Tree Pests and Pathogens of Concern

Field Guide

treehealth.wsu.edu

FIELD GUIDE

Purpose

The purpose of this guide is to provide information to help monitor for the accidental introduction of novel plant pests and diseases. Early detection is key to reducing the impacts of introduced species on northwest forests and communities.

Partners

This booklet was made in partnership with the U.S. Department of Agriculture (USDA) and Washington State University.

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WSU Urban Forest Health Lab

The mission of the WSU Urban Forest Health Lab is to keep trees and communities healthy through discovery, applied learning, and engagement.

More information about the lab is available at https://treehealth.wsu.edu/

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Diseases

WSU Ornamental Plant Pathology Program

The WSU Ornamental Plant Pathology program specializes on pests and diseases of ornamental plants and Christmas trees.

More information about the program is available at https://ppo.puyallup.wsu.edu/

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Tree Pests and Pathogens of Concern

Mediterranean Oak Borer *(Xyleborus monographus)*

Adult. Image Credit: Pest and Diseases Image Library, Bugwood.org

Hosts

Oaks (*Quercus* spp.)

Identification

Cylindrical beetles that are reddish brown in color and 3.0 - 3.2 mm long and three times as long as they are wide. Adult females are larger and can fly, while males are smaller (2.3 mm), incapable of flying, and has a rhino horn-like structure. These beetles can be seen nearly all year in galleries or outside the tree.

Signs and Symptoms

- Wilting or stunted leaves
- Defoliation or flagging (browning or absent leaves on individual branches) on top third of tree
- Dead or broken branches, sometimes dying close to the trunk first
- Thinning crown
- Canopy dieback
- Black-stained galleries primarily located in the sapwood
- Frass accumulated on branches, bark, or around the base of the tree
- Perfectly round entrance and exit holes (1.6 mm)

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Adult Mediterranean Oak Borer


Galleries


Galleries


Canopy dieback

Emerald Ash Borer *(Agrilus planipennis)*

ACTUAL SIZE

Adult. Image Credit: David Cappaert, Bugwood.org

Hosts

Ash trees (*Fraxinus* spp.)

Signs and Symptoms

- D-Shaped Exit Holes in Bark (2.5 - 5 mm)
- Serpentine galleries under bark from larval feeding
- Unhealthy Ash Trees:
  - Branch Dieback
  - Canopy Dieback
  - Woodpecker Damage
  - Epicormic Branching

Identification

Adults: Beetles can be 8.5 - 19 mm long and are typically bright, metallic green. With its wings open, you can see their coppery, red abdomen. Emerge from early June to late August.

Larvae: Found inside the galleries, larvae can be up to an inch long. The bodies are creamy white with segmented, bell-shaped bodies. The larvae are typically inside the tree in June-October.

Image Credits: Top Left & Right: Eric R. Day, Virginia Polytechnic Institute and State University; Bottom Left: Art Wagner, USDA-APHIS; Bottom Right: Joseph OBrien, USDA Forest Service

Adult in galleries

Branch/ Canopy Dieback

Galleries

D-Shaped Exit Holes

Asian Longhorn Beetle *(Anoplophora glabripennis)*

Adult. Image Credit: Gillian Allard, FAO of United Nations

Hosts

Preferred US Hosts: Maples, birches, elms, horsechestnut, and willow (hardwoods)

Identification

Adults: 2.5 - 3.8 cm long beetles that are shiny black with irregular white spots and distinctive bluish-white legs. Adults have long black and white banded antennae. Seen late spring to fall.
Larvae: Creamy, white and grub-like, reaching up to 5 cm long. Larvae are typically inside the tree.

Signs and Symptoms

- Round dime sized exit holes
- Sap may be leaking from exit hole wounds
- Yellowing Leaves
- Branch dieback and flagging
- Premature leaf drop
- Oval shaped egg pits dug into trunks, branches, or exposed roots
- Frass around the base of the trunk

Image Credits: Top Left & Bottom Right: Joe Boggs, Ohio State University; Top Right: Pennsylvania Department of Conservation and Natural Resources - Forestry; Bottom Left: Steven Katovich


Emergence Hole


Branch Dieback


Larvae


Galleries

Japanese Cedar Longhorn Beetle

(Callidiellum rufipenne)

ACTUAL SIZE

Adult. Image Credit: Gilles San Martin, iNaturalist

Hosts

Arborvitae (*Thuja*), cypress (*Cupressus*), juniper (*Juniperus*), and cedar (*Chamaecyparis*)

Identification

Adults: 6 - 14 mm long beetles. Males are deep blue to black with brownish red patches on their upper wing covers and have antennae longer than their bodies. Females are reddish brown with antennae shorter than their bodies.

