



Insect and Disease Review

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The Morton Arboretum and University of Florida

iLandscape
the illinois+wisconsin
Landscape Show

Marmorated stink bug

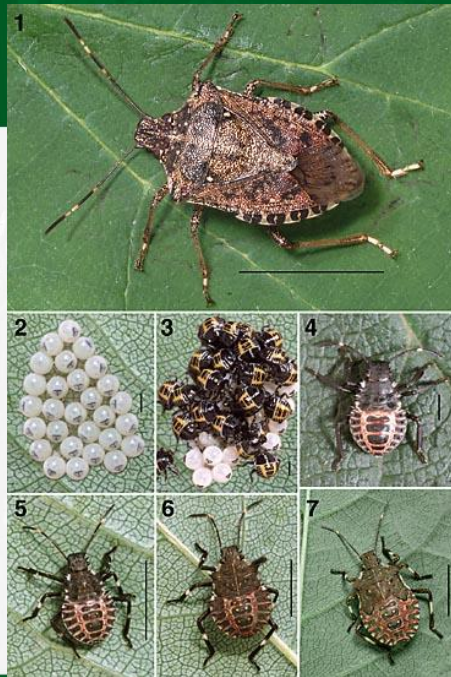
The Morton
Arboretum*

- *Halymomorpha halys*
- Causes injury to crops and ornamentals
 - Pear, peach, mulberry, persimmon, apple, soybeans, and shade trees
- True bug – piercing-sucking mouthparts
 - Feeds on plant stems and fruit
- Infest buildings in autumn



Lifecycle

- Overwinter as adults
- Adults emerge Apr-May
- Mate and lay eggs from Jun-Aug
- Eggs hatch and nymphs go through five molts
- Adults begin looking for overwintering location Sept-Oct



Photographer – Kent Loeffler © Cornell University, Dept. of Plant Pathology, 2004



Photo: Doug Pfeiffer



David Wright: corn photos, Eric Day: tomato

Viburnum Leaf Beetle

- *Pyrrhalta viburni*
- United States since 1990s
 - Chicago region 2013
 - Widespread 2015
- Adult and larvae cause skeletonizing damage
- One generation per year
- Overwinters as eggs in twigs
- Heavy feeding for 2 to 3 years can lead to the death



Viburnum Leaf Beetle



Adults

- ¼" long
- Covered in golden hairs
- Present from early July until Oct.
- Female lay (<500) eggs in cavities they chew into the stems
 - Several eggs are laid in each cavity
- Egg-laying occurs from late summer into autumn



Eggs

- Laid in small holes on twigs in rows
- Holes are capped with chewed wood and excrement



Viburnum Leaf Beetle



Larvae

- Hatch mid-May
- Feed on new leaves
 - See damage before larvae
- 3 instars
 - Grow to 1/3" long
 - Pale green–yellow, dark spots
- Early to mid-June larvae pupate in the soil (~10 days)



Viburnum Leaf Beetle Hosts



Highly susceptible – Killed in the first 2-3 years

- *Viburnum dentatum* – arrowwood viburnum
- *V. nudum* – possum-haw, smooth witherod viburnum
- *V. opulus* – European cranberry-bush viburnum
- *V. opulus* var. *americana* – American cranberry-bush viburnum, formerly *V. trilobum*

Susceptible species – Eventually killed

- *V. acerifolium* – mapleleaf viburnum
- *V. lantana* – wayfaringtree viburnum
- *V. rufidulum* – rusty blackhaw, southern black-haw
- *V. sargentii* – Sargent viburnum

Viburnum Leaf Beetle Hosts



Moderately susceptible – Usually are not killed

- *V. burkwoodii* – Burkwood viburnum
- *V. x carlcephalum* – Carlcephalum viburnum
- *V. cassinoides* – witherod viburnum
- *V. dilatatum* – linden viburnum
- *V. farreri* – fragrant viburnum
 - except 'Nanum', which is highly susceptible
- *V. lentago* – nannyberry viburnum
- *V. prunifolium* – blackhaw viburnum
- *V. x rhytidophylloides* – lantanaphyllum viburnum

Viburnum Leaf Beetle Hosts



Resistant species – Little or no feeding damage

- *V. carlesii* – Koreanspice viburnum
- *V. x juddii* – Judd viburnum
- *V. plicatum* – doublefile viburnum
- *V. plicatum* var. *tomentosum* – doublefile viburnum
- *V. rhytidophyllum* – leatherleaf viburnum
- *V. sieboldii* – Siebold viburnum

