Thousand Cankers Disease, *Geosmithia morbida*

Enhanced First Detector Training

Thousand cankers disease

- Potential impacts
- Pathogen biology and spread
- The vector
- Hosts
- Symptoms
- Scouting—signs and symptoms
- What to do if you suspect you find it

Thousand cankers disease

- Thousand cankers (or TCD) is the name of a disease causing decline and death of walnut trees
- Caused by the combined, **sustained** activity of the fungal pathogen, *Geosmithia morbida*, and a tiny native bark beetle the walnut twig beetle, *Pityopthorus juglandis*.

Potential impact

Walnut harvest is a high-dollar industry in some states.

- 407 million pounds of walnuts were produced in the U.S. in 2011/2012
  - Up to 70% of all walnuts produced in the U.S. are exported
  - California alone has 280,000 acres of walnut trees planted (2011/2012)
    - English walnut grown in California was valued at over $1.3 billion in 2010.
  - Missouri estimates that over $35 million could be lost annually in nut harvest due to TCD

Slide courtesy of Protecting US

Potential impact

Several susceptible species (walnuts) in NY:

- *Juglans nigra* (black walnut, native)
- *Juglans cinerea* (butternut, native)
- *Juglans regia* (English walnut, introduced)

Economic damage

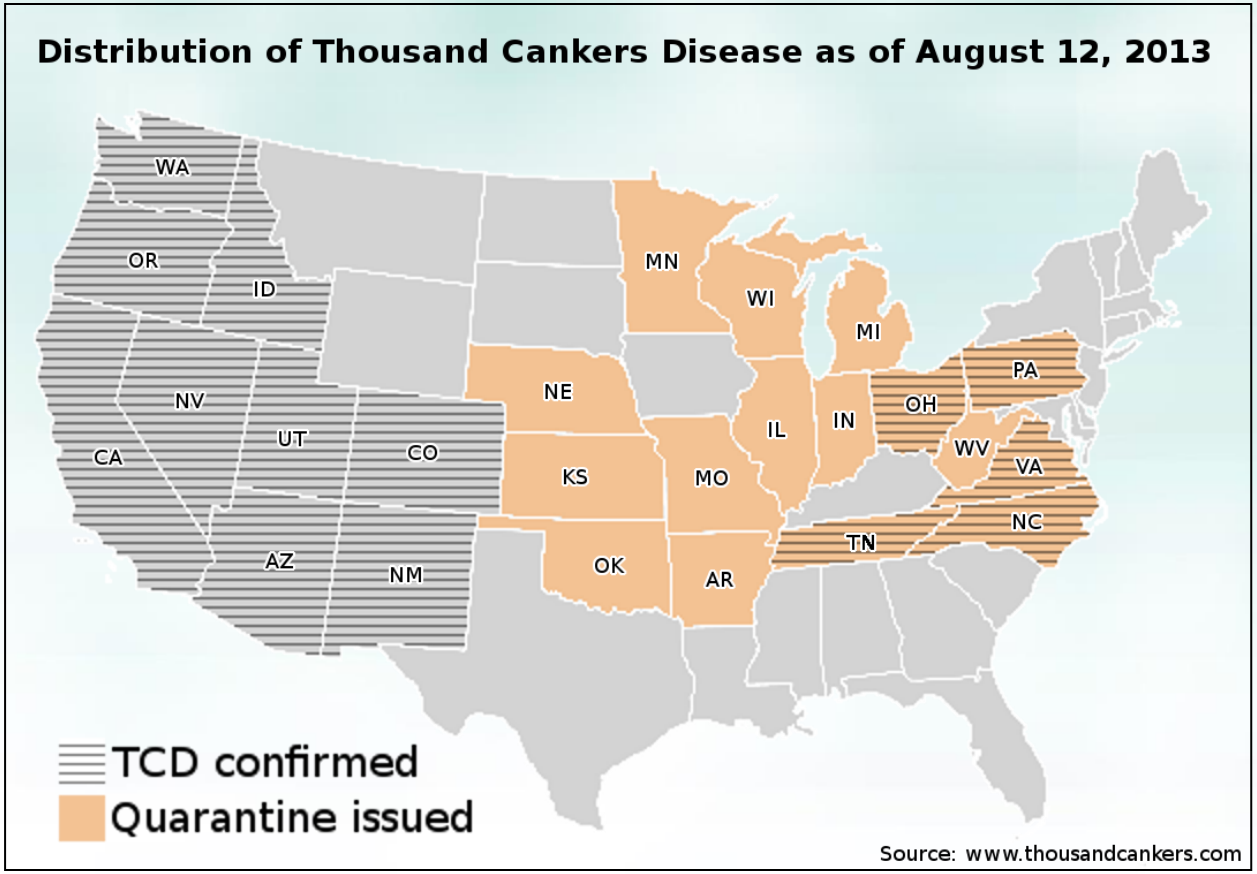
- Timber
- Walnut harvest

Ecological damage

- Compound impact of other forest diseases and pests (chestnut blight, Dutch elm, emerald ash borer)

Potential impact

- Rapid spread since first detected
- Spreading east from western states

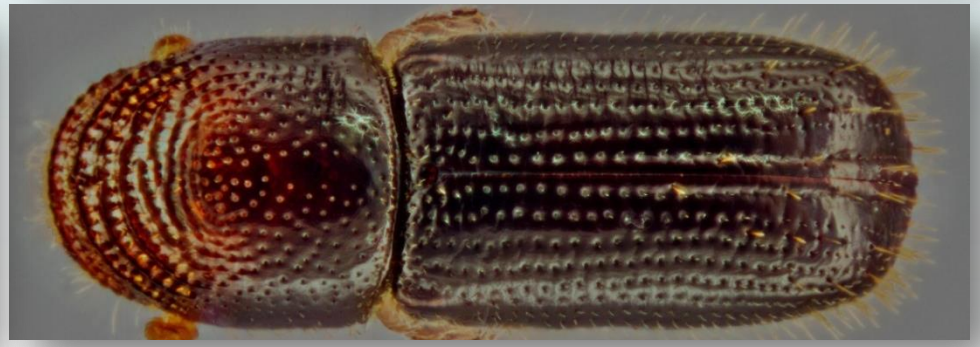


Geosmithia morbida biology

- Fungus
- Thought to be native to western states
- Damages the phloem tissue and disrupts nutrient transport
- Vectored by walnut twig beetle
- Cankers form around the walnut twig beetle galleries

Vector: the walnut twig beetle, *Pityophthorus juglandis*

- Small reddish-brown bark beetle
- Native to southwestern US, spreading to other states