Larvae: Up to 20 mm in length. Cream colored, slender, 3 pairs of thoracic legs

Signs and Symptoms

- 6-10 mm diameter oval shaped exit holes
- Depressions in bark
- Flat sawdust (frass) filled galleries under bark
- Light red or brown frass in openings of larval tunnels
- Branch dieback
- Bark splitting

Image Credits: Top Left, Bottom Right, and Bottom Left: Connecticut Agricultural Experiment Station, Bugwood.org; Top Right: Aaron Caswell, University of Massachusetts, Amherst

Emergence Hole

Wood boring damage to arborvitae

Larvae feeding damage on arborvitae stem

Larvae in gallery with frass plug

Citrus Longhorn Beetle *(Anoplophora chinensis)*

Adult. Image Credit: Ken-ichi Ueda, iNaturalist

Hosts (This list is not exhaustive)

Hardwoods including citrus spp., apple, alder, birch, pecan, chestnut, Japanese cedar, beech, fig, ash, mallow, holly, walnut, plane tree, poplars, cherry, peach, apricot, plum, pear, oak, sumac, rose, and elm trees

Identification

Adults: Shiny black beetles with 10 - 12 round white spots. Females are 3.5 cm long and males are 2.5 cm long. Adults have long black and white banded antennae. Seen April to August but some can be present in fall.

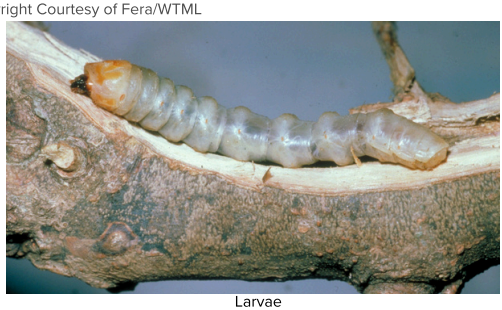
Larvae: Creamy white to yellowish brown with an amber head. Legless grubs up to 5.2 cm long.

Signs and Symptoms

- Large 6 - 9 mm diameter, round/oval exit holes
- Holes are deep into the tree to reach the xylem
- Weak, breaking branches on healthy-looking trees
- Thinning canopy and branch dieback
- Yellowing and drooping leaves
- Frass on the ground, on branches, or on bark
- Oozing sap
- Cracked or missing bark
- Round or oval egg pits dig into the bark, 1.3 cm in diameter
- Larval tunnels in the wood

Image Credits: Top & Bottom Left: Art Wagner, USDA APHIS; Top Right: National Plant Protection Organization, the Netherlands, Bugwood.org; Bottom Right: UK Crown Copyright Courtesy of Fera/WTML


Adult


Larvae


Emergence Holes


Adult with Exit Hole

Japanese Beetle *(Popillia japonica)*

ACTUAL SIZE

Adult. Image Credit: Joseph Berger, Bugwood.org

Hosts (this list is not exhaustive)

Can infest over 300 plant species. In the US, they most commonly infest: Japanese maple, Norway maple, Horsechestnut, Hollyhock, Gray birch, American chestnut, Shrub Althea, Black walnut, *Malus* spp., London planetree, Lombardy poplar, *Prunus* spp., *Rosa* spp., Sassafras, American mountain ash, American linden, *Ulmus* spp., Grape

Identification

Adults: 8-13 mm long. Green metallic thorax and head with copper wing covers. Five patches of white hair along side of body and two at the tip of wings. Larvae: 3-25 mm long. White with brown head. C-shaped with visible legs.

