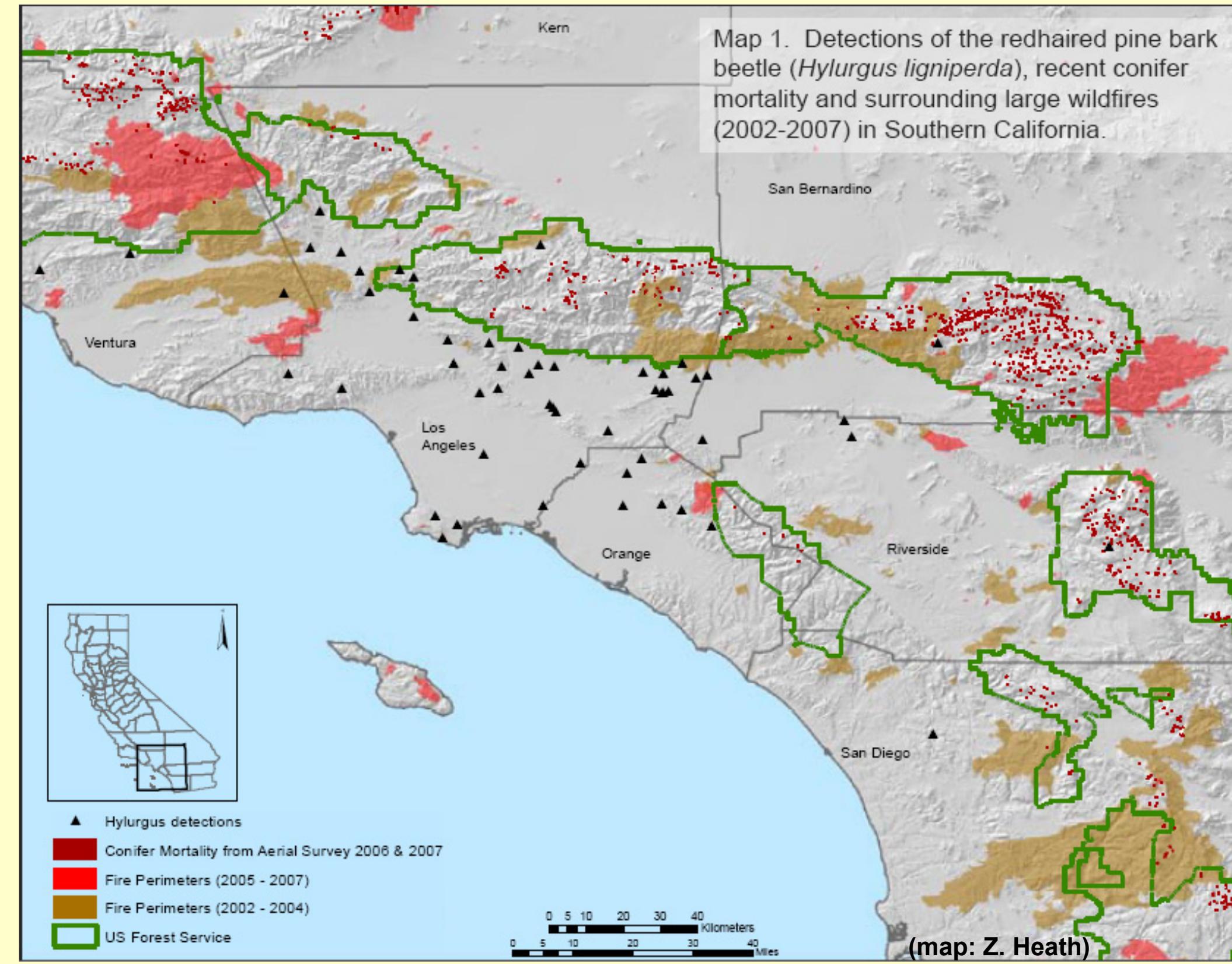




## The primary invasive: RPBB

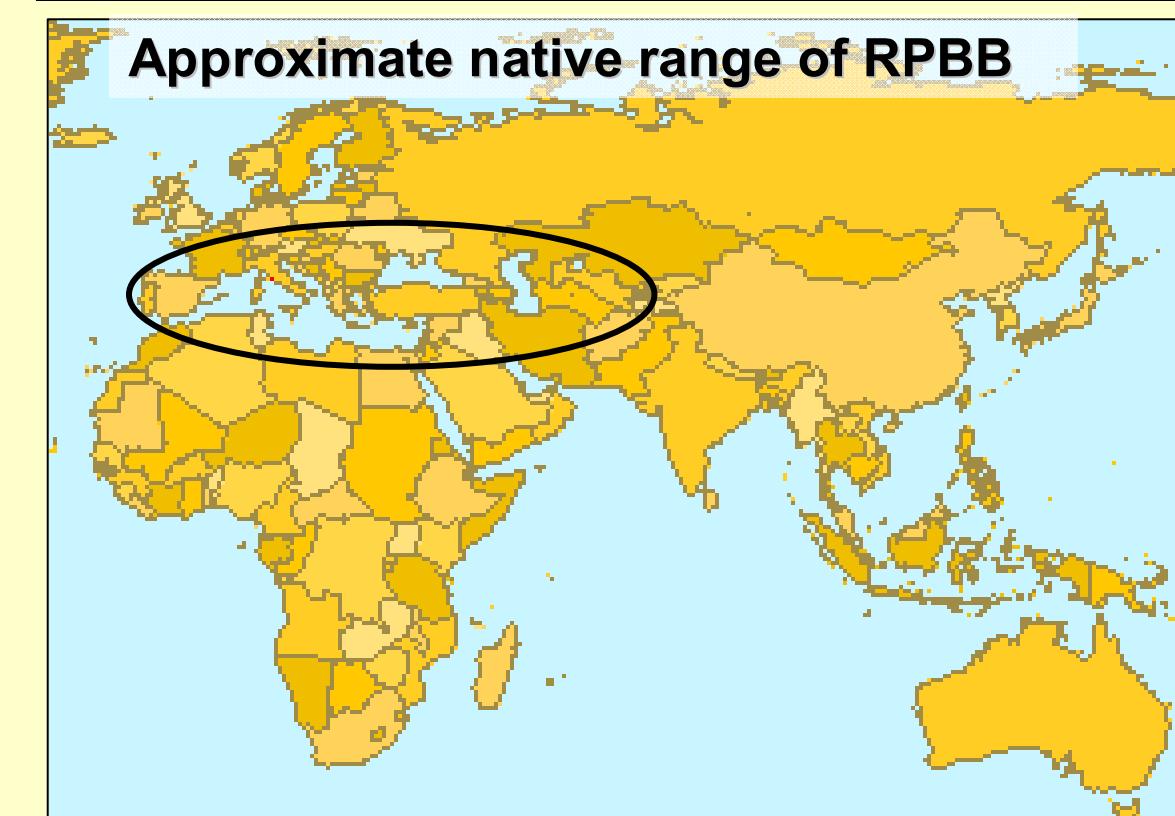


### Redhaired Pine Bark Beetle (RPBB) *Hylurgus ligniperda* (F.) (Coleoptera: Scolytidae) and fires

The redbodied pine bark beetle (RPBB) was first found overwintering in North America in New York in 2000. In July 2003, it was detected in Los Angeles Co., California. RPBB has since been collected in flight traps in urban forest lands in Orange, Riverside, San Bernardino, San Diego, and Ventura Cos. The impact of frequent wildfires in the surrounding national forests on RPBB invasion is not known.

RPBB is generally a secondary pest attacking the lower stem and roots of dead or stressed pines, but has also been reported to kill healthy trees and seedlings. A major concern in the U.S. is that RPBB could vector black-stain root disease, *Leptographium wageneri*, a virulent native pathogen that currently threatens western pines through a native bark beetle vector system.

## Native and introduced ranges of RPBB



Native range	Europe, Mediterranean, and Asia
Also invaded	Australia, Brazil, Chile, Japan, New Zealand, St. Helena Island, South Africa, Swaziland, Uruguay, U.S.
How RPBB entered the U.S. is unknown, but it likely arrived with solid wood packing material associated with imported goods.	