VLB Management

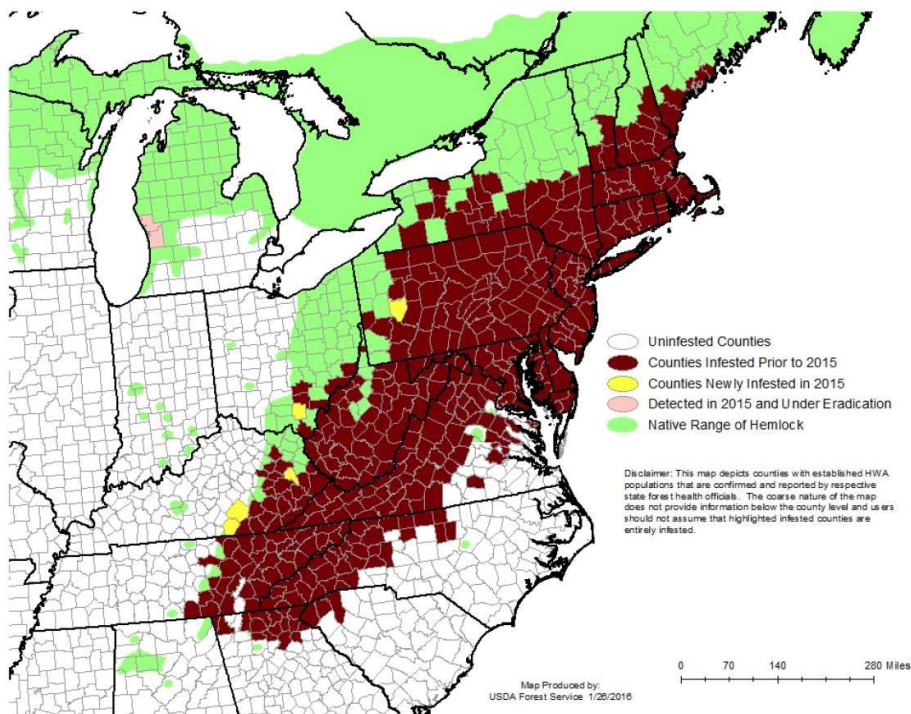
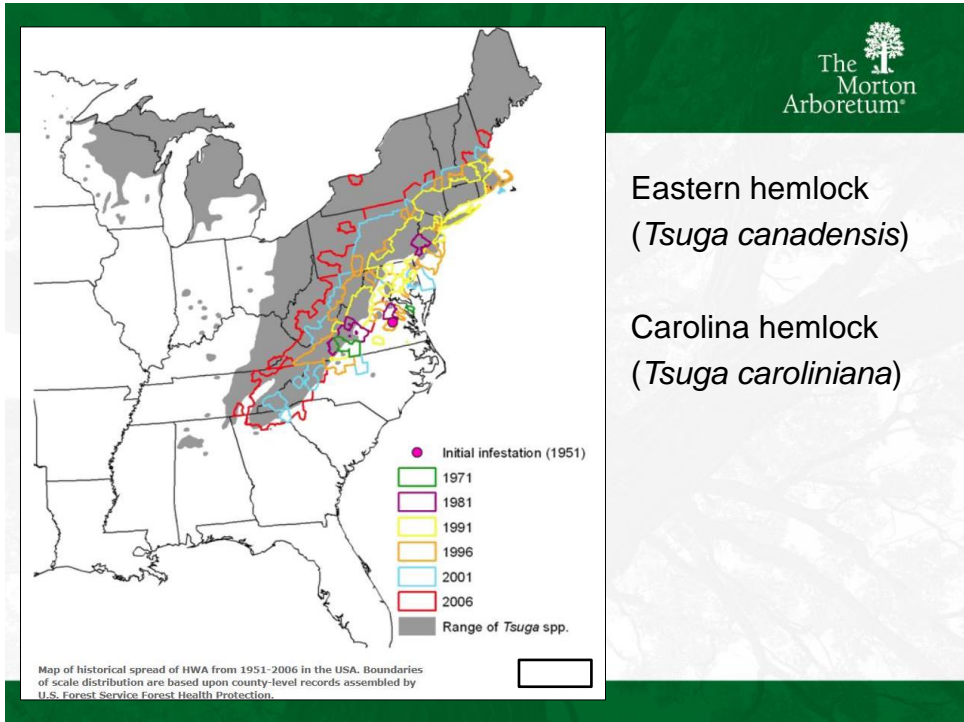


- Plant resistant species
 - Susceptible species - plant in moderation
- Remove and destroy twigs with eggs
 - Can easily be seen once the leaves have fallen
- Sticky barrier like Tanglefoot® applied to stems
 - Keep larvae from crawling to the ground to pupate
- Insecticide
 - Treat young larvae, they are easiest to kill
 - Can be applied to adults, damage already done

Hemlock wooly adelgid

- *Adelges tsugae*
- 1924 – Pacific NW
- 1950s – Virginia
- Found in Indiana 2012
 - LaPorte County
- Not found in Illinois
- Throughout Appalachians
 - Birds, animals, humans





Hemlock wooly adelgid



- Two generations per year
- Females reproduce asexually
 - Lay about 300 eggs
- 1/16” long, black, covered with white fluff
- Dormant during summer heat



5485677

USDA Forest Service Southern Research Station, USDA Forest Service, SRS, Bugwood.org

Hemlock wooly adelgid



Piercing-sucking mouthparts
– Similar to aphids

Symptoms

- Stunted needles and branches
- Slow decline
- death in a few years



UGA1748048



Jumping worms

- *Amyntas* species
- Wisconsin, 2013
- Three Illinois sites
- Name from the thrashing, jumping movements when disturbed
- Consume leaf litter and soil quickly
 - Can turn the soil into a dry, granular mess
- Biology and life cycle of this worm is still being studied



Jumping worms



Similar in appearance to earth worms, but...