Signs and Symptoms

- “Skeletonizing” of soft tissues (flowers, leaves, and buds)
- Severely injured trees appear scorched
- Eggs laid in soil, when larvae hatch they feed on turfgrass roots and vegetable seedlings causing dead patches in grass
- Severe damage reduces fruit, vegetable, and herb yield
- Leaf browning after severe damage

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Larvae

Adults’ damage to grape leaf

Adults’ damage to pink roses

Defoliation on European linden

Red-Necked Longhorn Beetle *(Aromia bungii)*

Image Credit: Gillian Allard, FAO of United Nations

Hosts

Prunus spp. (cherry, plum, apricot, peach, ornamentals)

Signs and Symptoms

- Oval shaped exit holes, 6 - 10 mm wide and 10 - 16 mm long
- Yellow to red leaves
- Wilting leaves and early leaf fall
- Galleries inside the tree
- Frass at the base of the tree trunk
- Eggs laid in bark crevices

Identification

Adults: Elongate, glossy black beetles with a red thorax between its head and abdomen. Beetles are 20 - 40 mm long. Female antennae are as long as its body and male antennae are 1 ½ times as long. Adults emerge between June and August

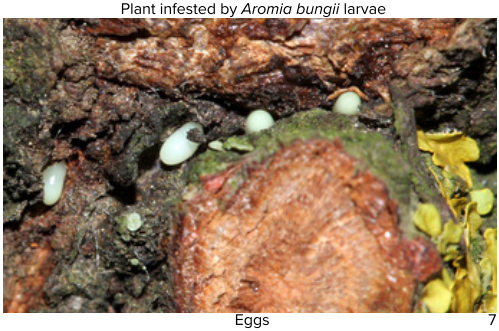
Larvae: Mature larvae are yellowish white. The larvae are typically inside the tree. Length ranges from 40 - 55 mm

Image Credits: Top Left: Fera Science Ltd.; Top Right, Bottom Left, & Bottom Right: Raffaele Griffo, Plant Protection Service Regione Campania, Napoli, Italy

Adult

Plant infested by *Aromia bungii* larvae

Emergence Holes



Eggs

Spotted Lanternfly *(Lycorma delicatula)*

Adult. Image Credit: Pennsylvania Department of Agriculture

Hosts

Preferred host: Tree of heaven (*Ailanthus altissima*)
The insect feeds on a wide variety of other hardwood trees and shrubs

Signs and Symptoms

- Branch Dieback
- Sap oozing from open wounds
- Wilting foliage
- Clear, sticky substance at bottom of tree called honeydew
- Black fungus growing on top of honeydew called sooty mold
- Increased ant, bee, and wasp activity from exposed honeydew and sap

Identification

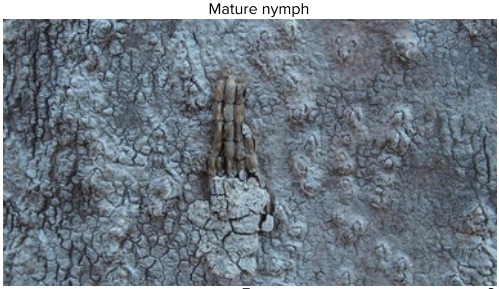
- Adults: 20.5 - 26.5 mm long and roughly 12.5 mm wide with a yellow with black striped abdomen and large, visually striking wings. The forewings are brown spotted with black tips and hind wings are scarlet towards the center, white striped with black tips. Adults can be seen June - December.
- Nymphs: Early in their development appear black with white spots, seen spring - summer. Turn red with white spots before becoming adults, seen late summer - early fall
- Eggs: Laid in mass, the eggs are yellowish-brown and covered with a gray, waxy coating. Coating darkens as egg mass weathers. Found on smooth surfaces September to June.

Image Credits: Top Left: Colin Purrington; Top Right: Lawrence Barringer, Pennsylvania Department of Agriculture; Bottom Left: Richard Gardner, Bugwood.org; Bottom Right: Emelie Swackhamer, Penn State University

Early stage nymph

Mature nymph

Adults with wings closed



Eggs

Brown Marmorated Stink Bug *(Halyomorpha halys)*

ACTUAL SIZE

Adult. Image Credit: Susan Ellis, Bugwood.org

Hosts (this list is not exhaustive)

Preferred hosts: apple, pear, peach, grape, blueberry, soybean, tomato, corn, ornamental trees and shrubs

