Invasive Ambrosia Beetle Conference
The Situation in California
August 12 – 14, 2012

Meeting sponsored by:

The Hofshi Foundation

University of California, Riverside

UC Center for Invasive Pest Research

The Huntington Botanical Gardens

The Los Angeles Arboretum

Invasive Ambrosia Beetle Conference
The Situation in California
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Session 6

Invasion Epidemiology

Ecological analysis of native and exotic ambrosia beetles in the U.S.

Implications for pest management

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Who says ambrosia beetles breed in dead trees?

- Tree “death” or “health” not discrete events
- Bark and ambrosia beetles both occupy transition zone between live and recently dead
- Important consideration is fresh (undegraded)
- >3,500 species of ambrosia beetles
- Spectrum of host interactions from obligate requirement for living hosts to near saprophytes
- Colonization of living host <> host death

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Who says ambrosia beetles breed in dead trees?

- Shift from phloem feeding to ambrosial feeding
  - Loss of host specificity (freedom of choice)
  - Host defenses seem to be very important in maintaining host specificity in phloem feeders
  - Fungus becomes intermediary between beetle and host defenses
  - Overcome small piece of host, not entire host

Who says ambrosia beetles breed in dead trees?

- Peaceful coexistence in natural settings between hosts and ambrosia beetles may be much more common than suspected
- How many of the >3500 species are flying under the radar
- In pest situations there are many factors out of balance

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Corthylus fuscus in pear

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Corthylus fuscus in pear

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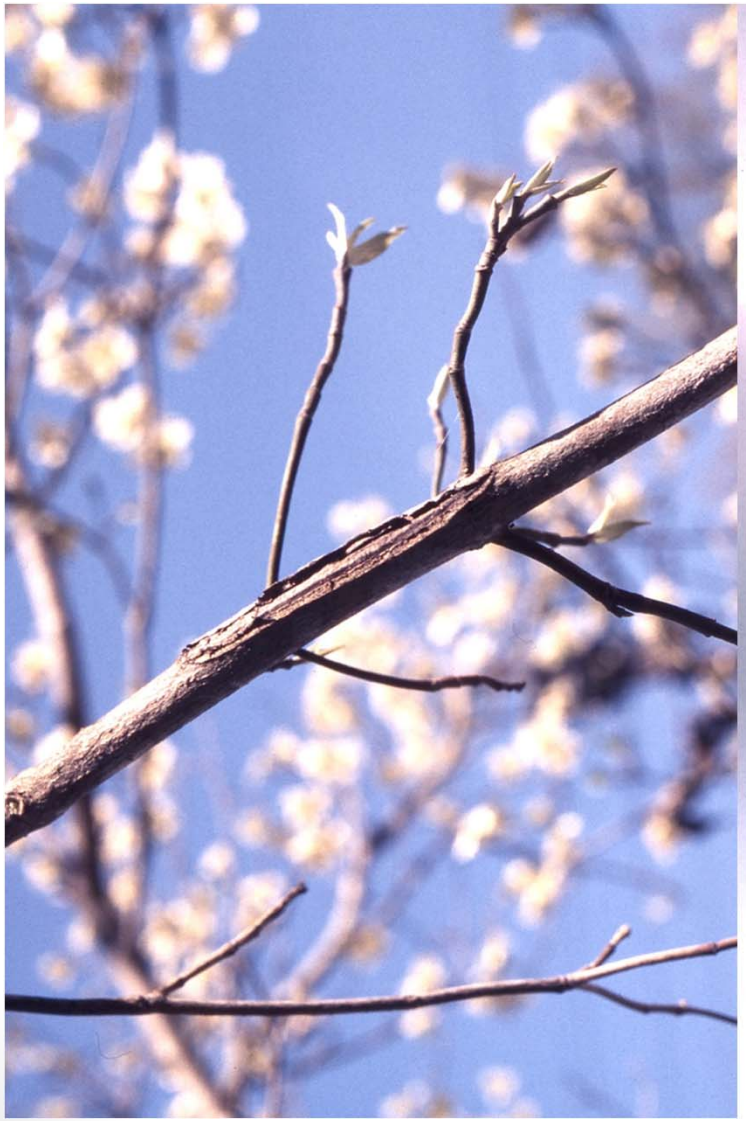
Xylosandrus compactus in dogwood



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Alternative model

- Discrete limited breeding in susceptible hosts
- Non-pathogenic or weakly pathogenic fungi
- Host recovers, can maintain certain parasite load
- Examples shown in branches, but other cases known from large trunks (*Corthylus columbianus, Xyleborus voychisiae*)

The Urban Forest

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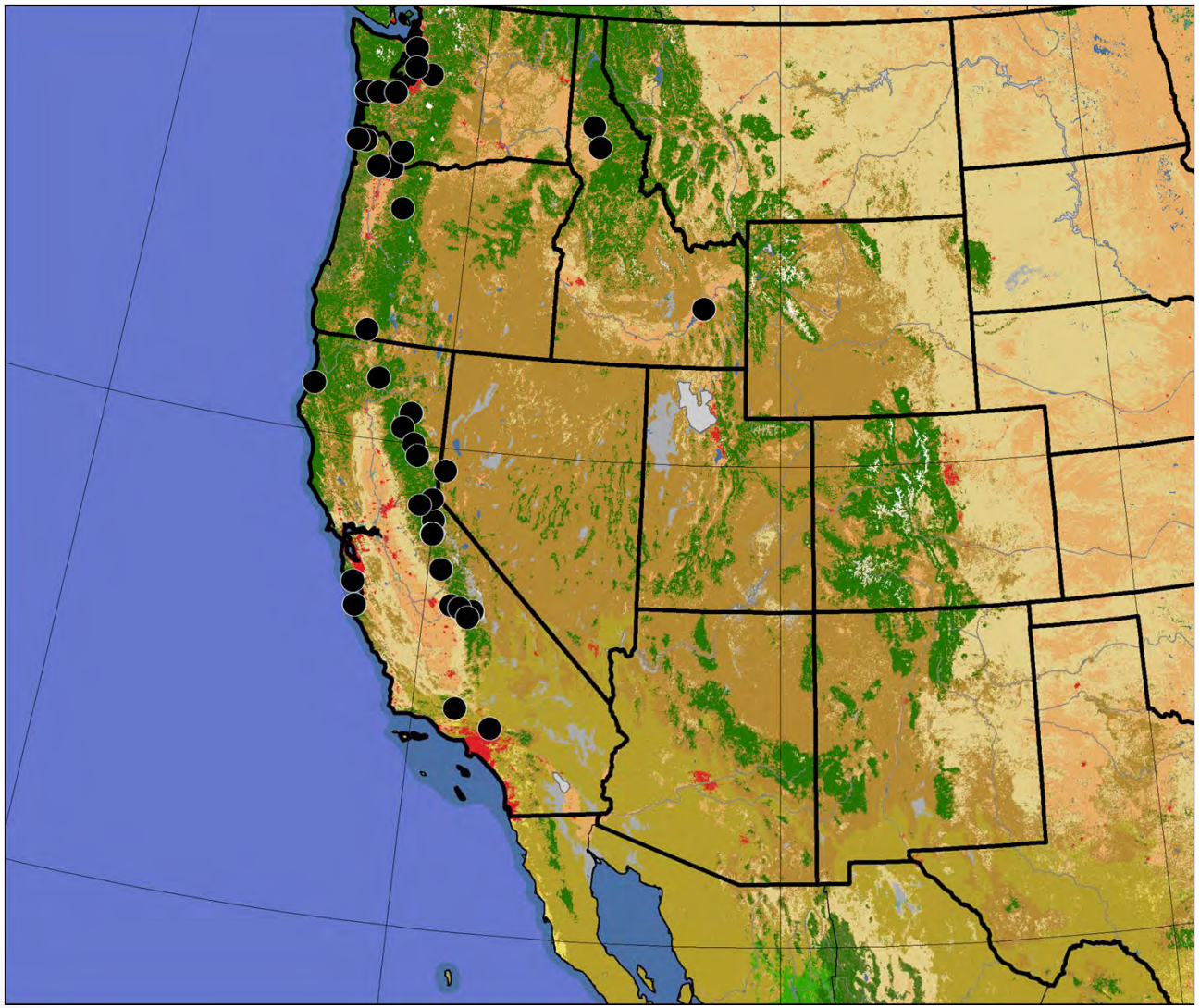
Conclusions

