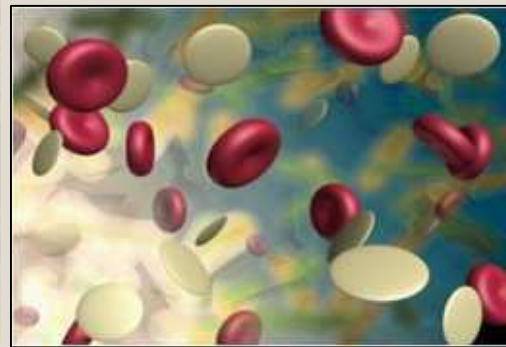
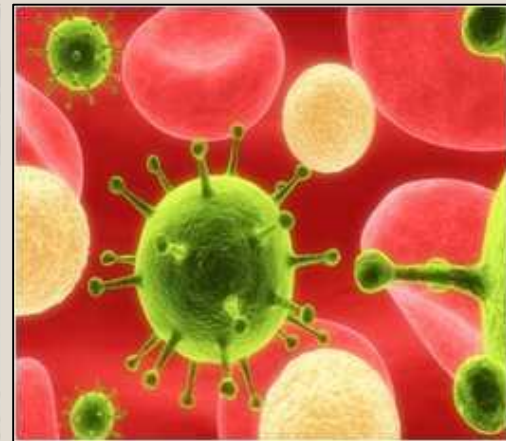


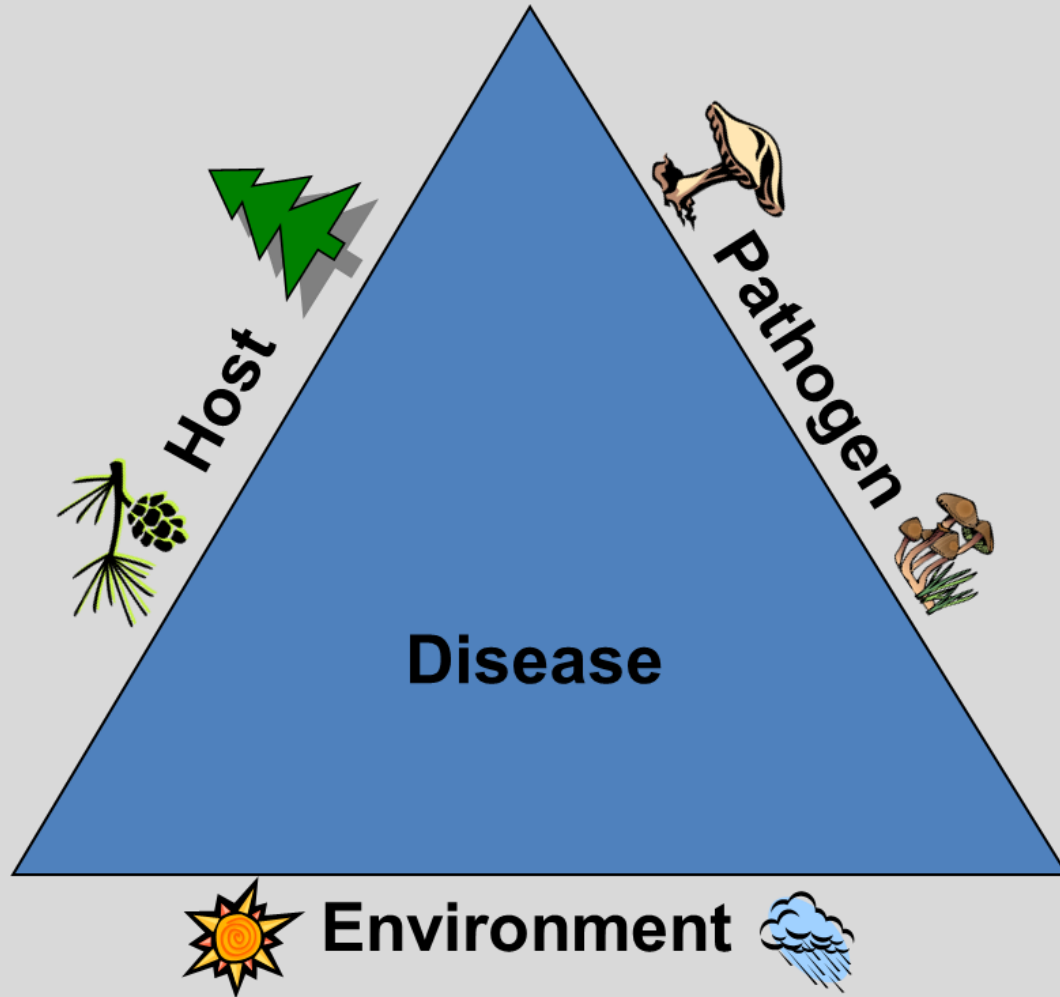
Urban Forestry Recovery and Resiliency Identification, Ecology and Management Part II: Diseases

