



Forest Health Threats

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Woods and Wildlife Conference

2/15/20



Forest Health Threats

- What's killing the oak trees??
- A new pest: the spotted lanternfly
- Increased pine bark beetle activity



What's killing my oak tree??

frost

gypsy moth

flooding

stand disturbance

hypoxylon canker

poor soil

physiological age

bacterial leaf scorch

armillaria root rot

red oak borer

variable oakleaf caterpillar

chemical damage

climate change

density/competition

fall cankerworm

oak button gall

anthracnose

drought

topography

invasive plants

soil compaction

two-lined chestnut borer



Gypsy Moth



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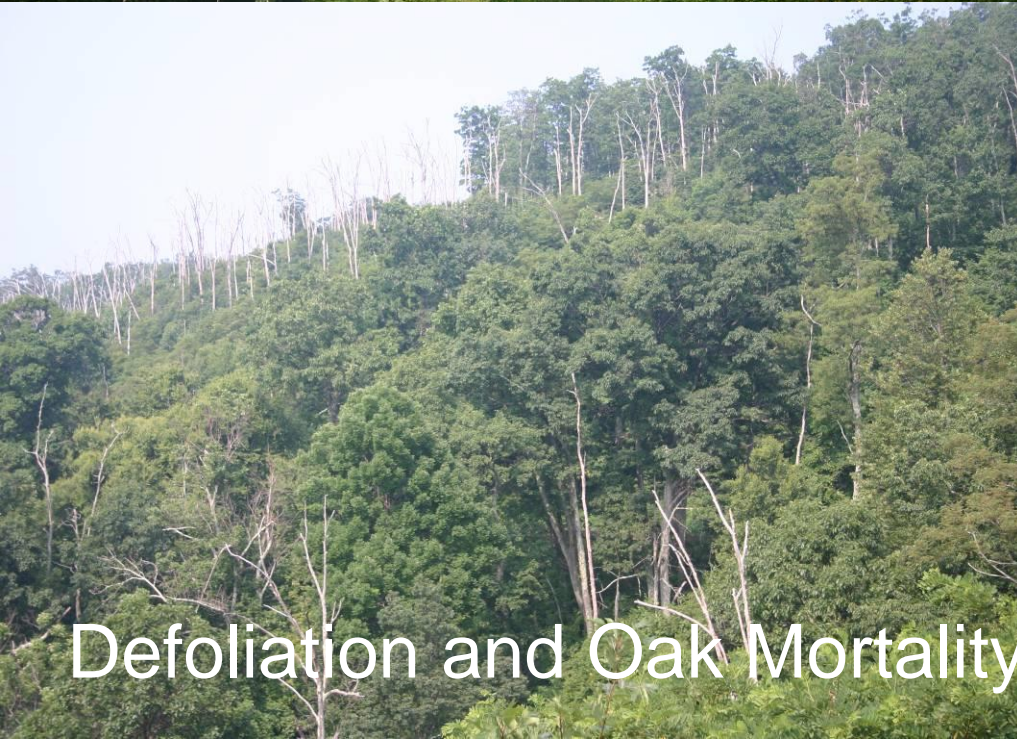