Signs and Symptoms

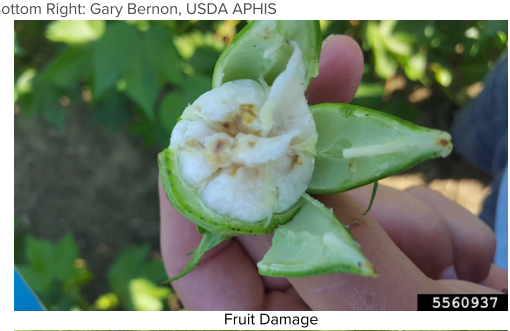
- Damaged fruits
- Discolored, irregular depressions on fruit surface
- Necrotic spots
- Misshapen fruit
- Early fruit drop
- Stippled yellow, white, or brown areas on leaves around feeding site

Identification

- Adults: Larger than our native stink bugs, this bug can be 12 - 17 mm long and has a base color of brown, red, and black on the dorsal surface. A distinguishing factor of adults are white bands on the legs and antennae and alternating dark and light bands on the abdomen.
- Nymphs: Hatching at 2.4 mm in length with black heads and orange abdomens, they transition from orange red to brownish and begin to develop the white bands on legs and antennae and spines on the humeral margins.

Image Credits: Top Left: Mike Lewis, Center for Invasive Species Research, UC Riverside; Top Right: Bryce Sutherland, S&R Ag Consulting; Bottom Left: Hectonichus, Wikipedia; Bottom Right: Gary Bernon, USDA APHIS

Adult on fruit

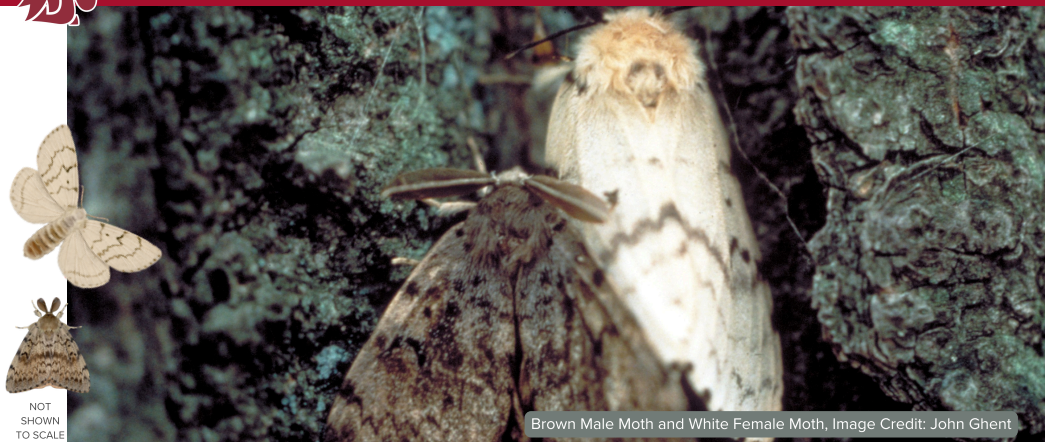


Fruit Damage

Fifth to sixth instar nymph

Newly hatched eggs and nymphs

Spongy Moth *(Lymantria dispar)*



Brown Male Moth and White Female Moth, Image Credit: John Ghent

Hosts (this list is not exhaustive)

Preferred hosts: Oaks (*Quercus spp.*)
Apple, alder, basswood, birch, larch, poplar, sweet gum, willow, hawthorn

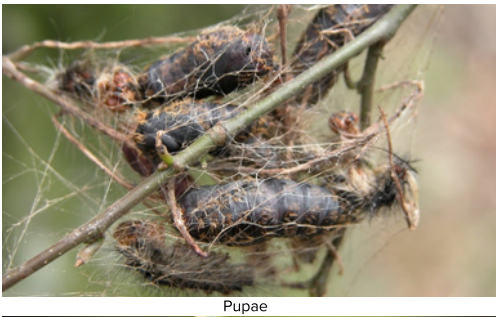
Signs and Symptoms

- Defoliated leaves
- Heavily infested trees will look barren in the summer
- Egg masses on bark or can be found on outdoor object
- Tan masses of eggs with hairy covering being the size of a quarter to 7.6 cm long

