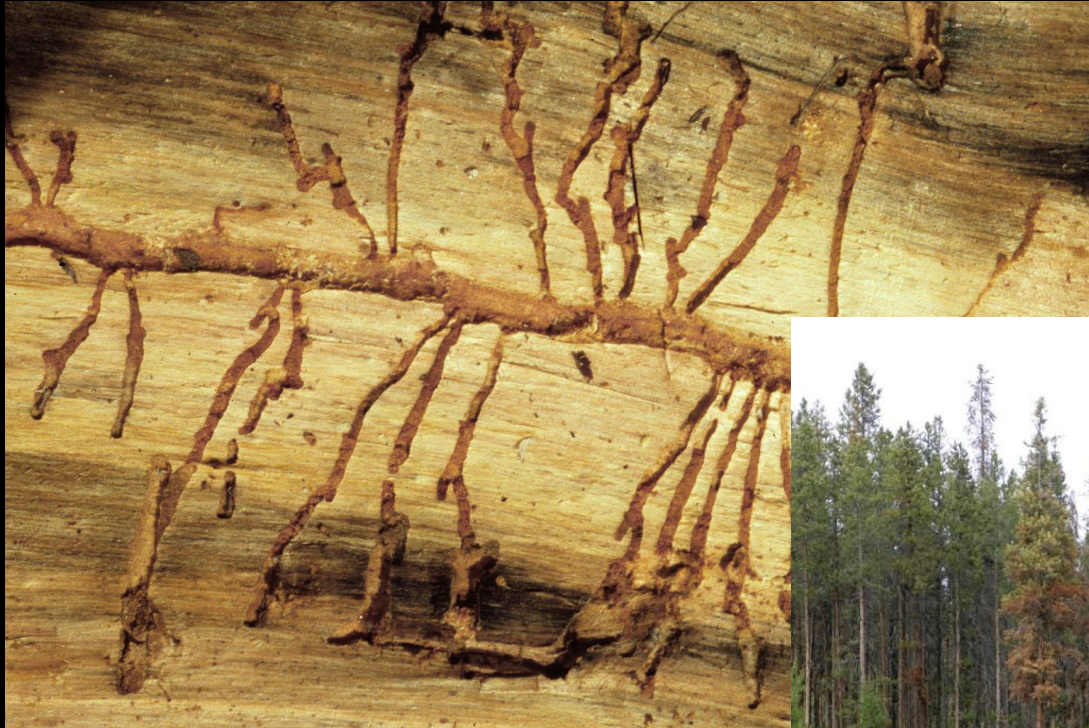
Fir Engraver Beetle – *Scolytus dendroctonus*



Fir Engraver Beetle



Mountain Pine Beetle



*Dendroctonus
ponderosae*

Jeffrey Pine Beetle



Dendroctonus jeffreyi

Ips Engraver Beetles



Ips paraconfusus

Ips spp.

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.

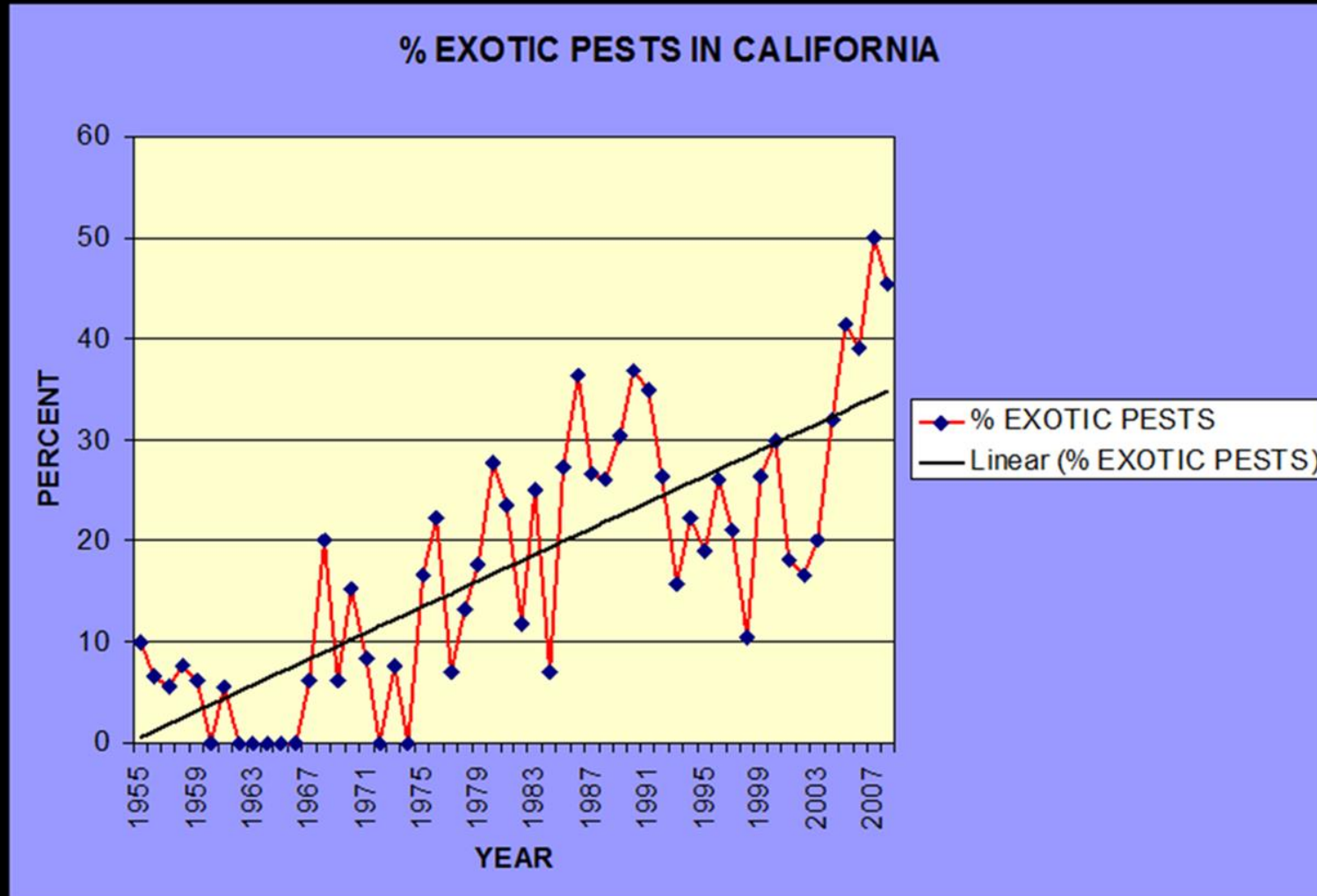
Loss of Carbon Sequestration

Forests can sequester carbon to fight climate change.