Oak Mortality, Skyline Drive, 2009



GW National Forest, Augusta Co., 2008



Defoliation and Oak Mortality from Gypsy Moth





Fall Cankerworm



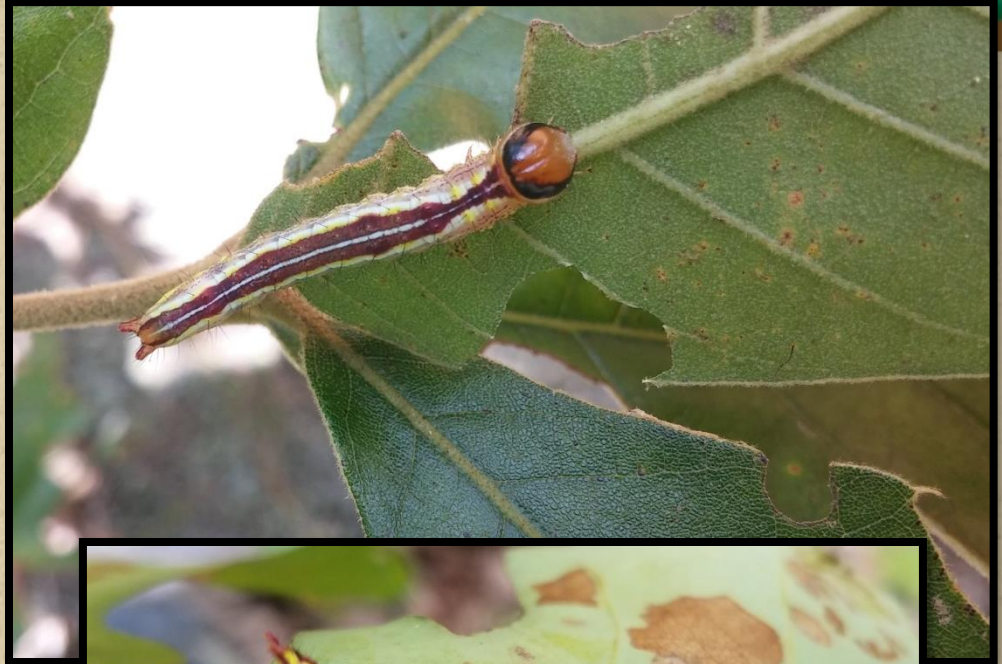
Photo: Joseph Berger, Bugwood.org

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Variable Oakleaf Caterpillar



Defoliation



- A **healthy** tree should recovery after one year of defoliation
- Defoliation of an tree that is **already stressed**, will lead to decline
- Multiple consecutive years of defoliation may lead to tree mortality



Oak Decline

■ Symptoms

- ◆ Crown dieback progressing from top down and outside inward
- ◆ Premature autumn leaf color
- ◆ Foliage browning but remaining on tree
- ◆ Tree mortality after a few years or decades





Oak Decline



- The **gradual** failure in the health of a tree that results from the **interaction** between three groups of stress factors: predisposing, inciting, and contributing

OAK DECLINE AND RED OAK BORER IN THE INTERIOR HIGHLANDS OF ARKANSAS AND MISSOURI: NATURAL PHENOMENA, SEVERE OCCURRENCES

Citation for proceedings: Spetich, Martin A., ed. 2004. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 311 p.

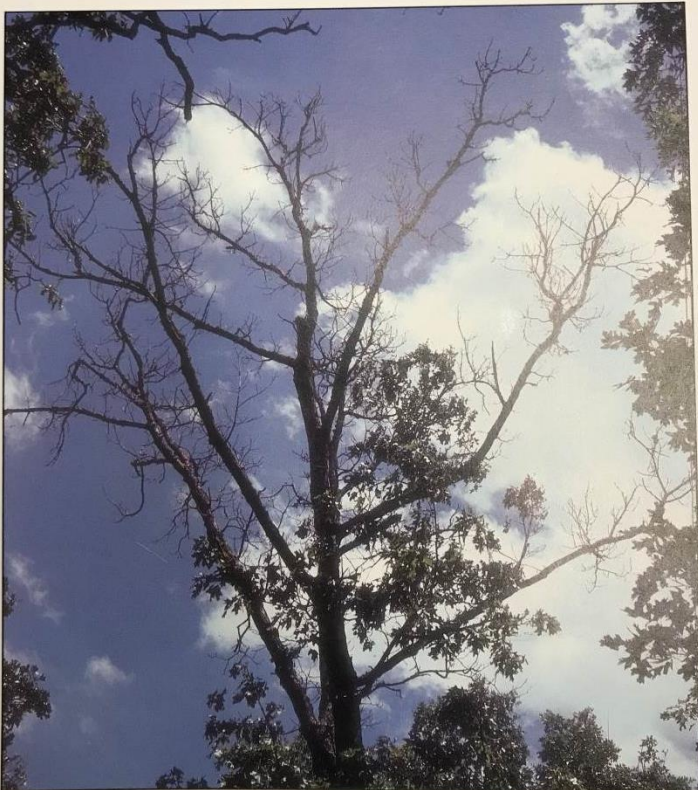


United States
Department of
Agriculture

Forest Service
Southern Region

Protection Report R8-PR 17
September 1989

Evaluation of Oak Decline Areas In The South



W Oak, Steven & A Starkey, Dale & M Dabney, Joseph. (1988). Oak Decline Alters Habitat in Southern Upland Forests. Proc. Annu. Conf. Southeastern Assoc. Fish Wildlife Agencies. 42.