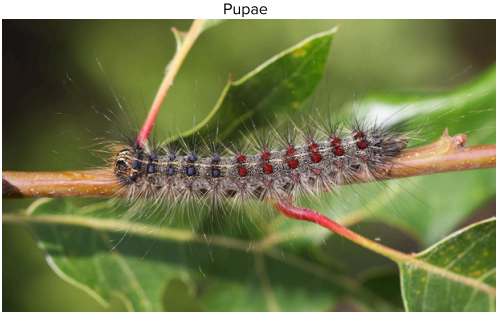
Identification

- Adults: Males have a 3.8 cm wingspan and are brown with dark brown patterns on the wings. Females are nearly white with zig-zag patterns on their wings, 6.4 cm wingspan, but are flightless. Moths can be seen in the summer in July and August.
- Larvae: Caterpillars are 3.8 - 6.4 cm long. Newly hatched, caterpillars start black and hairy and molt to gray as they mature with bristled tufts of hair and a pattern with 5 pairs of blue dots then 6 pairs of red dots along their backs. Caterpillars can be found in the spring around April- June.

Image Credits: Top Left: Ferenc Lakatos, University of Sopron; Top Right: Karla Salp, Washington State Department of Agriculture, Bugwood.org; Bottom Left: Steven Katovich, Bugwood.org; Bottom Right: John Ghent, Bugwood.org


Pupae

Adult Female on Egg Mass


Caterpillar


Adult Male

Oak Processionary Moth *(Thaumetopoea processionea)*

NOT SHOWN TO SCALE

Adult with wings closed. Image Credit: Adriaan van Os, Corsavy

Hosts

Oaks (*Quercus spp.*)

Signs and Symptoms

- Caterpillars feed on leaves of oak trees leading to defoliation
- White to brown webbed nests on trunks and branches of trees

Caution

- Caterpillar's barbed hairs cause skin rashes, eye irritation, sore throat, and breathing difficulties in humans and animals

Identification

- Adults: Brown moths with a 25-35 mm wingspan. Appear during summer.
- Larvae: Gray body with dark head. Very long white hairs all along body which hide smaller irritating hairs. Appear in late spring to early summer. Move in nose to tail processions on trees or along the floor.

Image Credits: Top Left: Forest Research; Top Right and Bottom Left: Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org; Bottom Right: Schellhorn/ullstein bild, Getty Images

Nest on trunk of tree

Eggs

Caterpillars

Adult with open wings

Elongate Hemlock Scale *(Fiorinia externa)*

Infestation. Image Credit: Eric R. Day, Virginia Polytechnic Institute and State University

Hosts

Hemlocks (*Tsuga spp.*) and firs (*Abies spp.*)
Occasionally: Spruce (*Picea spp.*), pines (*Pinus spp.*), and Douglas fir (*Pseudotsuga menziesii*)

Signs and Symptoms

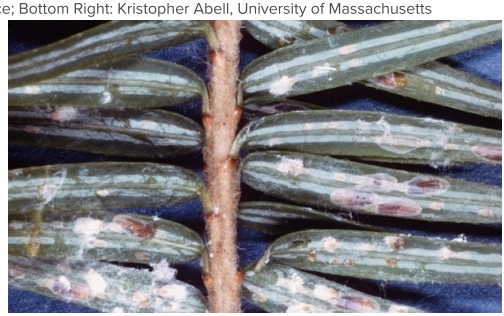
- Yellow spotting on needles
- Premature needle loss
- Branch and limb dieback
- Thin crowns (More typical with severe infestations)
- Scales covering the underside of the needles

Identification

- Adults: These insects are barely visible to the naked eye and may go unnoticed.
- Females are soft-bodied, legless, and wingless and are only 2 mm long. The yellow, immobile females lay their eggs under an orange, brown wax coating.
- Males are light brown, 1.5 mm long and may look like tiny wasp parasitoids and can fly. Because they have two overlapping generations a year, all life stages can be found year-round.

Image Credits: Top Left: Eric R. Day, Virginia Polytechnic Institute and State University; Top Right: John A. Davidson, University of Maryland College Park; Bottom Left: Kristen Wickert, USDA Forest Service; Bottom Right: Kristopher Abell, University of Massachusetts

Infestation



White male cover and brown female covers.

