

Interactions between humanized environments and wildland plant health: Problem overview

Shannon Lynch Ph.D.

Assistant Professor of Forest Pathology & Plant Disease Ecology

UC Davis Plant Pathology Department



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Pathogens are a part of forest communities





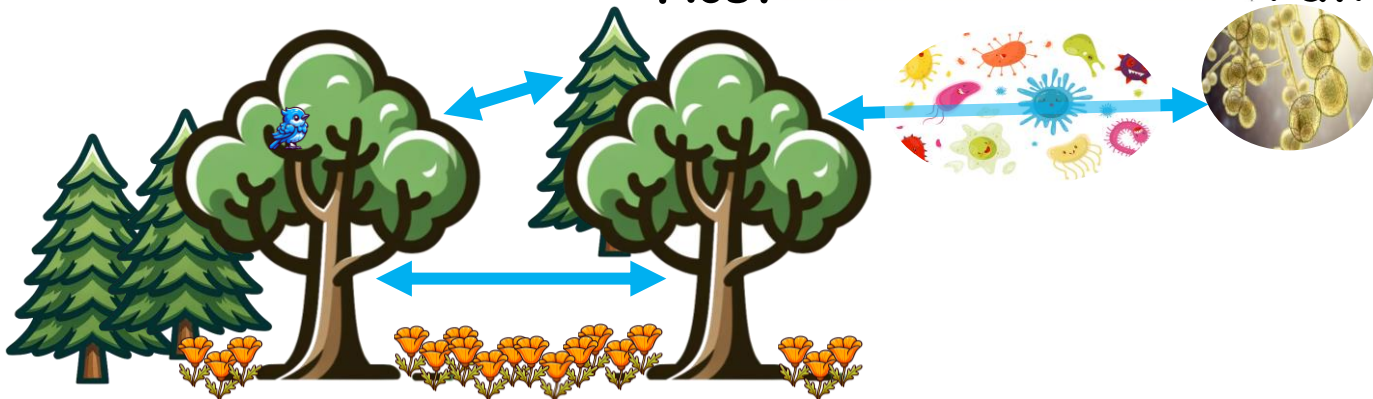
Environment

Disease

Host

Pathogen

Disease plays a critical role in structuring plant communities



Drivers of global change

Land-use change



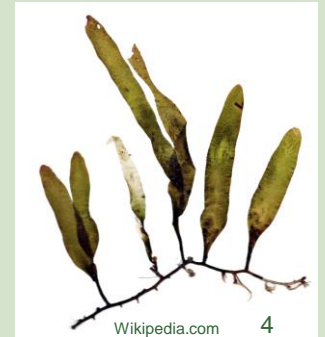
Climate change



Pollution



Invasive species



Emergent pathogens and pests

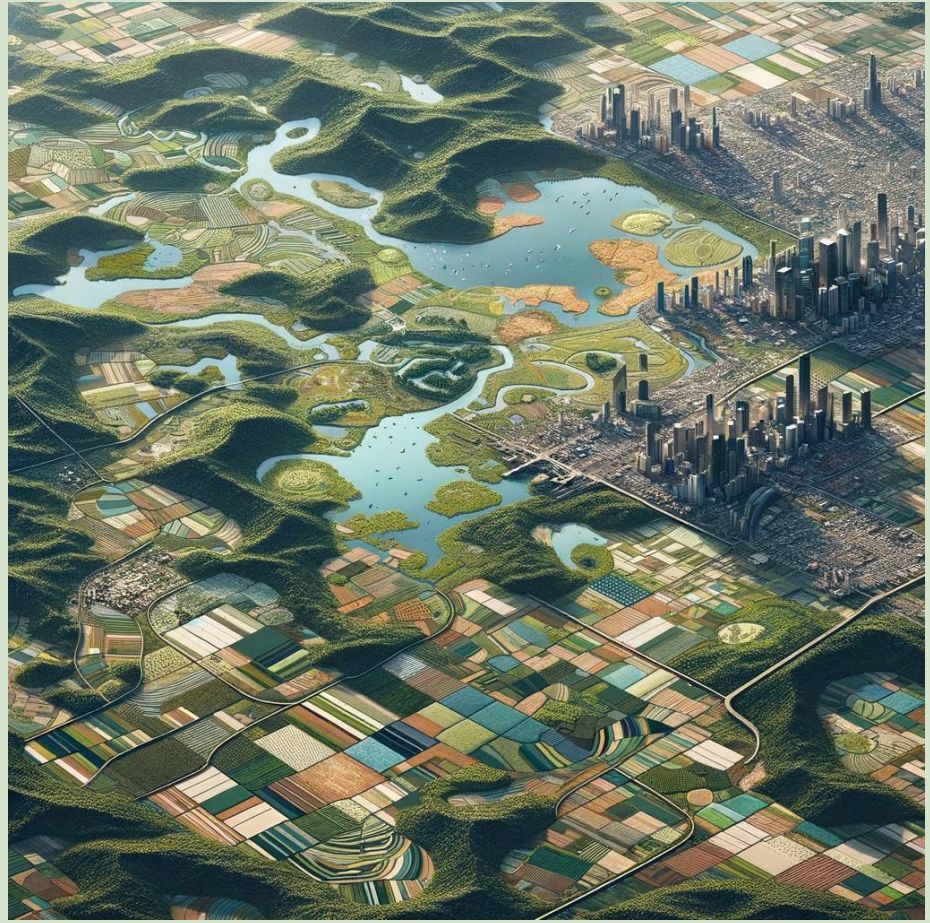


