

# Thousand Cankers Disease of Walnut

**Richard Bostock**  
**Dept. of Plant Pathology, UC Davis**

**Current Issues in Invasive and Emerging Pests and Diseases**  
**February 5, 2014**



# **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



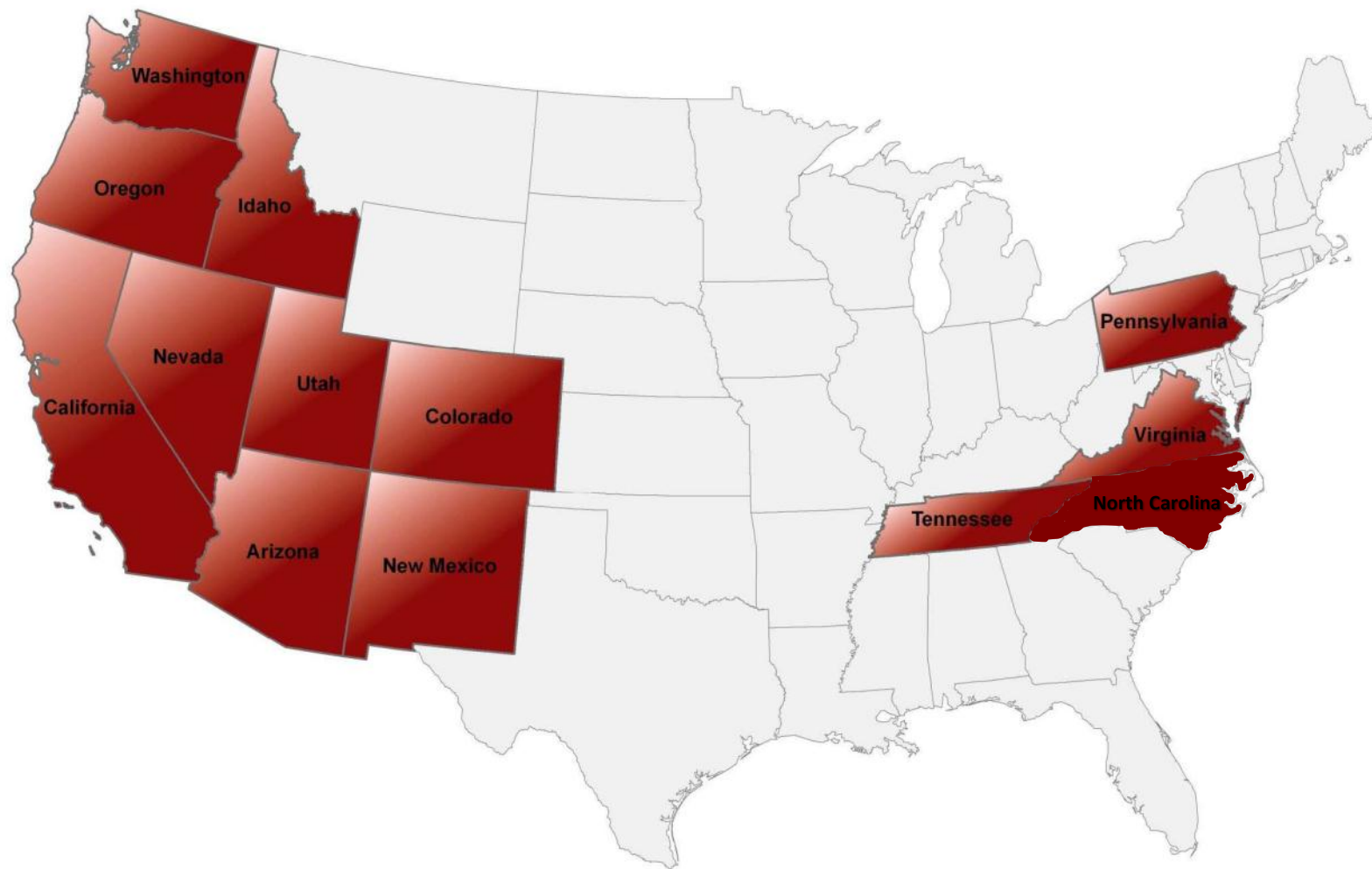
# Dying *Juglans hindsii* (northern CA black walnut) trees outside Davis, CA in 2008