United States
Department of
Agriculture

Forest Service



Southeastern Forest
Experiment Station

Resource Bulletin
SE-123

Incidence and Impact of Oak Decline in Western Virginia, 1986

Steven W. Oak
Cindy M. Huber
Raymond M. Sheffield



Oak Decline

■ Predisposing Factors: weaken tree over time

- ◆ Poor soil
- ◆ Topography
- ◆ Competition
- ◆ Advanced age



<https://invest-in-albania.org/prolonged-drought-takes-toll-crops/>



Oak Decline

■ **Inciting Factors:** rarely kill the tree outright but initiate decline

- ◆ Defoliating insects
- ◆ Drought events
- ◆ Frost





Oak Decline

- **Contributing Factors:** secondary pests that ultimately lead to tree death
 - ◆ Boring insects
 - ◆ Root diseases





Armillaria Root Rot



White mycelial fans

Photo: William Jacobi, Colorado State University, Bugwood.org

Honey-colored mushrooms



Black shoe-string rhizomorphs

- Fungus colonizes roots and base of trunk
- Results in insufficient water and nutrient transport
- Branch dieback and wood decay



Hypoxylon Canker



Photo: Molly Giesbrecht, Texas A&M AgriLife Extension Service, Bugwood.org



Photo: Robert L. Anderson, USDA Forest Service, Bugwood.org

- Most common on stressed red/post oaks
- Bark becomes thin and flakes off
- Spores travel in wind and are everywhere

Predisposing Factors

Climatic trends or past events
Density/competition
Physiological age
Soil depth/texture/fertility
Species/genotypes
Topography

Inciting Factors

Drought
Defoliating insects
Frost
Stand disturbance

Contributing Factors

Boring insects
Canker fungi
Root disease

**OAK
DECLINE**

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graph TD; P["Predisposing Factors"] --> O["OAK DECLINE"]; I["Inciting Factors"] --> O; C["Contributing Factors"] --> O;
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Causal factors of oak decline organized by their function in the decline syndrome.

From: Starkey et al. 2004.