Wilcove et al. (1998). *BioScience*; and others



Yet...

- Spillover of pathogens across novel host populations in CA is understudied



Eutypa dieback of grapevine in California:

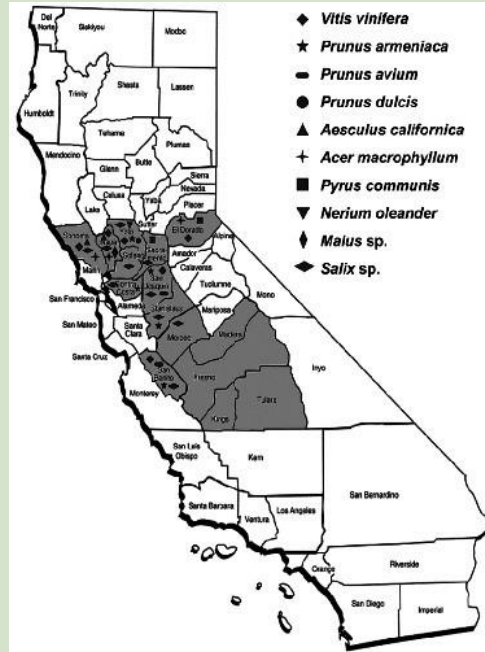
- Caused by *Eutypa lata* (Diatrypaceae)
- In 1990's, *E. lata* was the only known canker pathogen of grapevine



Investigating the host range (inoculum sources) of *Eutypa lata* in CA:

Perithecia Found on Surrounding Native Species:

- California Buckeye
- Big Leaf Maple
- Willow species



Mycology

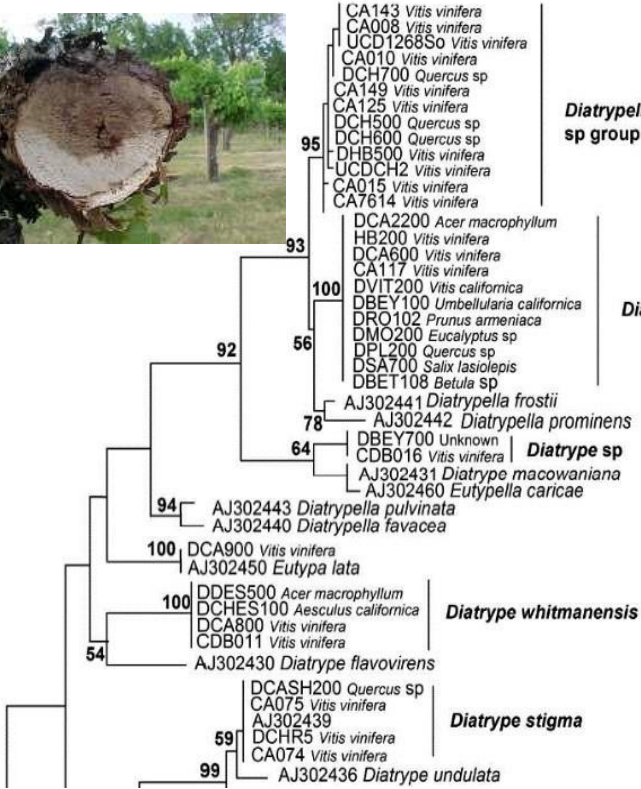
Host Range, Biological Variation, and Phylogenetic Diversity of *Eutypa lata* in California