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*

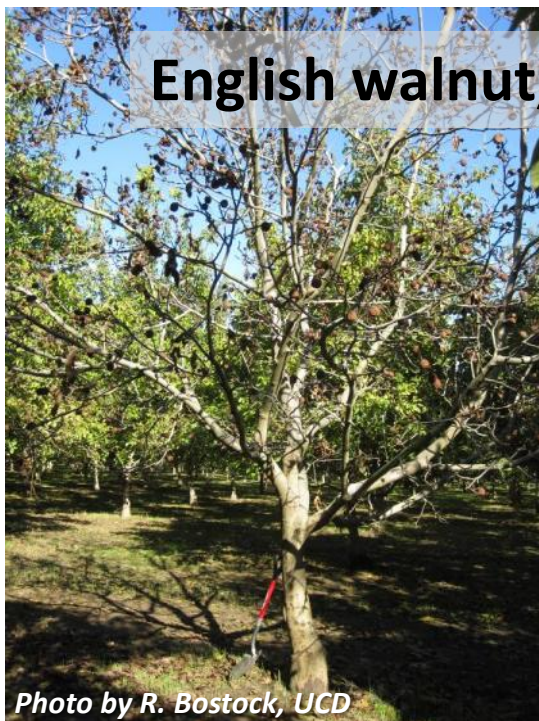


Photo by R. Bostock, UCD



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



*Photos by Steve Seybold & Stacy Hishinuma*

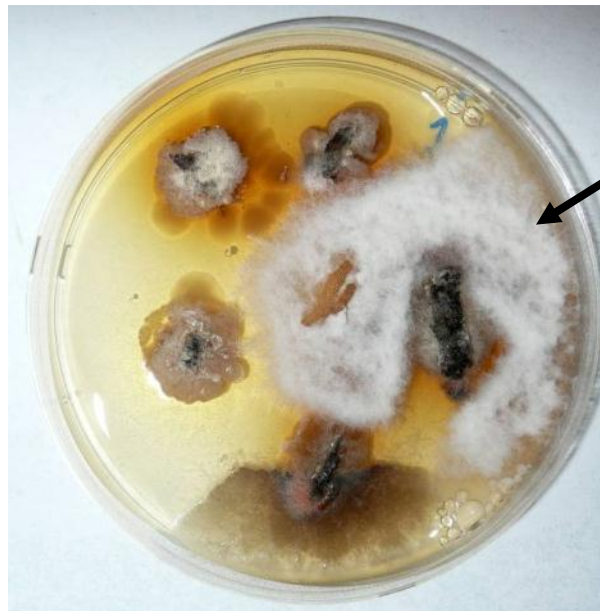
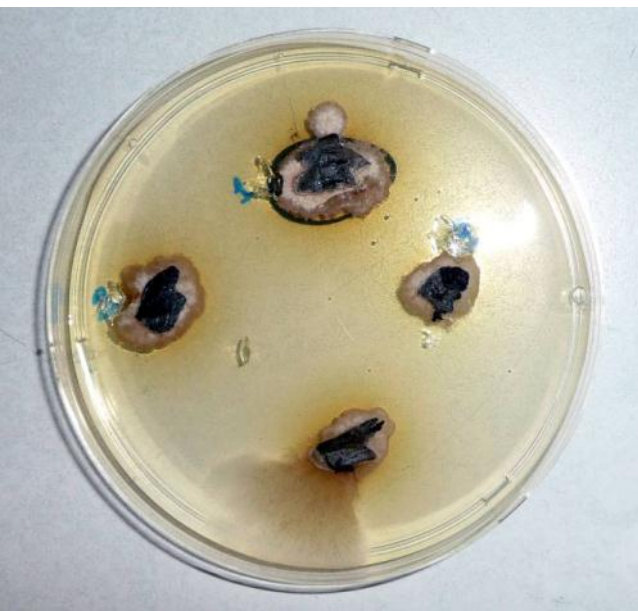
**The males colonize initially**

