INVASIVE SHOT-HOLE BORERS: UPDATES FROM ORANGE COUNTY

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

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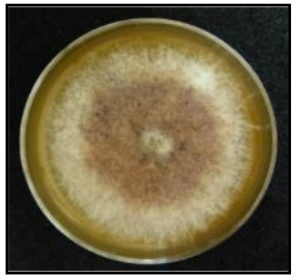
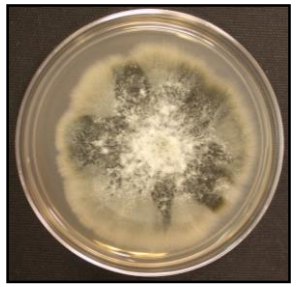
Invasive Shot-Hole Borers / Fusarium Dieback

Polyphagous Shot Hole Borer
(PSHB)

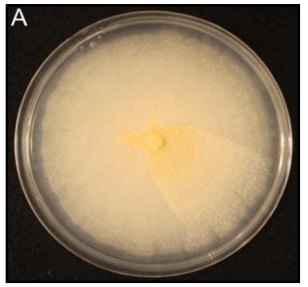
Photos | Akif Eskalen - UCR



Fusarium euwallaceae



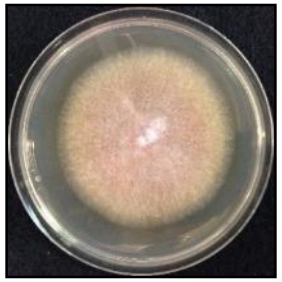
Graphium euwallaceae



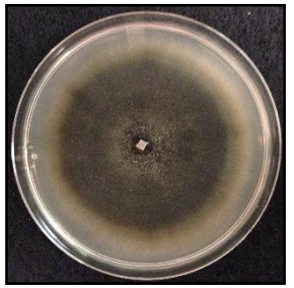
Acremonium pembeum

Kuroshio Shot Hole Borer
(KSHB)

Photos | Akif Eskalen - UCR



Fusarium kuroshium



Graphium kuroshium

Reproductive Host Species

Susceptible to ISHB/FD (cause tree death)

1. *Acer buergerianum* - Trident maple
2. *Acer macrophyllum* - Big leaf maple*
3. *Acer negundo* - Box elder*
4. *Parkinsonia aculeata* - Palo verde
5. *Platanus racemosa* – California sycamore*
6. *Platanus* x *hispanica* - London plane
7. *Populus fremontii* – Fremont cottonwood*
8. *Populus nigra* - Black poplar*
9. *Populus trichocarpa* - Black cottonwood*
10. *Quercus lobata* - Valley oak*
11. *Quercus robur* - English oak
12. *Ricinus communis* - Castorbean
13. *Salix gooddingii* - Black willow*
14. *Salix laevigata* - Red willow*
15. *Salix lasiolepis* - Arroyo willow*