Amy Ramsey, Forest Pathologist
WA Dept. of Natural Resources
amy.ramsey@dnr.wa.gov

Most tree diseases are caused by fungi.



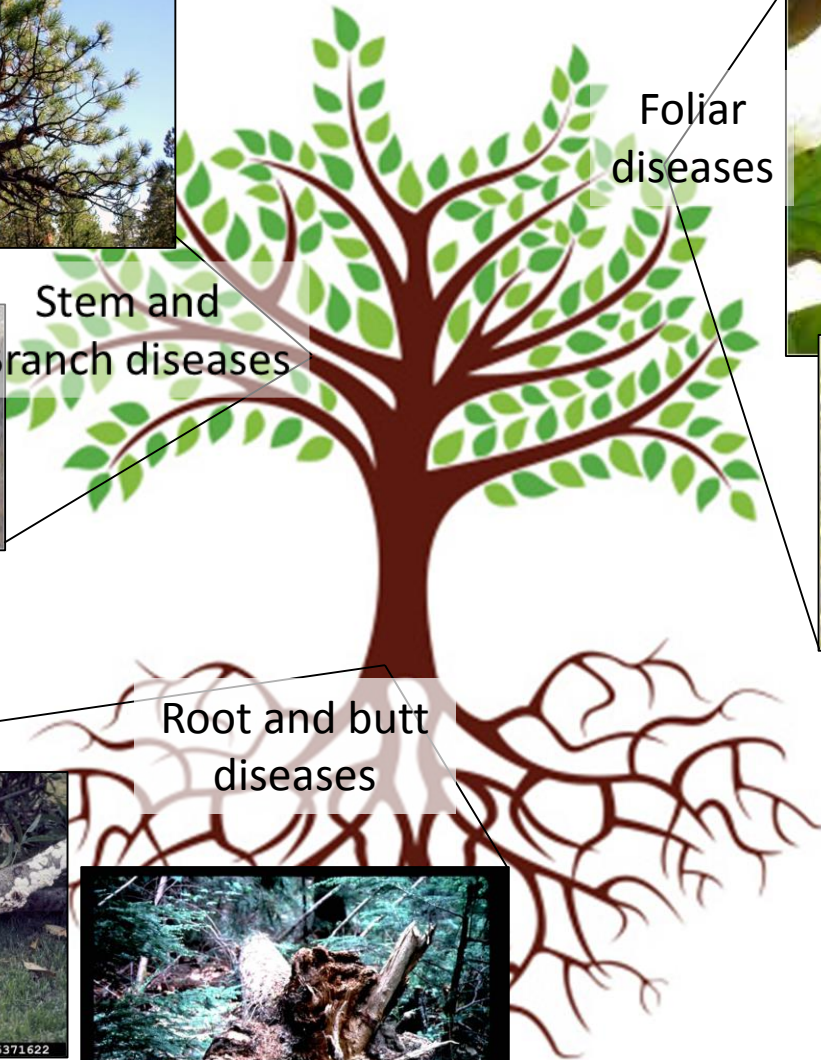
The disease triangle is integral for understanding tree diseases.



Different diseases can affect different parts of the tree.