**Joined by 1-2 females in the galleries**

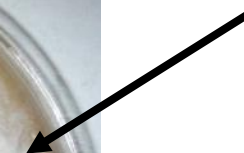
**The males produce a pheromone that attracts the females.**

**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*)

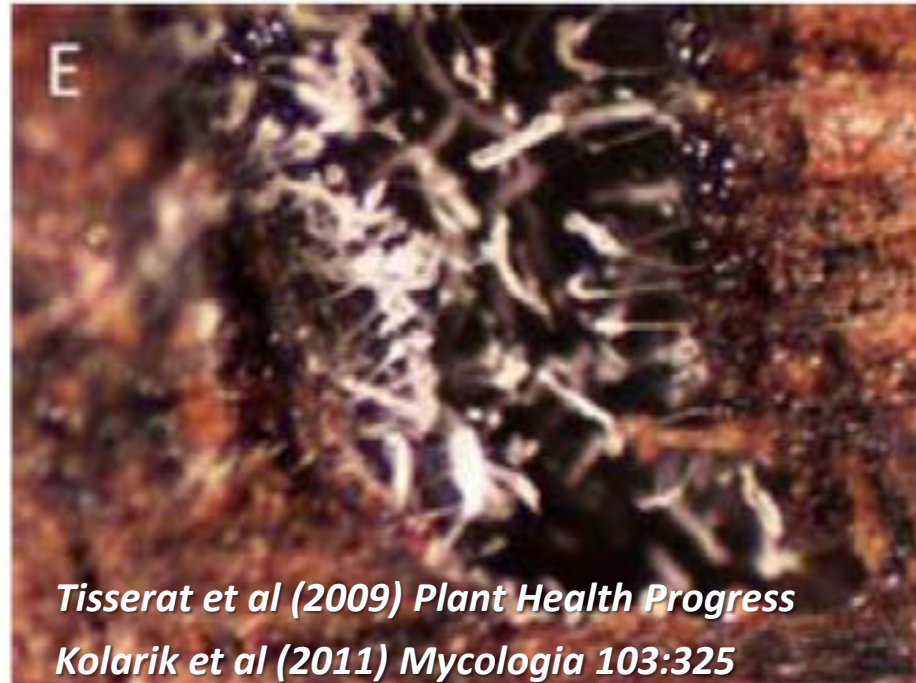
↓ *Geosmithia morbida*

Can be a little tricky!