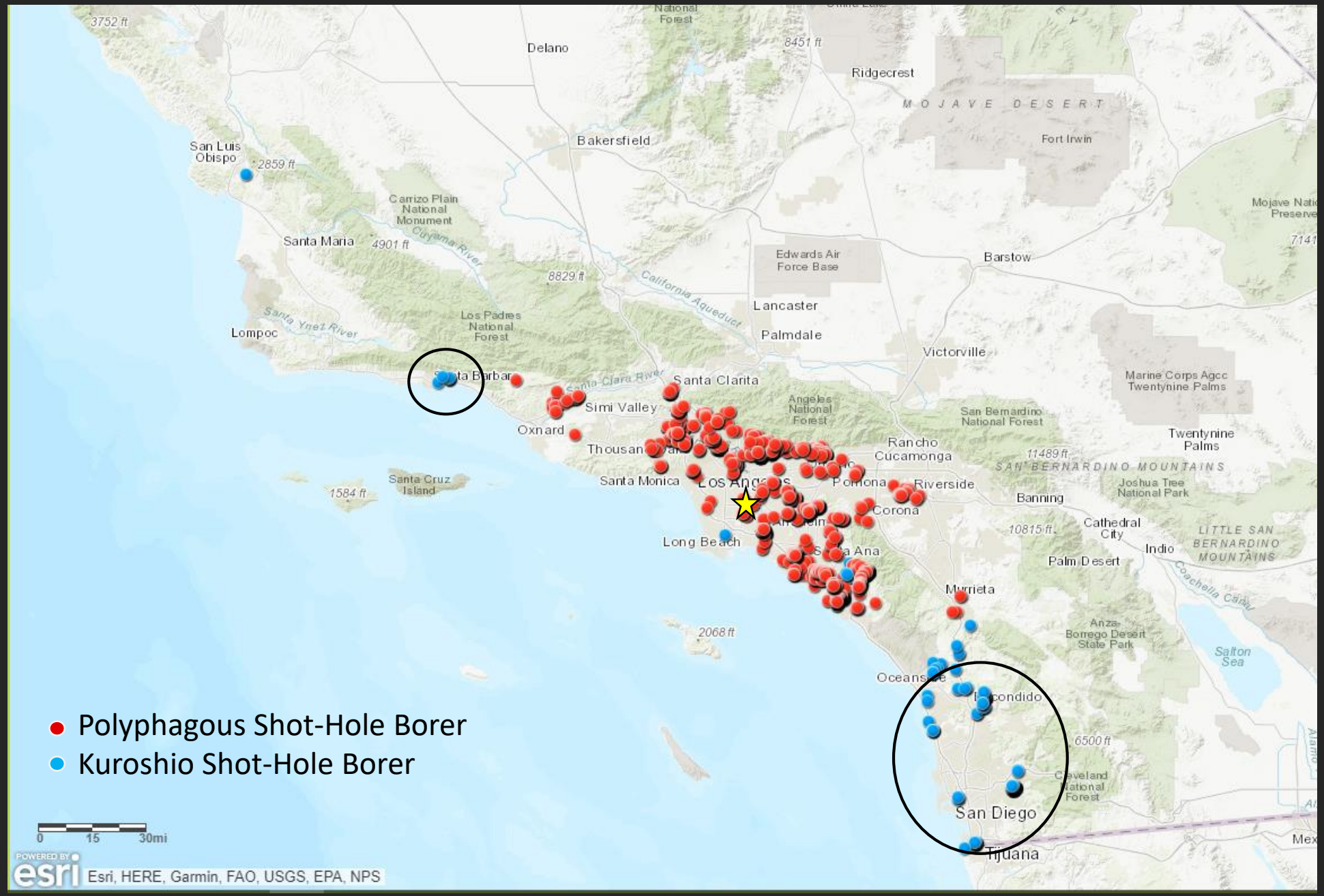
* California Natives

Reproductive Host Species

* California Natives

Less susceptible to ISHB/FD (causes branch dieback) and/or the beetle commonly colonizes at the margin of canker diseases.

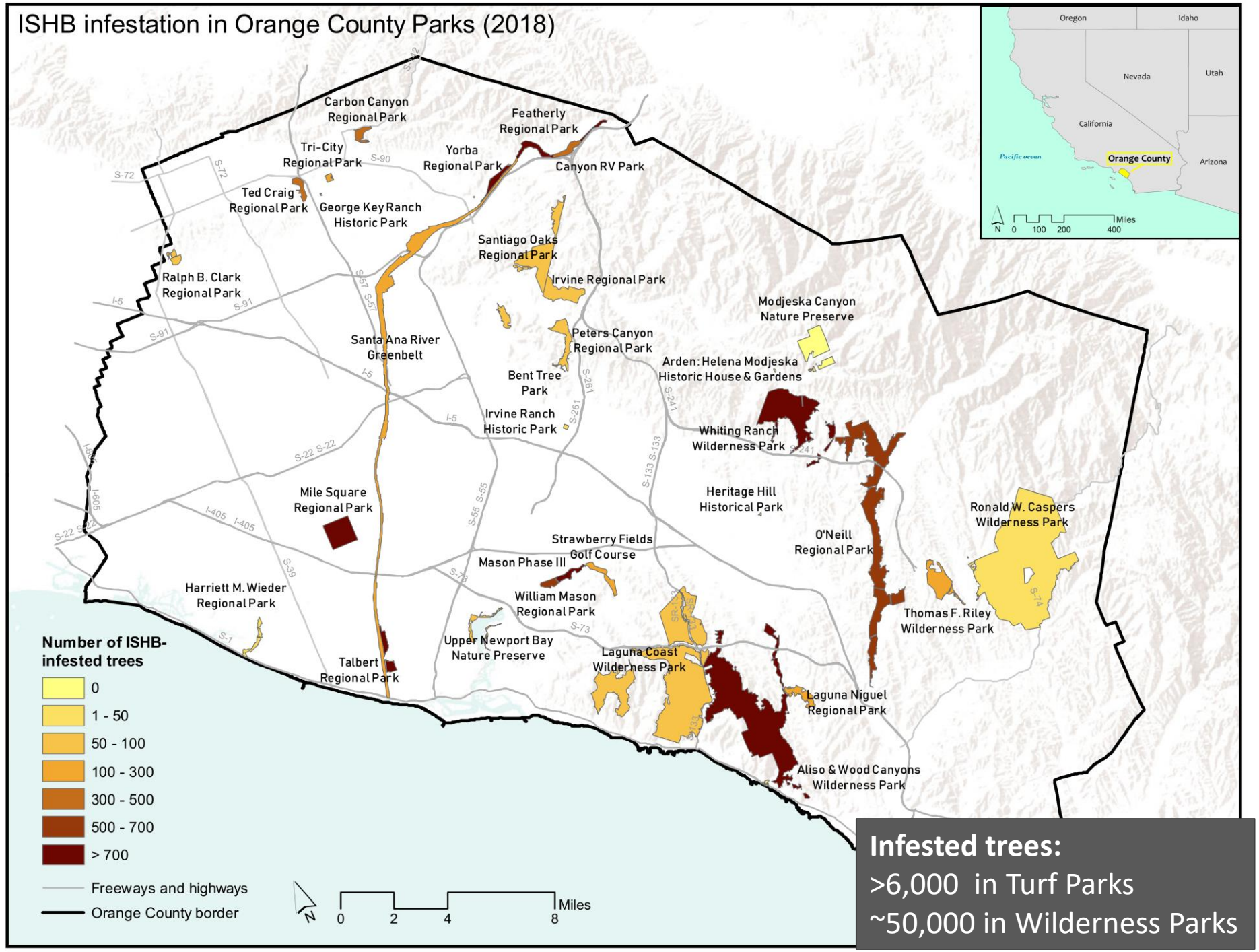
1. *Acacia melanoxylon* - Australian blackwood
2. *Acacia* spp. - Acacia
3. *Acer paxi*i -Evergreen maple
4. *Aesculus californica* - California buckeye*
5. *Ailanthus altissima* - Tree of heaven
6. *Albizia julibrissin* - Mimosa
7. *Alectryon excelsus* - Titoki
8. *Alnus rhombifolia* - White alder*
9. *Archontophoenix cunninghamiana* - King palm
10. *Baccharis salicifolia* - Mule fat*
11. *Bauhinia variegata* - Purple orchid Tree
12. *Brachychiton populenus* – Kurrajong
13. *Camellia semiserrata* - Camellia
14. *Castanospermum australe* - Moreton bay chestnut
15. *Cercidium floridum* - Blue palo verde*
16. *Cercidium sonorae* - Brea
17. *Cocculus laurifolius* - Laurel leaf Snail Seed Tree
18. *Cupaniopsis anacardioides* - Carrotwood
19. *Dombeya cacuminum* - Strawberry tree
20. *Erythrina caffra* - Coast coral tree