Photos © side view and dorsal view of beetle-Steven Valley, Oregon Department of Agriculture, Bugwood.org; beetles on penny-Whitney Cranshaw, Colorado State University, Bugwood.org


Photo © Whitney Cranshaw, Colorado State University, Bugwood.org


Photo © Karen Snover-Clift, Cornell University, Bugwood.org


Photo © Karen Snover-Clift, Cornell University, Bugwood.org

So tiny but over time, SO many…

Over 23,000 beetles were collected out of two 18” logs.

Thousand cankers disease develops from the combined, sustained activities of both the fungus and the beetles.

Reason for it taking so many years for visual symptoms to become apparent.

Pathways

- Locally-beetles carry spores on them to new hosts
- Long distance or human assisted spread
  - Transport of logs containing live beetles and fungus
  - most likely wood for woodworking
  - less likely firewood

Pathways

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Disease Notes

First Record of Thousand Cankers Disease *Geosmithia morbida* and Walnut Twig Beetle *Pityophthorus juglandis* on *Juglans nigra* in Europe

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Thousand cankers disease (TCD) of walnut is responsible for widespread mortality of black walnut (*Juglans nigra* L.) in the United States since the mid-1990s (2). The disease is caused by the fungus *Geosmithia morbida* Kolařik (Ascomycota, Hypocreales), vectored by the walnut twig beetle *Pityophthorus juglandis* Blackman 1928 (Coleoptera, Scolytinae). In September 2013, TDC was observed in northeastern Italy (Bressanvido, Vicenza, 45°39′ N, 11°38′ E) in black walnuts of different ages: ~80-year-old plants growing in a garden and 17-year-old trees belonging to a nearby walnut plantation for timber production. Main symptoms were yellowing, wilting, twig and branch dieback, and a high number of small bark cankers (3). Longitudinal and radial sections collected through the cankers revealed gray to

Photo © Whitney Cranshaw, Colorado State University, Bugwood.org

If TCD is a native disease why has it only recently become a problem?