- Southern California is mostly poor habitat for ambrosia beetles
  - True for natives as well as exotics
- The predominant habitat for exotic ambrosia beetles in southern California is the urban forest
- Community and regional ecology of exotic ambrosia beetles within the region will be fundamentally different from that in the eastern and southeastern U.S.
- This will have important implications for management and control

Western Ambrosia Beetles (natives)

- Restricted to moist and/or high elevation forests
- Mostly host specific (pines, oaks, firs)
- Historically absent from largest urban areas
- Relatively little spread into urban areas (except oak-breeding species)

Treptoplatypus wilsoni



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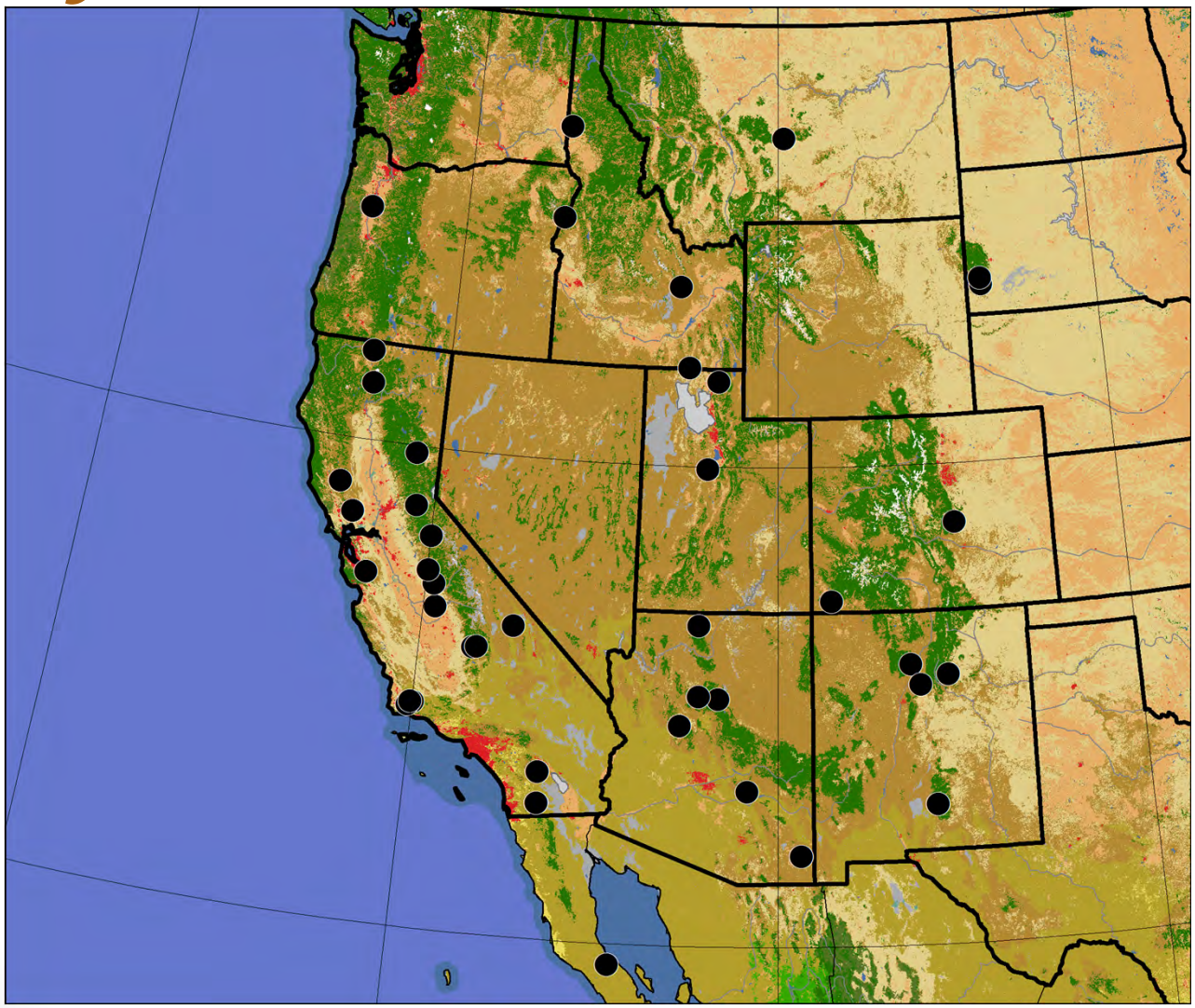
Xyleborus intrusus