21. *Erythrina coralloides* - Coral tree
22. *Erythrina falcata* - Brazilian coral tree
23. *Eucalyptus ficifolia* - Red flowering gum
24. *Fagus crenata* - Japanese beech
25. *Ficus altissima* - Council tree
26. *Ficus carica* - Black mission
27. *Gleditsia triacanthos* - Honey locust
28. *Harpullia pendula* - Tulip wood
29. *Howea forsteriana* - Kentia palm
30. *Ilex cornuta* - Chinese holly
31. *Jacaranda* mimosifolia - Jacaranda
32. *Acer palmatum*- Japanese maple
33. *Koelreuteria bipinnata* -Chinese flame tree
34. *Liquidambar styriciflua* - American sweet gum
35. *Magnolia grandiflora* - Southern magnolia
36. *Platanus mexicana* - Mexican sycamore
37. *Prosopis articulata* – Mesquite*
38. *Pterocarya stenoptera* - Chinese wingnut
39. *Quercus agrifolia* - Coast live oak *
40. *Quercus chrysolepis* - Canyon live oak*
41. *Quercus engelmannii* - Englemann oak*
42. *Quercus suber* - Cork oak
43. *Salix babylonica* - Weeping willow
44. *Spathodea campanulata* - African tulip tree
45. *Tamarix ramosissima* - Tamarisk
46. *Wisteria floribunda* - Japanese wisteria
47. *Xylosa congestum* - Dense logwood/Shiny Xylosma