## Other invasives in southern CA

- The native range of *Arhopalus syriacus* (Reitter) (Coleoptera: Cerambycidae) includes the Mediterranean region, Canary Islands, and Middle East. It has invaded Australia, New Zealand, and the U.S. It develops in pines (*Pinus pinaster*, *Pinus salzmanni*, *Pinus laricio*, and *Pinus halepensis*).



- The Asian ambrosia beetle, *Xyleborinus saxeseni* (Ratzeburg) (Coleoptera: Scolytidae), appears to have invaded the U.S. over a century ago. It attacks recently cut, injured, and dying conifers and hardwoods.



## Methods

**Baits:** Both  $\alpha$ -pinene and ethanol were used in every trap, because ethanol and  $\alpha$ -pinene worked synergistically to attract RPBB. A previous year-long flight study in southern California showed that  $\alpha$ -pinene was attractive to RPBB, and ethanol was not. No differences were found in the responses of males and females. Similar responses to ethanol and  $\alpha$ -pinene were found for *A. syriacus*, whereas ethanol was found to be very attractive to *X. saxeseni*.



95%-( $\alpha$ )- $\alpha$ -pinene (>98% chemical purity) purchased from Pherotech International Inc.; five bottles used in each trap.



Ethanol (>98% chemical purity) purchased from Synergy Inc.; one bag used in each trap.

# The Impact of Wildfire on Invasive Bark and Woodboring Beetles in Periurban Forests of Southern California (Project #: WC-F-08-01)

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Redhaired pine bark beetle (dorsal view)