Decline Disease Spiral

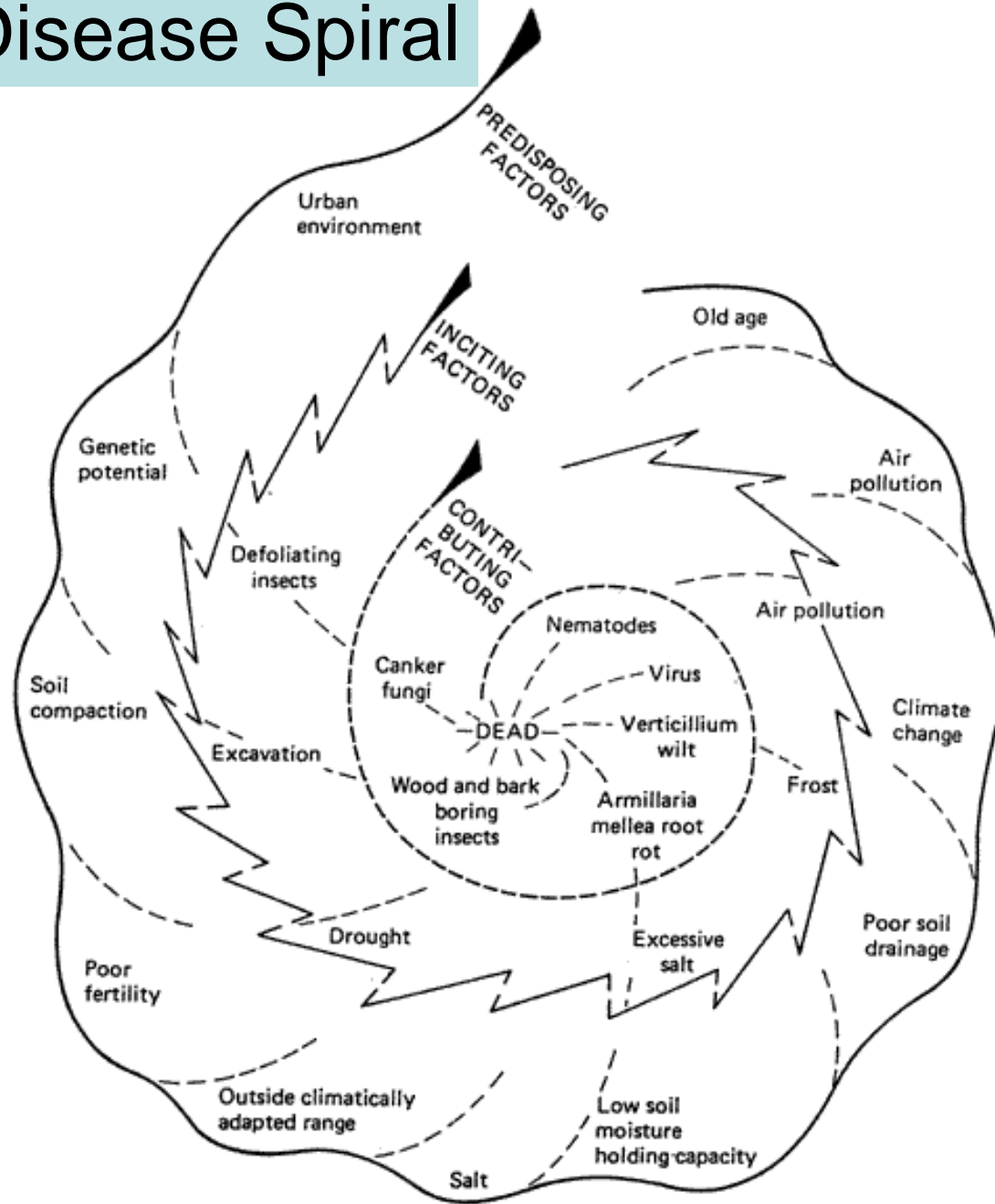


Fig. 1. Decline disease spiral (Reprinted with permission from Tree Disease Concepts by Paul D. Manion c 1991, Prentice-Hall, Inc., Englewood Cliffs, NJ).



Urban Oaks

■ The lifespan of an urban tree is shorter

- Soil compaction
- Construction activities
- Planting issues- depth, root girdling, transplant shock
- Pollution, heat island





