

Thousand Cankers Disease of Walnut

Richard Bostock
Dept. of Plant Pathology, UC Davis

Current Issues in Invasive and Emerging Pests and Diseases
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An epidemic in eastern black walnut, *Juglans nigra*, in Colorado and the west

- **Mortality of *J. nigra* was first observed in UT & OR in the 1990's**
- **Mortality first observed in CO in 2001**
- **Disease widespread in Colorado Springs & Boulder by 2004**
- **By 2008 nearly all *J. nigra* trees in the Colorado Springs area were dead**
- **More than 2000 dead *J. nigra* in Boulder – Denver area**

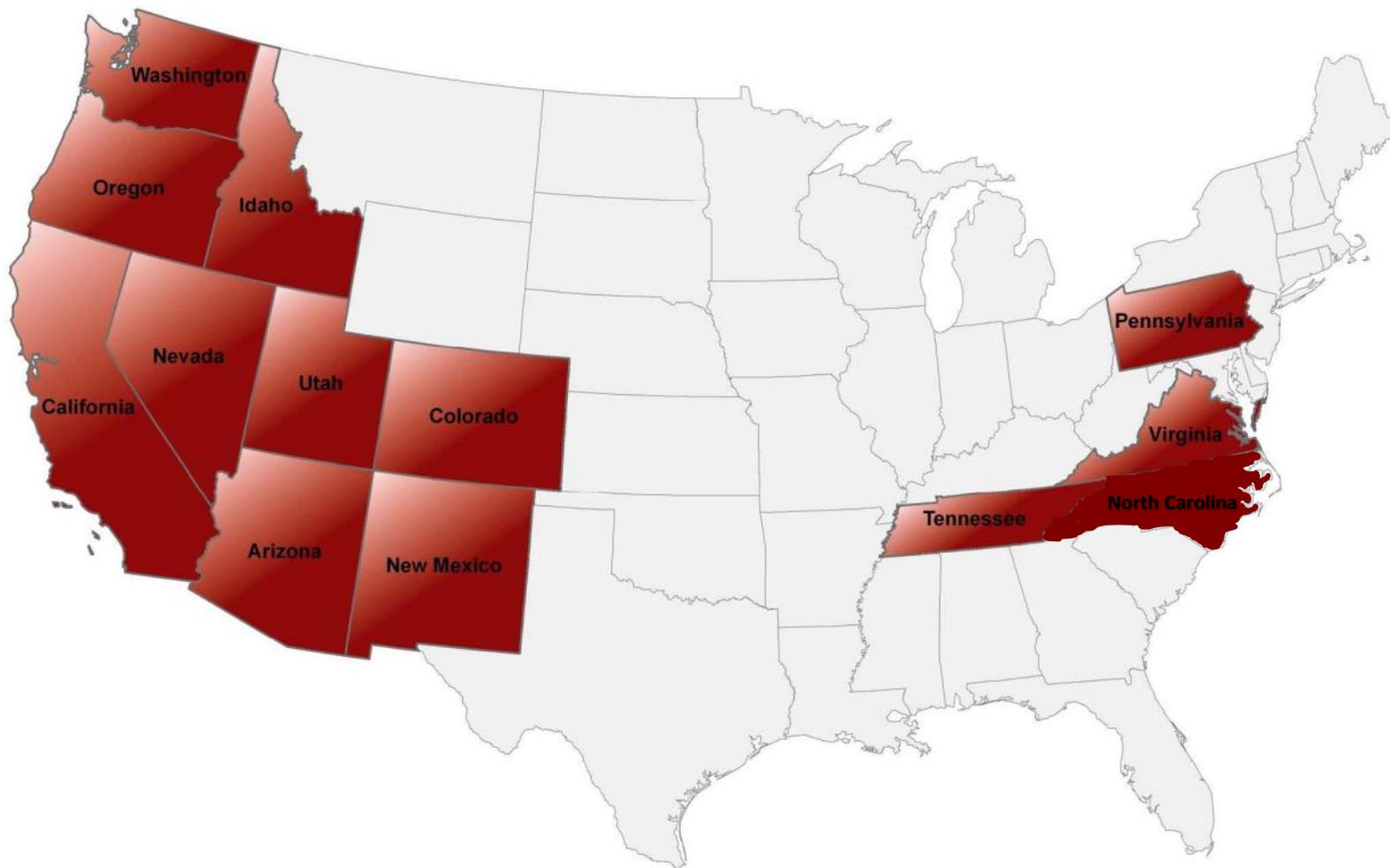


Dying *Juglans hindsii* (northern CA black walnut) trees outside Davis, CA in 2008



