Update on Forest Pests - CALIFORNIA

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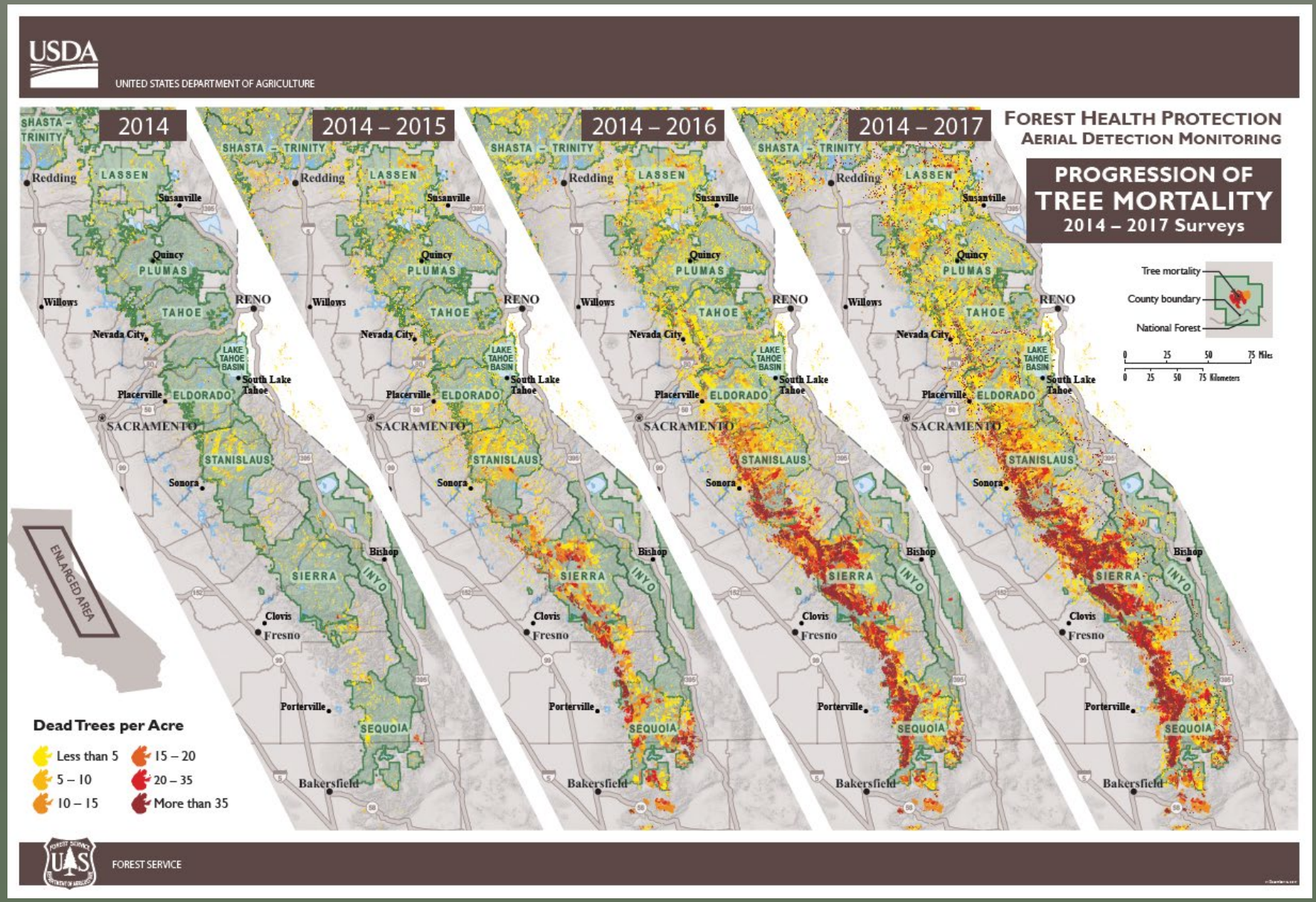
CA Native Forest Pests - ~129 million dead trees (2014-2017)



Bark Beetles
primary tree killers in CA forests

- Jeffrey pine beetle
- Mountain pine beetle
- Western pine beetle
- Fir engraver beetle