Source: www.pshb.org

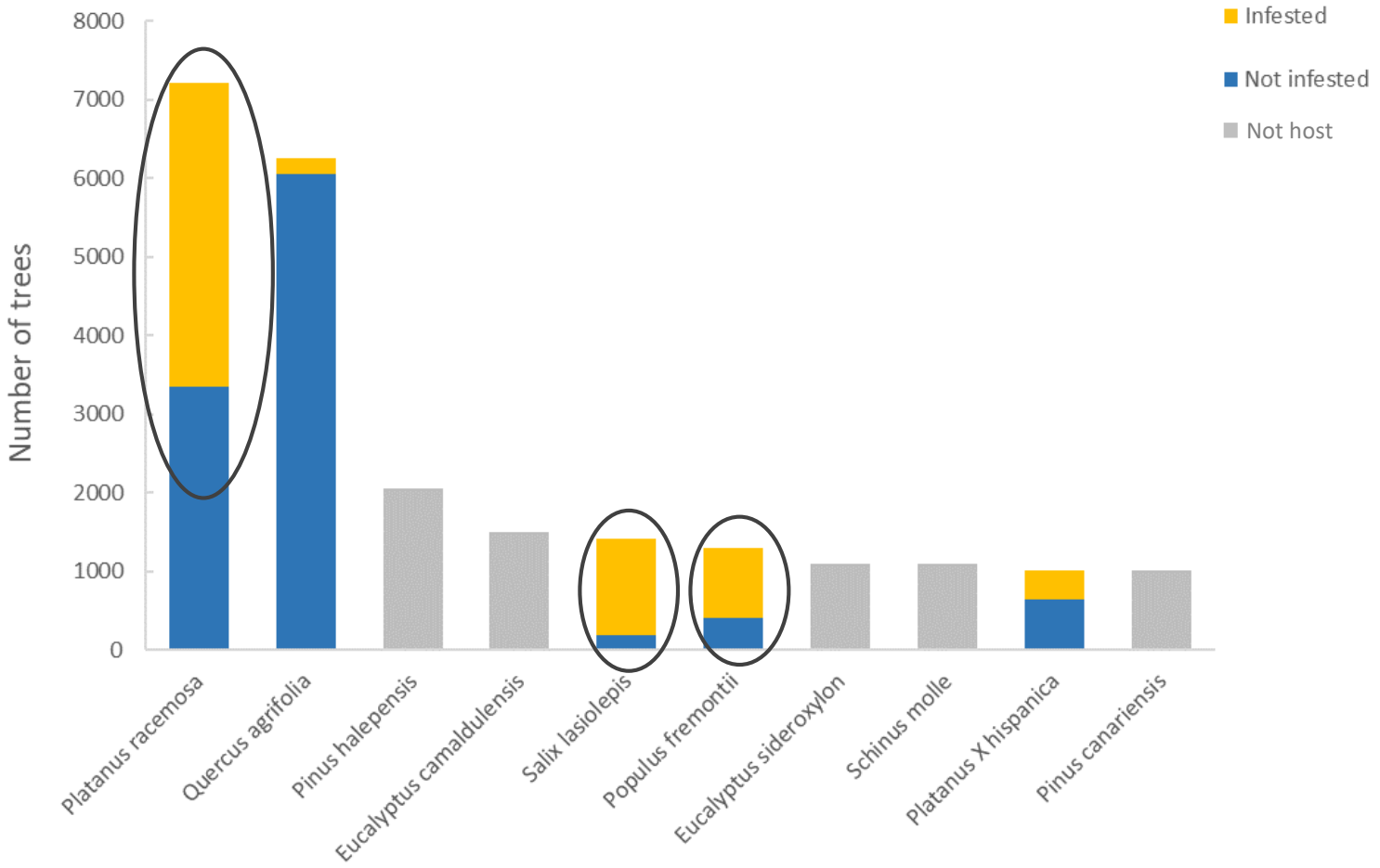
Our experience working with OC Parks

- Species preference/susceptibility
- Spatial patterns of infestation
- Management guidelines