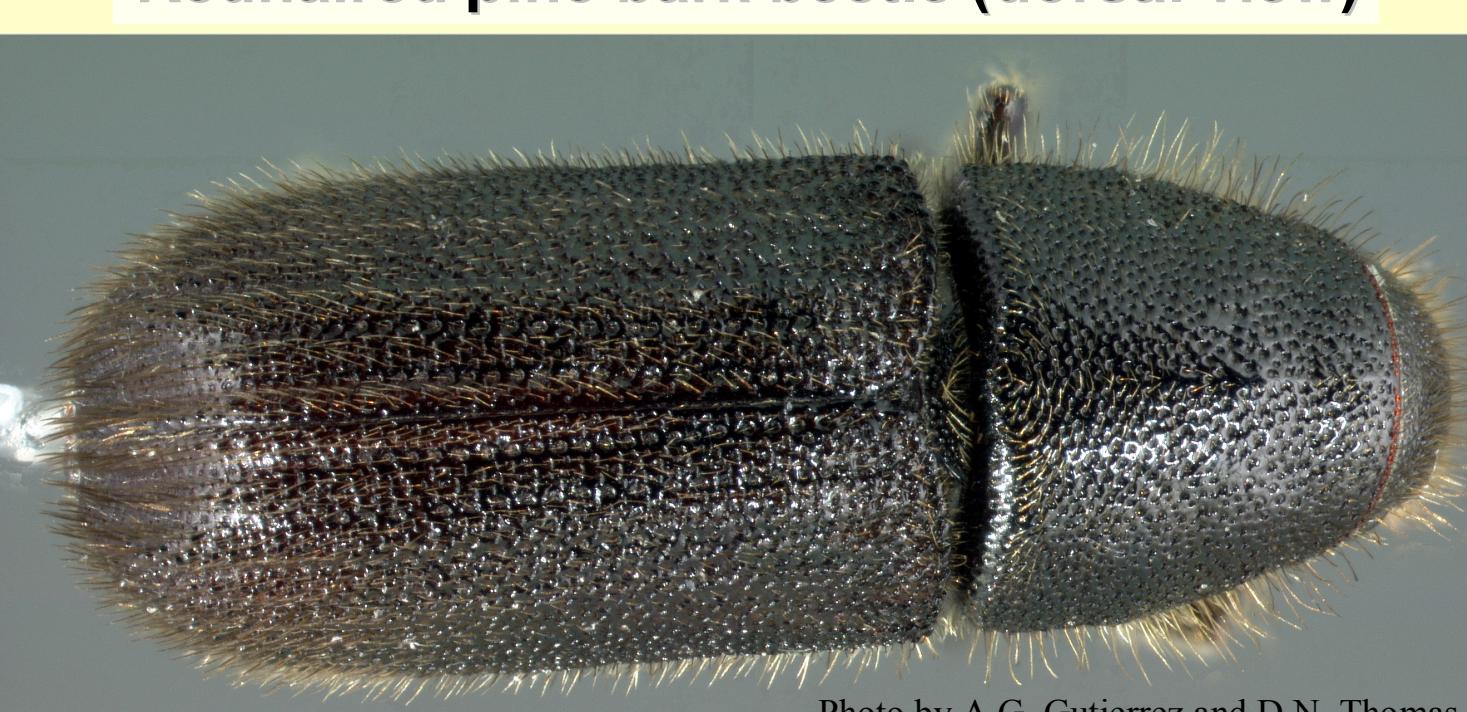
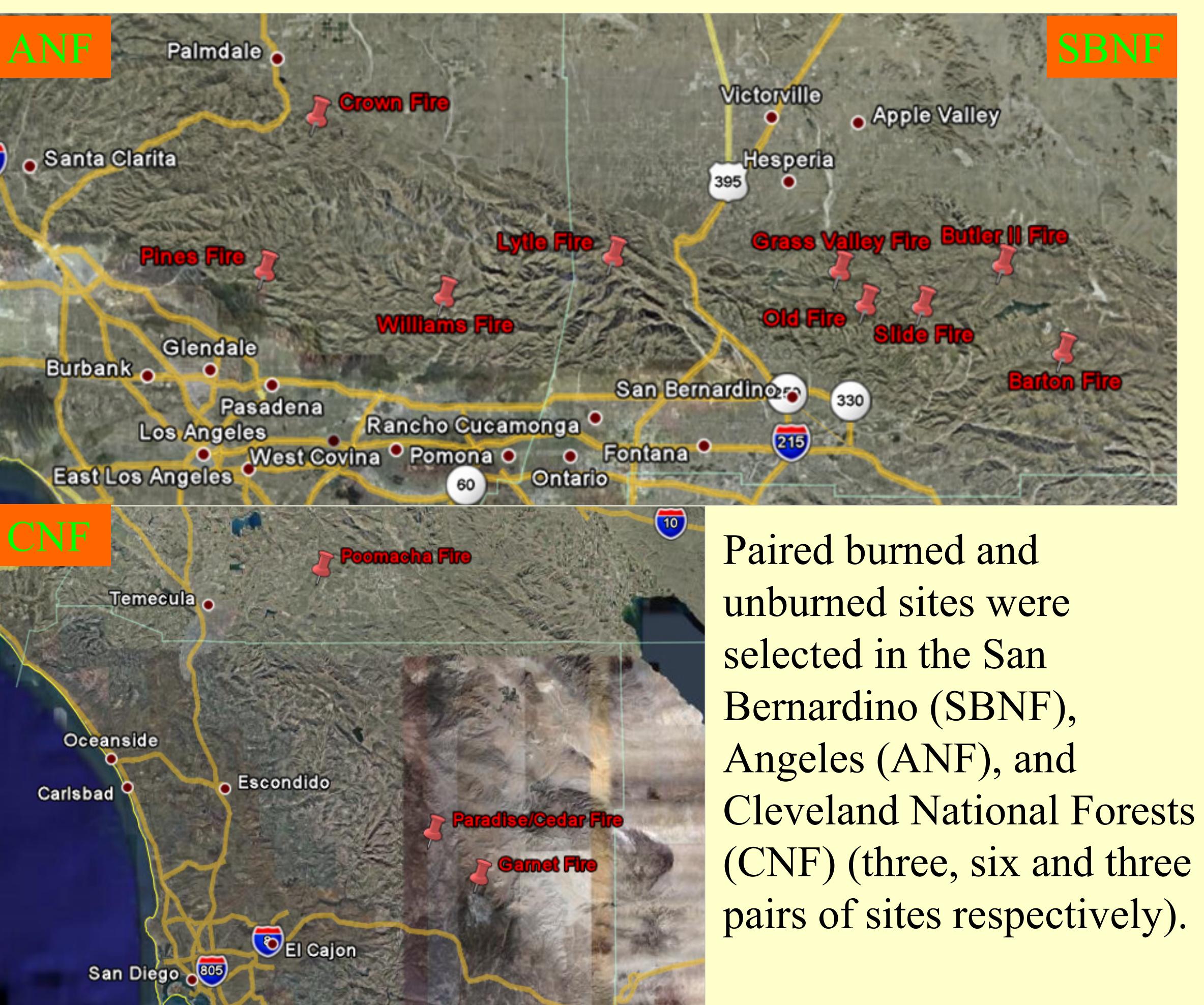