Dead trees release carbon back into the environment and no longer sequester carbon.

Invasive Pests



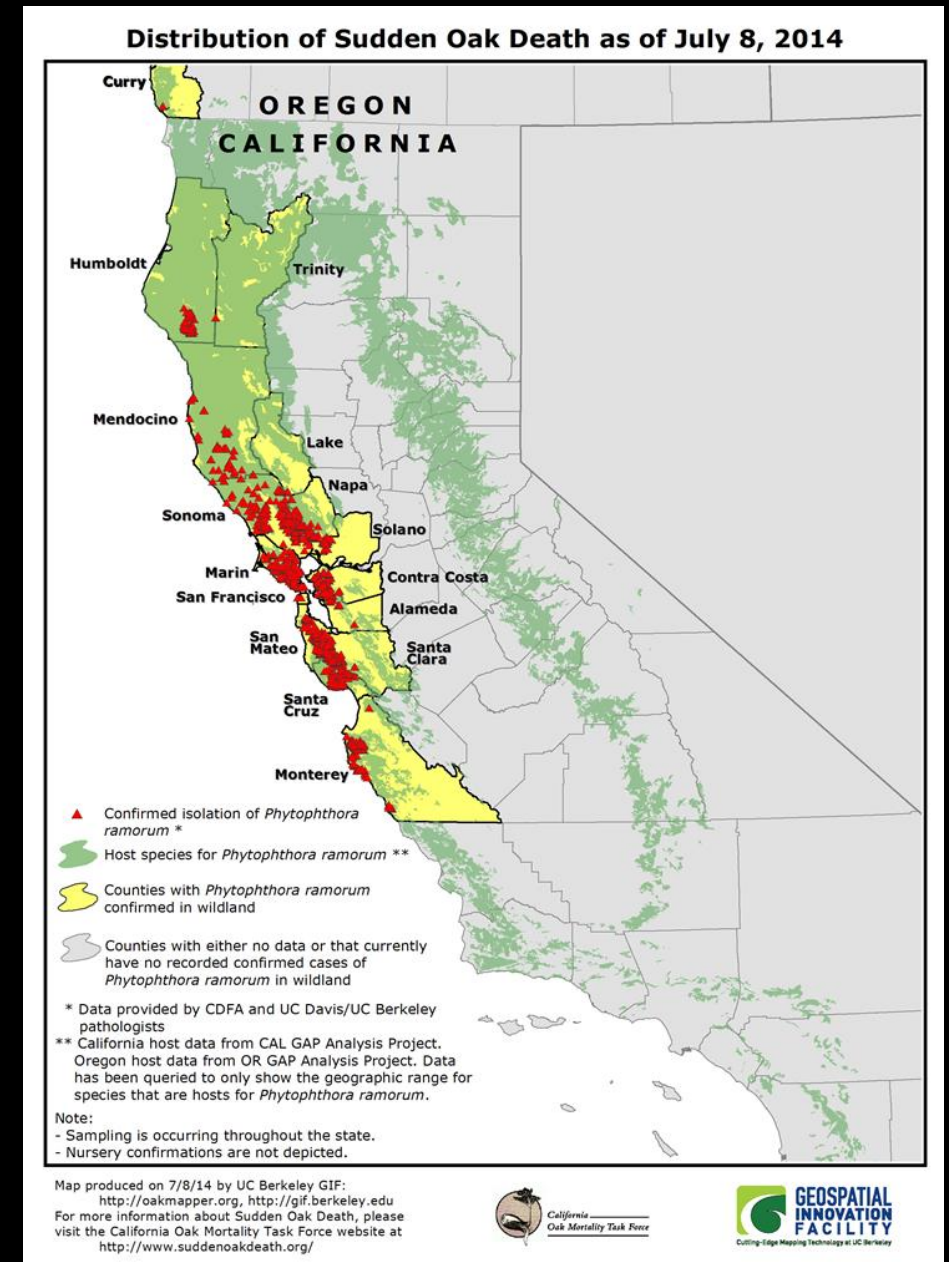
Sudden Oak Death – *Phytophthora ramorum*