Infested trees:
>6,000 in Turf Parks
~50,000 in Wilderness Parks

Ten most abundant species in OC Parks



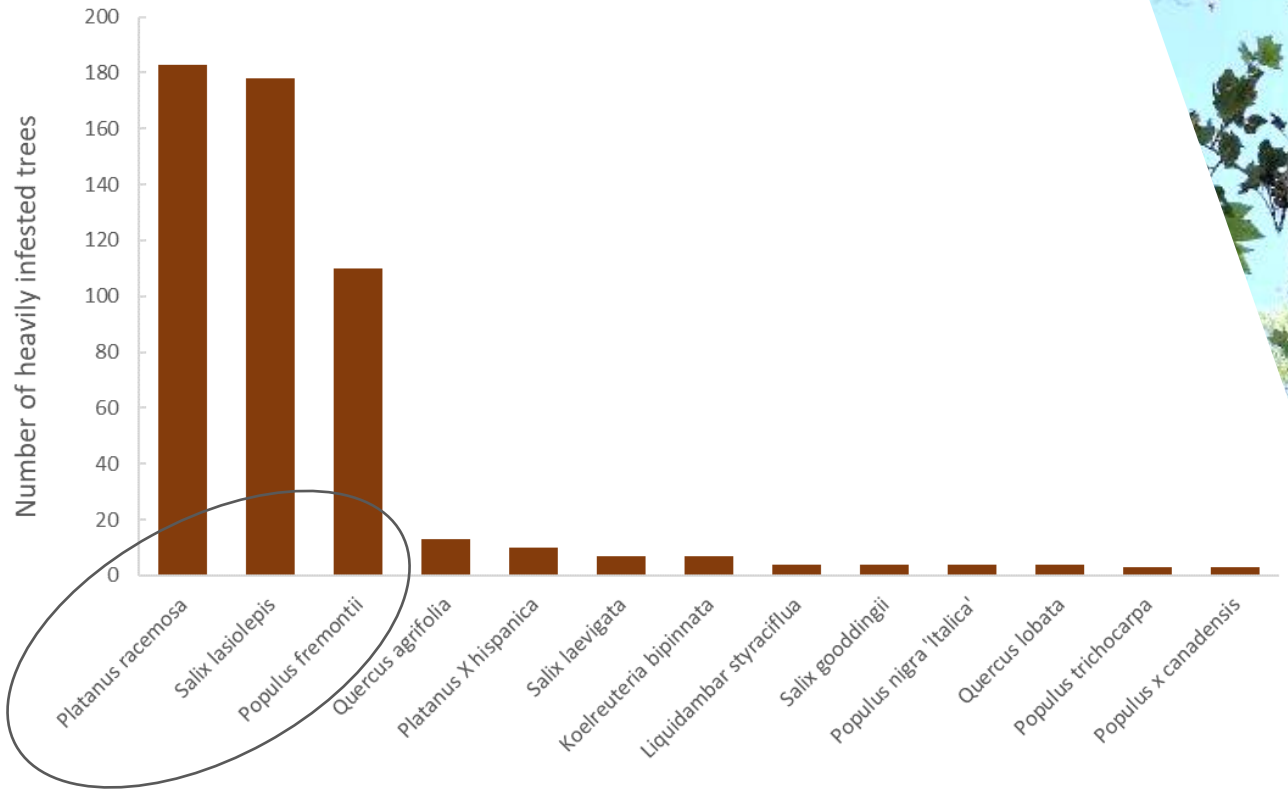
Top 3 Infested Species at OC Parks

California Sycamore
47% of OCP infestation

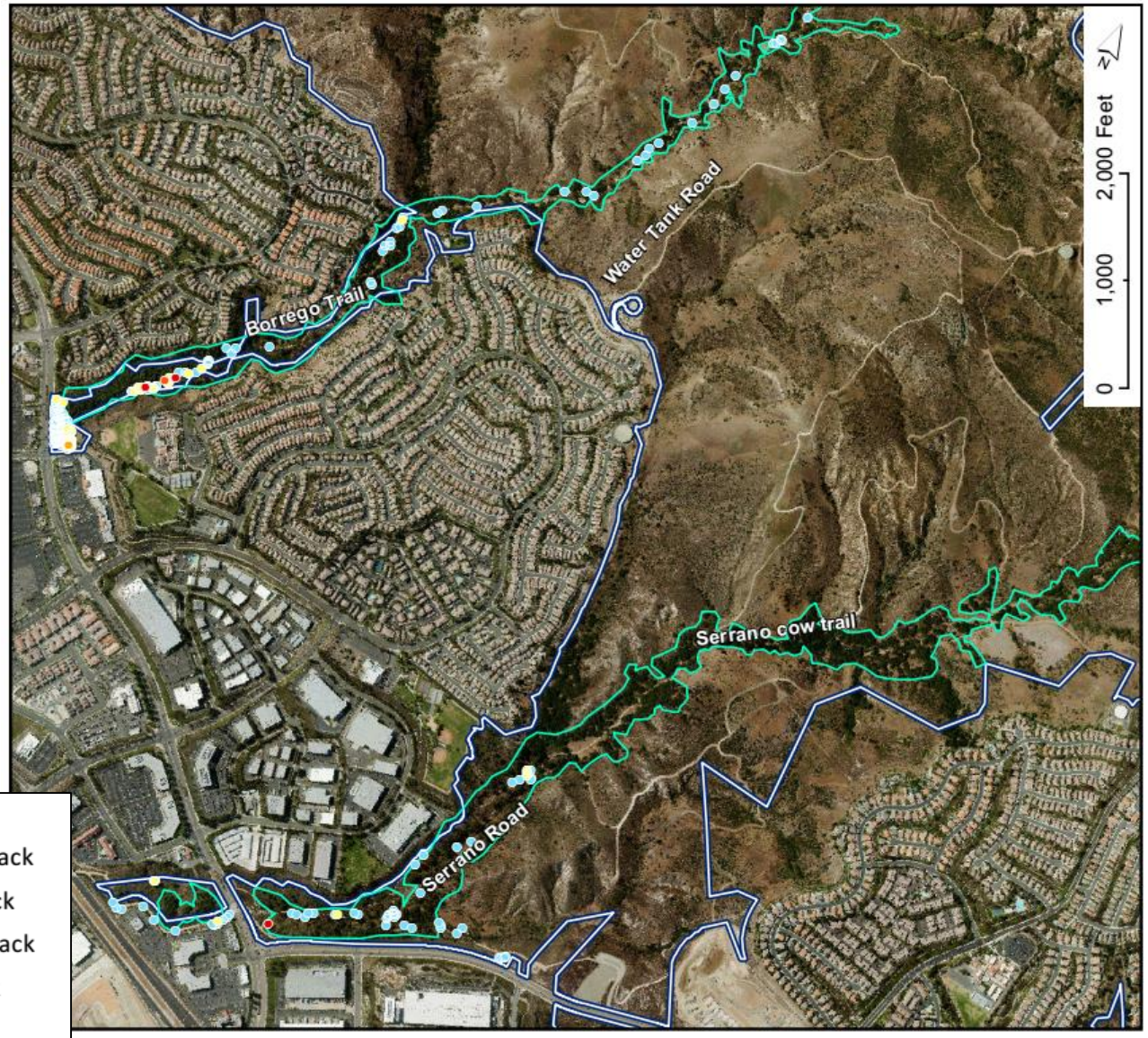
Willows
15% of OCP infestation