Fir engraver beetle

Sequoia NF

colors enhanced to improve distinction between green and dead trees

High levels of sugar pine mortality – Sequoia NF

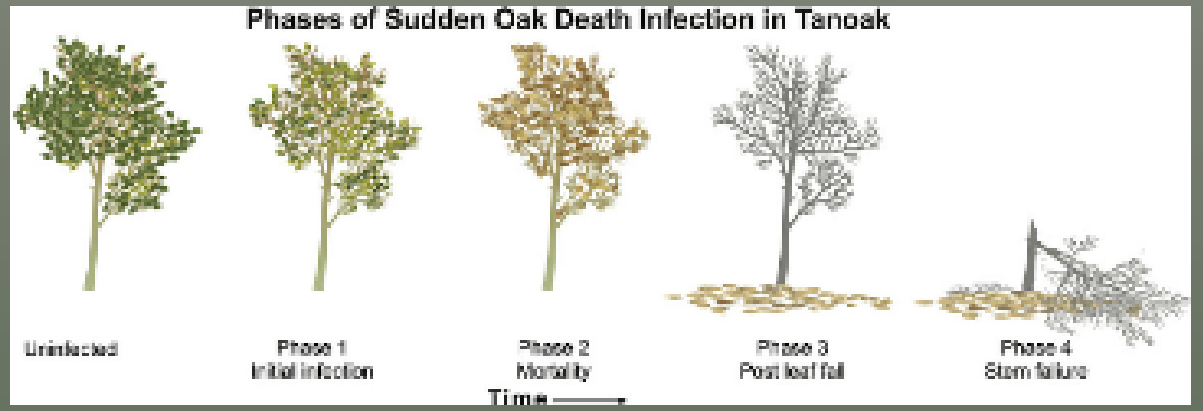
piñon pine mortality, north of Mt. Pinos, Los Padres NF

CALIFORNIA Invasive forest pests

Sudden Oak Death – affecting tanoak

Marin
Santa Cruz
Sonoma
Napa
San Mateo
Monterey
Santa Clara
Mendocino
Solano
Alameda
Contra Costa
Humboldt
Lake
San Francisco
Trinity

Curry County, Oregon



CA coastal counties from Monterey to Humboldt are affected by SOD

- working on genetic resistance in tanoak
- suppression in some area
- survey and detection
- annual SOD symposium
- education and outreach

White pine blister rust (Cronartium ribicola)

Introduced from Europe and Asia

Affects 5-needle pines
- western white pine
- sugar pine
- limber pine
- whitebark pine
- bristlecone pine
- foxtail pine

Caused branch and stem cankers

Top-kill or tree death

Goldspotted oak borer
Agrilus auroguttatus

- Native to southeastern Arizona
- Invasive in California since the late 1990's
- Likely brought into California in infested firewood
  - Movement of infested firewood has also likely resulted in satellite infestations
- No quarantines in place
- >53,000 oaks killed

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All lands affected - Private, City, County, State, Federal, Tribal

A coast live oak tree killed by GSOB on private land in San Diego Co.

A culturally significant heritage oak on the Pechanga reservation (The Great Oak) which is at potential risk of GSOB infestation