Photos by Steve Seybold and Andrew Graves

States Known to have Thousand Cankers Disease as of August 2, 2013



State With TCD Confirmed



State Without TCD

English walnut, *Juglans regia*

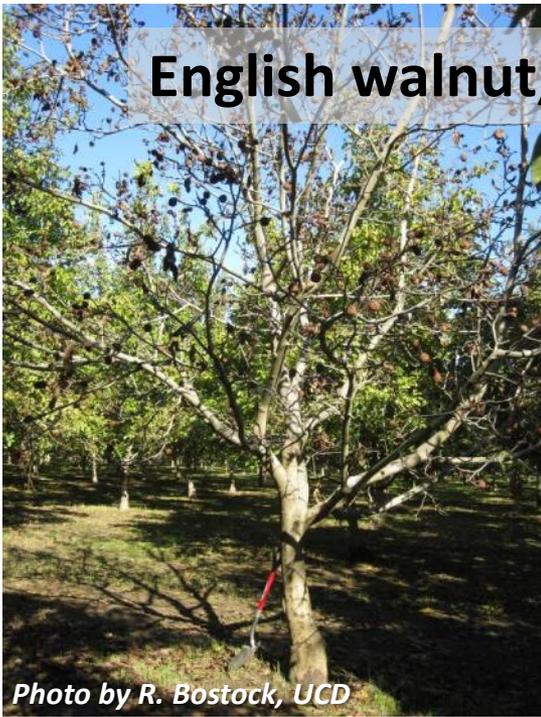


Photo by R. Bostock, UCD



Jim LaBonte – Oregon Dept Ag

***Pityophthorus juglandis*
walnut twig beetle (WTB)**





Elizabeth Fichtner, UCCE Tulare County

WTB Host Colonization Behavior



**Newly attacking male walnut twig beetles on underside of branch
of *Juglans major*, NCGR, Winters, Solano Co., Aug. 2, 2010**



***J. regia* cv. Chandler
Tulare County**

Elizabeth Fichtner, UCCE Tulare County

WTB makes galleries in the larger branches of the walnut tree



photo by Ned Tisserat & Whitney Cranshaw, Colorado State Univ.