Cottonwood
11% of OCP infestation

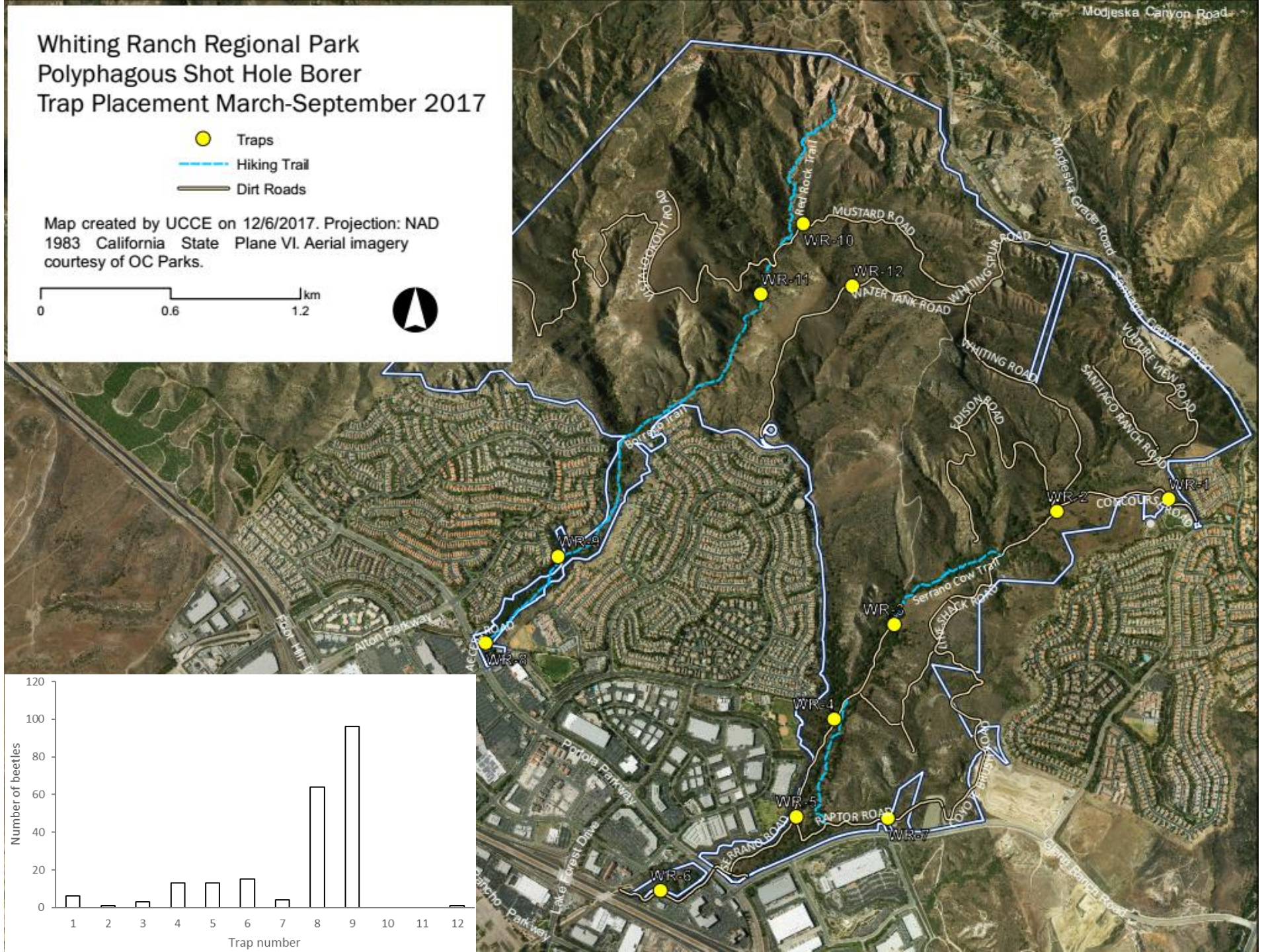
Heavily infested trees in OC Parks



Whiting Ranch



Infestation Level	Definition
Heavy	>150 holes, with dieback
Moderate II	>150 holes, no dieback
Moderate I	50-150 holes, no dieback
Low	<50 holes, no dieback
None	no infestation