Oak Decline

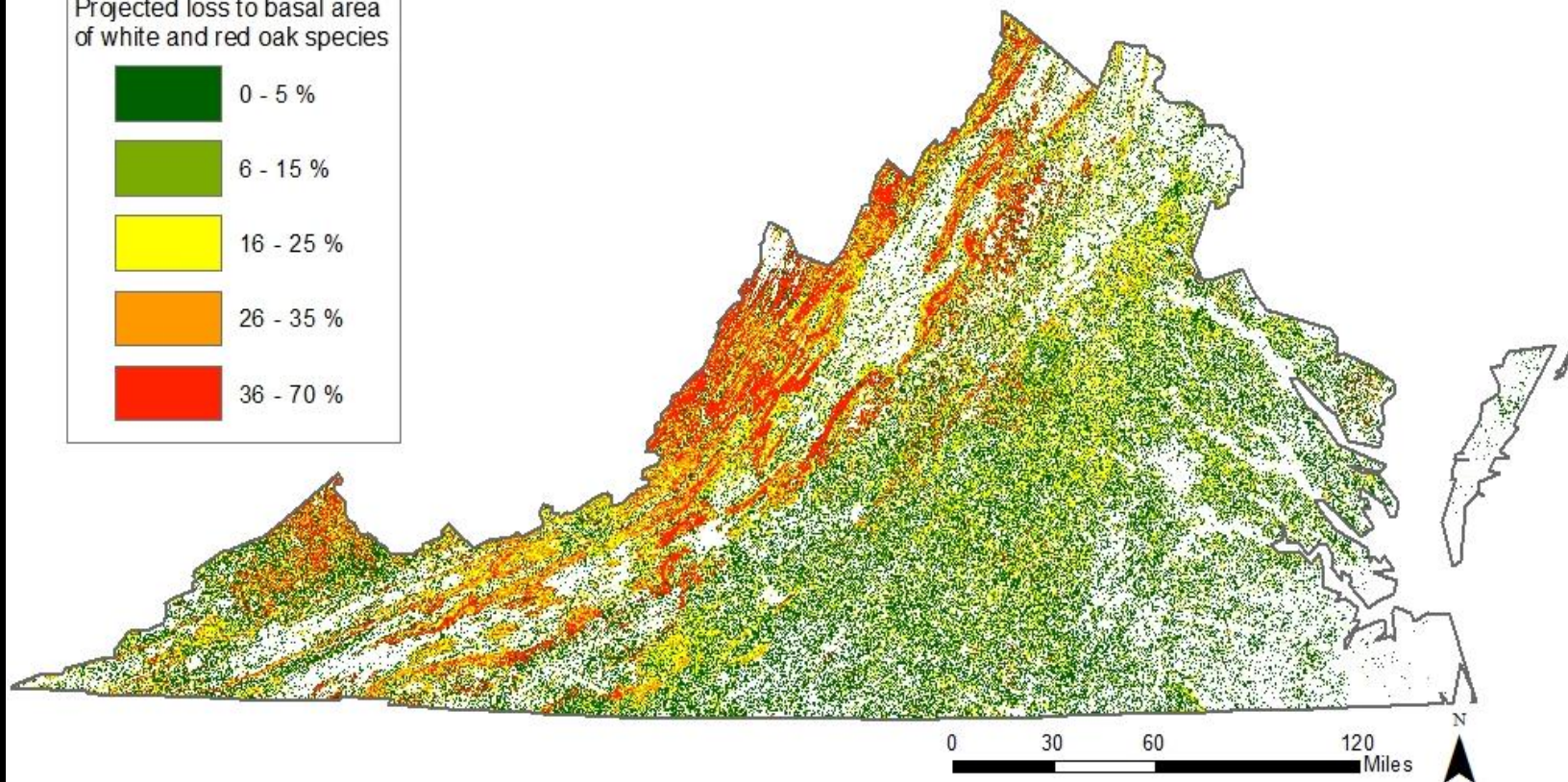
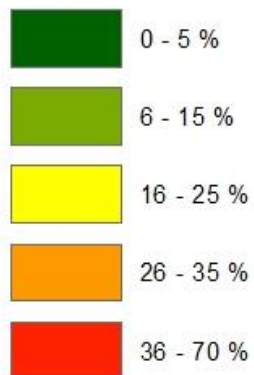
- Prior to 1900s, southern Appalachian forests were dominated by American chestnut in many places
- Chestnut Blight!
- Oaks came in as a relatively even-age cohort after the loss of chestnut
- These oaks are now reaching mature ages
→ predisposing factor for decline



Oak Decline

Oak Decline and Gypsy Moth in Virginia

Projected loss to basal area
of white and red oak species





Spotted Lanternfly



Spotted Lanternfly

■ *Lycorma delicatula* (White) (Hemiptera: Fulgoridae)



Egg
Mass



Hatched
Nymph



Developed
Nymph



Adult Spotted
Lanternfly



SLF Eggs



SLF Eggs



Egg Masses

- 1½ inch long, flat and gray
- laid on smooth surfaces





SLF Eggs



Photo credit: [Emelie Swackhamer, Penn State University, Bugwood.org](https://www.bugwood.org)