F. P. Trouillas and W. D. Gubler

Department of Plant Pathology, University of California, Davis 95616.
Accepted for publication 4 June 2010.



Natural host range of Diatrypaceae associated with grapevine cankers in CA:



Diatrypella verrucaeformis sp group

Oak species



Diatrype oregonensis

Oak species
 CA bay laurel
 Big leaf maple
 Arroyo willow



Diatrype sp

Big leaf maple
 CA Buckeye



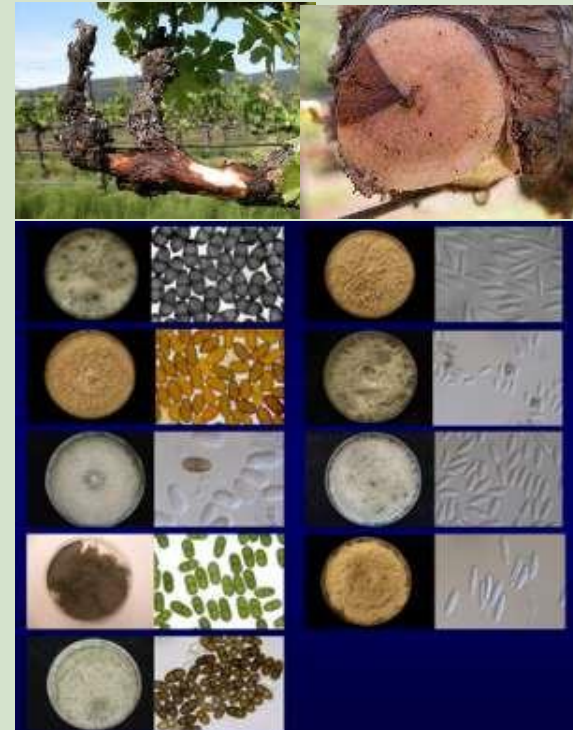
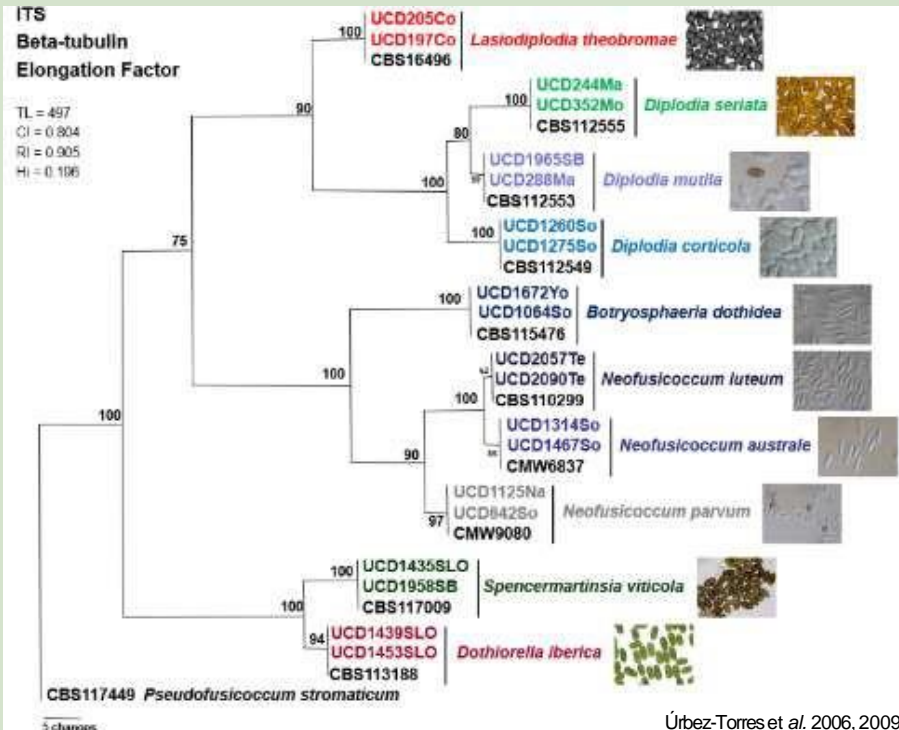
Diatrype whitmanensis