Sign(s) of Infestation

Adult(s)

Phytophthora species

Symptomatic leaf affected by *P. ramorum*. Photo Credit: Joseph OBrien, USDA Forest Service

Signs and Symptoms

- Small, chlorotic, or wilting leaves
- Leaf blight
- Thin and sparse crowns
- Branch, twig, or shoot dieback
- Heavy cone production
- Cankers
- Trees may have bleeding lesions on the trunk or from cankers
- The inner bark beneath the lesions can be orange to pink to brown in color
- Root rot
- Decreased fruit size and yield
- Necrotic lesions that start as blackening of leaf petiole and can extend to the base of the leaf, potentially progressing to cover the entire leaf

Spread

Phytophthora spp. can be spread through human movement of contaminated plant materials, soil, or tools. Phytophthora is able to spread through water, allowing in to move within soil an infect uninfected plants.

Image Credits: Top Left: Forest Research, United Kingdom Forestry Commission, Bugwood.org; Top Right: Joseph Hulbert, WSU; Bottom Left: Joseph OBrien, USDA Forest Service, Bugwood.org; Bottom Right: Sarah Green, Forest Research

Bleeding on bark surface of coast live oak, caused by *P. ramorum*

Stem leasions caused by *P. ramorum* on Tanoak

Canker caused by P. cinnamomi on oak

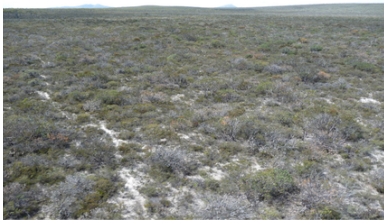
P. austrocedri causing juniper tree dieback

Phytophthora species of concern

Phytophthora ramorum

Affects native oak and tanoak forests in Southern Oregon and California and causes lethal stem cankers, also known as sudden oak death. Besides infecting oak, *P.ramorum* is known to have a wide range of hosts and can spread aerially.

Forest trees killed by P. ramorum in Oregon. Photo Credit: Joseph Hulbert, WSU.



Phytophthora cinnamomi

Known to have the broadest host range among *Phytophthora* species. It has a global distribution, causing extensive damage in forests in Australia, the Mediterranean, and southeast United States. It tends to cause the largest issues in warmer climates.

Western Australia landscape decimated by P. cinnamomi. Photo Credit: Trudy Paap, FABI.

Phytophthora occultans

Causes root, collar, and crown rot, and stem cankers on woody plants in multiple plant families. *P. occultans* was originally found in the Netherlands and has since been found in other parts of Europe and the United States.

Dead sword fern in container where P. occulants was found in Tacoma, Washington. Photo Credit: Joseph Hulbert, WSU

Phytophthora austrocedri

The cause of “mal del ciprés” the disease affecting *Austrocedrus chilensis in* Andes mountain range of Chile and southern Argentina. Also known to affect common juniper (*Juniperus communis*) and Mediterranean cypress (*Cupressus sempervirens*). It was recently found in an Oregon nursery.

Dead and dying Austrocedrus chilensis (Cordilleran cypress) affected by P. austrocedri. Photo credit: E.M. Hansen, OSU

Phytophthora alni

Phytophthora alni is a concern for alder (*Alnus* spp.) populations because it causes lethal root and collar rot. The disease has been found across several countries in Europe, but it is highly variable likely due to *P. alni* hybridizations with other species. It is a USDA APHIS Priority Pest.

Disease symptoms seen under bark of alder trees (alnus spp.). Photo credit: Andrej Kunca, National Forest Centre Slovakia

Phytophthora kernoviae

Phytophthora kernoviae can affect many plant species. It is well known in the United Kingdom because it causes lesions on rhododendron leaves and European beech stems. It is also a USDA APHIS Priority Pest.

Wilting rhododendron leaves affected by P. kernoviae. Photo credit: Forest Research, United Kingdom Forestry Commission

Laurel Wilt *(Rafaelea lauricola)*

Felling dead redbays, Image Credit: Albert Mayfield, USDA Forest Service

Hosts

Oaks (*Quercus spp.*), *lauracea*

Causal Agent

Rafaelea lauricola fungus

Signs and Symptoms

- Tree wilt starts in one portion of a tree and eventually spreads
- Defoliation or browning/ reddening of leave depending on the host
- Black staining of the sapwood

Spread

Laurel wilt is caused by the fungal pathogen, *Rafaelea lauricola*, spread through the Redbay ambrosia beetle (*Xyleborus glabratus*). As the fungus spreads, the water-conducting cells become clogged.