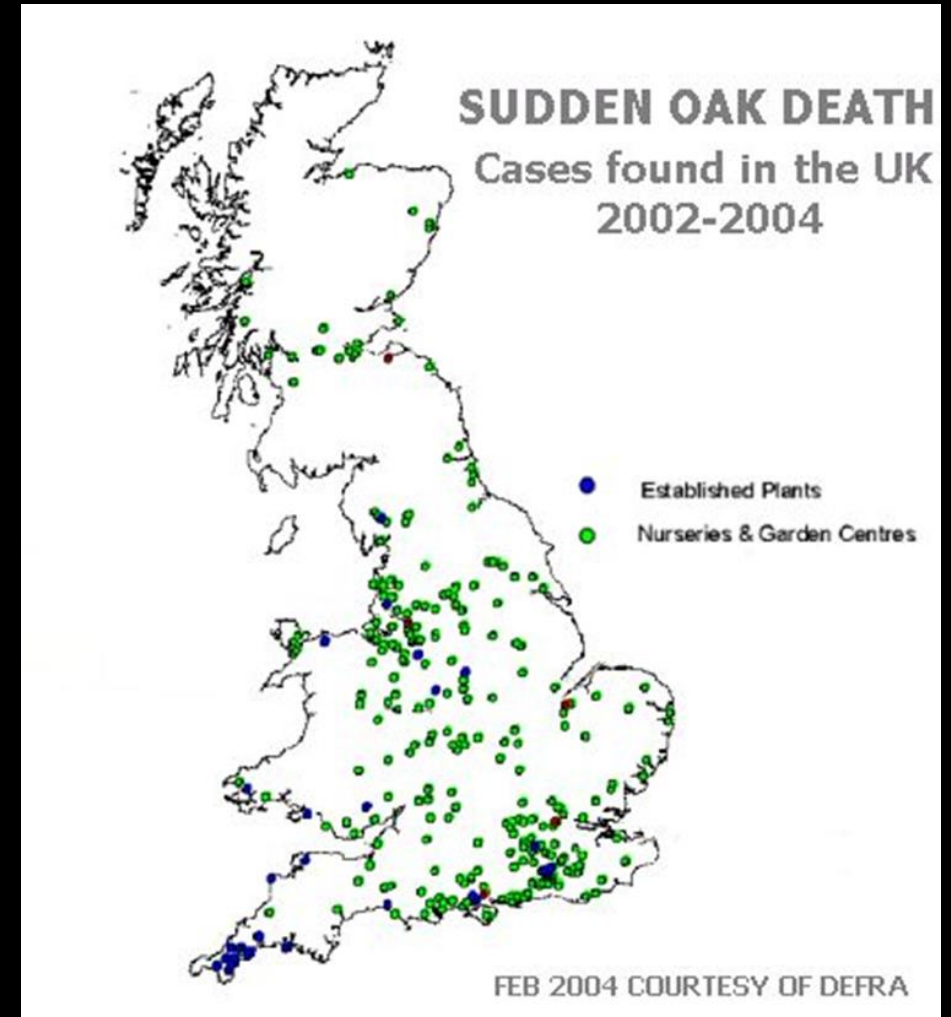
Expansion of SOD Range

- 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 circinatum*

- 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



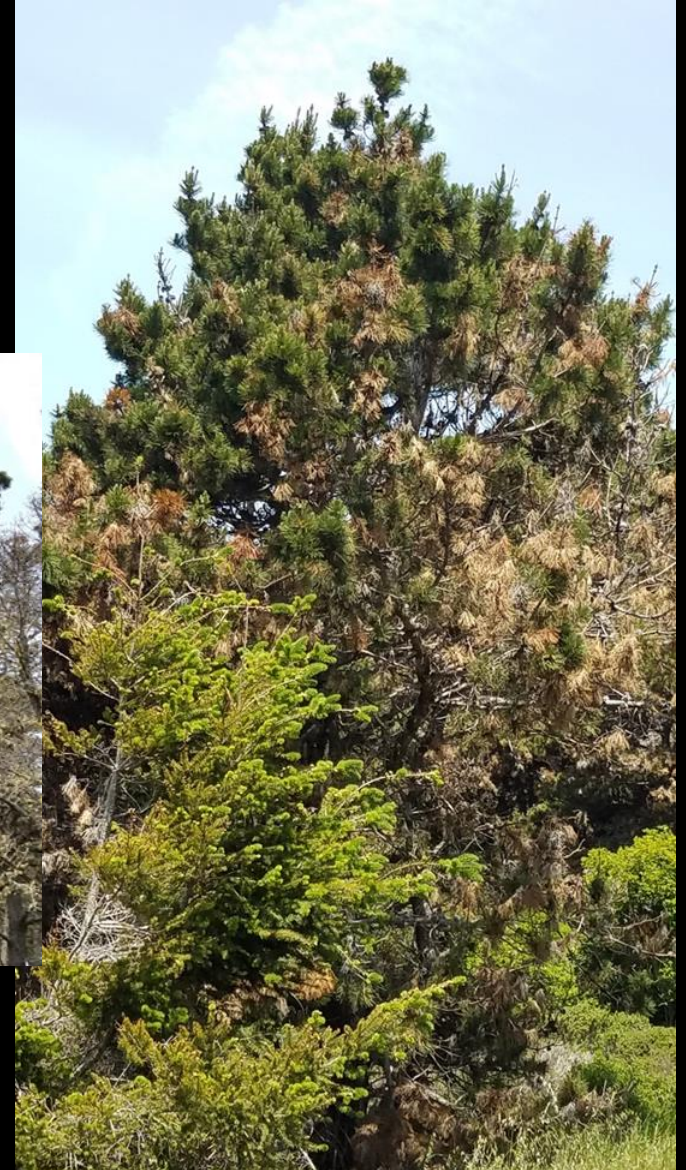
Pitch Canker Disease



Pitch Canker in Point Reyes



Pitch Canker



Pitch Canker in Grass Species



Gold Spotted Oak Borer – *Agrilus auroguttatus*



5432273

GSOB Symptoms





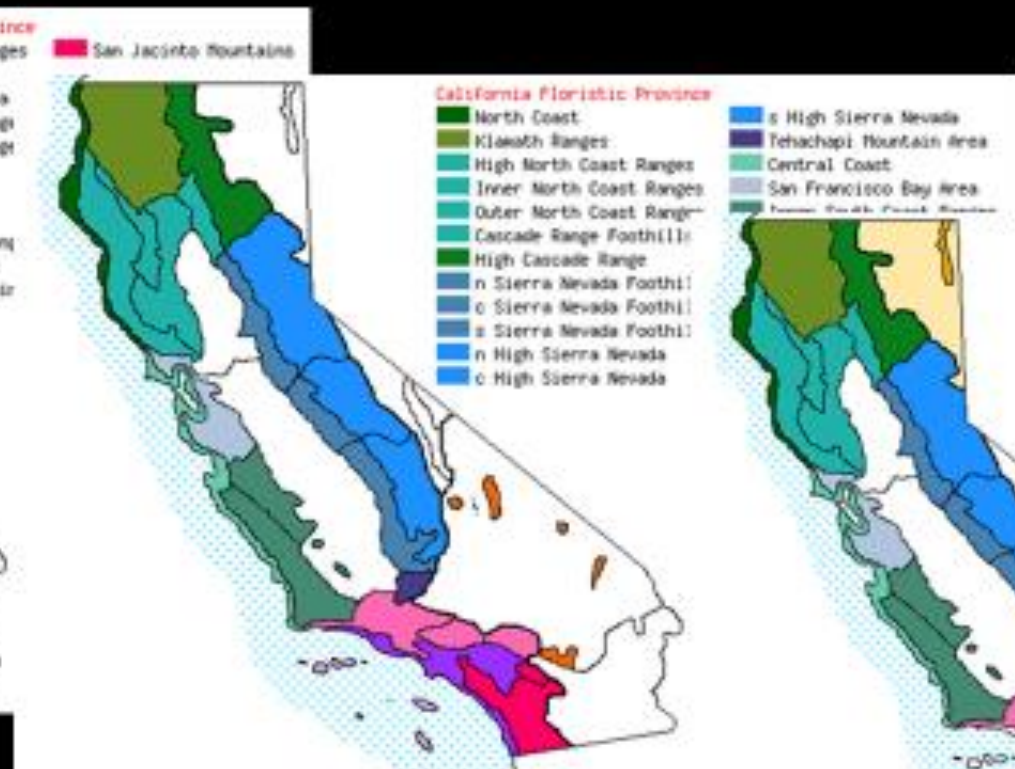
GSOB Host Trees



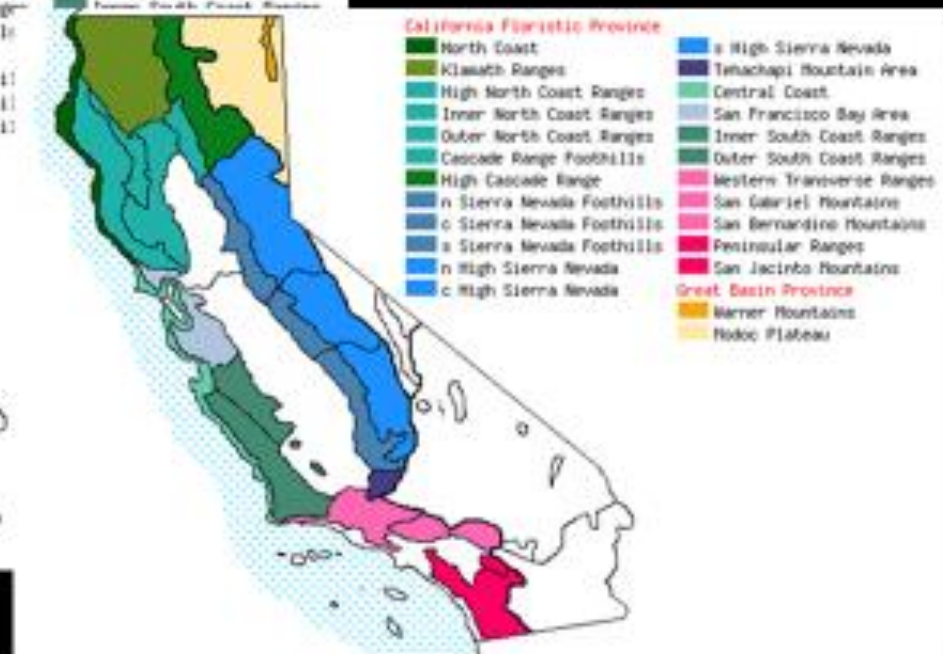