Oak species



Botryosphaeriaceae canker diseases:

- Widespread pathogens of perennial crops: grape, almond, walnut, pistachio, olive
- Global pathogens of grape and many tree species



Botryosphaeriaceae in nut crops in CA:

Themis Michailides, UC Davis

Fungal species	Walnut	Pistachio	Almond
<i>Botryosphaeria dothidea</i>	+	+	+
<i>Neofusicoccum parvum</i>	+	+	+
<i>Neofusicoccum mediterraneum</i>	+	+	+
<i>Diplodia mutila</i>	+	---	---
<i>Neofusicoccum nonquaesitum</i>	+	---	+
<i>Neofusicoccum vitifusiforme</i>	+	+	---
<i>Diplodia seriata</i>	+	+	+
<i>Dothiorella iberica</i>	+	+	+
<i>Lasiodiplodia citricola</i>	+	+	+
<i>Neoscytalidium dimittatum</i> (= <i>Hendersonula toruloidea</i>)	+	+	+



Botryosphaeriaceae associated with native trees in CA:

MYCOLOGIA
Mycologia
ISSN: 0007-5042 (Print) 1557-2526 (Online) Journal homepage: <http://www.tandfonline.com/doi/journal/10.1080/00075042>

Identification and pathogenicity of Botryosphaeriaceae species associated with coast live oak (*Quercus agrifolia*) decline in southern California

Shannon C. Lynch, Akif Eskalen, Paul J. Zambino, Joey S. Mayerquin & Danny H. Wang



Diplodia corticola, *Dothiorella iberica* and *Diplodia agrifolia*

BRITISH MYCOLOGICAL SOCIETY
bms
British Mycological Society
journal homepage: www.blackwell-synergy.com/doi/10.1111/j.1365-3113.2011.00511.x

Botryosphaeriaceae species associated with dieback and canker disease of bay laurel in northern California with the description of *Dothiorella californica* sp. nov.

Daniel F. LAWRENCE¹, Francesca PEDUTO HAND¹, W. Douglas GUBLER¹, Florent P. TROILLAS²

¹Department of Plant Pathology, University of California, One Shields Avenue, Davis, CA 95616, USA
²Department of Plant Pathology, The Ohio State University, 2021 Coffey Road, Columbus, OH 43210, USA