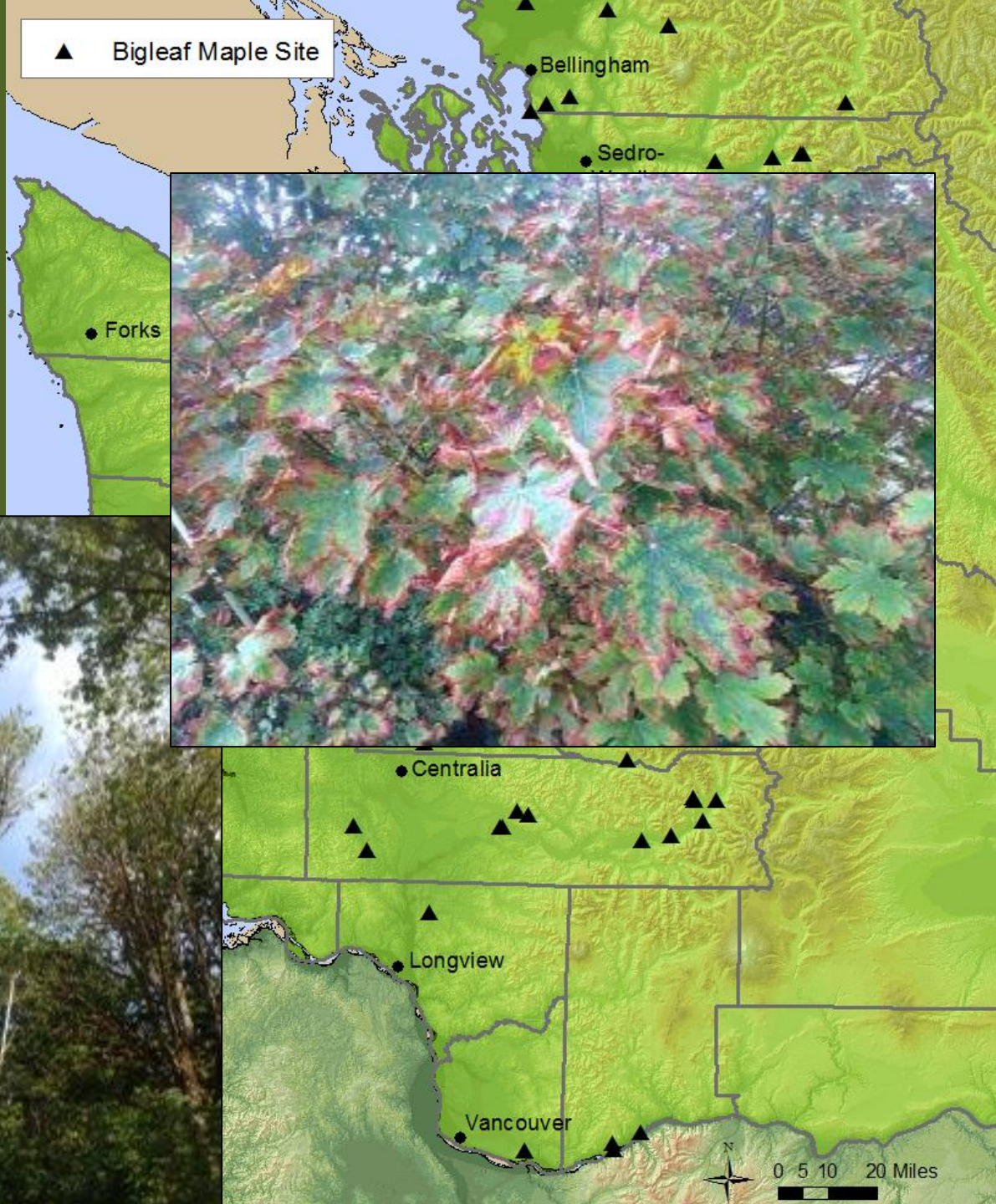


Stem and Branch diseases



Sometimes it's not so simple.





Tree diseases may be working in concert with other disturbance agents.