SLF Nymphs



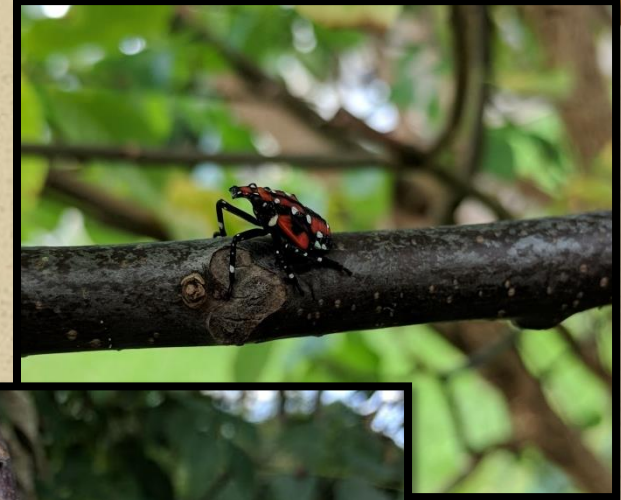


SLF Nymphs





SLF Nymphs



SLF Adults





Hosts

- 65 host plants worldwide
- Prefer Tree-of-Heaven, *Ailanthus altissima*
- Grape, apple, stone fruit
- Have been observed feeding on oak, poplar, walnut, maple, and pine





Damage

- Phloem feeders
- Yellowing and browning of foliage
- Branch dieback
- May reduce grape and tree fruit crop yield

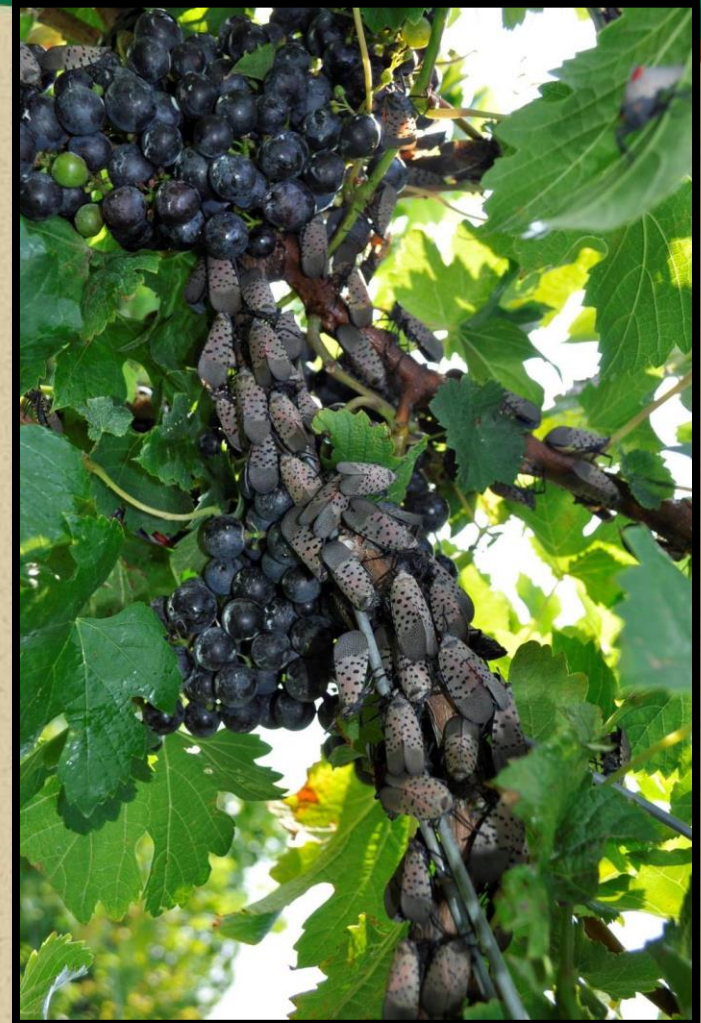


Photo credit: Erica Smyers, Penn State



Damage

- Produce honeydew on which sooty mold develops
- White yeast patches
- Vinegar smell





Damage

■ Nuisance pest!!