Economic

Cost of tree removal /replacement
Reduction in property values
Loss of shade

Environmental

> Fuels
Wildlife habitat

Cultural and Social impacts

2003

2010

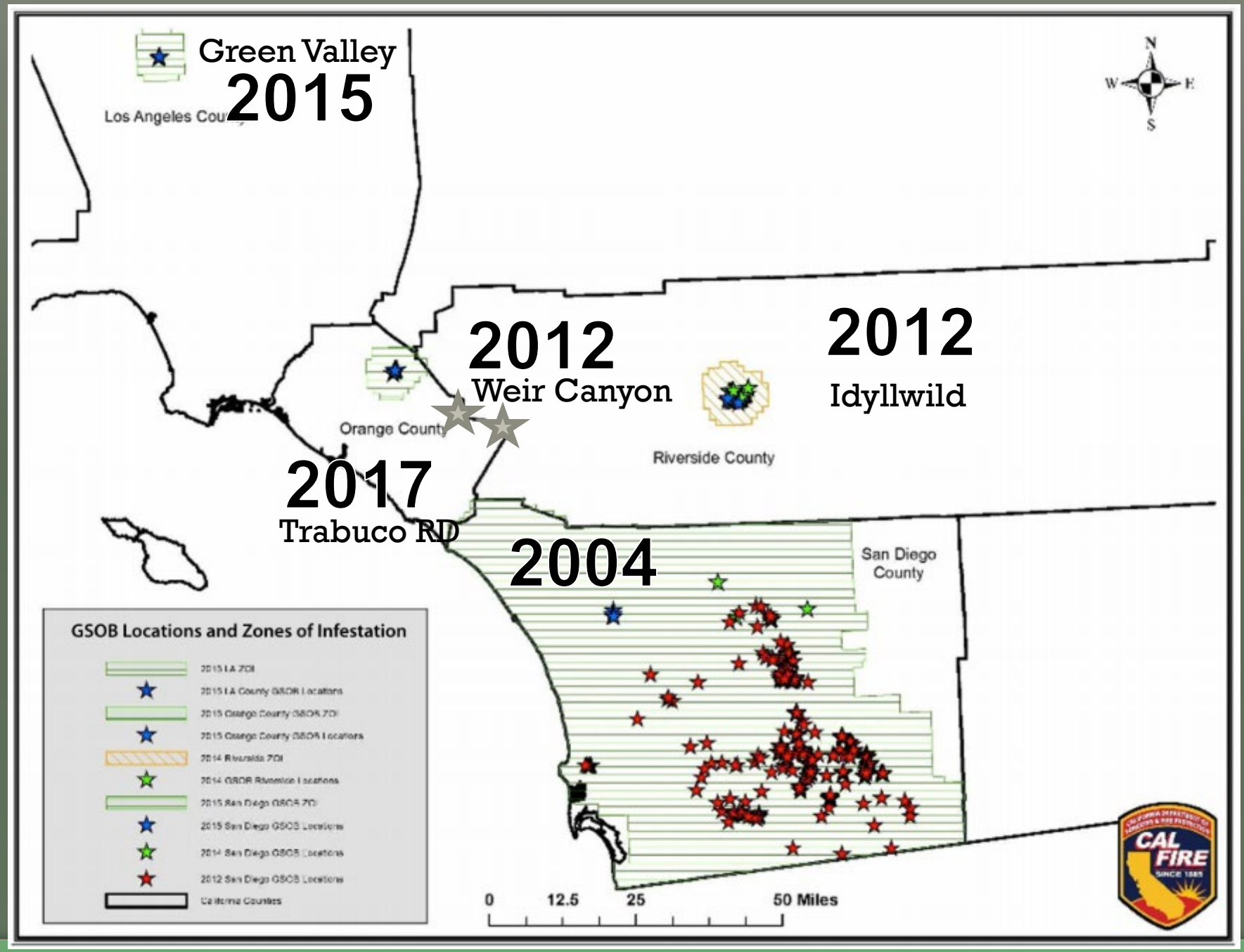
Satellite imagery of the same site in San Diego Co. in 2003 (left) and 2010 (right)

Trees with grey crowns have been killed by GSOB.

INFESTED FIREWOOD

Heading North on Hwy 15 from San Diego

A likely scenario for the human-assisted movement of GSOB into and within CA.



Dates indicate when GSOB was initially identified in each area

Native range

Arizona

- 2% mortality
- 4% infestation

Invasive range

San Diego Co. epicenter

- up to 45% mortality
- >90% infestation

Emory oak foliage (*Quercus emoryi*)

Oak mortality in San Diego Co.

Hosts in CA

Attacks coast live oak, California black oak, canyon live oak, and Engelmann oak in southern CA

- Prefers red oak species
- Prefers larger diameter trees

CA black oak
> 20" DBH

Coast live oak
>18"DBH

Canyon live oak

Engelmann oak

How does GSOB kill trees?

- GSOB larval feeding girdles trees
- Larval feeding occurs primarily at the interface of the phloem and xylem
- Several years of repeated larval feeding are required to kill a tree
- Greatest density of attacks occur along the lower tree bole