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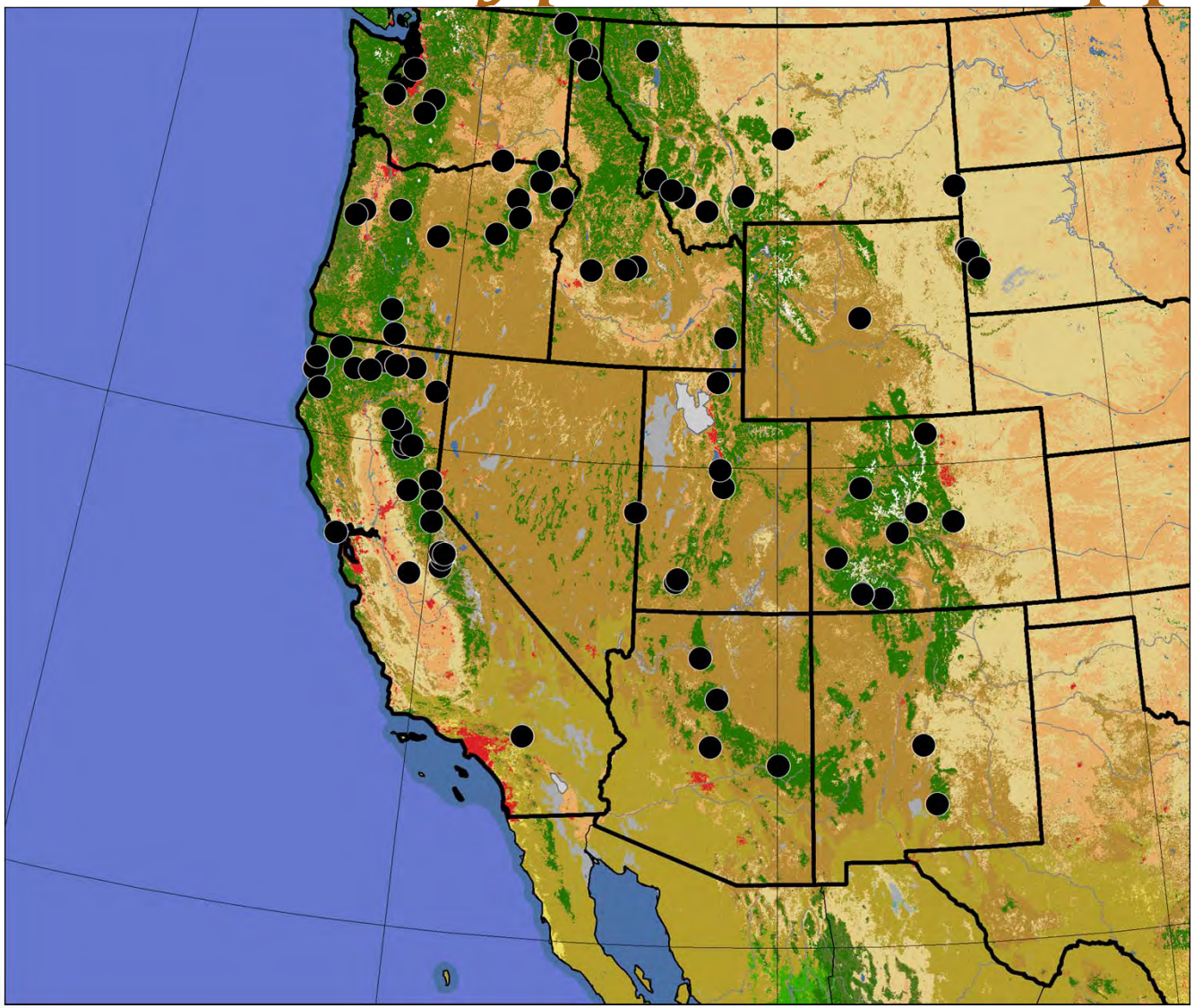
Western *Trypodendron* spp. (3)



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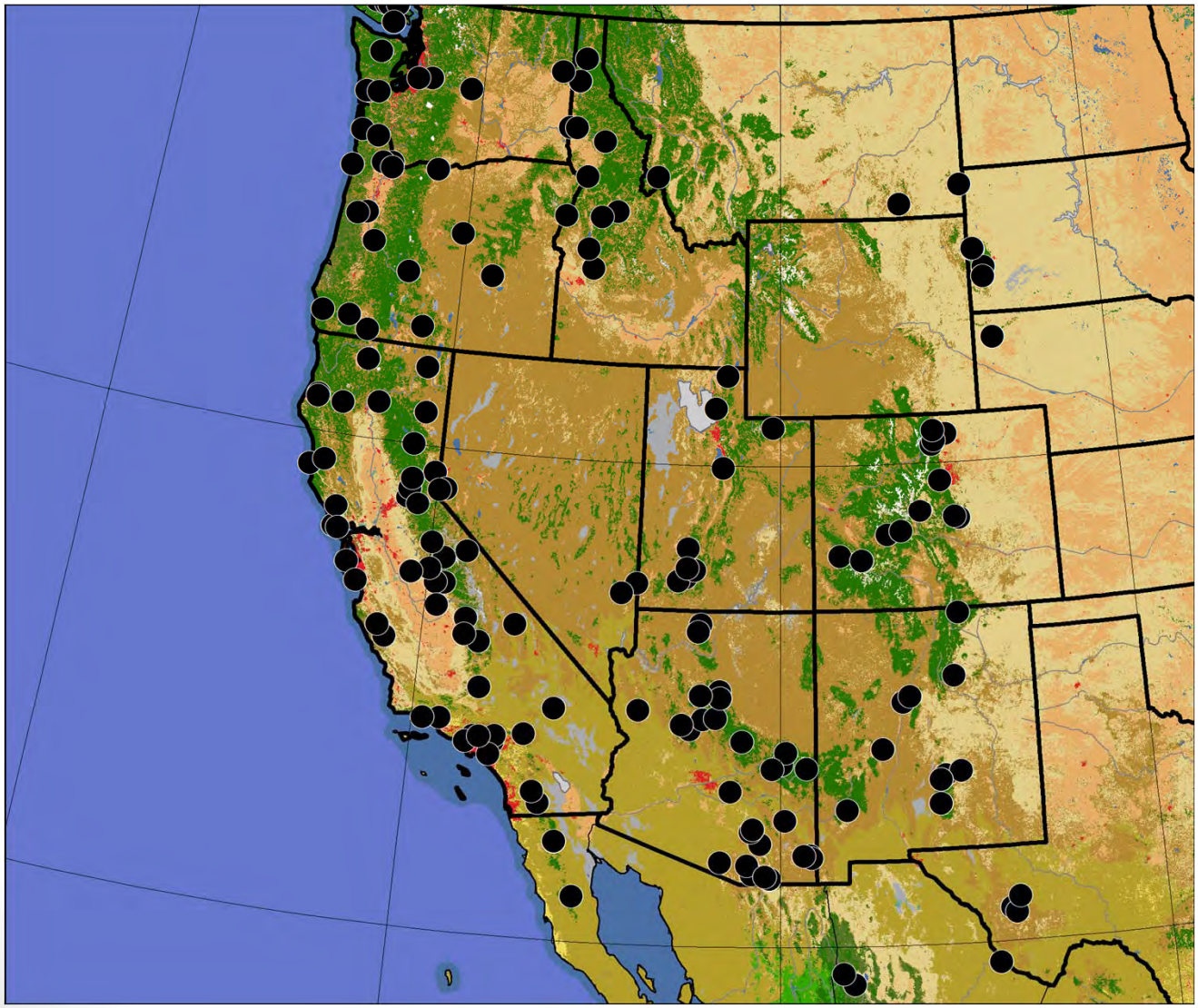
Western *Gnathotrichus* spp. (3)