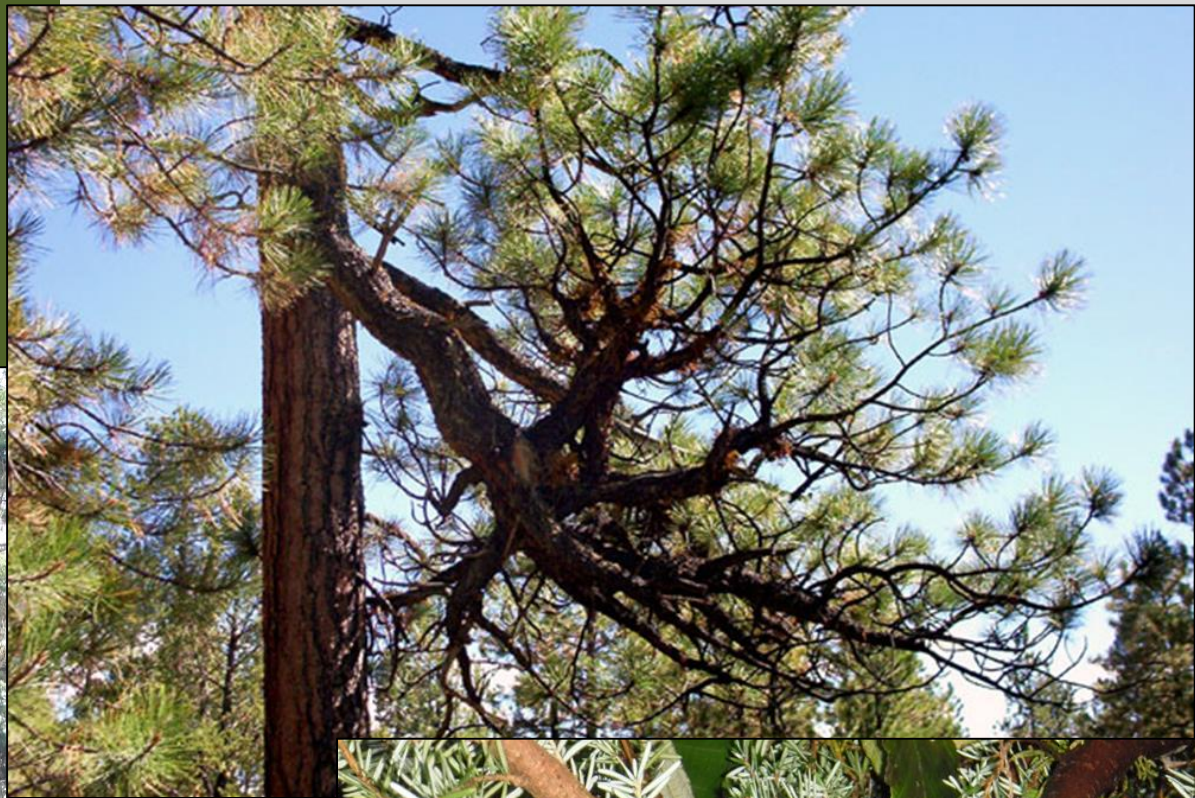
Steps to Diagnosis: (what are the clues?)

- Note damage and trees affected.
- Note signs and symptoms.
- Look for pattern to damage development.
- Look at the big picture over the site.
- Incorporate personal or local knowledge.





Dwarf mistletoes
are parasitic
plants.



Lodgepole Dwarf Mistletoe



Seed Dispersal



Seed Germination



Swelling



Young Shoots



Female

- Prune infected branches early to reduce impacts
- Replace tree with less susceptible or resistant host



Foliar damage:
Disease or
something else?

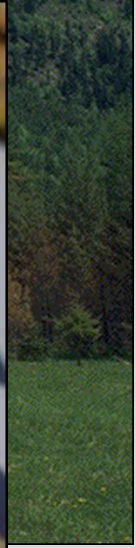
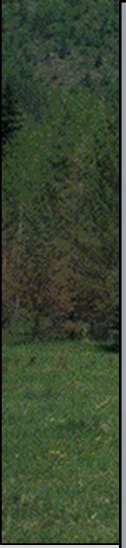
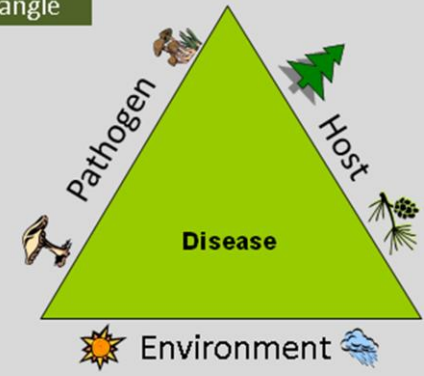


- Note damage and trees affected.
- Note signs and symptoms.
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- Incorporate personal or local knowledge.