The thickened band

- Jumping worms is milky white to gray and smooth
- Regular earthworms the band is raised and the color is similar to that of the rest of the worm



- JW, the band completely encircles the worm's body
- REW, it does not encircle the body

Photo courtesy Wisconsin DNR

Jumping worms



Illinois Department of Agriculture is tracking this pest, notify:

scott.schirmer@Illinois.gov

cwevans@Illinois.edu

No chemical controls of the jumping worms at this time



Photos © Susan Day / UW Madison Arboretum



Boxwoods

- Leafminer - *Monarthropalpus flavus*
- Boxwood blight
- Volutella
- Fusarium canker

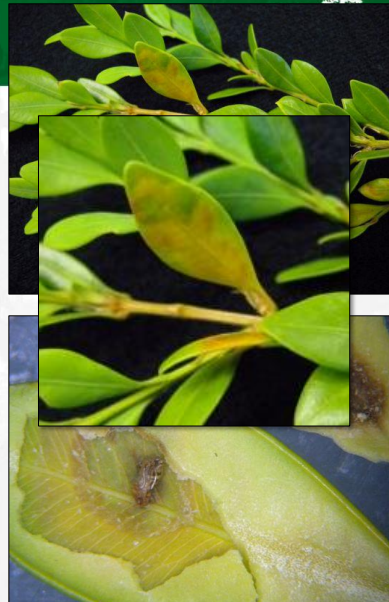
Boxwood leafminer

- Big problem in 2016
- Overwinter in the leaves as larvae
- Blister-like mines on the leaves
 - light green to brownish
- Mines sometimes mistaken for leaf spots
- Larva pupate inside the leaf
- Emerge as an adult, early to mid-May (around GDD₅₀ 450)
- Insecticides can be sprayed when the adults are emerging



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Boxwood blight



- *Clindrocladium buxicola*
- 1990s in the UK
- 2002 in New Zealand
- 2011 North Carolina and Connecticut
- 2012 VA, MD, RI, MA, OH, OR, PA, NY, BC
- January 2017, confirmed in Illinois
 - Lake, Cook, Clinton Counties



Photo: Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org

Boxwood blight



- Plants were recent landscape introductions
 - Plants obtained from out of state nurseries
- More susceptible *Buxus sempervirens*
 - 'Suffruticosa' (English) and 'American' (American)
- Also susceptible: *Pachysandra terminalis* and *Sarcococca*
- Other plants in the Buxaceae??



Photo: David L. Clement, University of Maryland, Bugwood.org

Boxwood blight Symptoms



- Branch dying AND defoliating
 - Without orange-pink fungal growths
- Diseased plants cannot be cured with fungicides
 - VA Tech: chlorothalonil on healthy plants as a preventative
- Focus should be on monitoring new plants entering the landscape



Boxwood Blight Management



- Quarantine new boxwood shrubs for a month after purchase
- If you think you might have boxwood blight contact
- Illinois Department of Agriculture at 815-787-5476
- University of Illinois Plant Clinic for laboratory <http://web.extension.illinois.edu/plantclinic/>

Boxwood & Volutella



- *Volutella buxi*
- Fungal canker and leaf spot
 - Looks similar to winter injury
- Infection possible at any time
 - rainy weather, high humidity, overcrowding, too much sun, winter injury, and shearing
- Older and injured plants are more susceptible



Boxwood & Volutella



- Symptoms in late mid- to late-summer
 - brown to tan leaf margins and blighting
- Spring wet periods, orange-pink growths on the underside of leaves and on branches
- Can spread within a plant



Boxwood & Volutella



- Management:
 - Purchase disease-free plants
 - Water during dry periods
 - Use drip irrigation and prevent wet foliage
- Remove diseased leaves, stems, and plants
- Clean up debris under the plants
- Thin, prune, and divide overcrowded plants during dry weather
 - improve air circulation
- Do not over-fertilize
- Copper sulfate and mancozeb



Boxwood Stem Cankers



- Stress related
- Caused by several different fungi
- Leaves on infected branches turn army-green-grey then straw-colored on random branches throughout the canopy once they die

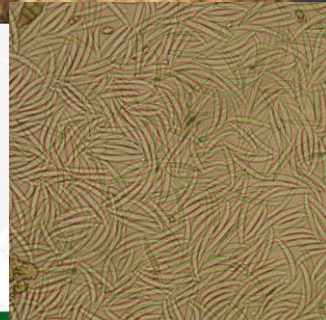




- No fungal fruiting bodies on the leaves
- No leaf spots
- No marginal necrosis

Boxwood Stem Cankers

- Dive down into the plant and inspect the lower and larger stems (~1/3" diameter and larger)
- Look for cracked and sloughing bark on the stems
- On branches with cracked or sloughing bark, look for fungal growth
 - Orange, brown, black, white



Spotted Lanternfly

- *Lycorma delicatula*
- International trade
- 2014 – Pennsylvania
- Native to China, India, Japan, and Vietnam



Spotted Lanternfly



- Feeds on phloem with piercing-sucking mouthparts
- Hosts with a lot of sugar in their sap
 - Humans transport egg masses laid on smooth surfaces



Lawrence Barringer, Pennsylvania Department of Agriculture

Spotted Lanternfly



- Egg masses in Oct
- Hatch in April
- Honeydew and sooty mold
- Not a strong flier
- Excellent jumper



Lawrence Barringer, Pennsylvania Department of Agriculture

Spotted Lantern Fly Host Plants

Almonds

Apples

Apricots

Birch

Cherries

Dogwood

Grapes

Lilac

Maple



Nectarines

Oak Trees

Peaches

Pine Trees

Plums

Poplar Trees

Sycamore Trees

Tree-of-heaven****

Walnut Trees

Willow Trees



Photograph: Holly Ragusa, Pennsylvania Department of Agriculture

Spotted Lantern Fly



- Look for suspicious egg masses on smooth surfaces
 - 30 to 50 small eggs in a gray, waxy, crusty coating
- Hatched eggs appear as brownish seed-like deposits in four to seven columns about 1 inch long
- Gray or black lines of moldy sap down the trunk



Photo: Holly Ragusa, Bugwood.org

Thousand Cankers of Black Walnut

Only on walnut species

Black walnut (*J. nigra*), Hinds walnut (*J. hindsii*),
California walnut (*J. californica*), English walnut (*J.*
regia), Arizona walnut (*Juglans major*)