Photo by A.G. Gutierrez and D.N. Thomas

## Research Questions

- Do burned forests support higher population densities of invasive bark and woodboring beetles?
- What is the impact of postfire interval on the response of the invasives?
- What is the impact of the extent of wildfires on the response of the invasives?

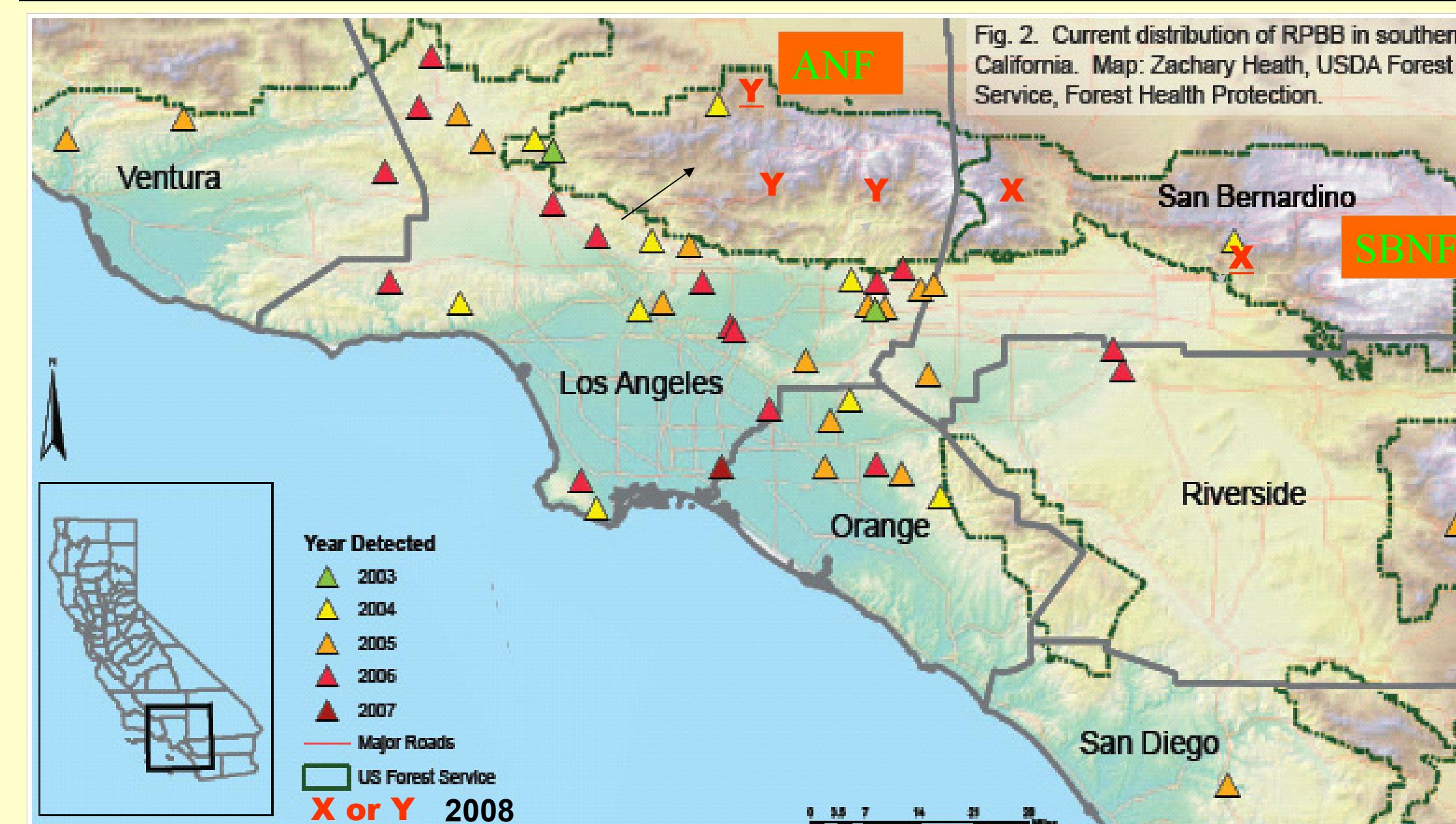
**Study Sites:** Historical fire data and aerial survey data were used to guide our selection of burned and unburned sites in national forests of Southern California. Wildfires were classified as recent (2005-2007), older (2002-2004), large (>405 ha or 1,000 acres), or small (121-405 ha or 300-1,000 acres).