Beetle colonization



The males colonize initially

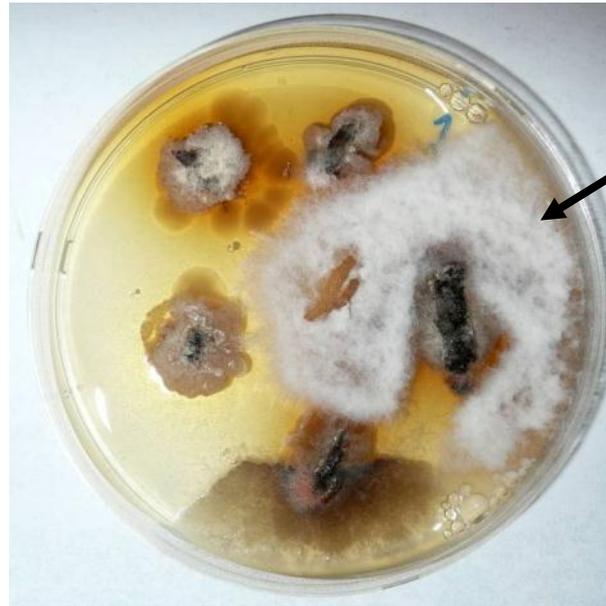
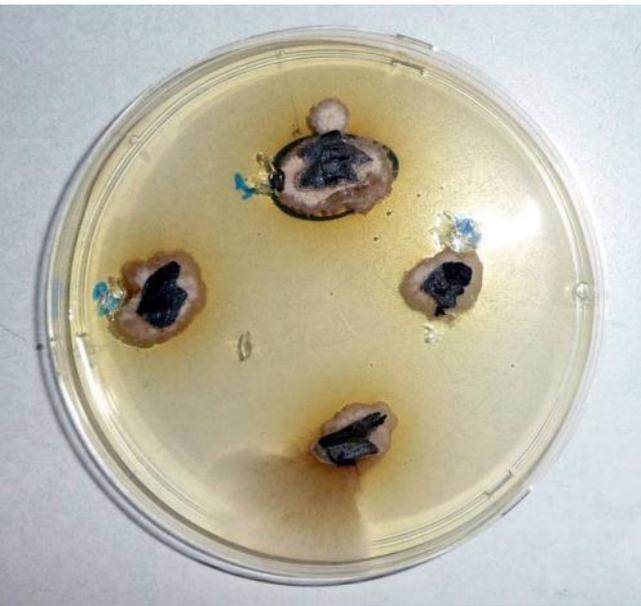


Photos by Steve Seybold & Stacy Hishinuma

Joined by 1-2 females in the galleries

The males produce a pheromone that attracts the females.

The more beetles there are in a colony, the more beetles are then attracted to the infested tree



Botryosphaeria?



Researchers find other
canker fungi in disease
samples also
(e.g. *Fusarium solani*)

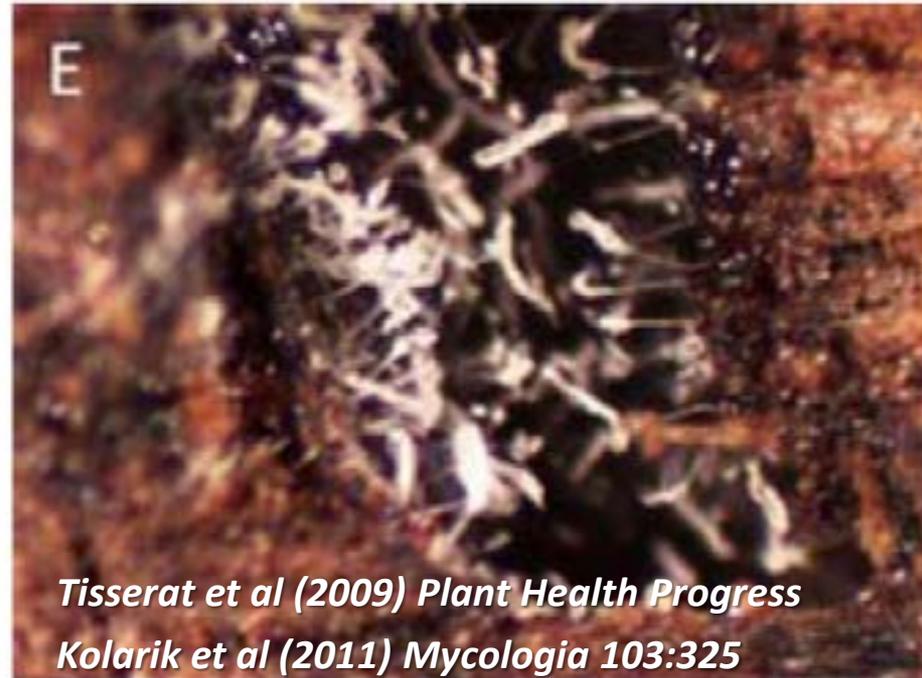
↓ *Geosmithia morbida*

Can be a little tricky!