Distribution of Oaks Susceptible to GSOB



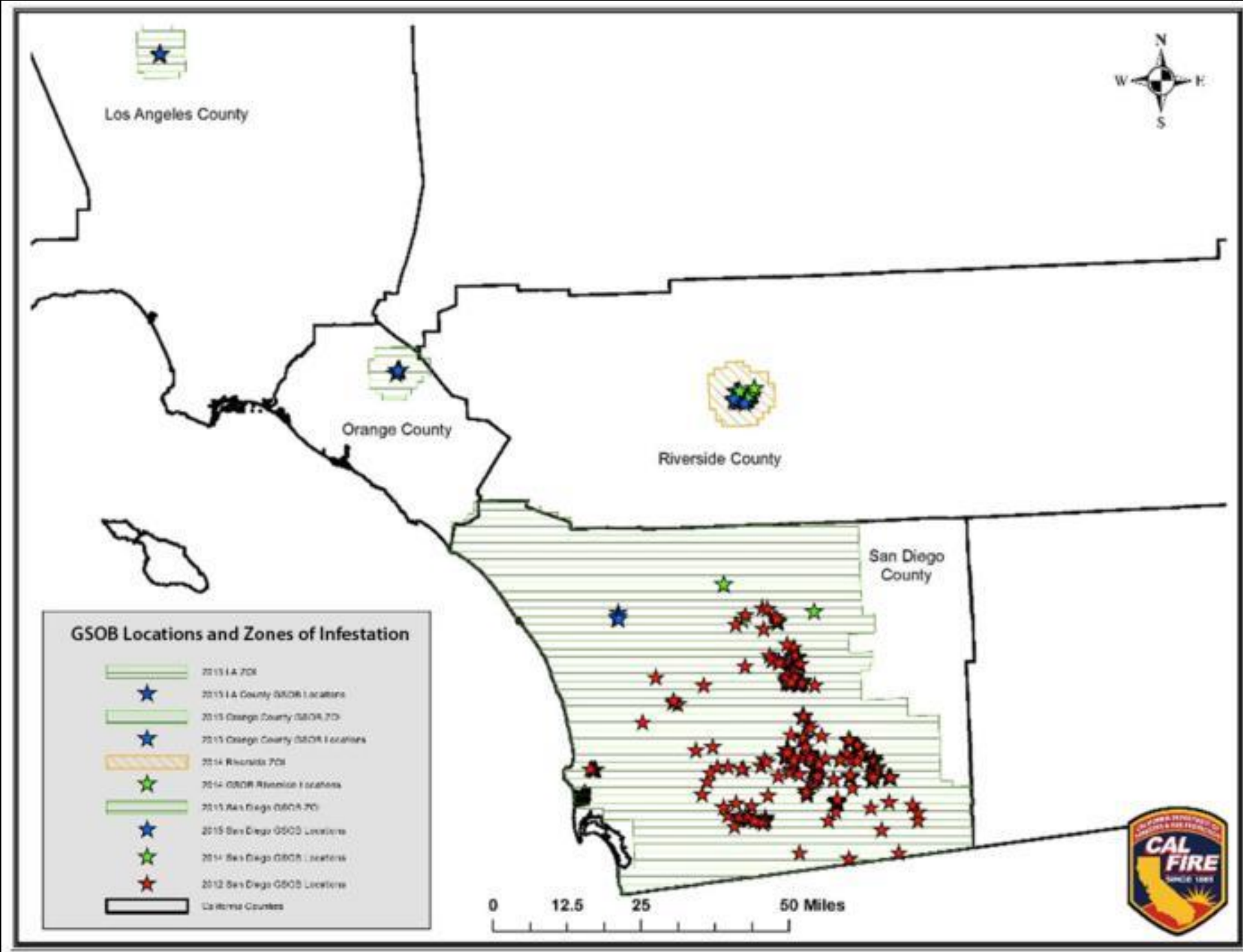
Coastal Live Oak
Quercus agrifolia



Canyon Live Oak
Quercus chrysolepis



California Black Oak
Quercus kelloggii



GSOB life cycle



Healthy and/or stressed Tree

- Eggs laid in bark crevices???

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 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/spfftr/p/ or www.fs.fed.us/r5/cleveland/

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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