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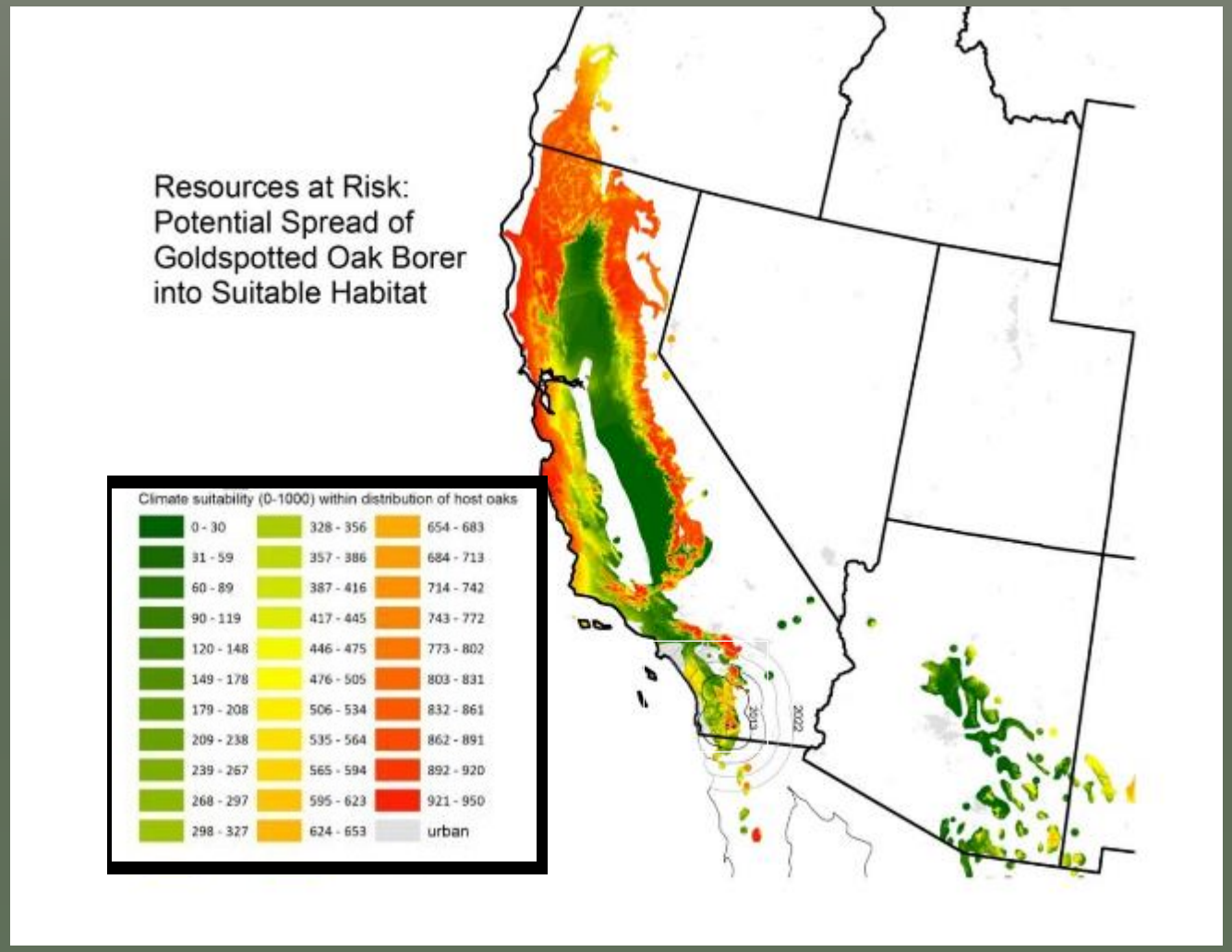
Treatment options are limited:

- protect high value trees with insecticides
- remove infested trees
- manage wood

  - funding/capacity constraints

Risk of establishment in the United States

- **The highest risk of establishment:**
  - throughout CA along the Coastal Mountain Range and the foothills of the Sierra Nevada Mountain Range and into southwestern Oregon.
- **Additional risk:**
  - native region of AZ and southwestern New Mexico and in Baja California Norte, Mexico
- Model did not account for human mediated spread



Climatically suitable areas with susceptible hosts appear as shades of yellow (moderately suitable), orange, and red (highly suitable)

Venette et al., 2015

- Tribal lands affected: coast live oaks and CA black oaks
- San Diego, Orange, Riverside, Los Angeles Counties
- Angeles, Cleveland and San Bernardino NFs
- Using bifenthrin and carbaryl for insecticide treatment
- movement in infested firewood
- active work group and steering committee - many partners and agencies
- CA Climate Initiative funding (work in Green Valley area)
- Lots of volunteer time and effort

Invasive shot hole borers (*Euwallacea* nr. *fornicatus*)

native range: southeast Asia

Invasive shot hole borers were most likely introduced to CA in wood-packing material from southeast Asia.




- Majority of their life cycle is spent in galleries
- Brothers and sisters can mate in galleries
- Females are already mated when they emerge