conidiophores and conidia

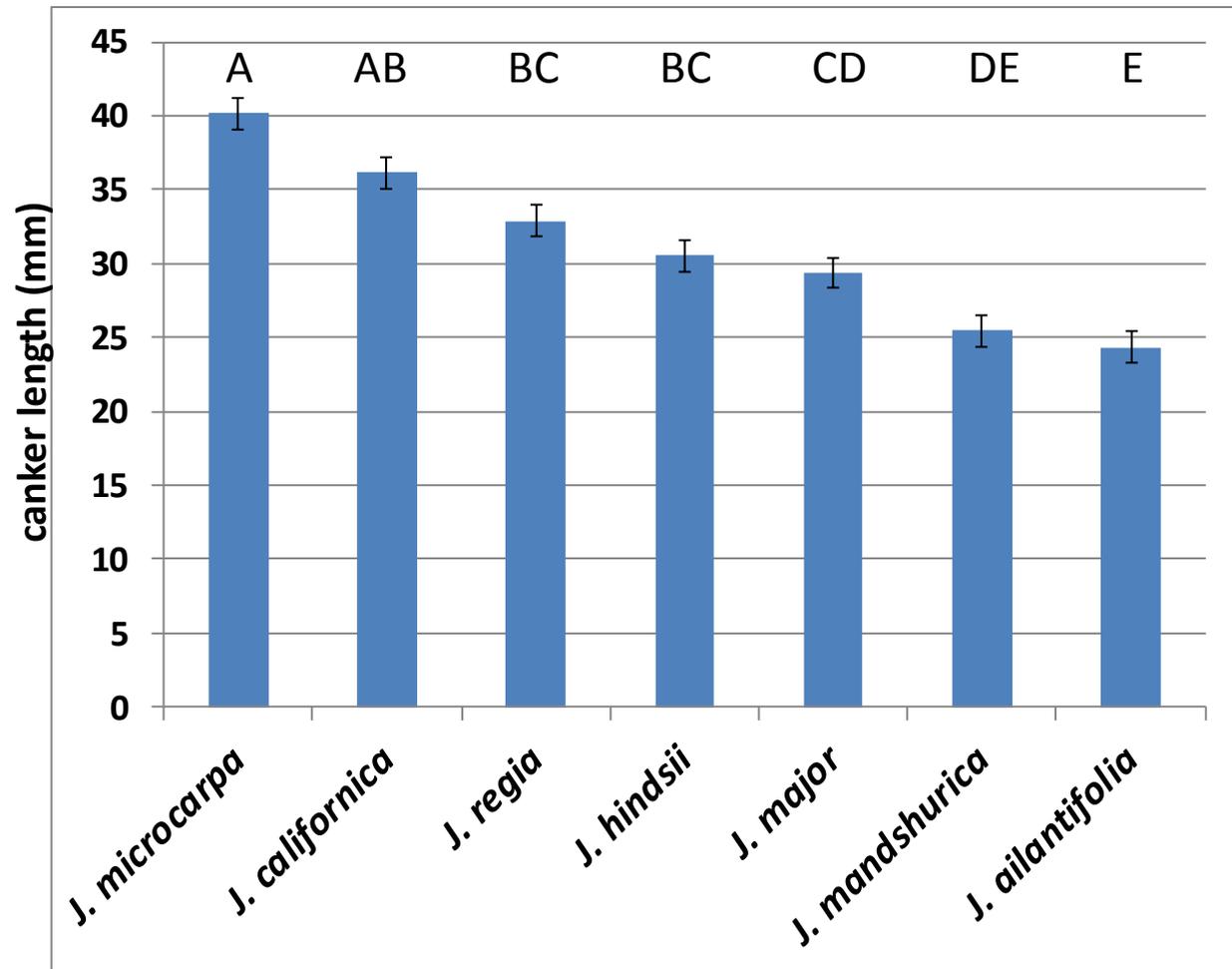
Geosmithia morbida



Tisserat et al (2009) Plant Health Progress
Kolarik et al (2011) Mycologia 103:325



Canker lengths six weeks after inoculation of branches with *Geosmithia morbida* in seven *Juglans* species at the NCGR (2010, 2011)



Values with the same letter are not significantly different ($P = 0.05$) by LSD.