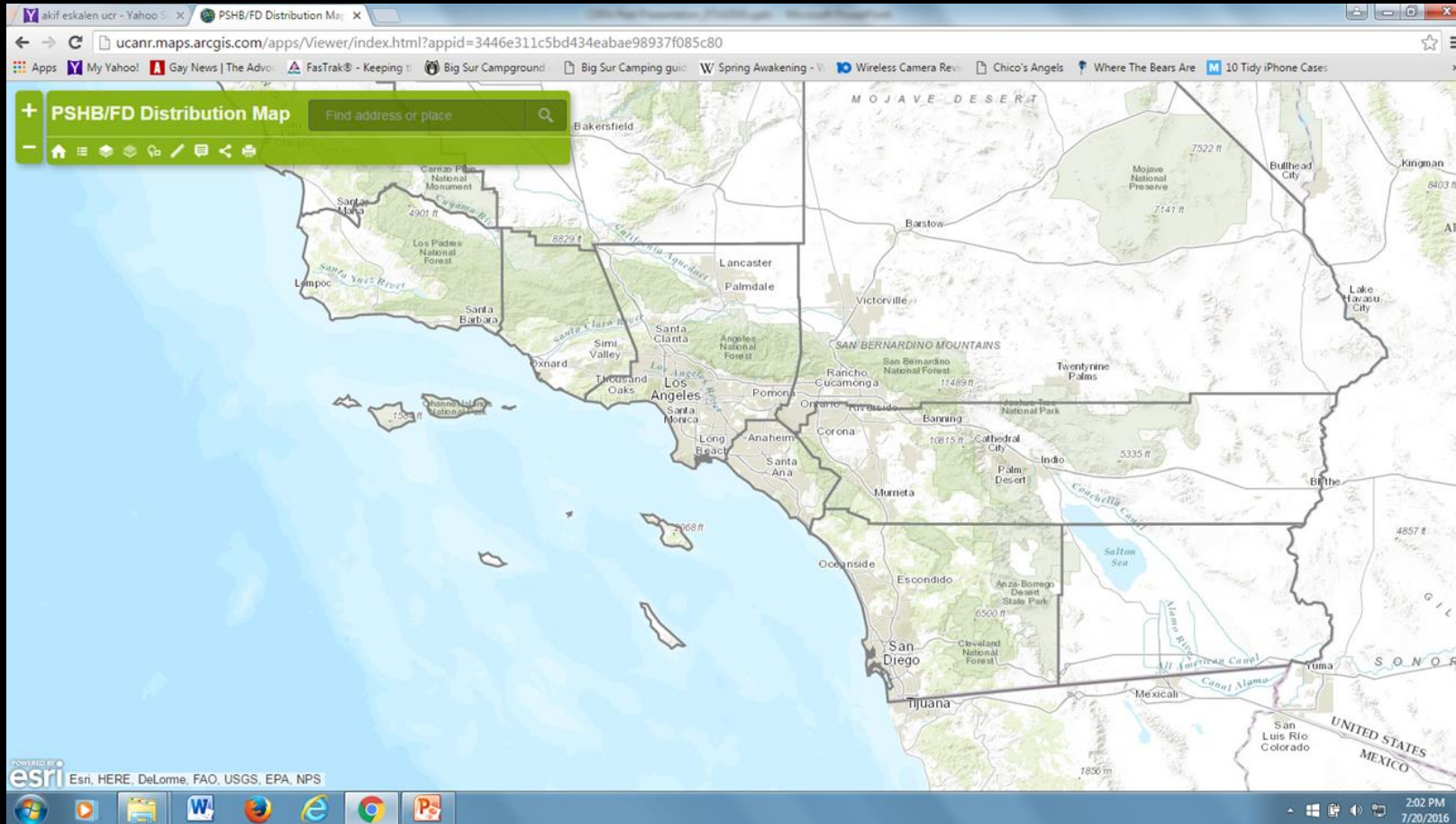
- The known host range is huge, including 207 species in 58 plant families
- It includes native species (11), many riparian species, urban shade trees (1/4 of all trees planted along Los Angeles streets), invasive plants (castor bean) and important agricultural crops (13).
- Some are reproductive hosts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

Hosts include:

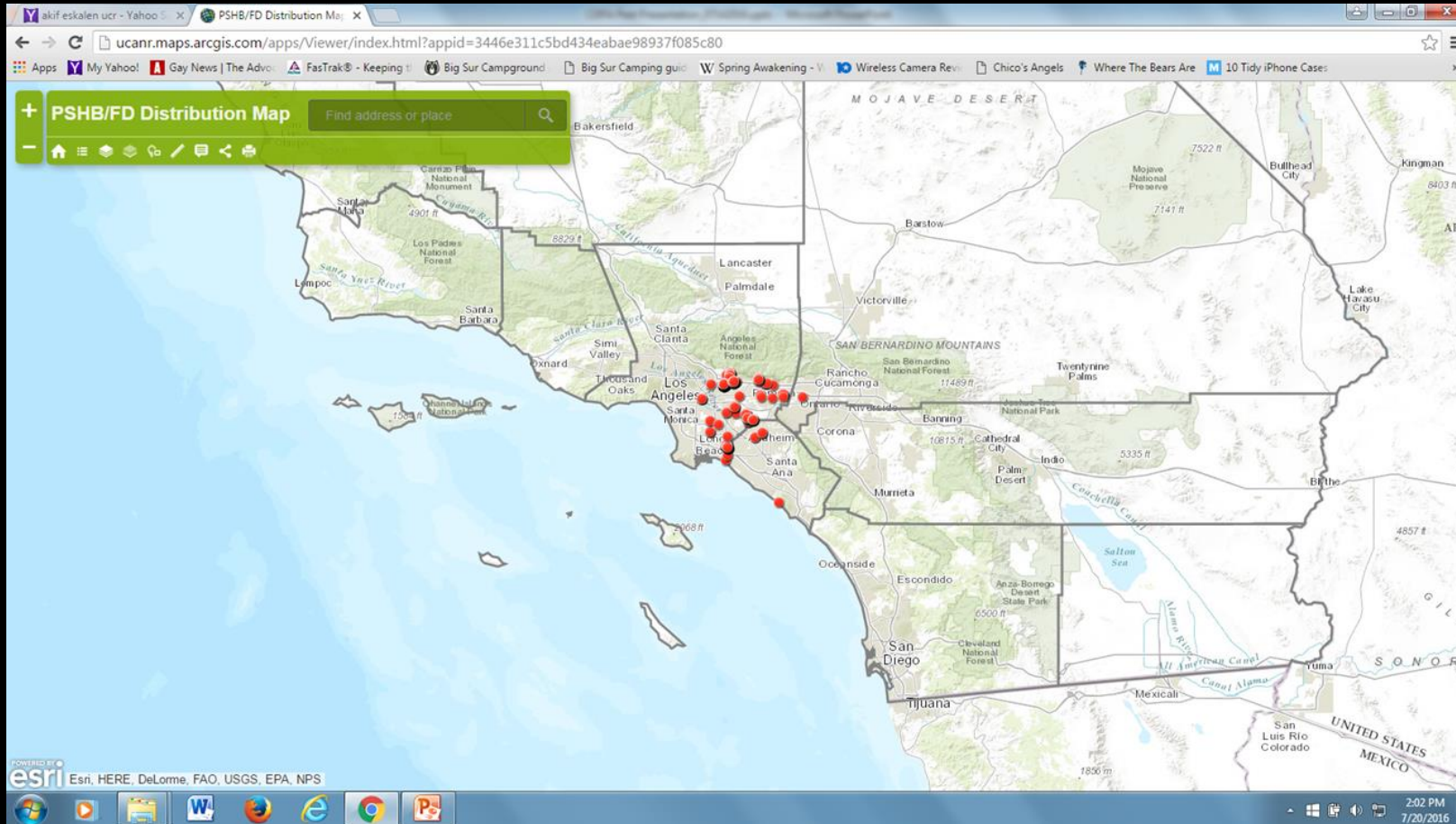
- Maples
- Oaks
- Willows
- Olives
- Avocado
- Sycamore
- Many native and introduced urban shade trees, riparian and woodland trees and agricultural crops