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Western *Monarthrum* spp. (2)

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Eastern Ambrosia Beetles (natives)

- Widely distributed throughout region
- Mix of host generalists / specialists
- Abundant in urban areas as long as hosts and required conditions met

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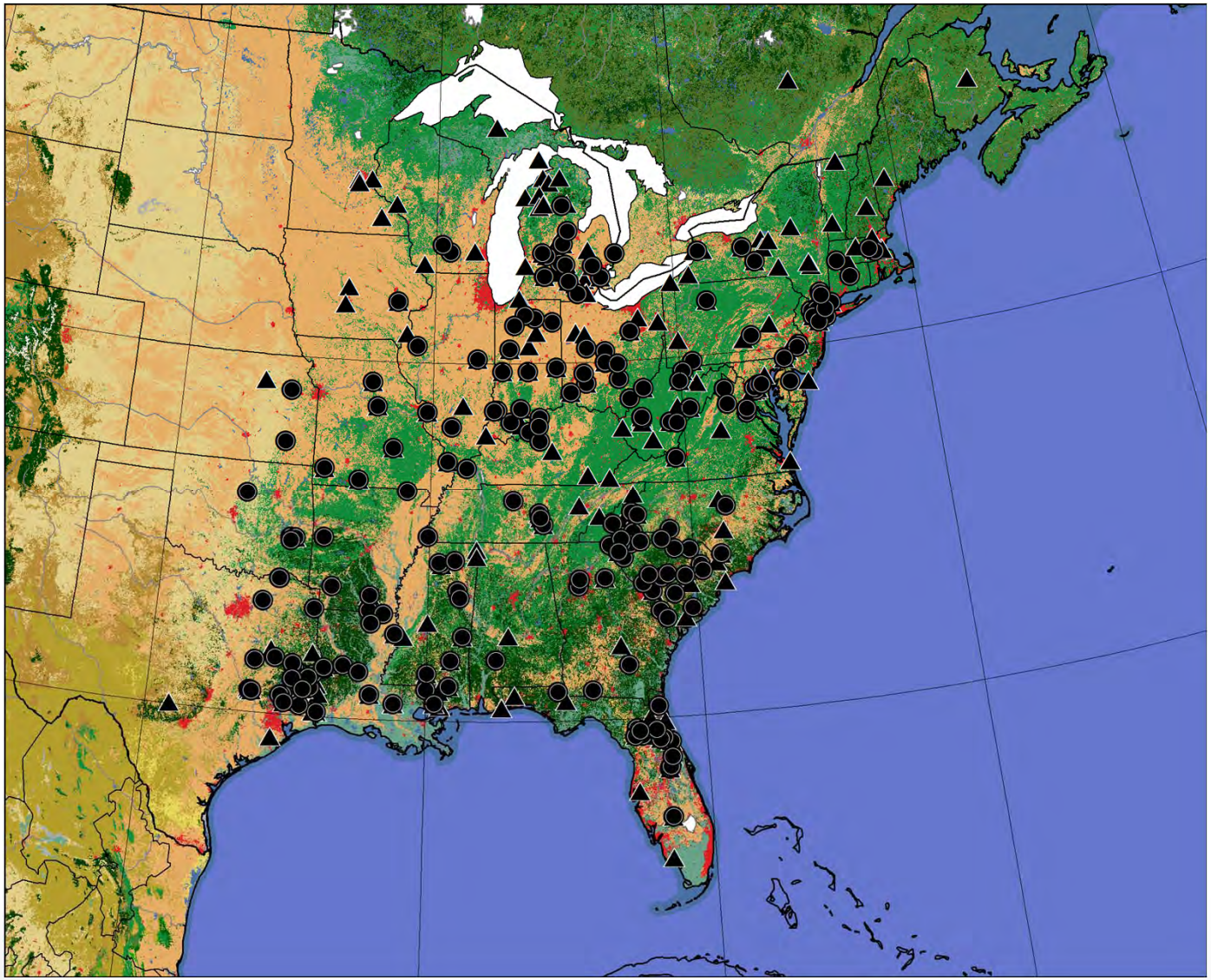
Eastern *Monarthrum* spp. (2)



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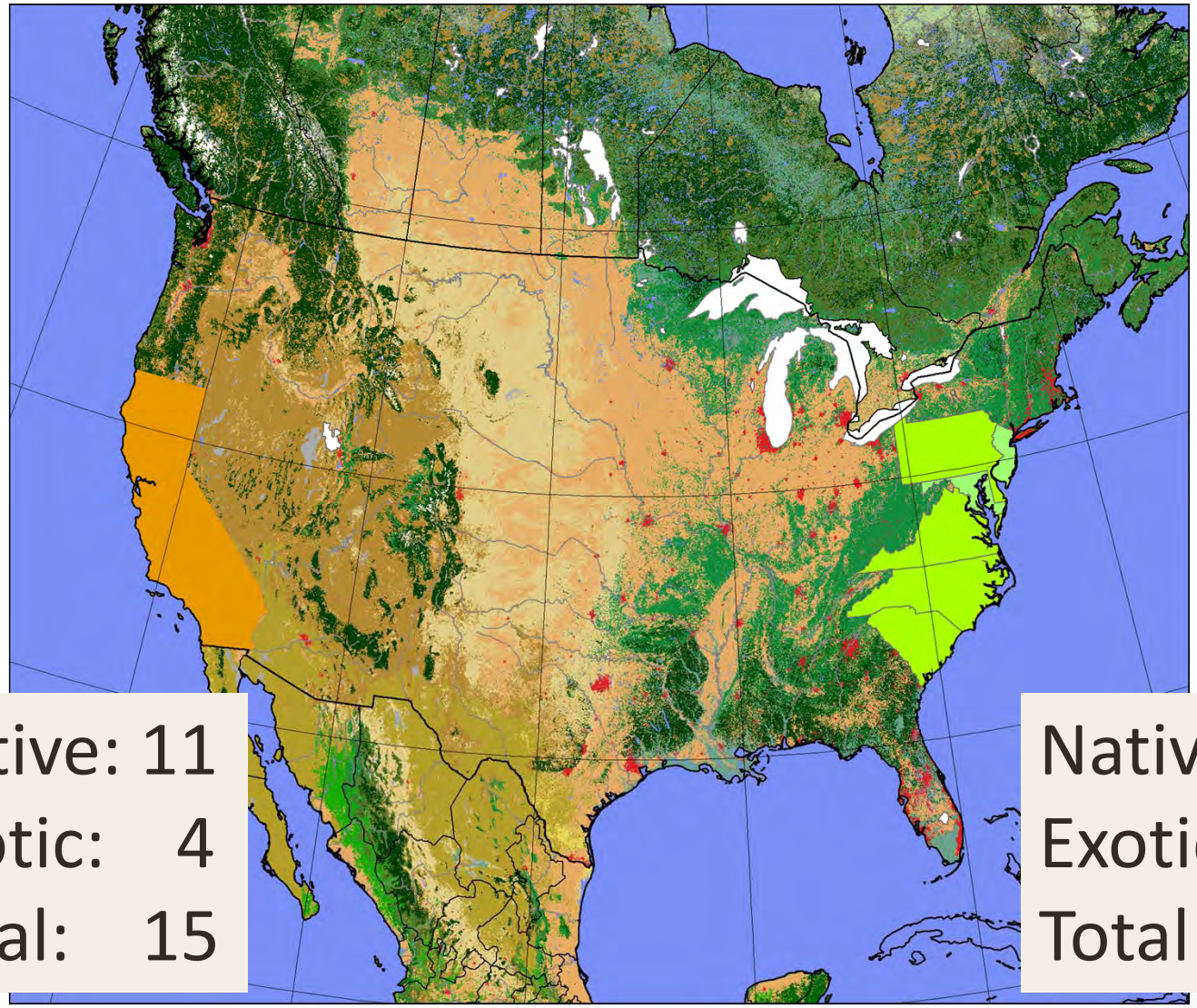
Eastern vs. Western Ambrosia Beetles