Host Resistance to WTB: Are there Differences in Landing Rates on Live *Juglans* Branches from Different Species?



Measure number of adults landing per unit time on a Tanglefoot-coated acetate sleeve trap on large branches of various species of *Juglans* in the USDA ARS Germplasm Collection, Winters, CA,

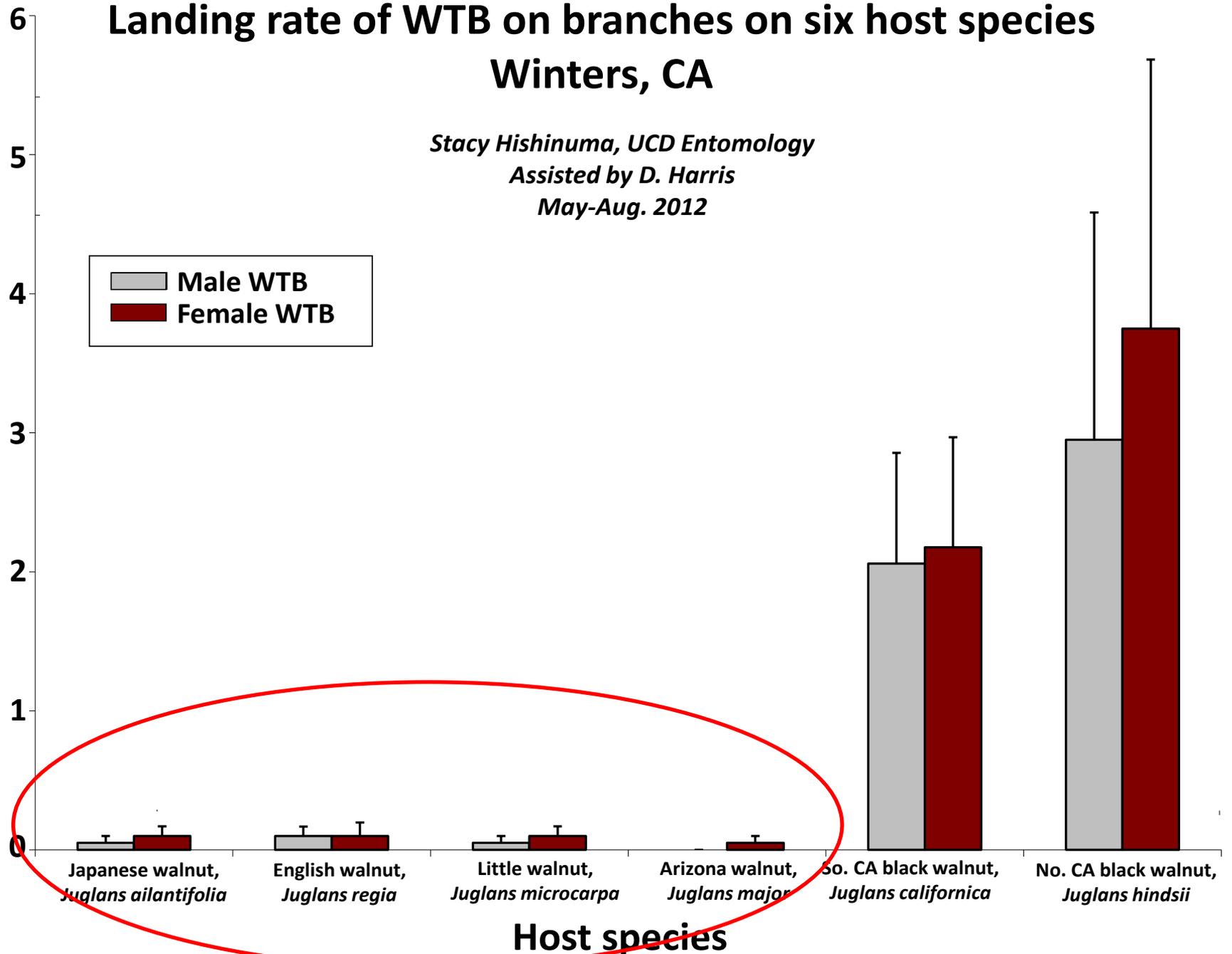
Landing rate of WTB on branches on six host species Winters, CA