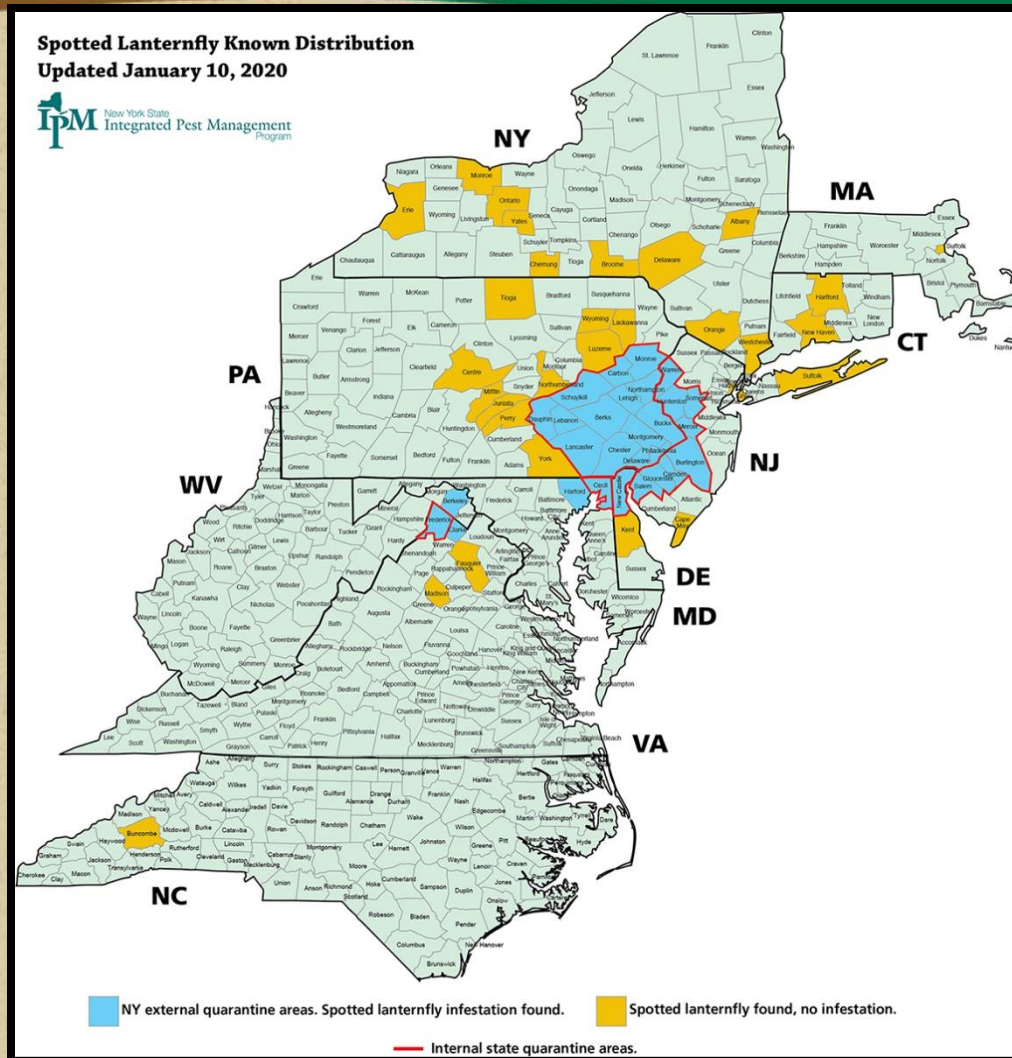


[Photo credit: Lawrence Barringer, Pennsylvania Department of Agriculture, Bugwood.org](#)

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Quarantine





How YOU can help

- Learn how to identify SLF and always be vigilant
- Always inspect vehicles and outdoor equipment before leaving infested area
- Do not park or store items near trees





How YOU can help

- Don't move firewood
- Kill any SLF you find
- If you have SLF on your property
 - ◆ Scrape egg masses
 - ◆ Remove tree of heaven
 - ◆ Apply insecticides when appropriate





Questions

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