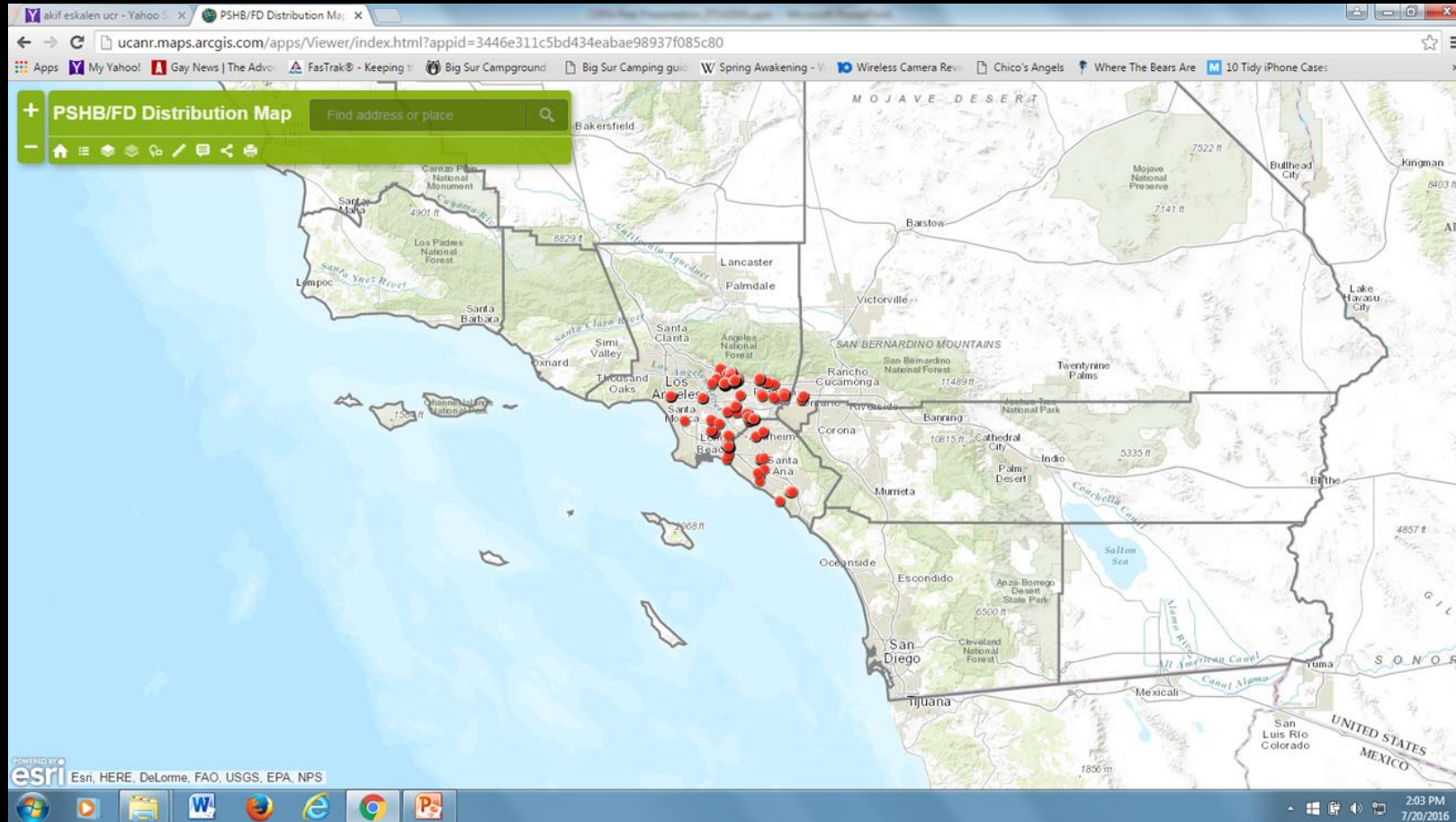
Distribution 2011



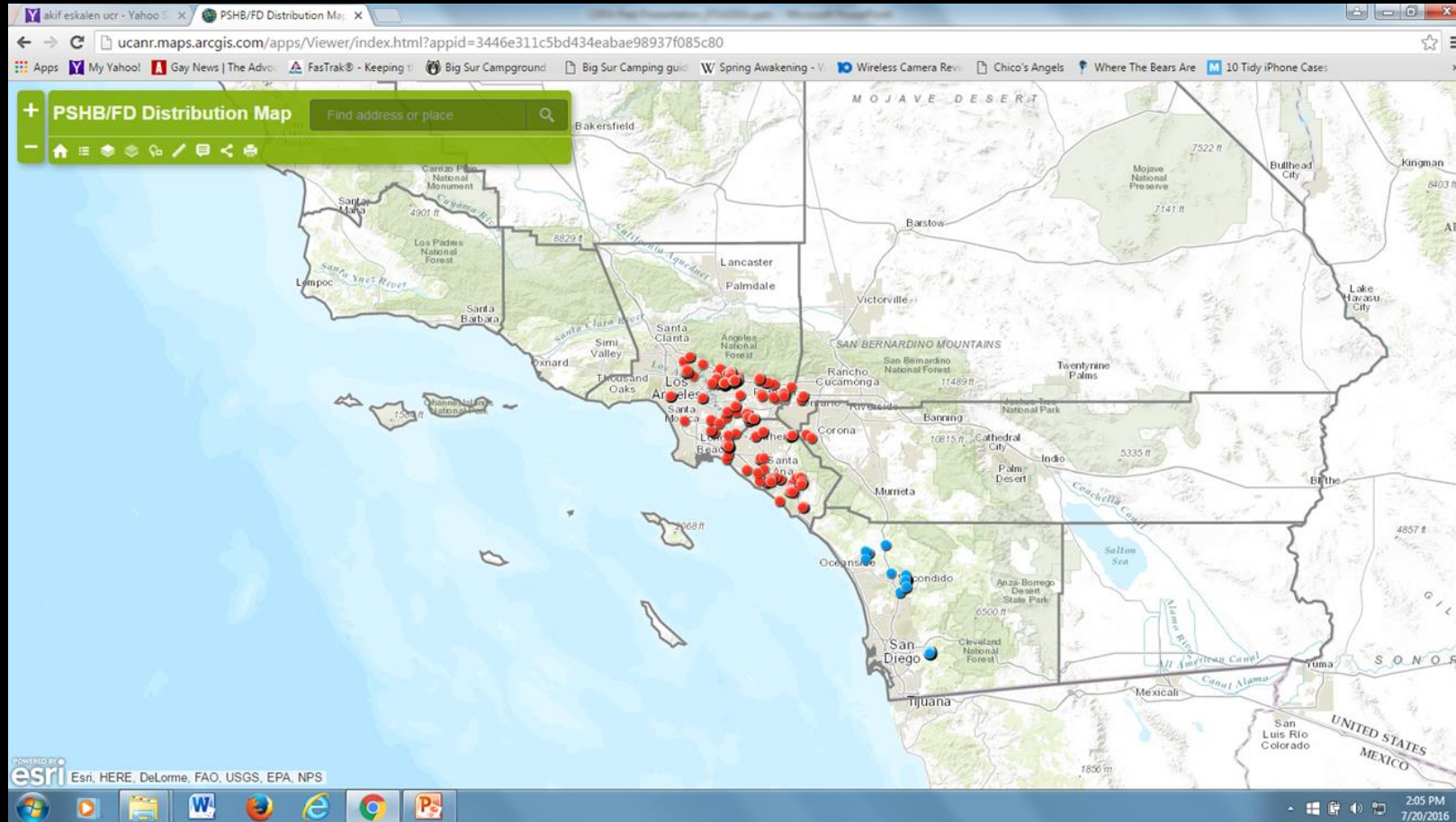
Distribution 2012