conidiophores and conidia

*Geosmithia morbida*



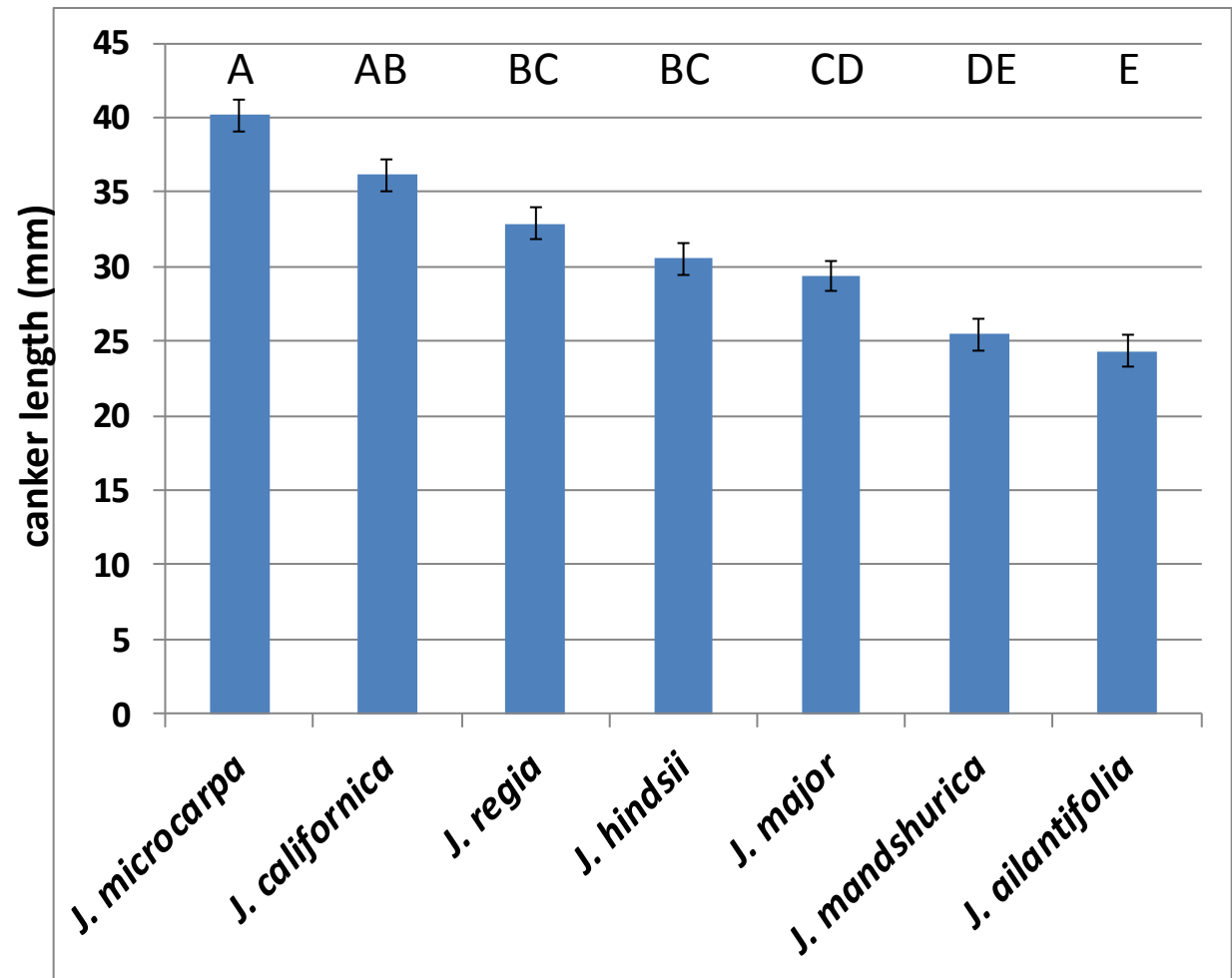
*Tisserat et al (2009) Plant Health Progress*  
*Kolarik et al (2011) Mycologia 103:325*