Redbay Ambrosia Beetle Identification

- Cylinder shaped
- Brown to black color
- 2 mm long
- 1 mm diameter entrance holes

Image Credits: Top Left: Chip Bates, Georgia Forestry Commission; Top Right: Albert (Bud) Mayfield, USDA Forest Service, Bugwood.org; Bottom Left: Mary Ann Hansen, Virginia Polytechnic Institute and State University; Bottom Right: Joseph Benzel, Screening Aids, USDA APHIS

Infection on camphor tree

Redbay with black staining of sapwood

Redbay with black staining of sapwood

Redbay Ambrosia Beetle

Ash Dieback *(Hymenoscyphus fraxineus)*

Ash dieback , Image Credit: Forest Research, United Kingdom

Hosts

Ash (*Fraxinus spp.*)

Causal Agent

Hymenoscyphus fraxineus fungus

Spread

Hymenoscyphus fraxineus is spread locally by wind, but the movement of diseased ash plants is causing more widespread dispersal of this pathogen.

Signs and Symptoms

- Leaf wilting and discoloration
- Early leaf drop
- Lesions where branches meet the trunk
  - Diamond shaped
- Inner bark under lesions is brown to gray
- Epicormic growth

Image Credits: Top Left: Cumbria Wildlife Trust; Top Right: Ludwig Treuter, iNaturalist; Bottom Left: Joe Bates, Woodland Trust; Bottom Right: Thomas Kirisits, Forest Research United Kingdom

Black lesion on ash

Hymenoscyphus fraxineus on dead leaf stalk

Ash leaf wilting

Small, dried lesion

Oak Wilt *(Bretziella fagacearum)*

Signs of oak wilt. Image Credit: Ryan Armbrust, Kansas Forest Service, Bugwood.org

Hosts

Oak (*Quercus spp.*)

Causal Agent

Bretziella fagacearum fungus

Spread

Oak wilt can spread locally through connected root systems. The fungus can also be transferred from an infected to a healthy tree through oak bark beetles (*Scolytidae*) and sap beetles (*Nitidulidae*) which can carry spores to tree wounds. Human movement is another vector that can spread oak wilt.

Signs and Symptoms

- Flagging in upper canopy
- Leaves become dull green and wilted
- Bronze or brown tissue at leaf tip and margins
- Defoliation
- Black/gray fungal mats under the desiccating bark
- Sapwood streaking

Image Credits: Top Left & Top Right: Steven Katovich, Bugwood.org; Bottom Left: alexfeltmeyer1, iNaturalist; Bottom Right: Sandra Jensen, Cornell University, Bugwood.org

Large yard tree killed by oak wilt

Oak wilt pocket

Bretziella fagacearum on Northern red oak

Dark streaking on wood of oak branch

Sooty Bark Disease *(Cryptostroma corticale)*

Sooty Bark Disease on big leaf maple, Image Credit: Joey Hulbert, WSU

Hosts

Maples (*Acer spp.*)

Causal Agent

Cryptostroma corticale fungus. Note there are other closely related *Biscogniauxia* fungi causing similar signs and symptoms.

Spread

Sooty bark disease spores can spread through wind and rain. Humans can aid in the movement of the fungus through diseased plant materials, but it is hypothesized to be native and widespread throughout the northwest.

Signs and Symptoms

- Crown dieback
- Small or dwarfed leaves
- Black 'sooty' fungal crust within the bark (not on the xylem tissues or outer bark)
- White spores within the bark when the outer bark is pushed off
- Staining within the xylem tissues

More Information

More information and contacts for diagnostics are available at https://treehealth.wsu.edu/sbd.

Image Credits: Joey Hulbert, WSU

Spores from a branch sampled with sooty bark disease

Bigleaf maple trees in various stages of decline

Staining inside the infected sycamore maple

'Sooty' patch on big leaf maple

Aspen Running Canker *(Neodothiora populina)*

Aspen running canker along the Resurrection Pass Trail. Image credit: Steve Swenson, USDA Forest Service

Hosts

Trembling aspen (*Populus tremuloides*)

Causal Agent

Neodothiora populina fungi

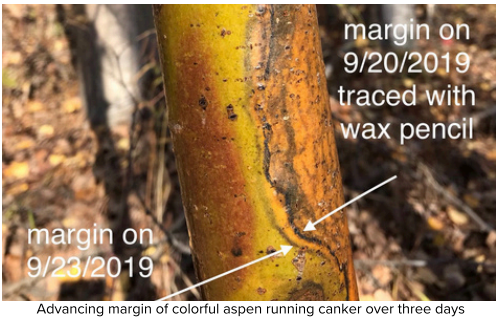
Spread

Currently only been observed in southcental and interior Alaska mainly in boreal forests. Canker induced mortality is strongly correlated to drought and aspen leaf miner. The cause of disease and spread is still being studied.