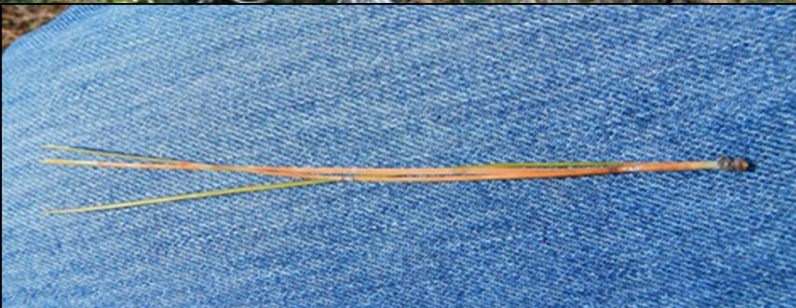
Look close.
What are
the clues?



The Disease Triangle



Pine Needle Casts



- *Dothistroma*
- *Lophodermella*
- *Lophodermium*



Dothistroma



Lophodermium



Lophodermella



Management strategies for foliar diseases



- Fungicides can buy protection on a yearly application basis product and timing depend on pathogen (lifecycle, weather conditions)



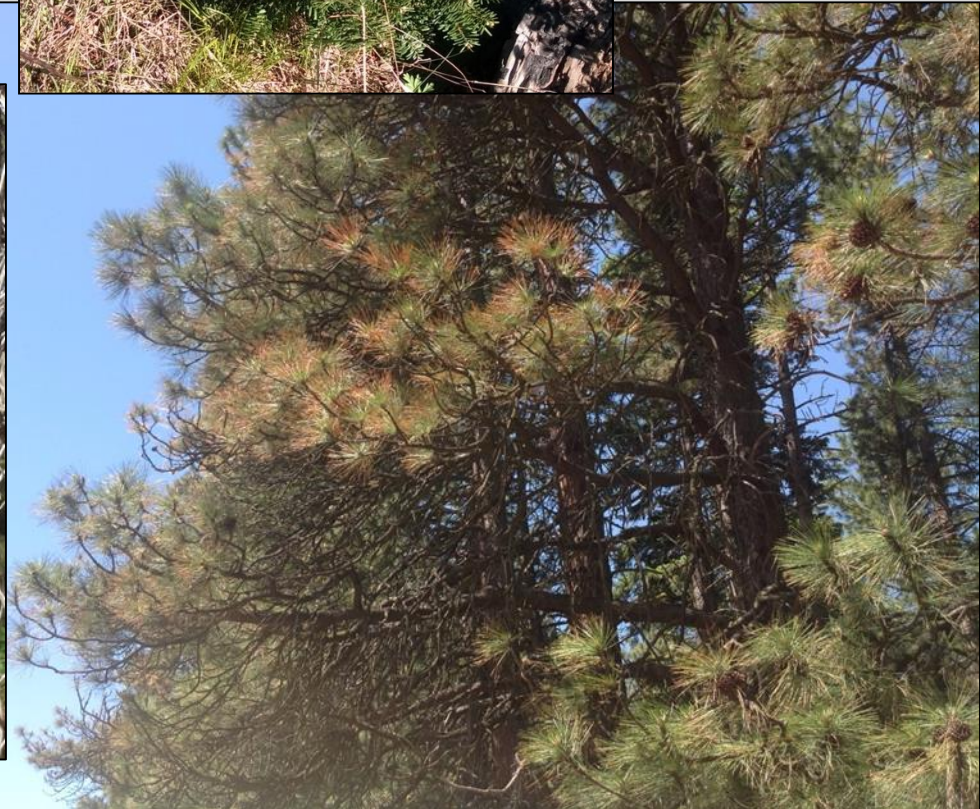
- Prune or thin to keep airflow at a maximum if foliar issues occurring
- If pruning, prune in late fall or winter to avoid other disease and insect issues
- Right tree in right place
 - avoid planting offsite species (offsite seed source or offsite species in wet or drainage areas)

Fall Flagging



Red Belt/Parch Blight

- Needles damaged uniform distance on tip.
- No fruiting bodies.
- Position that is exposed to dry or cold winds.



Sometimes it's not so simple.