Fungus: *Geosmithia morbida*

Walnut twig beetle
(*Pityophthorus juglandis*)



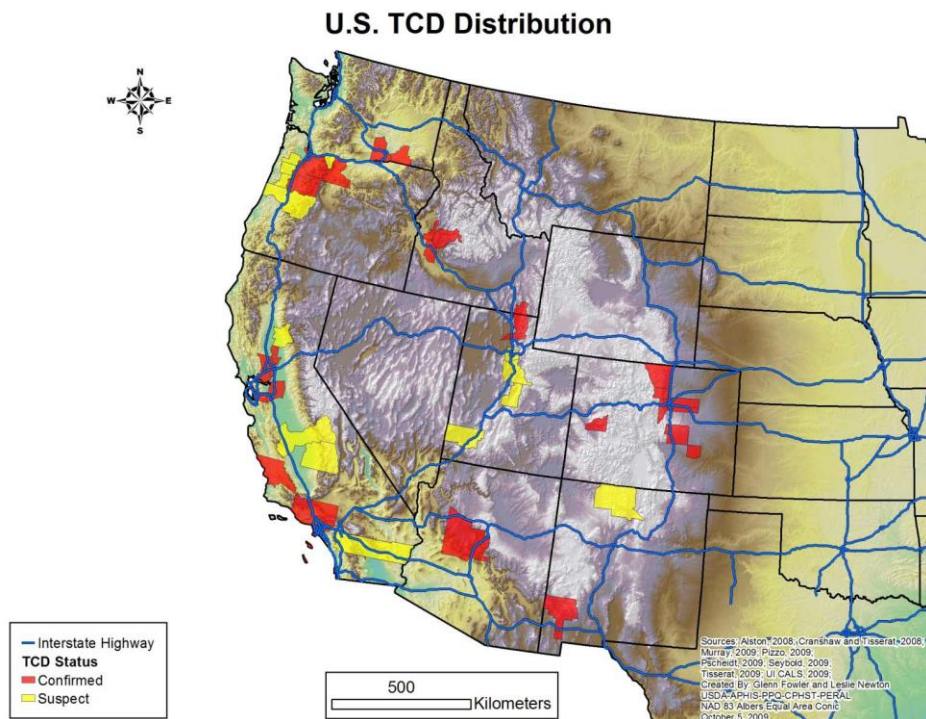
Trees die within three years after infection

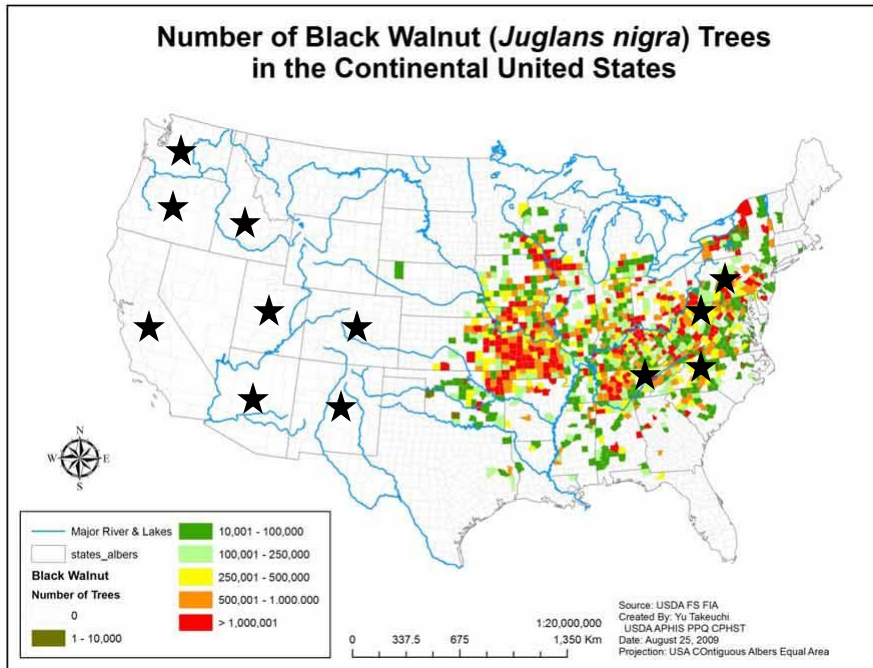
www.agnr.umd.edu

Detection and Quarantines



- Dieback first notice in 1990s
 - Initially suspected to be drought stress
- First identified in Colorado in 2008
- Washington, Oregon, California, Idaho, Utah, Colorado, Arizona, New Mexico
 - Pennsylvania, Virginia, Tennessee, and North Carolina
- State wide quarantines on moving wood
- Mills quarantined after processing infested wood





- Bores >2cm into wood

- Number of beetles per square inch
 - 35 insects per square inch of wood

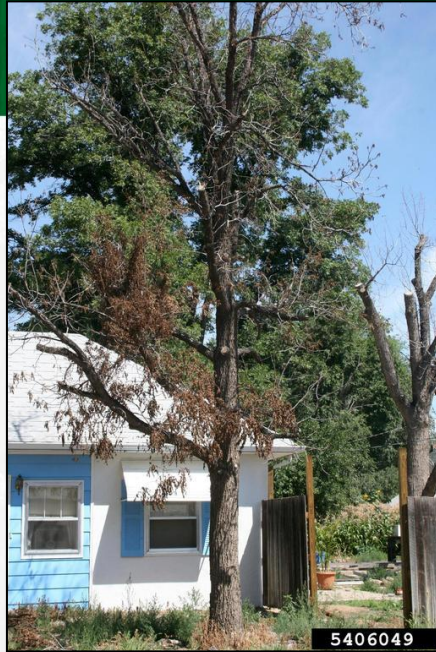
- Localized dead areas overlap or coalesce
 - nutrient disruption to foliage