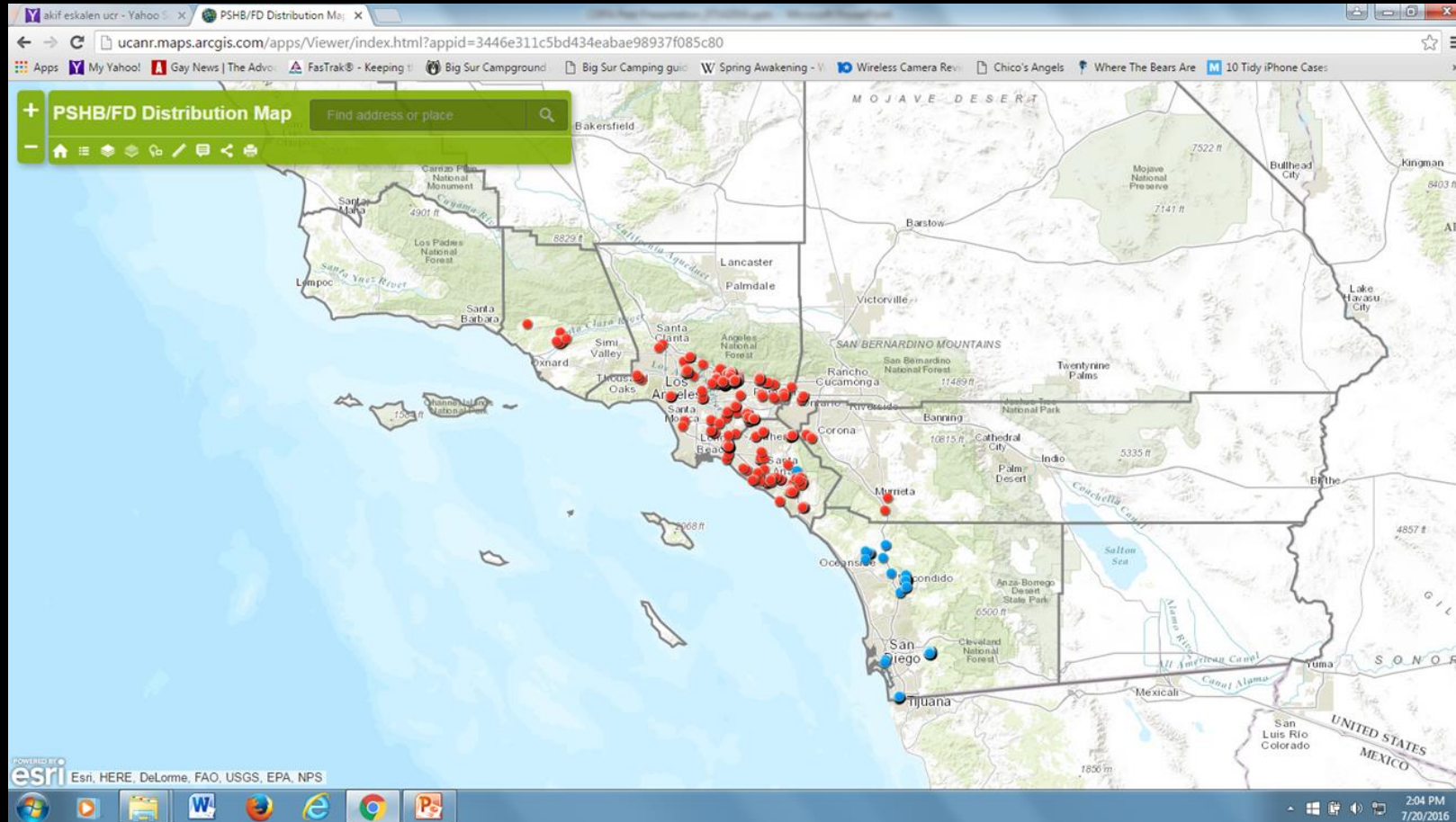
Distribution 2013



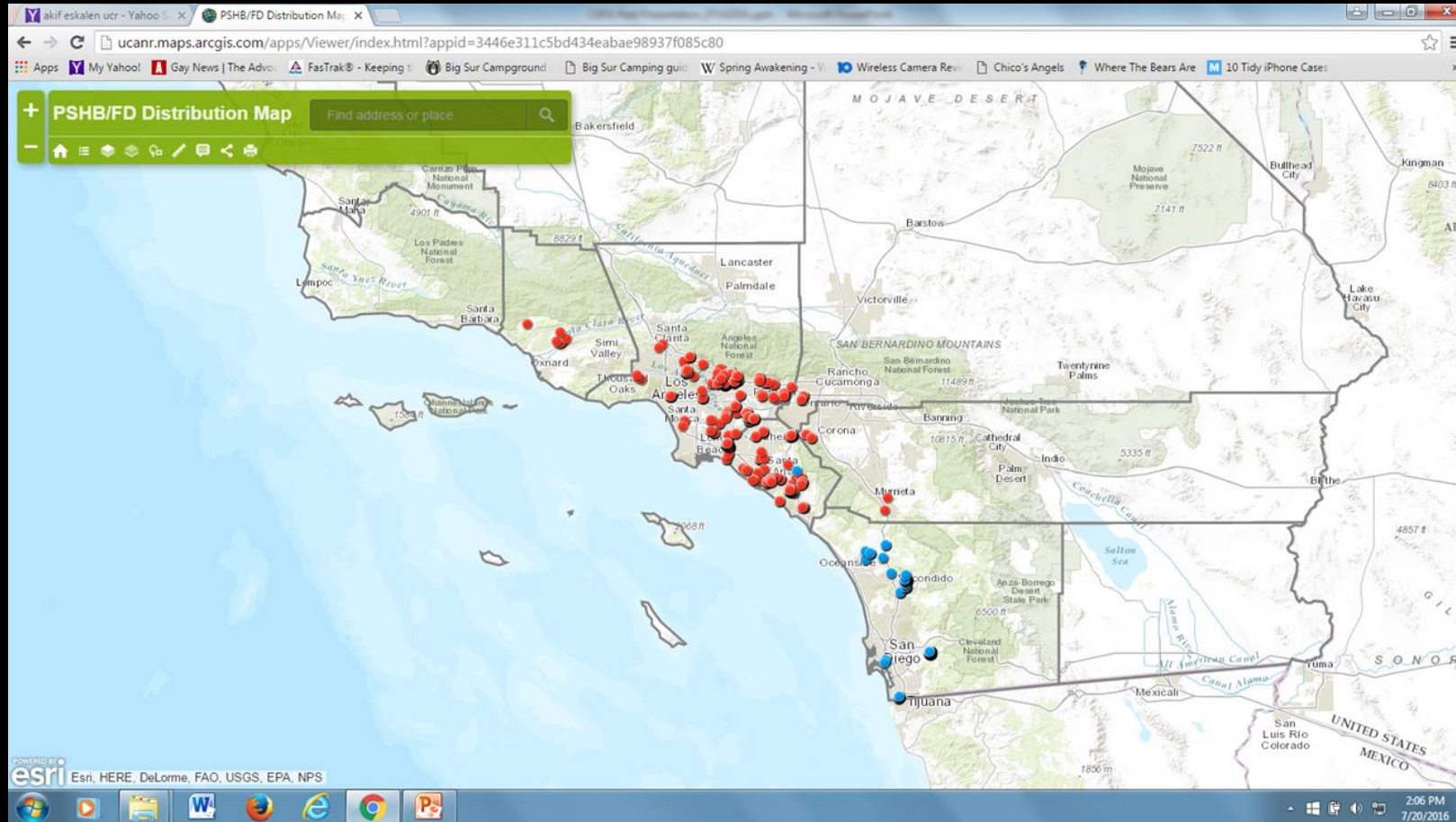
Distribution 2014