# 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,

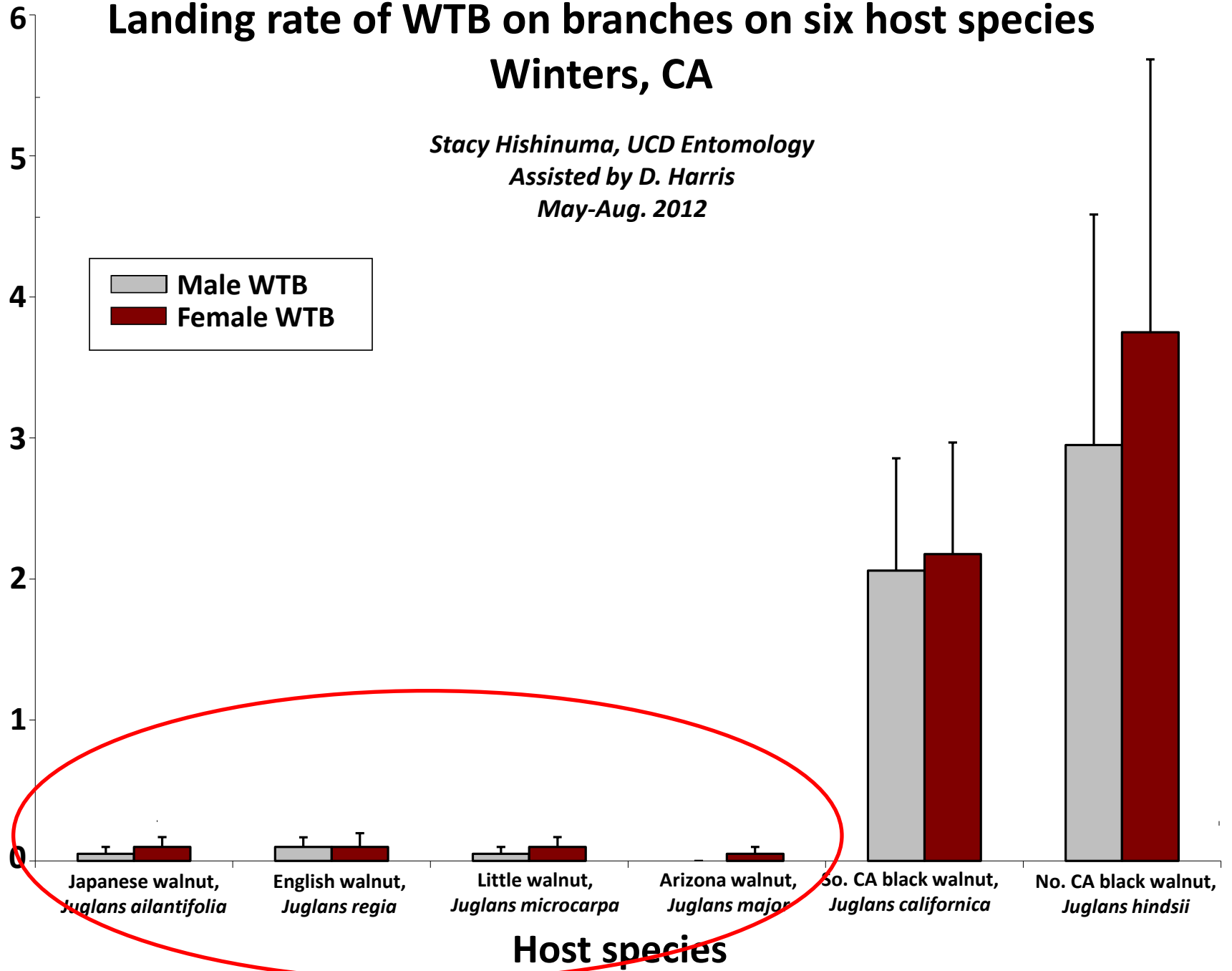
# Landing rate of WTB on branches on six host species Winters, CA