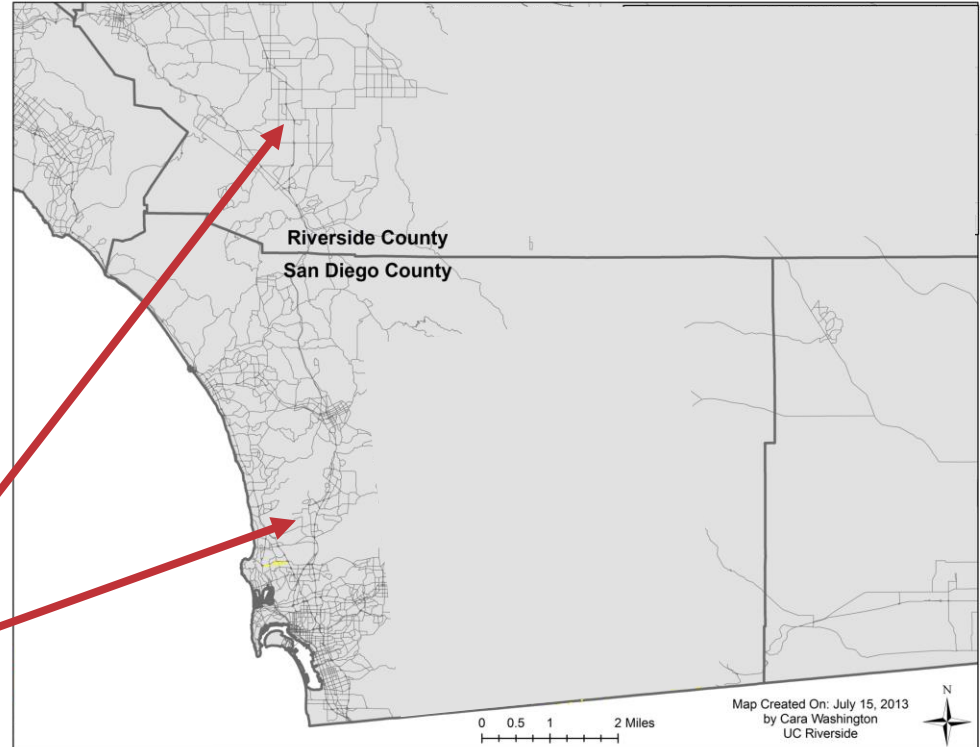


Disease Progression of *Phytophthora ramorum* and *Botryosphaeria dothidea* on Pacific Madrone

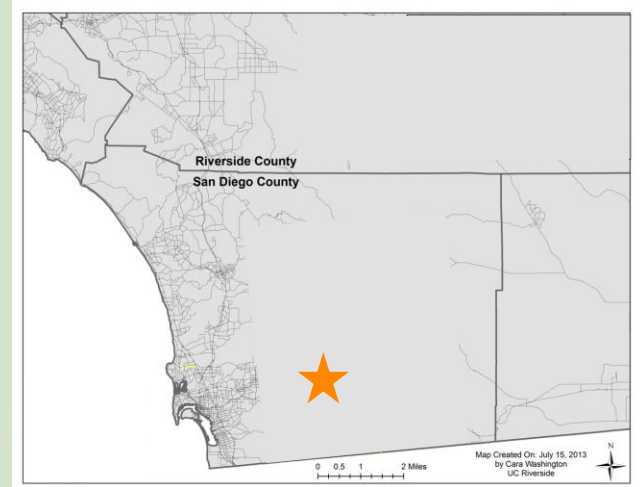
P. E. Maloney, S. C. Lynch, S. F. Kane, and D. M. Rizzo, Department of Plant Pathology, University of California, Davis 95616