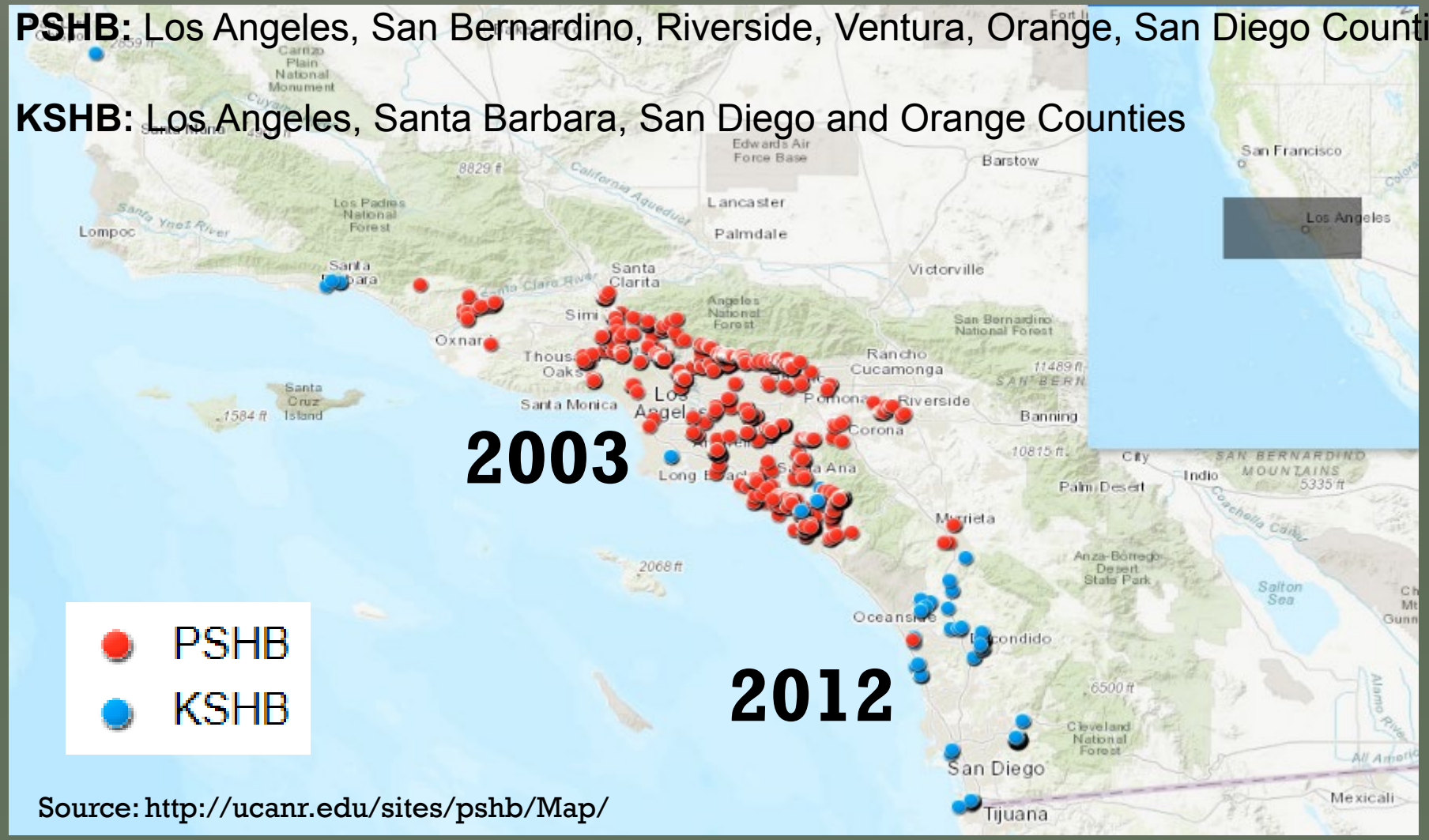
Reproductive host species:
PSHB: 64
KSHB: 15

Photos: Akif Eskalen/UC Riverside; Mike Lewis/UC Riverside

Current distribution of invasive polyphagous and Kuroshio shot hole borers in southern CA

PSHB: Los Angeles, San Bernardino, Riverside, Ventura, Orange, San Diego Counties

KSHB: Los Angeles, Santa Barbara, San Diego and Orange Counties



Female beetles spread short distances via natural flight.

Longer distance spread is human-assisted.

August 2018

Invasive Shot Hole Borers Quarterly Situation Report - January through March 2018

2013-2017
Invasive Shot Hole Borer (ISHB) Expenditures for Tree Removals & Treatments from Orange County Parks
2013-2017

- Number of treatments: 3424
- Number of trees treated: 1491
- Total cost of treatment: $461,420
- Number of ISHB infested trees removed: 1617
- Total cost for removal: $559,830
- Total cost of treatments & removals: $1,021,250
- Total value of trees removed because of ISHB: $6,574,930