- Walnut twig beetles prefer wood larger than 2cm

TCD Symptoms

- *Geosmithia* kills the phloem (cambium) just under the bark
- Yellowing leaves that wilt and turn brown
- Beetles prefer small branches/twigs – beetle holes
- Circular to oblong cankers
- Large cankers on the stem in the later stages
- Bark surface may not have symptoms



Staining may be seen on infected stems

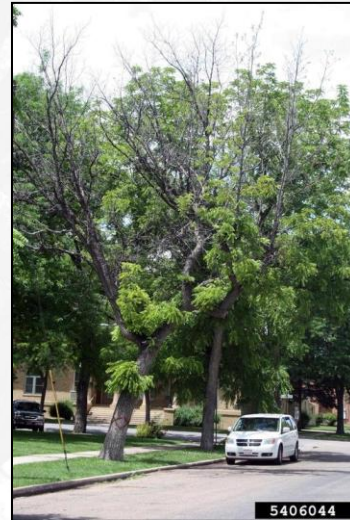


<http://www.denvergov.org/Portals/626/images/1000%20Canker%20Trunk%20Canker.JPG>

TCD Management



- State quarantines
- Sanitation – removals
- No chemicals are labeled
 - Fungicide injections
- Bark beetle management
 - bifenthrin, permethrin



USDA APHIS United States Department of Agriculture National Agricultural Library

NATIONAL INVASIVE SPECIES INFORMATION CENTER

Pathway Assessment for *Juglans nigra* (Black Walnut) and *Juglans nigra* (Black Walnut) Pathway Assessment

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You are here: Home / Microbes / Species Profiles / Thousand Cankers Black Walnut

Microbes

Species Profiles

Thousand Cankers Black Walnut Disease

Scientific name: *Geosmithia morbida* (Kolářik et al. 2011)

Common name: Thousand cankers black walnut disease

Selected Resources

Native To: Disease was first detected in the Western U.S.; the disease vector, the walnut twig beetle, is native to the southwestern U.S. and Mexico (Utley et al. 2013)

Date of U.S. Introduction: First observed in the 1990s, but

Operational Meeting

[View video of presentations.](#) This meeting was supported by the Central Plant Board, Southern Plant Board, USDA Forest Service Forest Health Protection, USDA Forest Service R&D, and the Hardwood Tree Improvement & Regeneration Center at Purdue University. [Learn more](#)

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Rev. 1: 10.19.2009



Bur Oak Blight – BOB

- Caused by *Tubakia iowensis*
 - a newly described *Tubakia* species
- Only affects bur oak – *Quercus macrocarpa*
 - *Q. macrocarpa* var. *oliviformis*
- Confirmed in Illinois counties
- Similar symptoms to anthracnose
- Not a sudden decline and death
- Must be cultured for correct identification

Q. macrocarpa var. *oliviformis*



'Small' acorns



2.6 cm wide x 2.4 cm long

oliviformis

'Big' acorns



3.4 cm wide x 2.9 cm long

Bur oak

BOB History



- Symptoms were reported for the past 20 years, but they've only been diagnosed recently (5 yrs)
- BOB is caused by a native fungus *Tubakia iowensis* – endophyte??
- *T. iowensis* has been isolated even from 100% symptomless trees, which re-establishes the endophytic life style.
 - An endophyte is an organism – usually bacterium or fungus that lives within a plant for at least part of its life without causing apparent disease.

Tubakia iowensis Lifecycle



- OW on last year's petioles
- Produces spores during late winter warm spells into spring
- Primary infection occurs in the petiole – late May
- Secondary infection which is anthracnose-like
 - Secondary infection cycle usually cause leaves drop
- Secondary symptoms begin showing up in July and August



Overall BOB Symptoms



- BOB-infected trees can look like anthracnose and oak wilt
- Time of symptom development helps with identification
 - Anthracnose: April-June
 - BOB: July-September
- Symptoms start in the lower canopy and gradually move up
- Trees can have BOB for several years before dying

Foliar Signs & Symptoms



- Initial infection occurs on the base of the petiole, about 1 cm from attachment point
 - Black peppery appearance
- Infected petioles will remain attached to the tree even after the blade breaks off
- Secondary infections occur initially along the major veins on the blade
 - First visible on the underside of the leaf

Primary Infection Symptoms



Petiole infection begins at the very base of the petiole, usually within 1 cm from branch attach point



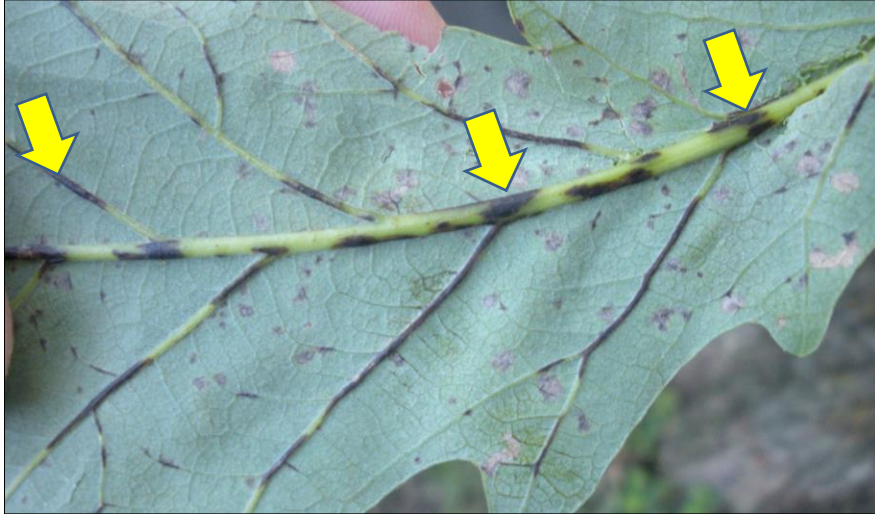


Previous year's BOB-infested petioles become the source of inoculum for the following year