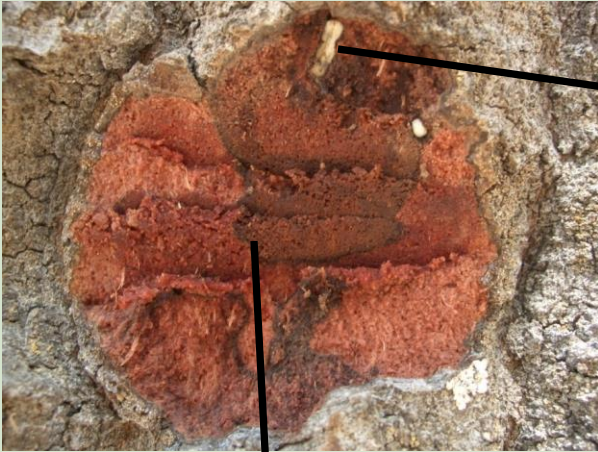
Riverside and San Diego Counties



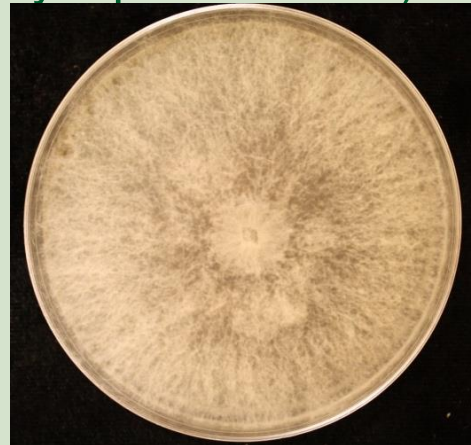
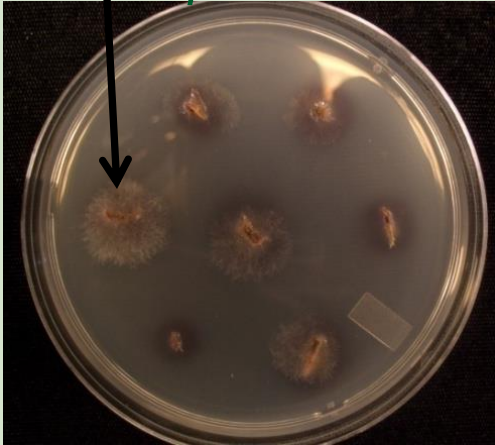
2008 San Diego County



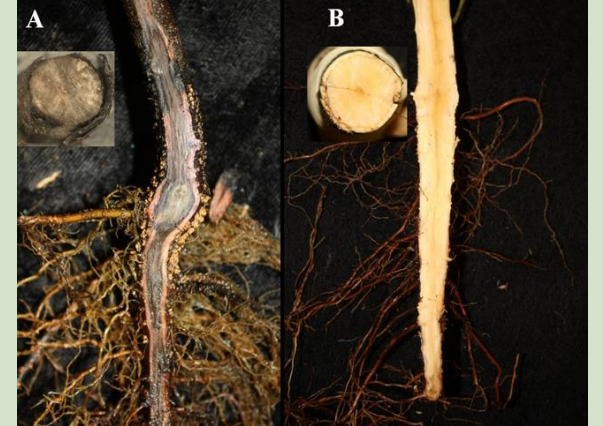
2008 San Diego County



Diplodia corticola (Botryosphaeriaceae)