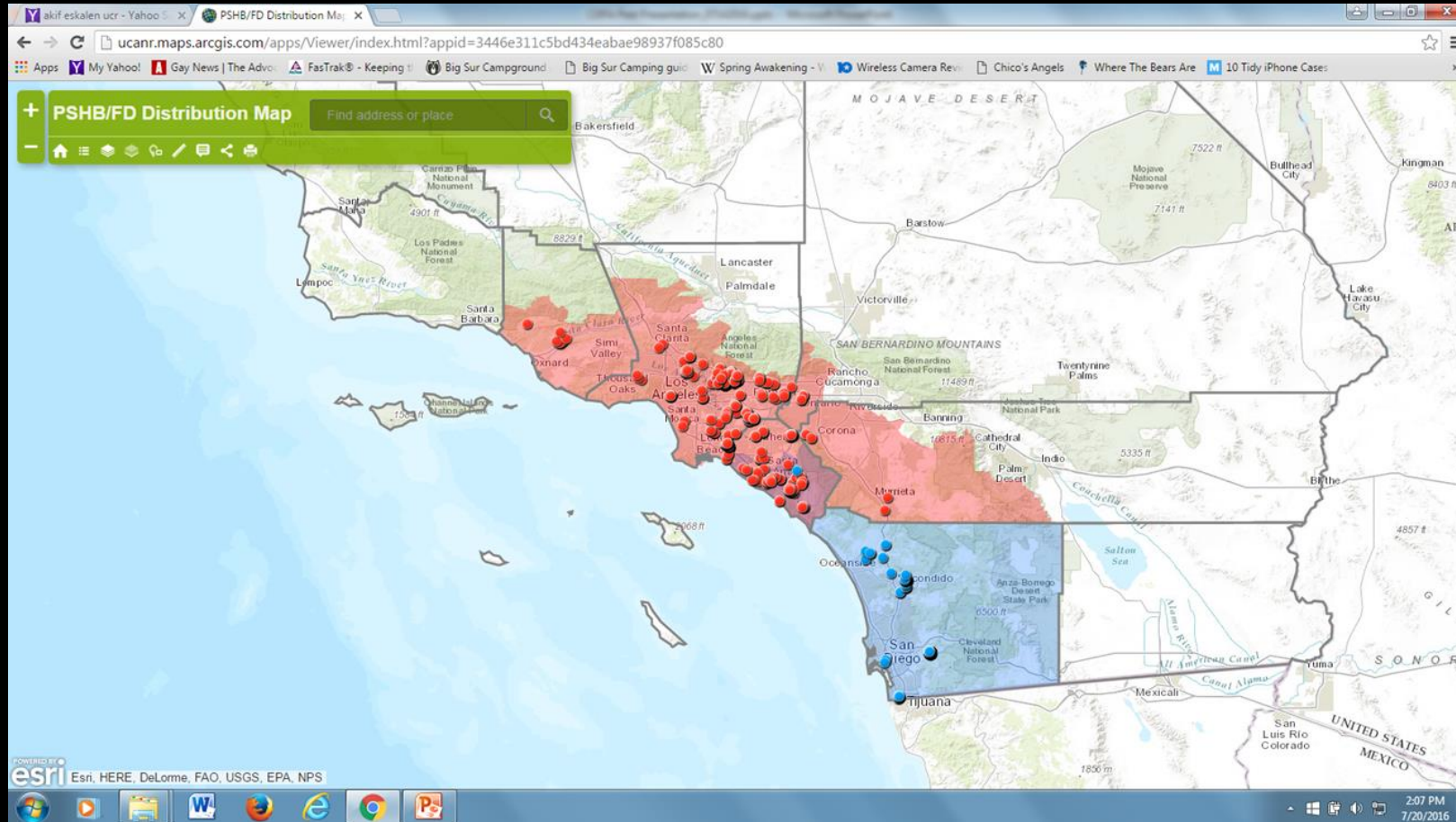
Distribution 2015



Distribution 2016



Distribution 2016









Questions?