The Most Common Root Diseases



Schweinitzii
root disease



Armillaria root disease



Laminated root rot



Phytophthora root diseases



Annosus root disease

Root Diseases

Fungi: multiple species

Hosts: all species, conifers and hardwoods



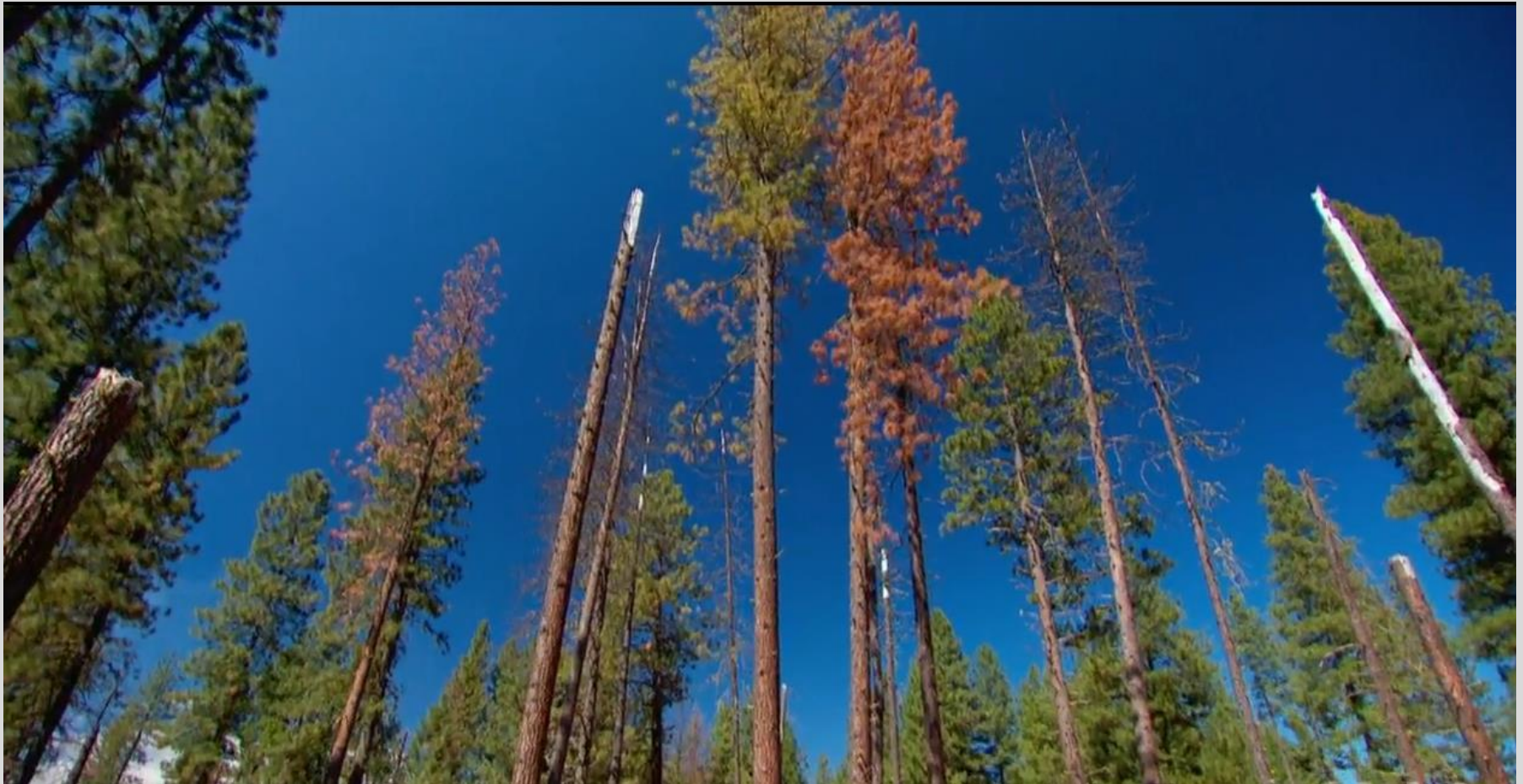
Functions of Root Diseases:

- Compromise structural integrity of roots and base of tree
- Reduce growth
- Cause mortality
- Increase tree susceptibility to windthrow and insect damage



Root disease patches have trees in various stages of decline next to seemingly healthy trees.