Pathogenicity Tests



Pathogenicity test: *Diplodia corticola* on coast live oak



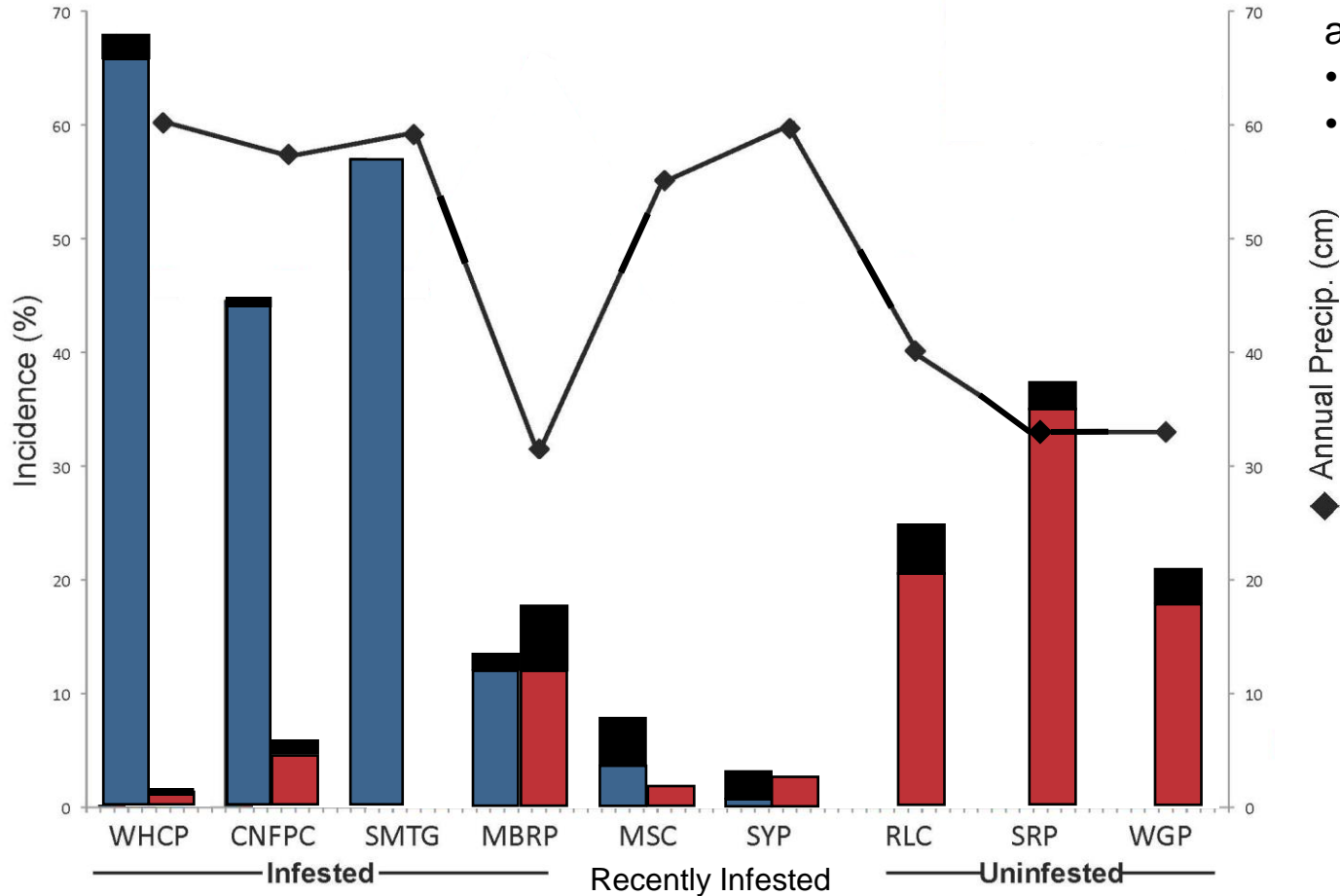
Control



Inoculated

■ *A. auroguttatus* (GSOB)

■ *D. corticola*



Differences explained by annual ppt ($R^2 = 0.92$):

- GSOB (+)
- *D. corticola* (-)

◆ Annual Precip. (cm)

Aggressive Pathogens

Diplodia corticola



*Diplodia agrifolia**



Fusarium solani



Lynch et al. 2013. *Mycologia* 105(1):125-140.

Weak Pathogens

Dothiorella iberica



*Cryptosporiopsis querciphila**



Diatrypella verrucaeformis



Phaeoacremonium mortoniae



Lynch et al. 2013. *Plant Disease* 97(8):1025-1036.

Fusarium Dieback—Invasive Shot Hole Borers: A Pest-Pathogen Complex



Invasive Shot Hole Borers (ISHB)

Euwallacea fornicatus

PSHB

Polyphagous
Shot Hole
Borer



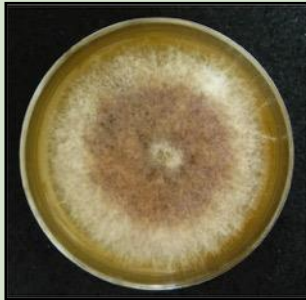
E. kuroshio

KSHB

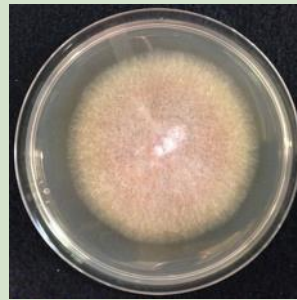
Kuroshio
Shot Hole
Borer



Fusarium euwallaceae



Fusarium kuroshium





Acer negundo



Acacia melanoxylon



Koelreuteria elegans



Quercus agrifolia



Albizia kalkora



Platanus racemosa



Ficus sp.