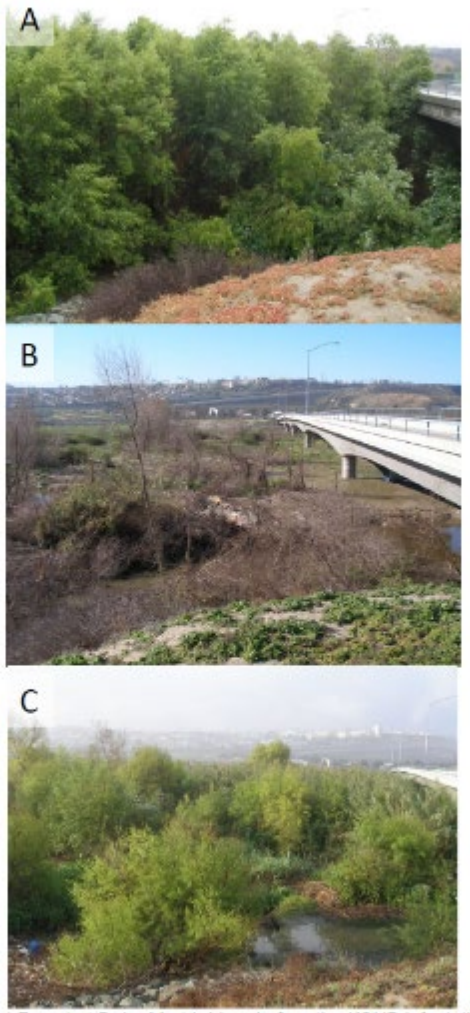
source: Cathy Nowak, Senior Planner, Orange County Parks

Tijuana River Valley

2015-2017

- 355,510 infested willows
- 95,791 dead willows
- 71,280 willows re-sprouted

- The Tijuana River Valley is an anomaly – sewage polluted site
- Arundo, castor bean, and tamarisk are abundant in the stream bed
- Least Bell's vireo have not been extirpated; breeding habitat is now shrub-like



May 2015

Feb. 2016

March 2018

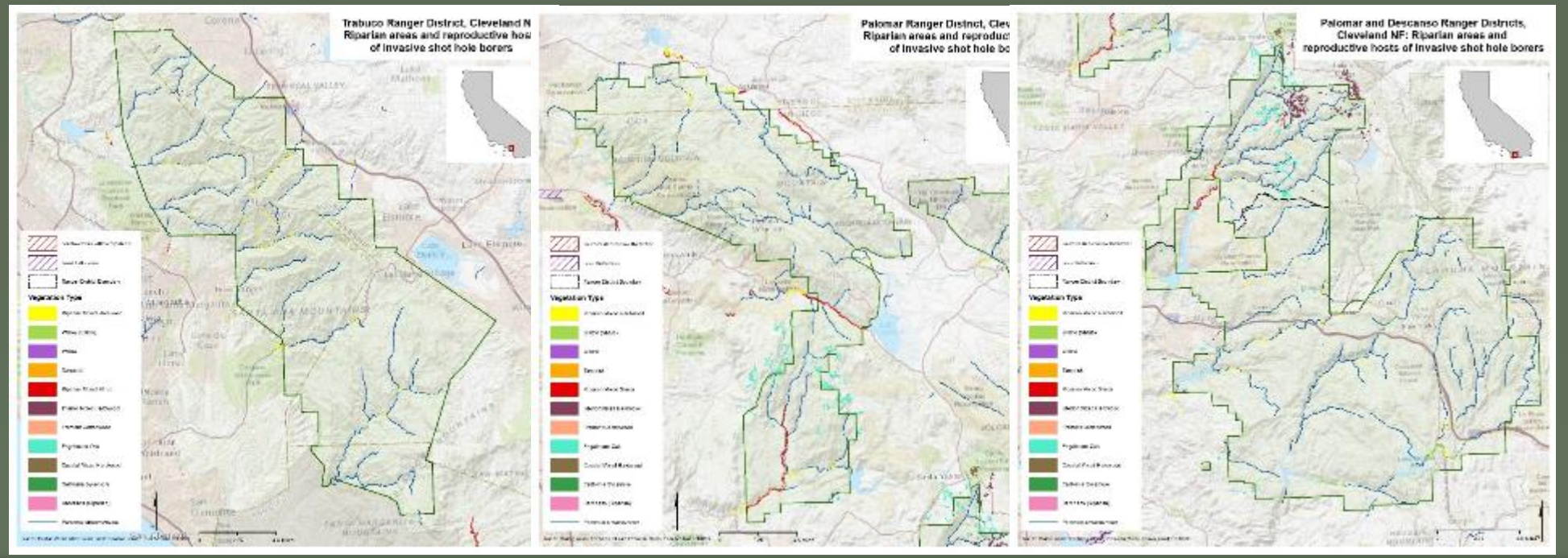
Figure 14. The Wet Forest at Dairy Mart bridge: before the KSHB infestation (A, May 2015); after the KSHB infestation (B, February 2016); and recently, showing the current forest recovery (C, March 2018).