- Association between the beetle and the fungus may be a recent development
- The twig beetle has expanded its host preference with the introduction of other walnut species within its range
- Expansion of the range of the walnut twig beetle into the eastern U.S.

Hosts

- All walnut trees (*Juglans*) are thought to be susceptible to varying degrees
- In New York *J. nigra, J. cinera* and *J. regia*

Photos (top) *Juglans nigra* leaf and (bottom) *Juglans nigra* fruit © Paul Wray, Iowa State University, Bugwood.org

Learn to identify walnuts

Leaves :

- Up to 24” long
- Alternately arranged
- Pinnately compound
- 15-23 leaflets

Fruit:

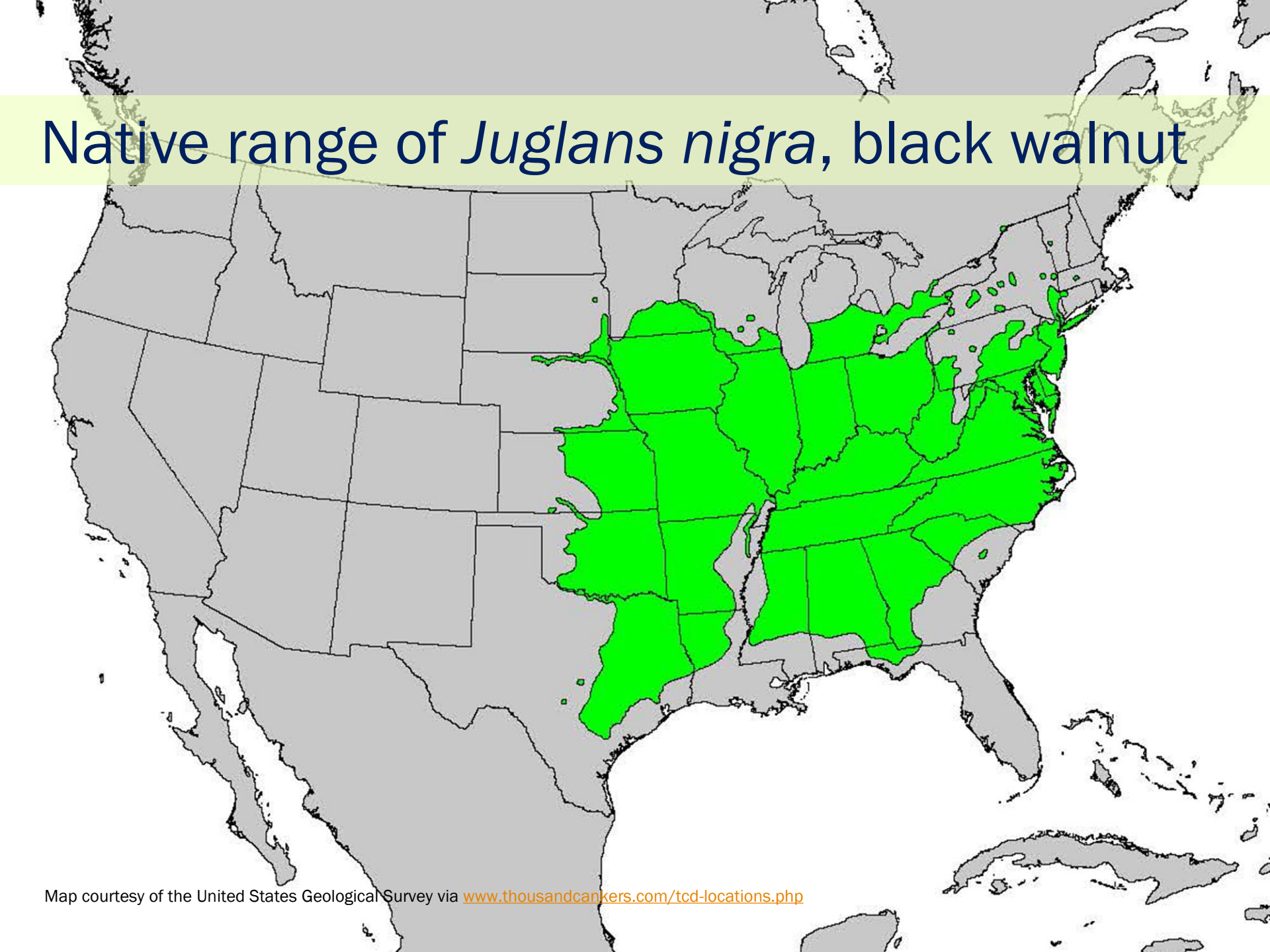
- Leathery husk
- Walnut inside

Host susceptibility

- **Highly susceptible**
  - –Black walnut (*Juglans nigra*)
  - –Butternut (*Juglans cinerea*)
- **Varying intermediate resistance**
  - –Northern California walnut (*J. hindsii*)
  - –Southern California walnut (*J. californica*)
  - –Persian/English walnut (*J. regia*)
  - –Little walnut (*J. microcarpa*)
- **Highly resistant**
  - –Arizona walnut (*J. major*)