*Stacy Hishinuma, UCD Entomology*

*Assisted by D. Harris*

*May-Aug. 2012*

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



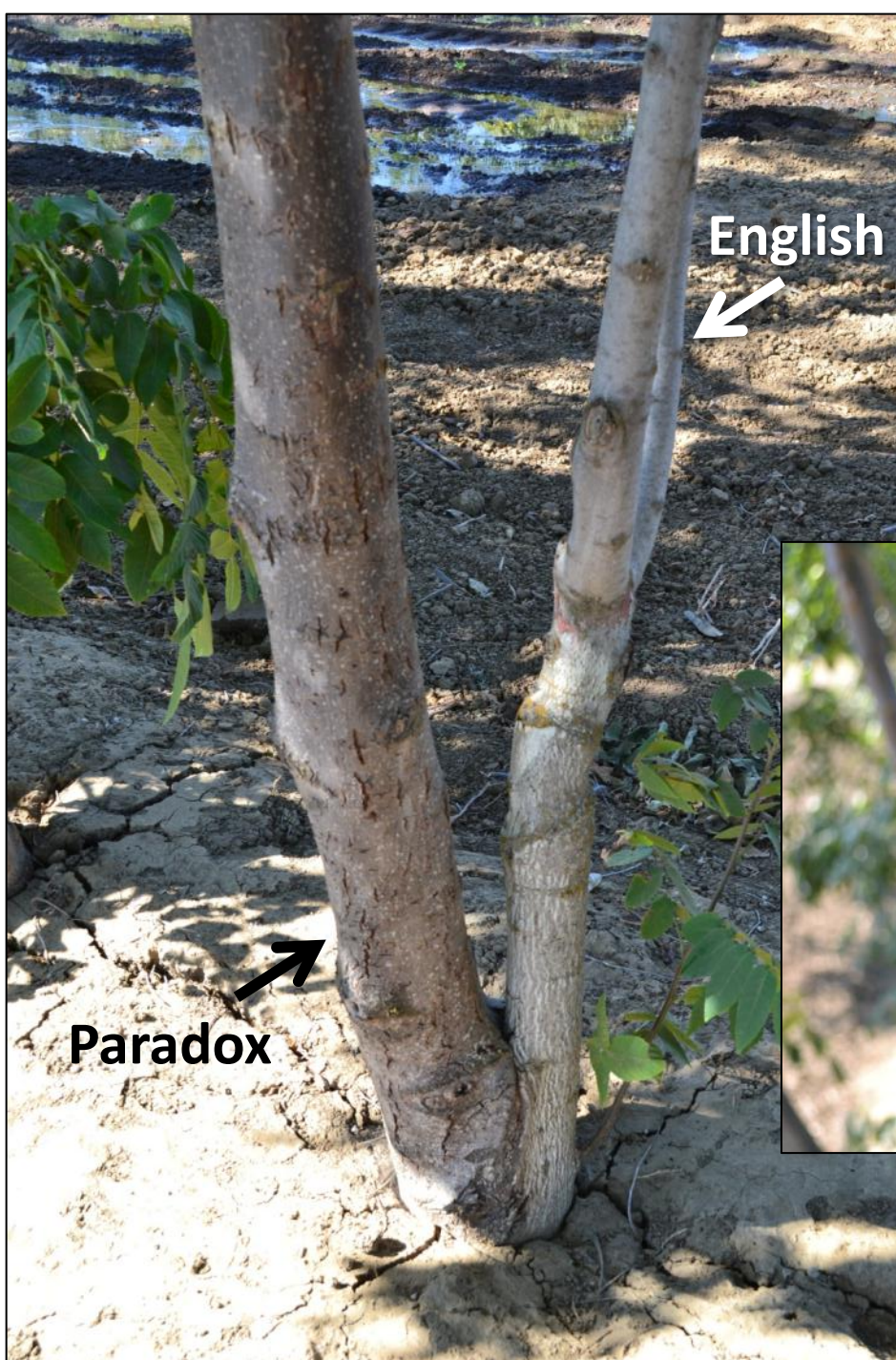




*Juglans californica*  
Wolfskill NCGR  
Solano Co., CA  
Aug. 2012

*Photo by Stacy Hishinuma*





English



Paradox



**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 Ziploc Seal

THE CLOSED  
FERME  
CERRADO

CAUTION: Do not use  
A Food Storage Bag  
Use Only for Food

MARQUE

Ziploc

ZIPPER BAGS  
ZIP SLIDER

# 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



?



Lethal Paradox  
canker  
?



shallow bark canker

# 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*

# Acknowledgements

## UC Davis and UCCE

Tivonne Nguyen	}	Plant Pathology
Tatiana Roubtsova		
Mohammad Yaghmour		
Richard Hoenisch		
Stacy Hishinuma	}	Entomology
Mary Lou Flint		
Chuck Leslie	}	Plant Sciences
Elizabeth Fichtner		
Janine Hasey	}	UCCE

## USDA

Steve Seybold-Forest Service  
John Preece - ARS  
Andy Graves - ARS

## Colorado State University

Ned Tisserat  
Whitney Cranshaw



**Support from UC ANR, USDA ARS, USDA Forest Service and USDA NIFA (NPDN)**