Native: 11
Exotic: 4
Total: 15

Native: 28
Exotic: 16
Total: 44

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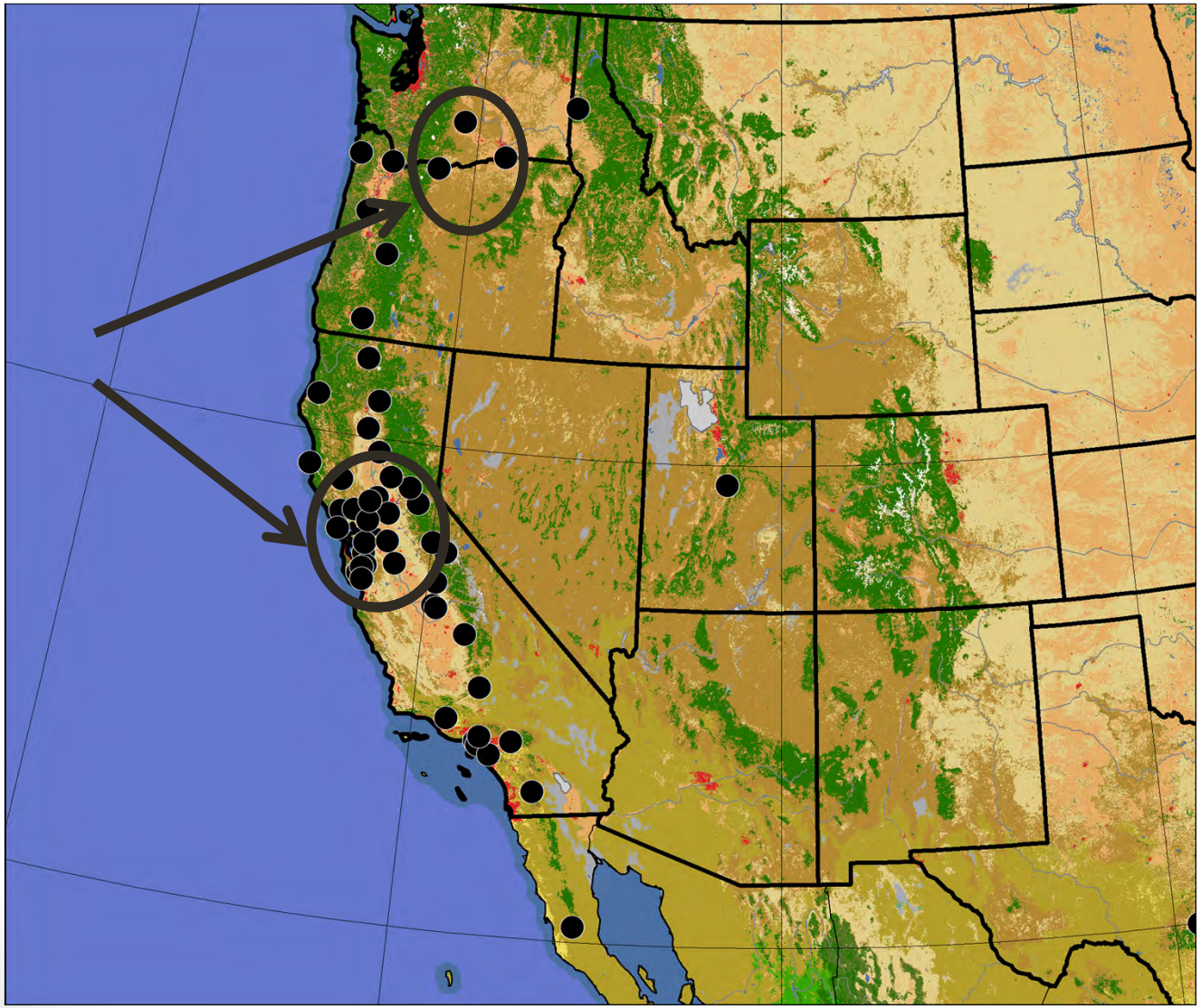
East vs. West

- Native faunas drawn from same pool of genera
  - Differences long standing, based on long term climatic differences
- Comparisons among different regions shows that high humidity (low moisture deficit) is positively related to species richness of ambrosia beetles.
- Differences of same relative magnitude (2.5 X) for both natives and exotics
- Most exotics are from eastern Asia (Eurasian)
  - Magnitude of Asian trade at west coast ports suggests that actual rate of introduction would be similar to that on east coast
  - Difference is rate of establishment
- Same factors acting today as historically

Xyleborinus saxeseni (exotic)



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Monarthrum mali (eastern U.S.)