Paired burned and unburned sites were selected in the San Bernardino (SBNF), Angeles (ANF), and Cleveland National Forests (CNF) (three, six and three pairs of sites respectively).

## Preliminary Results

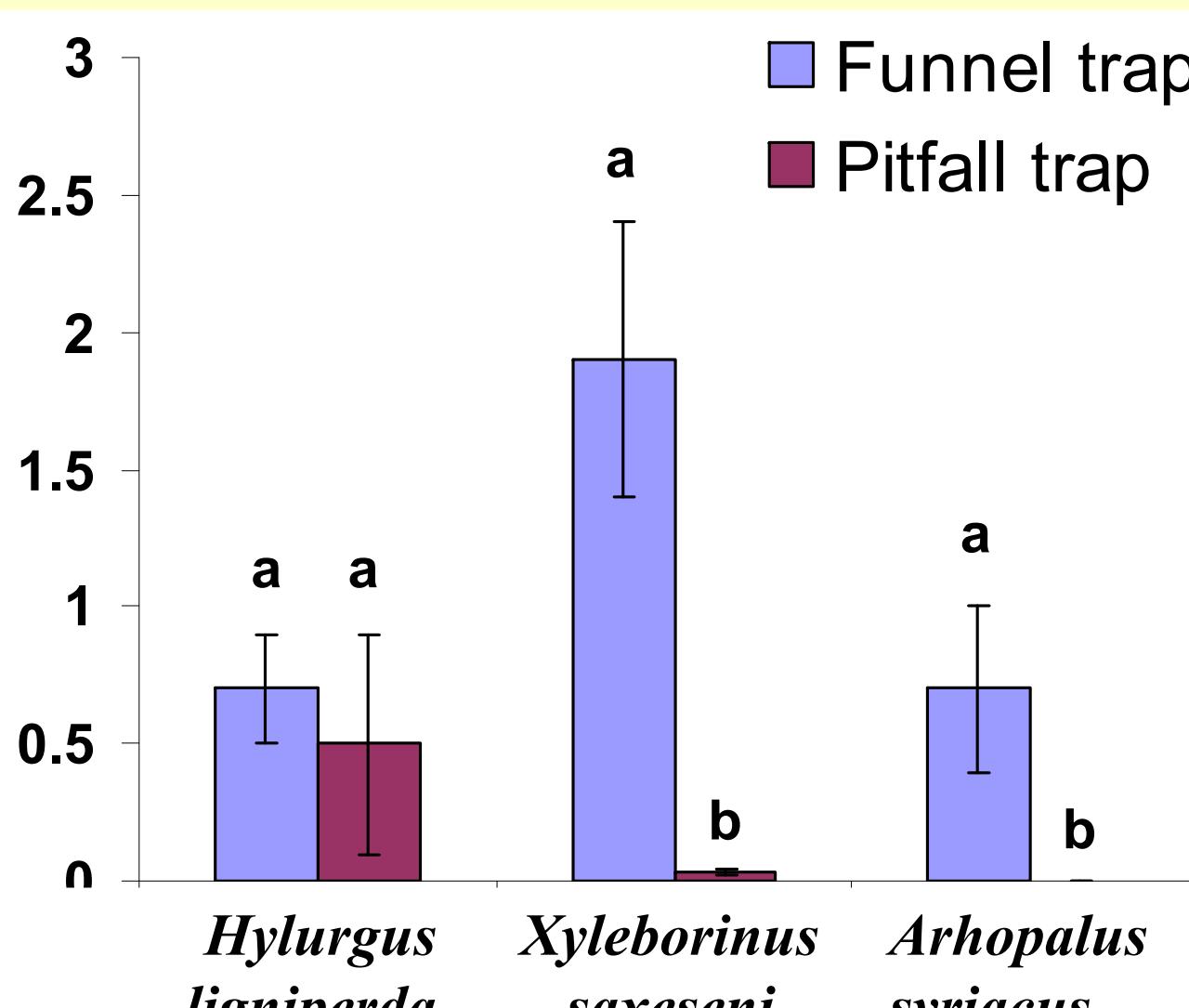
### 1. Invasion of RPBB into national forests in southern California