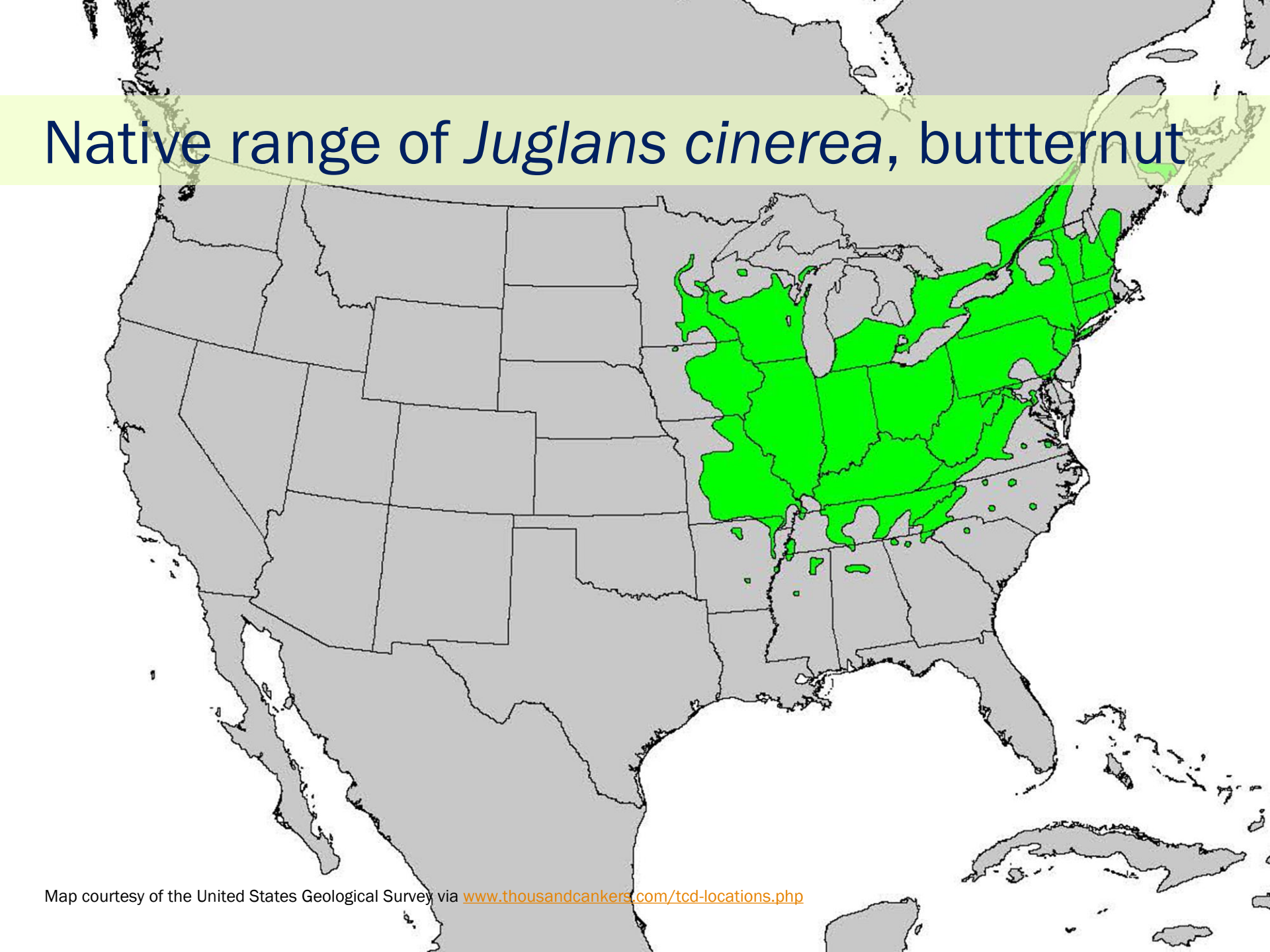
Native Eastern walnuts

Native range of *Juglans nigra*, black walnut



Map courtesy of the United States Geological Survey via www.thousandcankers.com/tcd-locations.php

Native range of *Juglans cinerea*, buttternut



Map courtesy of the United States Geological Survey via www.thousandcankers.com/tcd-locations.php

Early symptoms

- Yellowing of leaves
- Thinning of foliage in the upper crown
- Wilting
- Smaller than normal leaves

Late symptoms

- Flagging
- Branch death
- Tree death

Photos © Whitney Cranshaw, CSUE, Bugwood.org

Signs & symptoms

Smaller dark brown or black cankers just under outermost bark layer

Very tiny exit holes in bark

Photos © (left) Ned Tisserat and (right) Whitney Cranshaw, Colorado State University, Bugwood.org

- External cankers are made up of many individual infections that have coalesced
- External cankers are a sign of advanced infection and not always visible

Photo © Karen Snover-Clift, Cornell University, Bugwood.org

Scouting for TCD

- **Walnut or butternut tree**
- Tree symptoms (leaf yellowing, crown thinning, branch death)
- Beetles or beetle damage
- Cankers (under bark)

Photos (top) *Juglans nigra* leaf and (bottom) *Juglans nigra* fruit © Paul Wray, Iowa State University, Bugwood.org

Scouting for TCD

- Walnut tree
- **Tree symptoms (leaf yellowing, crown thinning, branch death)**
- Beetles or beetle damage
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Scouting for TCD

- Walnut tree
- Tree symptoms (leaf yellowing, crown thinning, branch death)
- **Signs of beetles or beetle damage**
- **Cankers (under bark)**

What to do if you suspect TCD

Collect a sample and submit it to our laboratory for identification

- Collect a branch 2 to 4 inches in diameter and 6 to 12 inches long showing the diseased wood
- Wrap the sample in DRY paper towels or newspaper
- Double bag your sample in zippered plastic bags
- Fill out the lab's sample submission form
- Mail the sample to the lab or give it to your local county agent for them to mail it in
  - Don't delay! A good sample is essential for diagnosis!

Management of thousand cankers disease

Not preventable, beetles can attack and infect healthy trees

Must limit movement of the beetle

- Inspect dying walnuts and report suspected TCD to county agent or state forester.
- Do not transport dead/dying wood off-site.
- Prompt and proper disposal of infected wood by burying or burning.
- Do not transport walnut for woodworking or firewood.

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