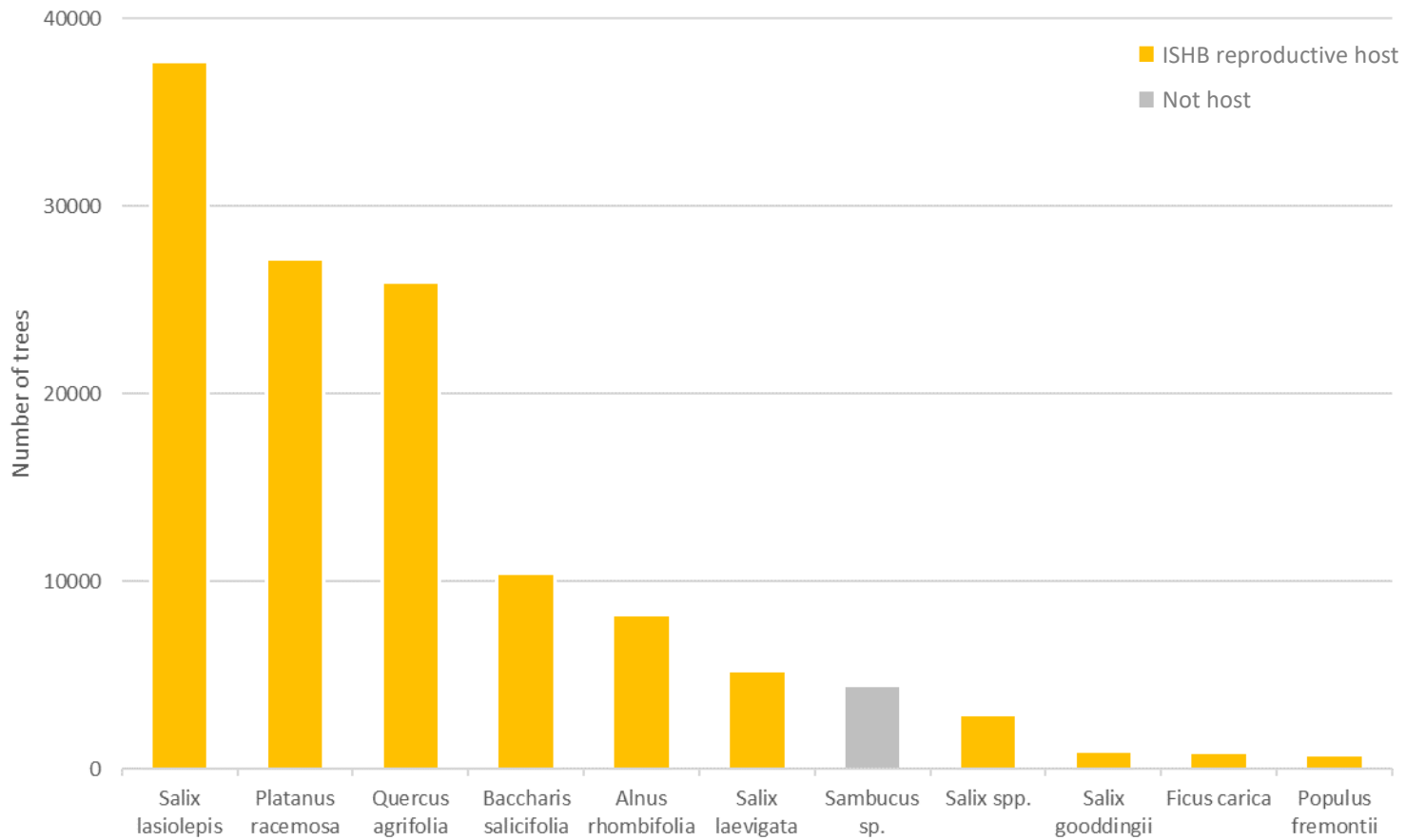

Whiting Ranch Regional Park
Polyphagous Shot Hole Borer
Trap Placement March-September 2017
Traps
Hiking Trail
Dirt Roads
Map created by UCCE on 12/6/2017. Projection: NAD 1983 California State Plane VI. Aerial imagery courtesy of OC Parks.
0
0.6
1.2
km
Modjeska Canyon Road
Red Rock Trail
MUSTARD ROAD
WR-10
WR-11
WR-12
WATER TANK ROAD
WHITING SPUR ROAD
Modjeska Grade Road
Santiago Canyon Road
VISTA HOYO ROAD
WHITING ROAD
VULTURE VIEW ROAD
SANTIAGO RANCH ROAD
EDISON ROAD
WR-1
WR-2
CONCOURS ROAD
Bobcat Trail
WR-9
Alton Parkway
ACCESS ROAD
WR-8
Serrano Cow Trail
WR-3
LOW SHACK ROAD
WR-4
Portola Parkway
WR-5
RAPTOR ROAD
WR-7
COYOTE CANYON ROAD
SILVERADO RANCH ROAD
WR-6
Lake Forest Drive
Rancho Parkway
Glenn Ranch Road
Number of beetles
Trap number
0
20
40
60
80
100
120
1
2
3
4
5
6
7
8
9
10
11
12

Urban/Wilderness Interface

Drought vs. No drought conditions

Image | Google earth

Species composition in Wilderness parks



Factors to Consider for managing:

- Host Species
- Infestation Level
- Host Value
- Hazard Level

Level of Infestation	# Entry/Exit Holes	Dieback Observed
Low	< 50	No
Moderate	50-150	No
Heavy	>150	No
Severe	≥ 150	Yes