Our data in 2008 showed that RPBB moved upslope from the Los Angeles Basin through a native knobcone pine stand located at intermediate elevation (1,028 m, X) to a more remotely located ponderosa pine forest (approx. 1,826 m elevation, X) in the SBNF. RPBB has also moved into a native piñon pine forests (1,195 m, Y) located on the northern edge of the ANF. RPBB was not detected on the CNF in 2008. *Arhopalus syriacus* was detected in burned sites of Williams and Pines Fires in ANF, as well as in the native knobcone pine stand and unburned site of Old Fire in SBNF. *Xyleborinus saxeseni* was found in all sites surveyed.

### 2. Comparisons between funnel and pitfall traps

on catches (mean  $\pm$  SE /trap/wk) of three invasive bark and wood-boring beetles (different letters in each comparison indicate significant differences found by using paired *t*-tests,  $\alpha=0.05$ ). The mean catch of *H. ligniperda* in pitfall traps was not significantly different from that in funnel traps. Significantly more *X. saxeseni* and *A. syriacus* were caught in funnel traps than in pitfall traps.



**3. Comparisons between burned and unburned sites** on catches (mean  $\pm$  SE /trap/wk) of bark and wood-boring beetles and ants in 3 national forests surveyed (no significant differences found by using paired *t*-tests,  $\alpha=0.05$ ).

	Burned	Unburned
<i>Hylurgus ligniperda</i> (invasive)	$0.8 \pm 0.4$	$0.3 \pm 0.1$
<i>Xyleborinus saxeseni</i> (invasive)	$2.2 \pm 0.9$	$1.0 \pm 0.3$
<i>Arhopalus syriacus</i> (invasive)	$1.1 \pm 0.5$	$0.1 \pm 0.1$
Total number of cerambycid beetles	$0.41 \pm 0.1$	$0.36 \pm 0.1$
Total number of scolytid beetles	$3.7 \pm 0.9$	$3.3 \pm 0.7$

Numerically more invasive beetles, as well as slightly more bark and woodboring beetles, were caught in burned sites.

## Summary

RPBB has expanded its range in both the ANF and SBNF. RPBB has moved upslope to a remotely located ponderosa pine forest (approx. 1,826 m elevation) in the SBNF, and to native piñon pine forests located on the northern edge of the ANF. *Arhopalus syriacus* was collected on the ANF and SBNF; *X. saxeseni* was collected at all sites on all three NF's, perhaps reflecting the longer time since its introduction into CA. The mean catch of RPBB in pitfall traps was not significantly different from that in funnel traps, which indicates that pitfall traps can also be used to detect RPBB. Wildfires seemed to be conducive to the survival and range expansion of invasive species, although the numerical differences between burned and unburned sites were not statistically significant. We anticipate that definitive patterns may be identified after more data are collected and analyzed from the second year of the study. The effects of fire sizes and post-fire intervals on range expansion of invasive species and shifts in native fauna will also be analyzed with the complete data set.

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