Signs and Symptoms

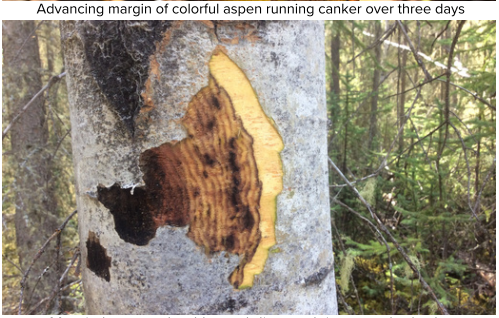
- Staining often runs along length of tree
- Fungal staining often appears as a subtle discoloration to occasionally orange
- Rapid tree mortality, death in ~1-2 years after infection
- No noticeable branch dieback or slowly declining tree health

Image Credits: All Images: Lori Winton, USDA Forest Service



Advancing margin of colorful aspen running canker over three days

Trees killed by aspen running canker



Margin between healthy and diseased tissue under bark

Margin between live and dead tissue on a nearly dead aspen

Dutch Elm Disease *(Ophiostoma novo-ulmi)*

American Elm with symptoms of Dutch Elm Disease. Image Credit: Ward Upham, Kansas State University

Hosts

Elm (*Ulmus spp.*)

Causal Agent

Ophiostoma ulmi and *Ophiostoma novo-ulmi* fungi

Spread

Dutch elm disease spreads through root grafts and elm bark beetles, including beetles from the *Scolytus* genus and the native elm bark beetle (*Hylurgopinus rufipes*)

Signs and Symptoms

- Leaves or branches in the outer crown yellow, wilt, then turn brown
- Discoloration and wilting progresses towards the tree trunk
- Premature leaf drop in spring and summer
- Diseased foliage and shoots
- Shoot tip die back
- Brown streaks in sap wood

Image Credits: Top Left: Steven Katovich, Bugwood.org; Top Right: William Jacobi, Colorado State University; Bottom Left: M. Grabowski, UMN Extension; Bottom Right: Roland J. Stipes, Virginia Polytechnic Institute and State University, Bugwood.org

Multiple egg galleries of native elm bark beetle

Brown staining of sapwood

Flagging of leaves on an infected tree

Wilted American elm leaves

Beech Leaf Disease *(Litylenchus crenatae)*

Beech leaf disease on American Beech , Image Credit: Matthew Borden, Bartlett Tree Experts, Bugwood.org

Hosts

Beech (*Fagus spp.*)

Causal Agent

Litylenchus crenatae subsp. *mccannii* nematode

Spread

Nematodes (microscopic roundworm) that cause beech leaf disease are primarily spread through human movement of infected plant materials.

Signs and Symptoms

- Dark bands on leaves in early spring caused by nematodes
- Leathery, deformed, crinkled leaves
- Yellowing leaves as season progresses
- Reduced bud and leaf production as the disease progresses
- Premature leaf drop
- Canopy dieback and thinning

Image Credits: Top Left: Paulo Vieira, USDA, ARS; Top Right & Bottom Left: Matthew Borden, Bartlett Tree Experts; Bottom Right: Yonghao Li, The Connecticut Agricultural Experiment Station, Bugwood.org

Litylenchus crenatae mccannii nematode under microscope

Damage on new leaves

Symptoms and damage on beech leaves

Banding symptoms on leaf

REPORT SIGHTINGS

Share reports with the QR codes
websites, or contacts below.

Washington

invasivespecies.wa.gov

Oregon

oregoninvasiveshotline.org

MORE RESOURCES

Forest Health Watch

Participate as community scientists, share reports,
or contact the program staff at:
https://foresthealth.org

WSU Urban Forest Health Lab

Find more information, trainings and resources at
https://treehealth.wsu.edu