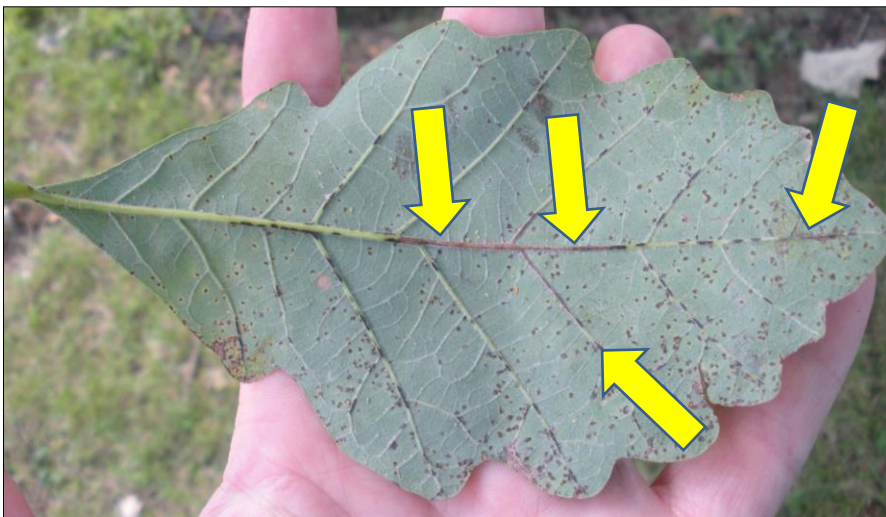
Previous year's BOB-infested petioles, which become the source of inoculum for the following years



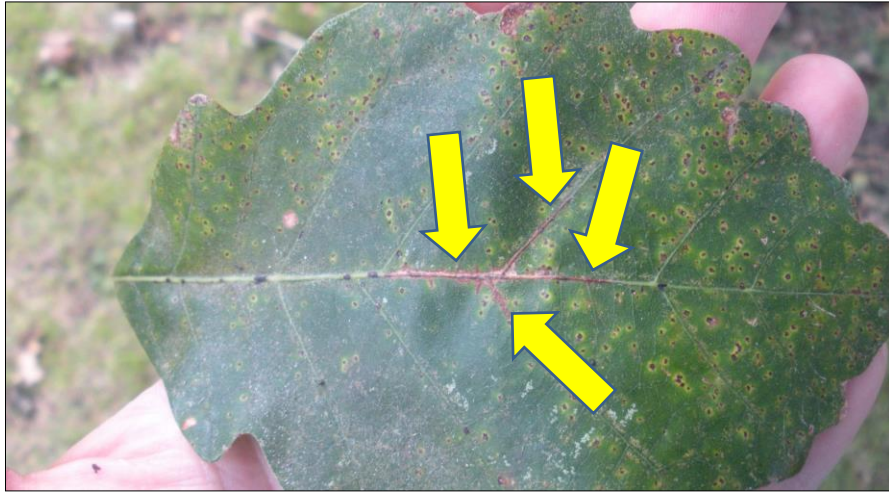
Secondary – late season infection symptoms