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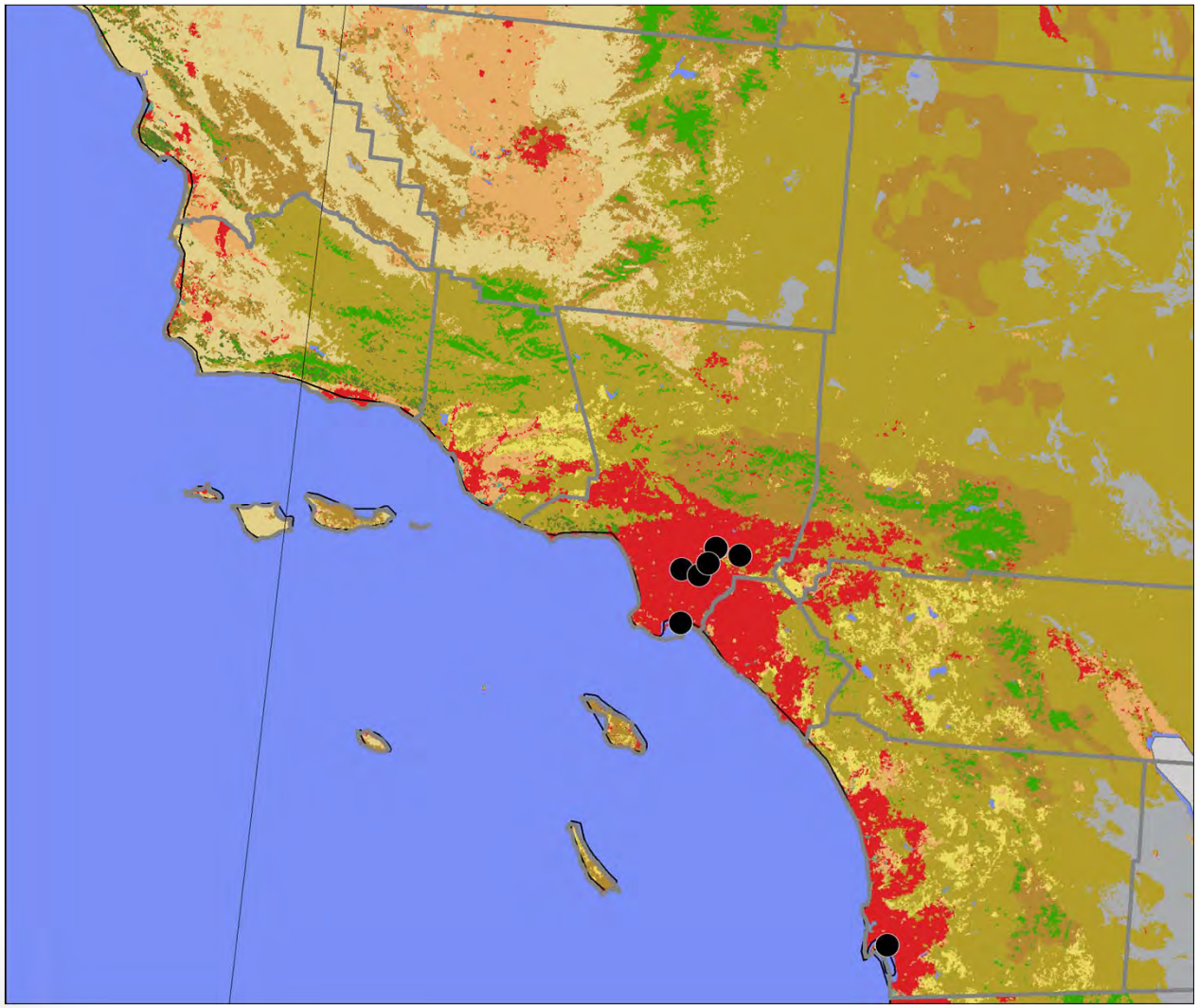
Exotic species

- Western U.S.
  - More likely to be found in urban and agricultural settings
  - Unclear how successful at invading natural plant communities
- Eastern U.S.
  - Exotics are abundant in communities regardless of degree of disturbance

Euwallacea in southern California



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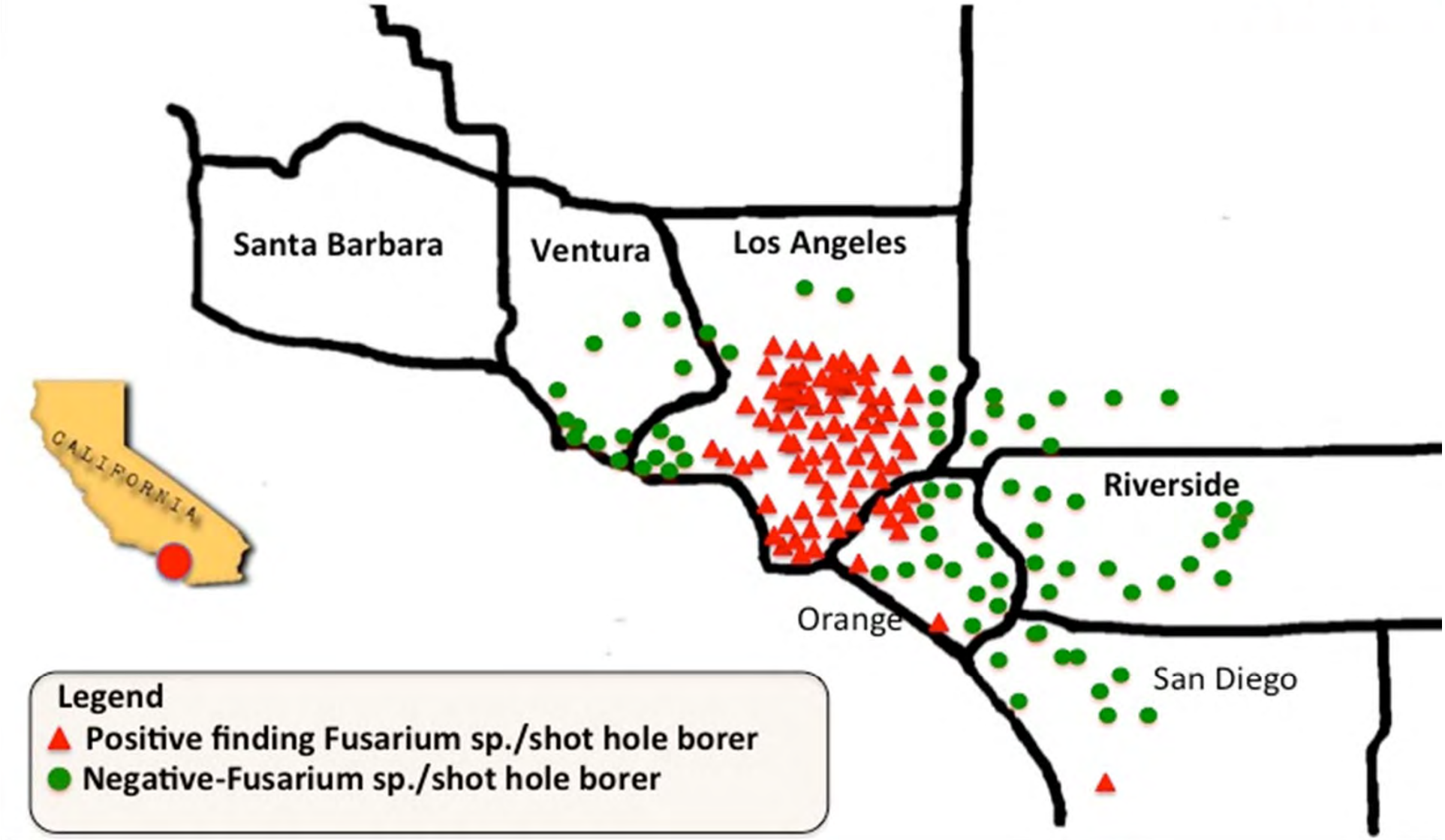
UC RIVERSIDE UNIVERSITY OF CALIFORNIA