Stacy Hishinuma, UCD Entomology

Assisted by D. Harris

May-Aug. 2012

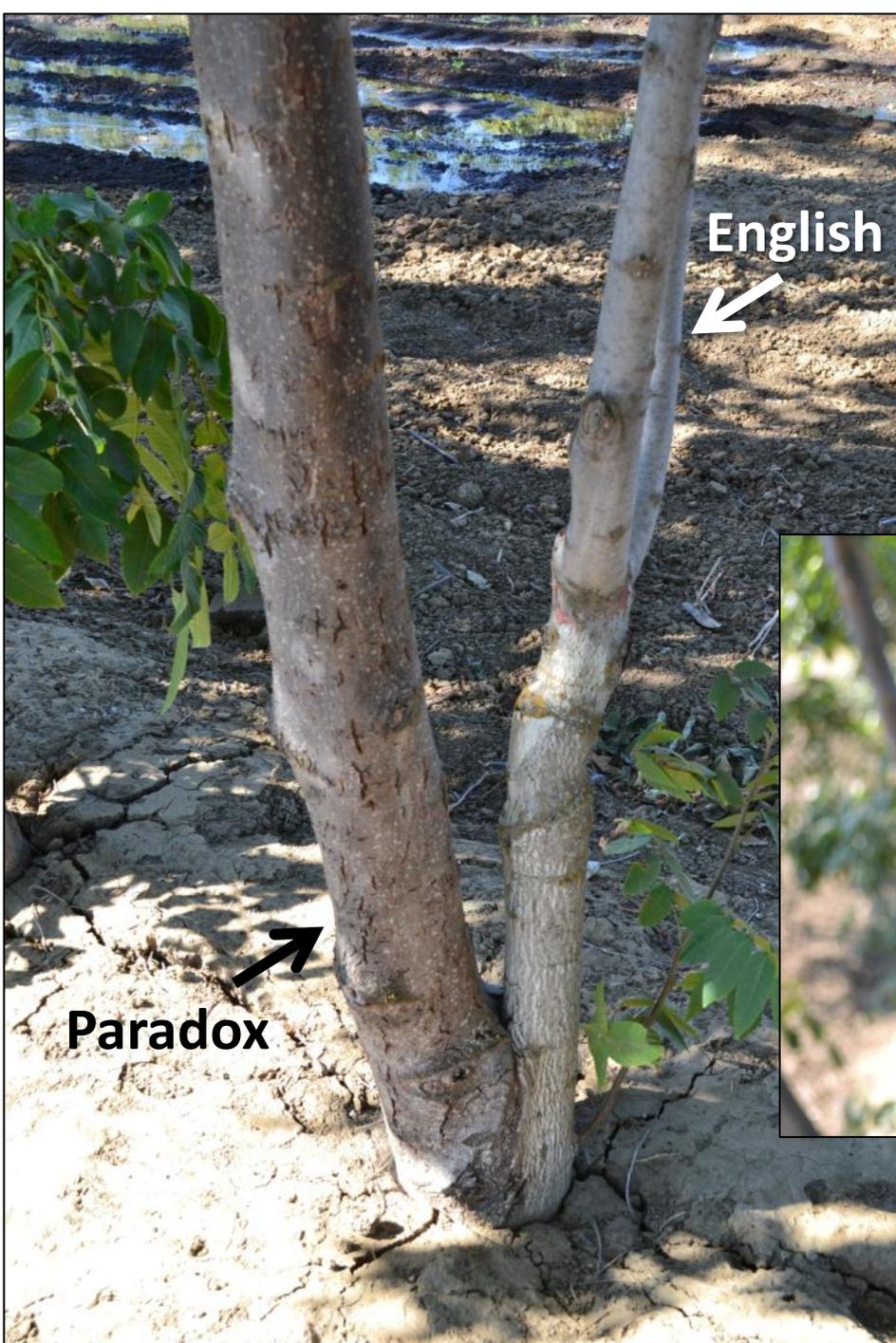
No. WTB/branch section (mean + s.e.)