Boland 2017

KSHB in TRV, Year 3, Boland 2018

Risk assessment of ISHB to Cleveland National Forest land

- ISHB host trees and threatened and endangered species areas on national forest land in riparian areas
- Identified 8 riparian areas less than 10 miles from known infestation (priority area for monitoring given high likelihood of introduction and establishment)
- Estimated 6,000 acres of riparian forest at risk of ISHB invasion



Potential ecological impacts to National Forests

- Erosion in forest streams
- Invasive plants…or transition to chaparral species
- Stream water temperatures
- Dead woody debris and fire hazard

thenounproject.com

- Water levels
- Other impacts to native plants, mammals, invertebrates, amphibians, and birds

ISHB Working Group Stakeholder Organizations
175 people representing over 60 public and private organizations.

APHIS (USDA Animal and Plant Health Inspection Services)
Brentwood (Los Angeles) Community Council
California Agricultural Commissioners and Sealers Association (CACASA)
California Association of Pest Control Advisers (CAPCA)
California Avocado Commission
CAL FIRE (California Department of Forestry and Fire Protection)
California Department of Fish and Wildlife
California Department of Food and Agriculture
California Firewood Taskforce California Native Plant Society
California Department of Parks and Recreation
California State Senate Center for Invasive Species Prevention
Center for Natural Lands Management City of Pasadena
City of San Diego
Davey Tree Service
Everest Consultants
Farm Bureau-San Diego County Farm Bureau-Ventura County
Irvine Ranch Conservancy
Los Angeles County Agriculture, Weights and Measures
Los Angeles County Arboretum
Los Angeles County Fire and Forestry
Los Angeles County Parks
Los Angeles/Santa Monica Mountains Chapter, California Native Plant Society
Malibu Creek State Park
National Park Service
Native American Environmental Protection Coalition
Nature Reserve of Orange County
North East Trees
NRCS (USDA Natural Resource Conservation Service)
Orange County Agricultural Commissioner
Orange County Fire Authority
Orange County Parks
Orange County Public Works
Rebecca Latta Consulting Arborist
Resource Conservation District of Riverside
Resource Conservation District of San Diego
Resource Conservation District of the Santa Monica Mountains
River Partners
Riverside/San Bernardino Chapter, California Native Plant Society
San Diego County Agriculture, Weights and Measures
San Diego County Parks SANDAG (San Diego Association of Governments)
Santa Barbara County Agricultural Commissioner
Santa Barbara County Master Gardeners
Santa Clara County Agricultural Commissioner/CACASA Pest Prevention Committee
Santa Monica Mountains National Recreation Area
Southwest Wetlands Interpretive Association (SWIA)
Sycuan Band of the Kumeyaay Nation
The Huntington Library, Art Collections and Botanical Gardens
The Nature Conservancy
Topanga State Park
Tree People
University of California Cooperative Extension
University of California Cooperative Extension, Master Gardeners
University of California Division of Agriculture and Natural Resources (UCANR)
University of California, Irvine
University of California, Riverside
University of California, Santa Barbara
University of California, Santa Barbara, Marine Science Institute
University of California, Santa Cruz
US Bureau of Indian Affairs
US Bureau of Land Management
US Fish and Wildlife Service
USDA Forest Service , Cleveland NF, Forest Health Protection, State and Private Forestry, R5
USDI National Park Service-Santa Monica Mountains National Recreation Area
Valley Crest Tree Company
Ventura County Agricultural Commissioner
West Coast Arborists, Inc.
Western Chapter of International Society of Arboriculture

ONGOING ACTIVITIES - ISHB

- Funding, legislation, planning, policy and regulation
- Surveying, monitoring, detection, mapping
- Research
- Management and restoration
- Wood utilization, sanitation and disposal
- Education and outreach; media

Predicted impacts associated with shot hole borers in So Cal urban Areas

- Estimates for **urban areas in three climate zones** where PSHB is found: Inland Empire, Coastal Southern California and Southwest Desert, comprising **4,244 sq. miles and 20.5 million residents.**
- Approximately **27 million trees, 38%** of the region's 71 million trees, are at risk.
- The **cost for removing and replacing** the 27 million trees should they die is approximately **$36 billion**.
- The value of **ecosystem services forgone** each year due to the loss of these trees is **$1.4 billion**.