Quercus robur



Persea americana



Populus fremontii



Branch dieback only



Quercus agrifolia

Killed when attacked



Salix lasiolepis

Host traits in susceptibility



Attack Attempt



Unsuccessful Colonization



Fungus Only



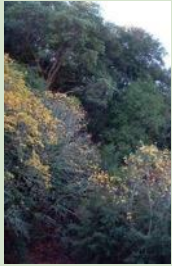
Beetle Reproduces

Successful Colonization

Where does ISHB attack?

Native Plant Communities

Mixed
Evergreen



Oak Woodlands



Riparian



Avocado Groves



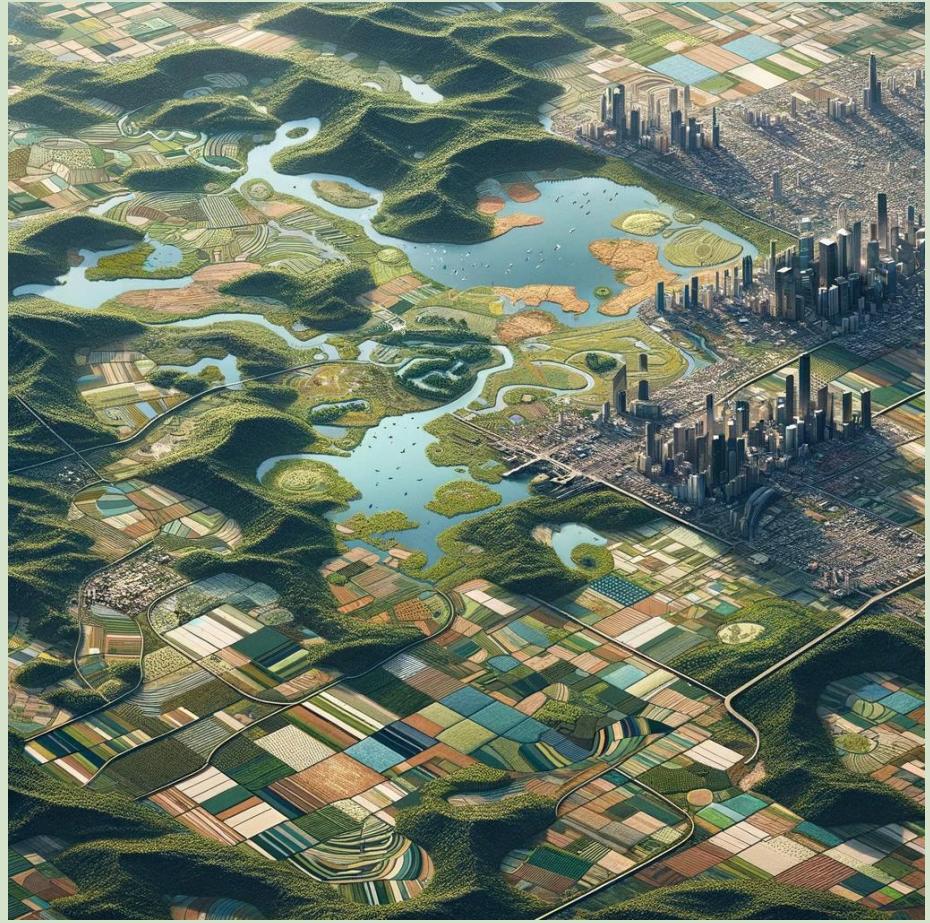
Urban Forests



FD-ISHB disease establishment in heterogeneous landscapes



- The same species occur in natural and managed forest communities
- Yet disease dynamics across heterogeneous landscapes are understudied



Questions to address

1. What conditions favor pathogen spillover across heterogeneous landscapes?
 - Host
 - Pathogen
 - Environment
 - Landscape Context
2. Are asymptomatic plants disease reservoirs?

Needs

- A framework that addresses ecological complexity and mobilizes decision-makers to quickly and effectively respond to emergent pathogens.
- Interdisciplinary teams of researchers and stakeholders across systems

Shannon Lynch
sclynch@ucdavis.edu