Juglans californica
Wolfskill NCGR
Solano Co., CA
Aug. 2012

Photo by Stacy Hishinuma



**WTB appears to choose
Paradox over English**



Plant Pathology Research Station
UC Davis
Sept. 2012

TCD Status in California English Walnuts

- More infected English walnuts and rootstocks in 2010-2013
- Confirmed English TCD trees in CA
 - Contra Costa, Colusa, Fresno, Lake, San Joaquin, San Benito, Solano, Stanislaus, Sutter, Tulare, Yolo, Yuba



***J. regia* cv. Howard in Yuba Co.**

photos courtesy Janine Hasey, UCCE



Black walnut trees

 = TCD positive

Detailed orchard surveys

Sampling tools of the canker pathologist







Removal of outer bark tissue reveals galleries and canker

Initially, cankers and galleries are evident in cork cambium and generally do not extend to wood cambium.

Clean tools – 70% ethanol









Smart Zip
Slider

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● FERMÉ
● CERRADO

● ZIPLOC is a registered trademark of
● A Food Storage Company
● Use Entretien de l'Empaquetage

MARQUE
Ziploc
SLIDER BAGS
CERRADOR

Sample Quality: Packaging & Shipping

- **Strong crush-proof box**
 - All seams taped
- **Do not add extra water or moist towels**
- **Double bag in plastic**
 - Zip-able lock bags are highly preferred
- **Disinfect exterior of bags**

Submitting the Sample

Notify County Ag Commissioner/UCCE Farm Advisor office...

- that you have a suspect sample**
- whether you will be delivering or shipping the sample**
- give estimated time and date of arrival**
- if shipping, give all relevant shipping info:**
 - carrier**
 - tracking number**
 - expected time of delivery**

Secure Sample Submission

Furnish all relevant information, including:

- **your contact information**
- **location, name of grower/owner, date found**
- **extent of damage, incidence and severity data**
- **more information means faster, better diagnosis**
- **Site conditions and history of sample**

Other canker diseases impact CA walnuts

Challenge for field surveys and diagnostics



deep bark canker

UC Statewide IPM Project
© 2008 Regents, University of California



?



Lethal Paradox
canker
?



shallow bark canker

UC Statewide IPM Project
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Diagnosing Thousand Cankers Disease of Walnut

Thousand cankers disease is a newly recognized disease of various species of walnut (*Juglans*). Eastern black walnut (*Juglans nigra*) is particularly susceptible to thousand cankers and during the past decade it has devastated plantings of black walnut in most western states. At present, the known eastern range of the disease is along the Front Range of Colorado.

Visual Symptoms of Affected Trees

Yellowing and flagging of leaves on upper branches is usually the first symptom of the disease. This is followed by a progressive dieback that over time causes death of larger limbs and, ultimately, the entire tree. In Colorado, black walnut usually is killed within 3-4 years after initial leaf yellowing symptoms of thousand cankers disease are noted.



Crown thinning and leaf yellowing associated with Thousand Cankers Disease



Rapid wilting in end stage of Thousand Cankers Disease

<http://www.ext.colostate.edu/pubs/insect/thousand-canker.pdf>

by Ned Tisserat

The production of leaf yellowing/flagging of black walnut can have many other - and far less serious - causes. However, in areas where the disease is suspected to occur there should be additional examination to determine if thousand cankers disease is the cause.

Symptoms of Cankers

Thousand cankers disease kills trees by the production of numerous small, dark, dead areas (cankers) under the bark. Each of these is associated with tunneling by the walnut twig beetle (*Pityophthorus juglandis*), a minute brown bark beetle that carries the fungus (*Geosmithia*, new species) that produces the canker. The cumulative effect of innumerable cankers produces



Chuck Leslie, UCD Plant Sciences

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