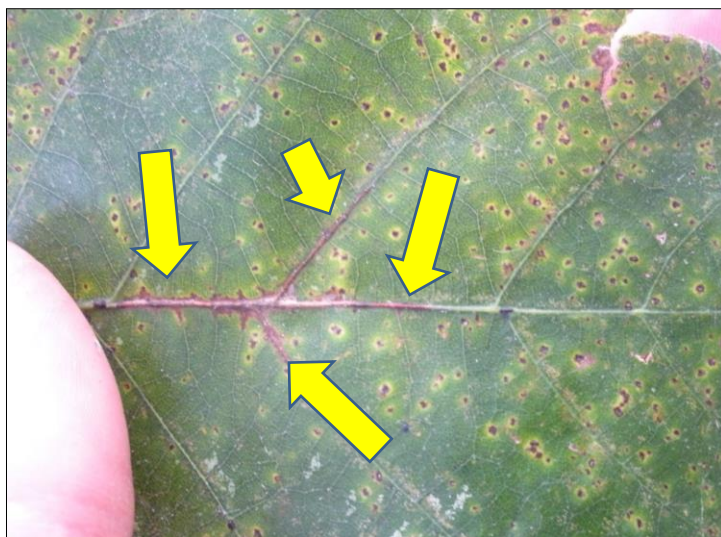
Secondary – late season BOB symptoms



Secondary – late season BOB symptoms



Secondary – late season BOB symptoms





Secondary/late season
infection - interveinal
necrosis

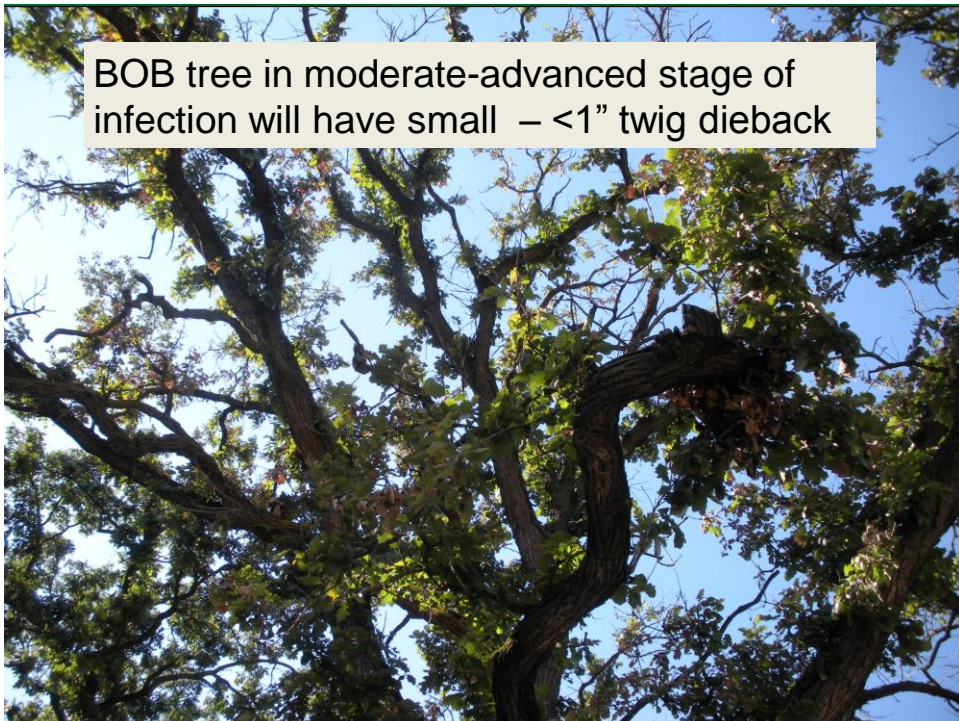
These leaves fall to the
ground

Are not part of the
infection cycle





BOB tree in moderate-advanced stage of infection will have small – <1” twig dieback



BOB Look-alikes



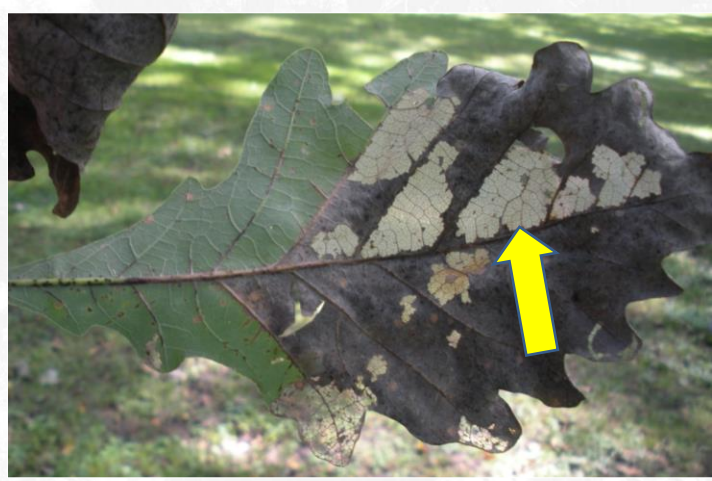
- *Botryosphaeria*, *Tubakia* sp., *Phomopsis*
- Callus formation on petiole
- Insect feeding
- Root damage
- Branch cankers

NOT necessarily BOB

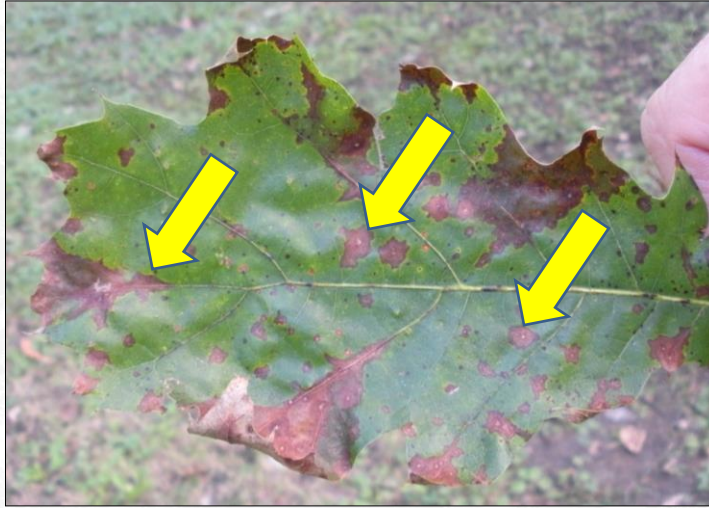




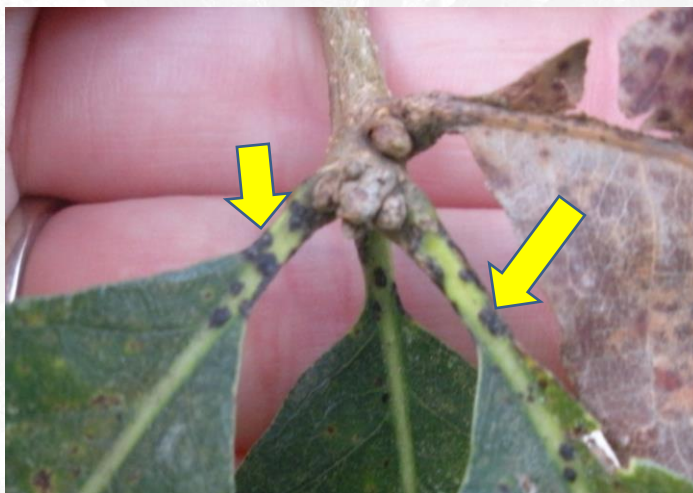
NOT BOB
'Window paneing' from [redacted] feeding