Source: Dr. Greg McPherson, US Forest Service (retired)

- Energy conservation
- Air quality improvement
- Carbon storage
- Storm water runoff reduction
- Wildlife habitat
- Social, aesthetic, and health benefits

Assembly Bill No. 2470, CHAPTER 870

[Approved by Governor September 28, 2018. Filed with Secretary of State September 28, 2018.]
AB 2470, Grayson. Invasive Species Council of California. ($2 million)

Establishes the Invasive Species Council of California, with a prescribed membership, to help coordinate a comprehensive effort to prevent the introduction of invasive species in the state and to advise state agencies how to facilitate coordinated, complementary, and cost-effective control or eradication of invasive species that have entered or are already established in the state, as specified.

Authorizes the council to establish advisory committees and ad hoc working groups, including the California Invasive Species Advisory Committee, with a prescribed membership, to advise the council on a broad array of issues related to preventing the introduction of invasive species and providing for their control or eradication, as well as minimizing the economic, ecological, and human health impacts that invasive species cause, as specified.

Requires the council to coordinate with state and local public agencies, publicly funded educational institutions, and stakeholder groups to develop a plan for the cure or suppression of diseases associated with the spread of invasive shot hole borers.

Establishes the Invasive Species Account in the Department of Food and Agriculture Fund and moneys in the account would be available, upon appropriation, to the Secretary of Food and Agriculture for the purposes of funding invasive species projects and activities recommended by the council.

Revises the purposes for which 20% of the moneys in the Noxious Weed Management Account are to be allocated for research to instead be made available through a grant program administered by the department for proposals evaluated in consultation with the Range Management Advisory Committee, with an emphasis placed on the funding of needs-based, applied, and practical research, as specified.

- Management options are limited, particularly in riparian areas.
- Have a good trap/lure for detection – statewide detection being planned.
- Spread and infestation rates are hard to predict but can happen very quickly.
- Can protect high value trees but this is expensive and currently requires multiple treatments for a long time.
- Upland riparian corridors on NFS lands will be affected by insects moving from the urban areas (e.g. Prado Dam area is heavily infested – Santa Ana River (SBNF).
- Continuing to look for biological control agents.
- CDFA-led ISHB Strategic Plan will be developed (Assembly Bill 2470).

Invasive Plants

- Annual invasive grasses (e.g., bromes, oats, goatgrasses, medusahead, others)
- Native to Europe
- Occur across millions of acres throughout the Western US
- Displace native plants, change fire regimes, affect wildlife habitat

Top 20 Largest California Wildfires

	FIRE NAME *(CAUSE)*	DATE	COUNTY	*ACRES*	STRUCTURES	DEATHS
1	MENDOCINO COMPLEX* *(Under Investigation)*	July 2018	Colusa County, Lake County, Mendocino County & Glenn County	459,123	280	1
2	THOMAS *(Under Investigation)*	December 2017	Ventura & Santa Barbara	281,893	1,063	2
3	CEDAR *(Human Related)*	October 2003	San Diego	273,246	2,820	15
4	RUSH *(Lightning)*	August 2012	Lassen	271,911 CA / 43,666 NV	0	0
5	RIM *(Human Related)*	August 2013	Tuolumne	257,314	112	0
6	ZACA *(Human Related)*	July 2007	Santa Barbara	240,207	1	0
7	CARR *(Human Related)*	July 2018	Shasta County, Trinity County	229,651	1,604	7
8	MATILIJA *(Undetermined)*	September 1932	Ventura	220,000	0	0
9	WITCH *(Powerlines)*	October 2007	San Diego	197,990	1,650	2
10	KLAMATH THEATER COMPLEX *(Lightning)*	June 2008	Siskiyou	192,038	0	2
11	MARBLE CONE *(Lightning)*	July 1977	Monterey	177,866	0	0
12	LAGUNA (POWERLINES)	September 1970	San Diego	175,425	382	5
13	BASIN COMPLEX *(Lightning)*	June 2008	Monterey	162,818	58	0
14	DAY FIRE *(Human Related)*	September 2006	Ventura	162,702	11	0
15	STATION *(Human Related)*	August 2009	Los Angeles	160,557	209	2
16	ROUGH *(Lightning)*	July 2015	Fresno	151,623	4	0
17	McNALLY *(Human Related)*	July 2002	Tulare	150,696	17	0
18	STANISLAUS COMPLEX *(Lightning)*	August 1987	Tuolumne	145,980	28	1
19	BIG BAR COMPLEX *(Lightning)*	August 1999	Trinity	140,948	0	0
20	HAPPY CAMP COMPLEX *(Lightning)*	August 2014	Siskiyou	134,056	6	0

* Fires uncontained and totals are likely to change.

*There is no doubt that there were fires with significant acreage burned in years prior to 1932, but those records are less reliable, and this list is meant to give an overview of the large fires in more recent times.
**This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility.

9/5/2018

Thank you!

Questions?

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