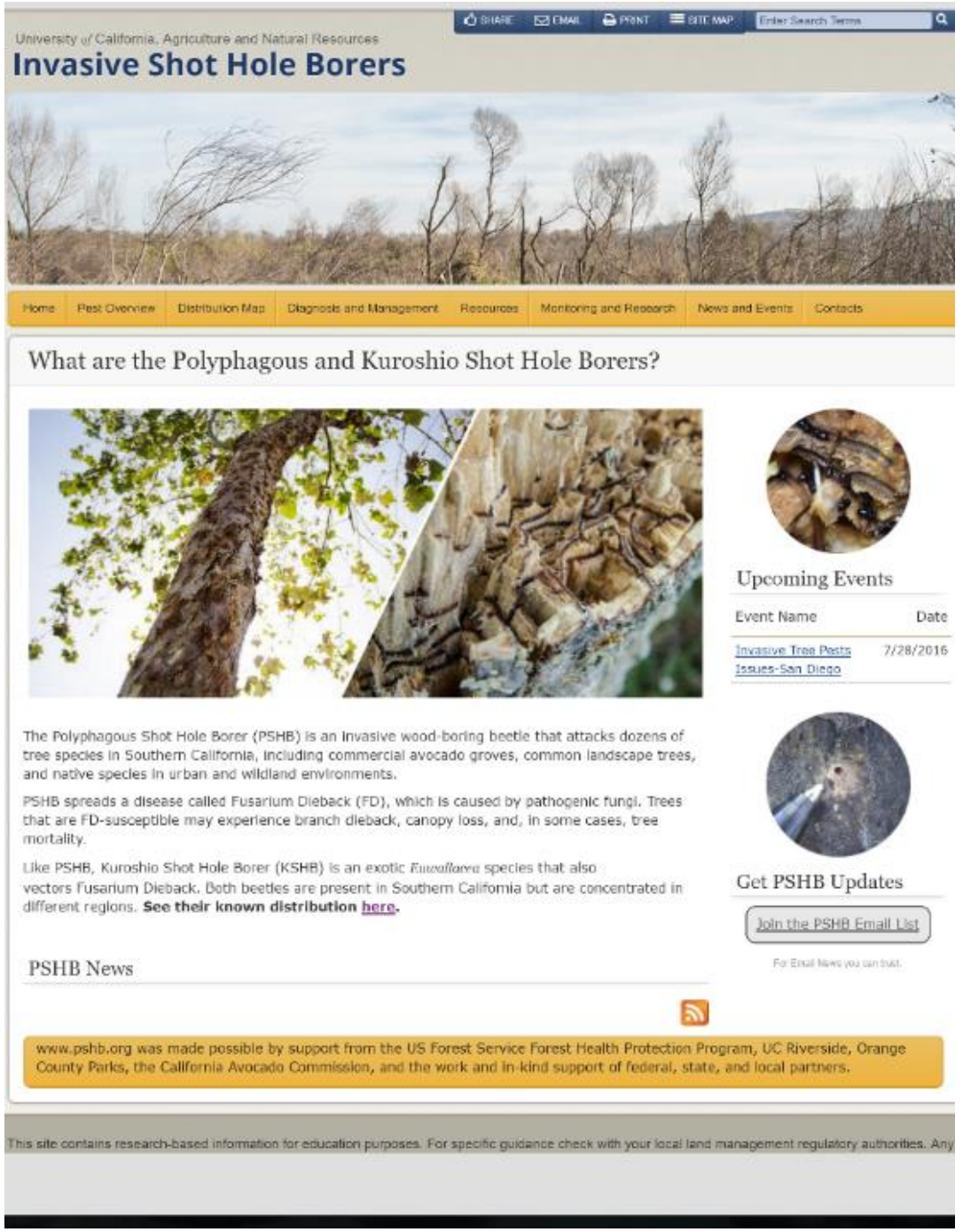
Management matrix example (different for each case)

			ISHB Infestation Level				
	Host Species	Hazard Level	No infestation	Low	Moderate	Heavy	Severe
HIGH VALUE HOSTS	Reproductive	Low	Preventative treatment	Treat/prune infested branches	Treat/prune infested branches	Treat/prune infested branches	Remove tree or infested branches
		High	Preventative treatment	Treat/prune infested branches	Treat/prune infested branches	Remove tree or infested branches	Remove tree or infested branches
	Non-Reproductive	Low	Monitor	Monitor	Notify UC ANR; reclassify species as reproductive host in consultation with ISHB/FD experts		
		High	Monitor	Monitor			

			ISHB Infestation Level				
	Host Species	Hazard Level	No infestation	Low	Moderate	Heavy	Severe
LOW VALUE HOSTS	Reproductive	Low	Monitor	Monitor	Remove tree or infested branches	Remove tree or infested branches	Remove tree or infested branches
		High	Monitor	Treat/prune infested branches	Remove tree or infested branches	Remove tree or infested branches	Remove tree or infested branches
	Non-Reproductive	Low	Monitor	Monitor	Notify UC ANR; reclassify species as reproductive host in consultation with ISHB/FD experts		
		High	Monitor	Monitor			

- > 1,200 heavily infested trees removed
- > 1,300 treated trees
- Ongoing research projects on new control methods

PSHB.ORG


University of California, Agriculture and Natural Resources
Invasive Shot Hole Borers
Home
Pest Overview
Distribution Map
Diagnosis and Management
Resources
Monitoring and Research
News and Events
Contacts
What are the Polyphagous and Kuroshio Shot Hole Borers?
The Polyphagous Shot Hole Borer (PSHB) is an invasive wood-boring beetle that attacks dozens of tree species in Southern California, including commercial avocado groves, common landscape trees, and native species in urban and wildland environments.
PSHB spreads a disease called Fusarium Dieback (FD), which is caused by pathogenic fungi. Trees that are FD-susceptible may experience branch dieback, canopy loss, and, in some cases, tree mortality.
Like PSHB, Kuroshio Shot Hole Borer (KSHB) is an exotic Euwallacea species that also vectors Fusarium Dieback. Both beetles are present in Southern California but are concentrated in different regions. See their known distribution here.
PSHB News
Upcoming Events
Event Name
Date
Invasive Tree Pests Issues-San Diego
7/28/2016
Get PSHB Updates
Join the PSHB Email List
www.pshb.org was made possible by support from the US Forest Service Forest Health Protection Program, UC Riverside, Orange County Parks, the California Avocado Commission, and the work and in-kind support of federal, state, and local partners.
This site contains research-based information for education purposes. For specific guidance check with your local land management regulatory authorities. Any

Acknowledgements

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Matt Deines, UC Irvine

OC Parks

California Avocado Commission

California Association of Nurseries and Garden Centers

Cal Fire

Great Scott Tree Services

RPW Services Inc.

US Forest Service

USDA Farm Bill and Specialty Crop Grants

West Coast Arborists