What *Tubakia* leaf spot on red oak



NOT BOB, likely another tip-dieback fungus like *Phomopsis* or *Botryosphaeria*



NOT BOB, callus formation from rubbing
Notice the right side of the petiole is green



BOB Treatments



- No pesticides labeled for BOB
- Preliminary studies done using propiconazole
- Sanitation is not an option
- Use low nitrogen fertilizer
- Improve health and vigor
- Need base of petiole for culturing and identification



Impatiens Downy Mildew

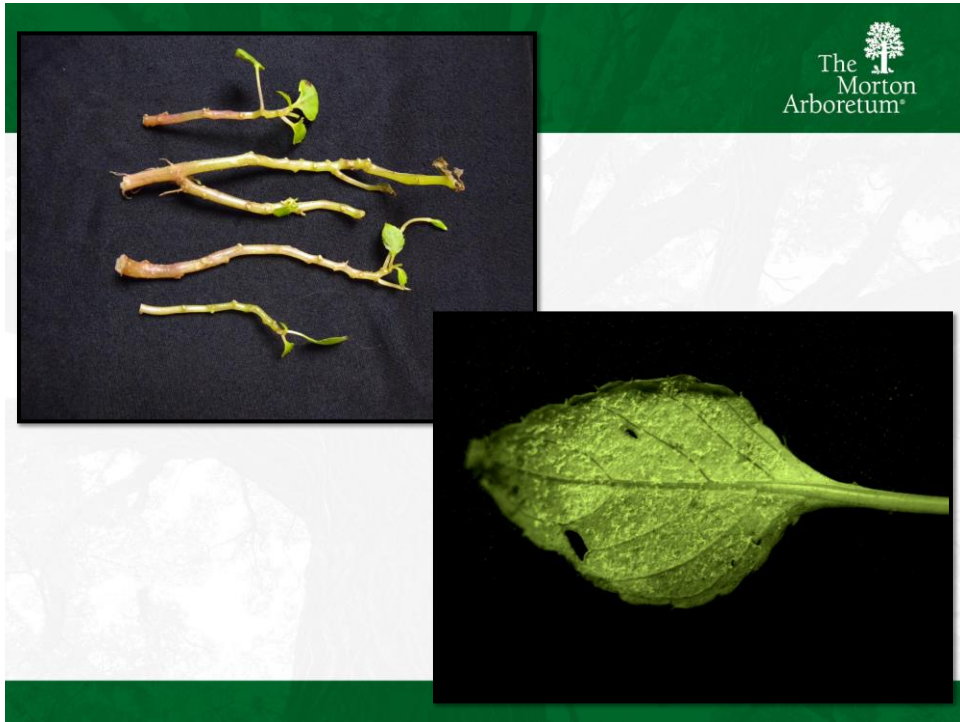
- *Plasmopara obducens*
- UK in 2003
- Florida 2004, widespread 2012
- Ornamental impatiens – *I. walleriana* and *I. balsamina*
- Native impatiens such as jewelweeds – *I. capensis* and *I. pallida*
- New Guinea impatiens – *I. hawkerii* and its hybrids resistant/tolerant



Impatiens Downy Mildew



- Plants will grow and look great until mid-late summer
- Leaves will start yellowing and falling
 - Spores and hyphae can be found on underside of leaves
- Eventually stems will have few leaves and flowers attached



Impatiens Downy Mildew



- Prevent overhead watering
- Do not compost infected plants
- Don't plant in the same locations year after year
- Space plants far apart
- Quarantine plants after purchase
 - Note: 2-3 weeks, still no symptoms



Fusarium canker

Fusarium species

Hosts:

Maple, Apple, *Populus* species, oak (pin, burr, white, post), *Cotoneaster*, winged euonymus, American horn beam, *Tilia* species, mountain ash

Not host specific



Fusarium Symptoms

- Cankers sunken
- Confirmation of a *Fusarium* canker usually requires the use of a microscope for diagnosis



Fusarium management



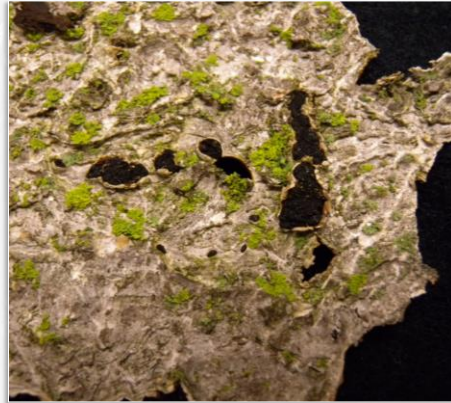
- Prune out cankers at least 6 inches below the diseased portion
- Avoid wounding the tree
 - Fungus can enter through wound
- Reducing stresses such as drought, heat or flooding will help to strengthen the trees natural defenses



Hypoxylon canker



- Air-borne, opportunistic fungi
- All hardwoods, oaks, maple, beech, sycamore, aspen, hickory, pecan
- Stressed or weakened trees more susceptible
 - Drought or injured root systems
 - Forest sites, trees in pastures, recently developed home sites, and established residential areas



Cause a white rot of the sapwood



Meg Williamson ©2010 Clemson University

Hypoxylon canker



- Symptoms of stress
 - Smaller leaves in the spring, foliar yellowing, and branch tip dieback
- Cankers on main branches or trunk, death is likely to occur
- Canker can grow 3 ft from inoculation site in one season





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