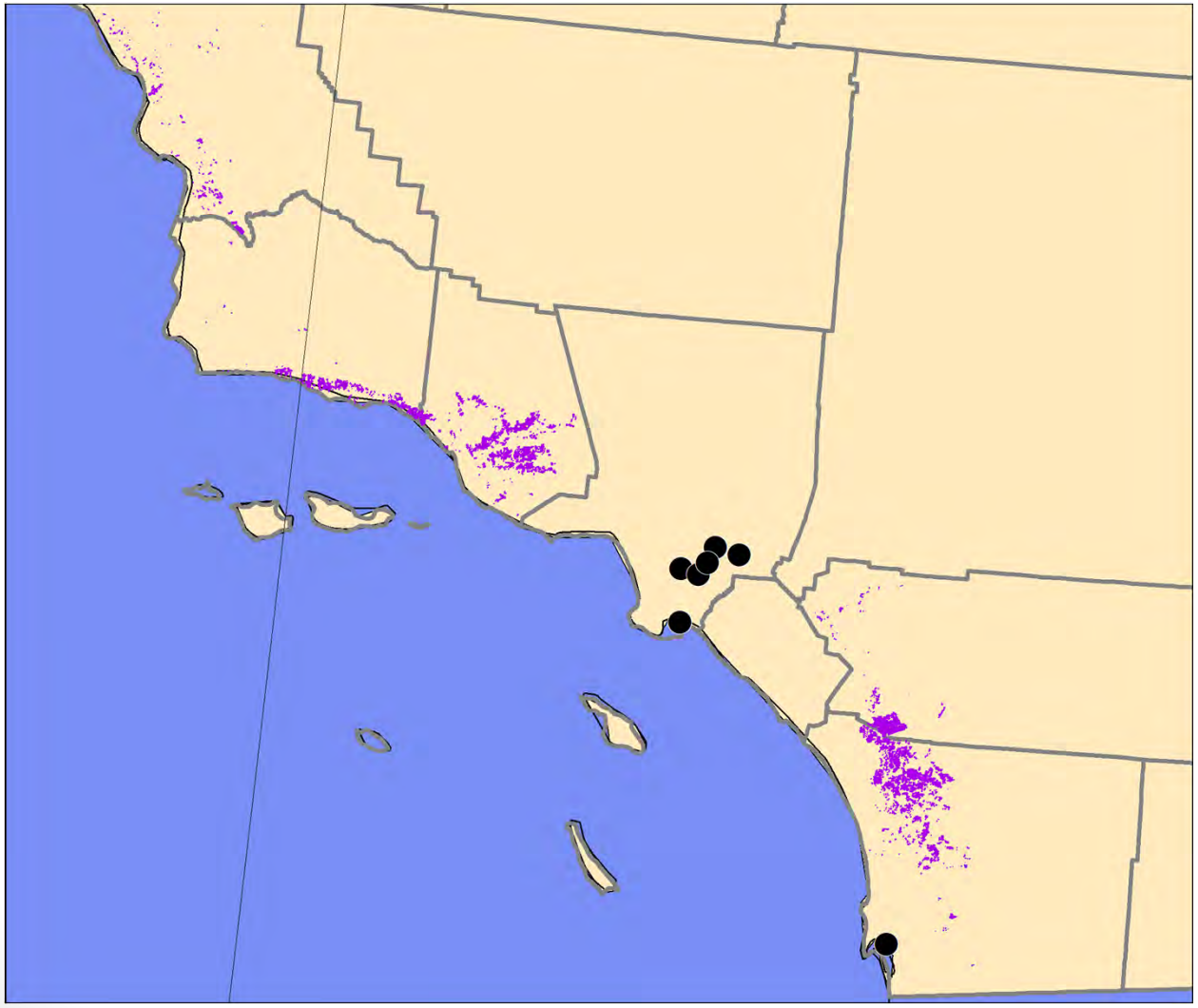
Known Distribution of Fusarium Dieback/Shot Hole Borer in Southern California 07/27/2012

California AVOCADO COMMISSION



Data source: University of California, Riverside. Department of Plant Pathology and Microbiology. 900 University Ave. Riverside, CA. *http://www.eskalenlab.ucr.edu*

Commercial avocado production



Commercial Avocados

Euwallacea

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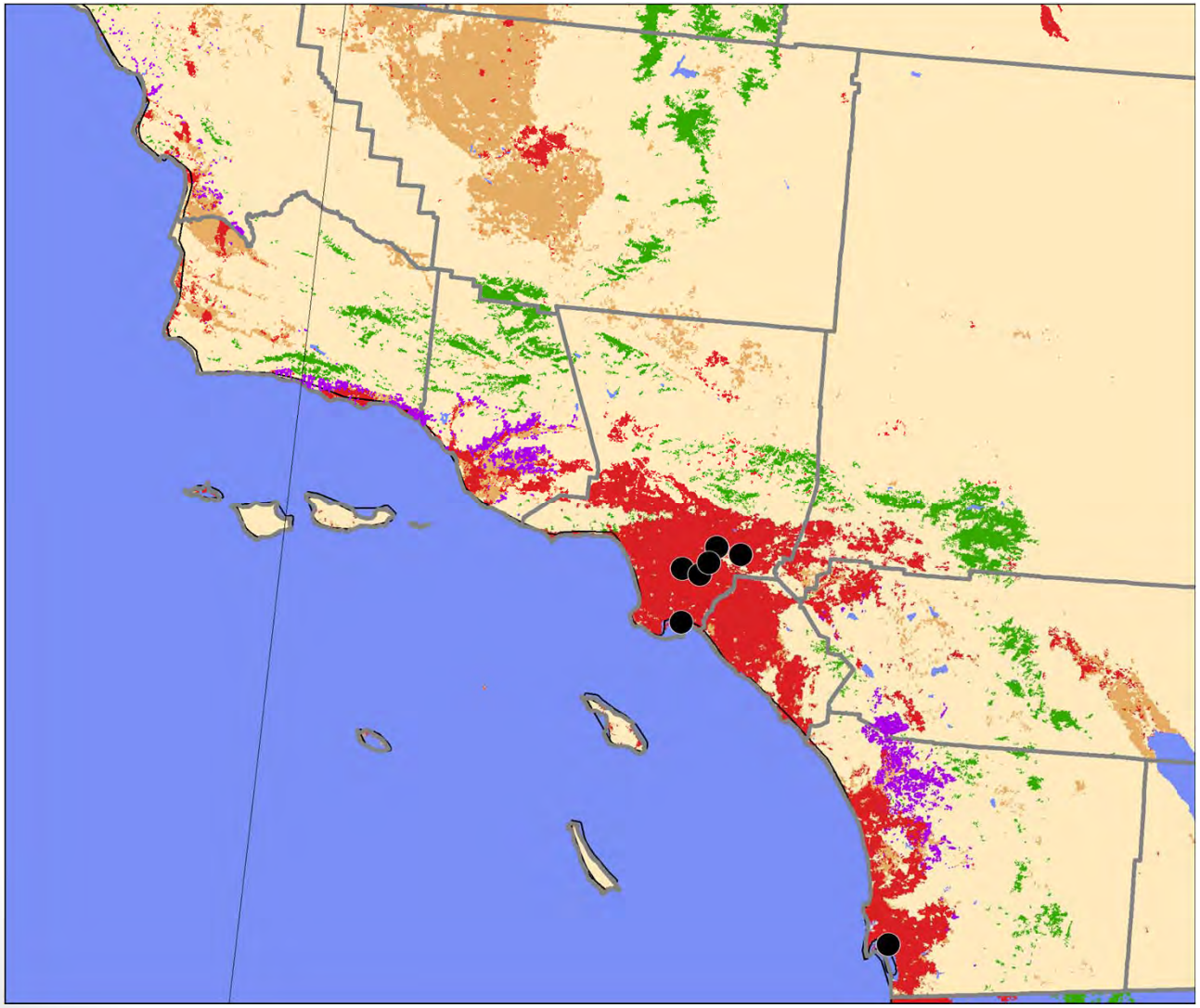
Euwallacea and significant habitats



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Pest Management Aspects

- *Euwallacea* will probably require areas with irrigation and closed canopy
- Primary pest reservoir will be irrigated urban forest or tree crops with similar conditions
- Given wide host range largest public perception will be as a pest of trees (fruiting or otherwise) in landscape.
  - Additional source of observers (interested parties)
  - Additional source of support?

Conclusions

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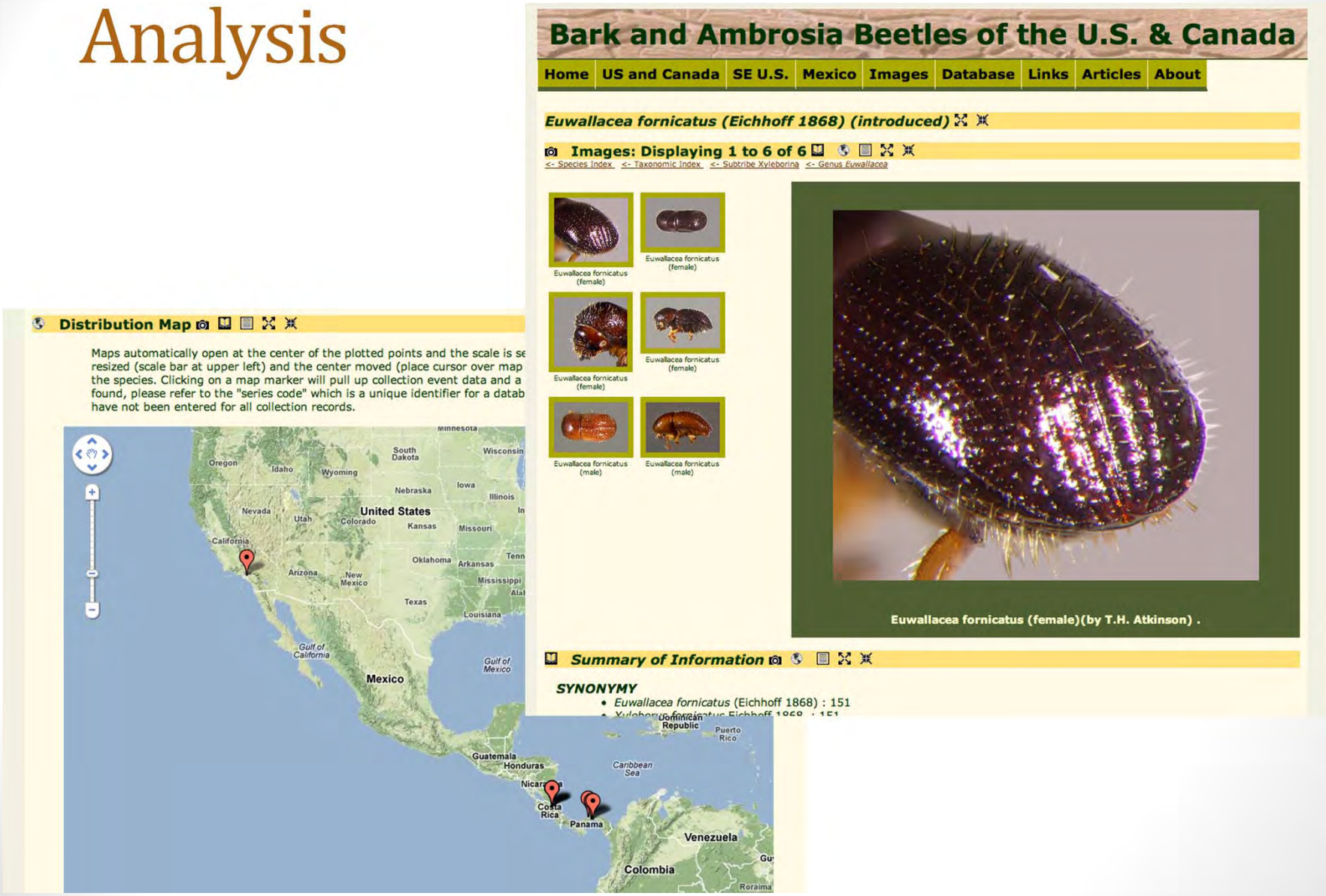
Real Time Tracking and Geographic Analysis



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Real Time Tracking and Geographic Analysis

- Establish and maintain web based database showing:
  - Survey results
    - Positive, negative, insect, fungus, disease
    - Trap catches (positive & negative)
    - Museum specimens
  - Location of significant landscape and ecological features
    - Commercial avocados
    - Other susceptible tree crops
    - Elevation
    - ???
  - Public and restricted access
  - UCR as lead host
    - Logos of other participating institutions
    - Any participating institution can link to page and incorporate into menus

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Real Time Tracking and Geographic Analysis

- Unless someone else wants it I would volunteer to coordinate and maintain site
- No direct user input.
  - Expensive and tricky to program
  - data vulnerable
  - quality control issues
- Users submit data to coordinator who then posts
  - Original database not online, not vulnerable
  - Consistency check

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Real Time Tracking and Geographic Analysis

- What's in it for me?
  - Unique chance to track spread of exotic species
  - Co-authorship on eventual article on distribution and spread
    - Might include data from other species of ambrosia beetles from region

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Acknowledgements

- Tom Bellamore, Gwen Peterson; California Avocado Commission for map of avocado production
- Akif Eskalen, UCR for survey map
- The North American Land Change Monitoring System (NALCMS) for vegetation cover map.

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