- Snags
- Trees with no fine branches, no foliage
- Trees with fine branches, no foliage
- Trees with thinning foliage



Other stand level symptoms may include:

- Trees with chlorotic foliage
- Trees with stress cone crops
- Trees with thinning foliage
- Rounded tops of crowns





Symptoms:
“Basal resinosis” or
excessive resin
flow



UGA4215007

Schweinitzii root disease

- *Phaeolus schweinitzii*
 - Velvet top fungus
- Old Douglas-fir & Sitka spruce, most common hosts





Armillaria root disease



5371622



WASHINGTON STATE DEPARTMENT OF
Natural Resources

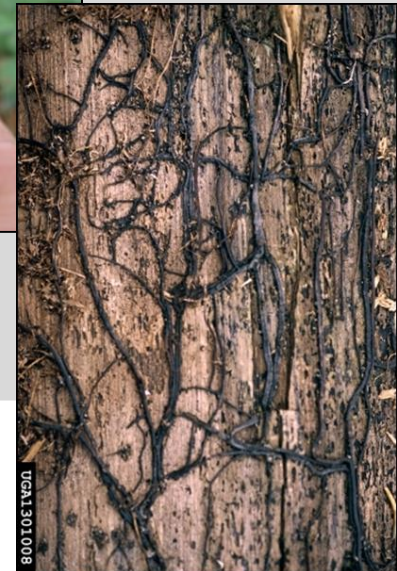
White mycelial fans



Basal
resinosus



Rhizomorphs



Laminated Root Rot

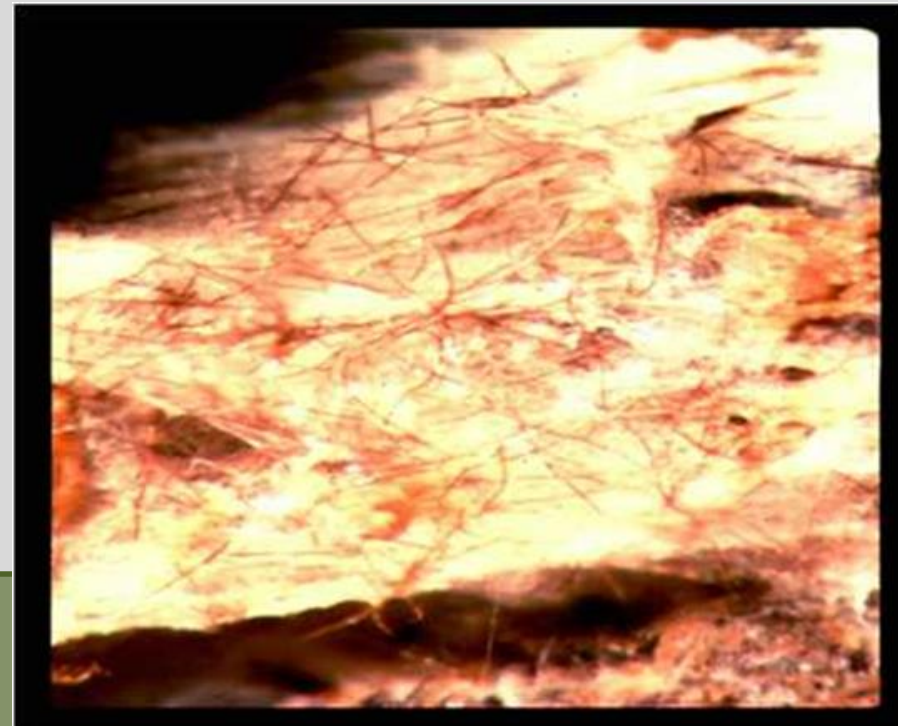
Fungus: *Phellinus sulphurascens*
(*Phellinus weirii*)

Host: most
commonly
Douglas-fir





Ecotrophic
mycelium



Setal hyphae,
red whiskers



Annosus Root Disease

Fungi: *Heterobasidion occidentale*
Heterobasidion parviporum
(*Heterobasidion annosum*)

Hosts:

Abies

Juniperus

Libocedrus

Pinus

Pseudotsuga

Sequoiadendron

Tsuga

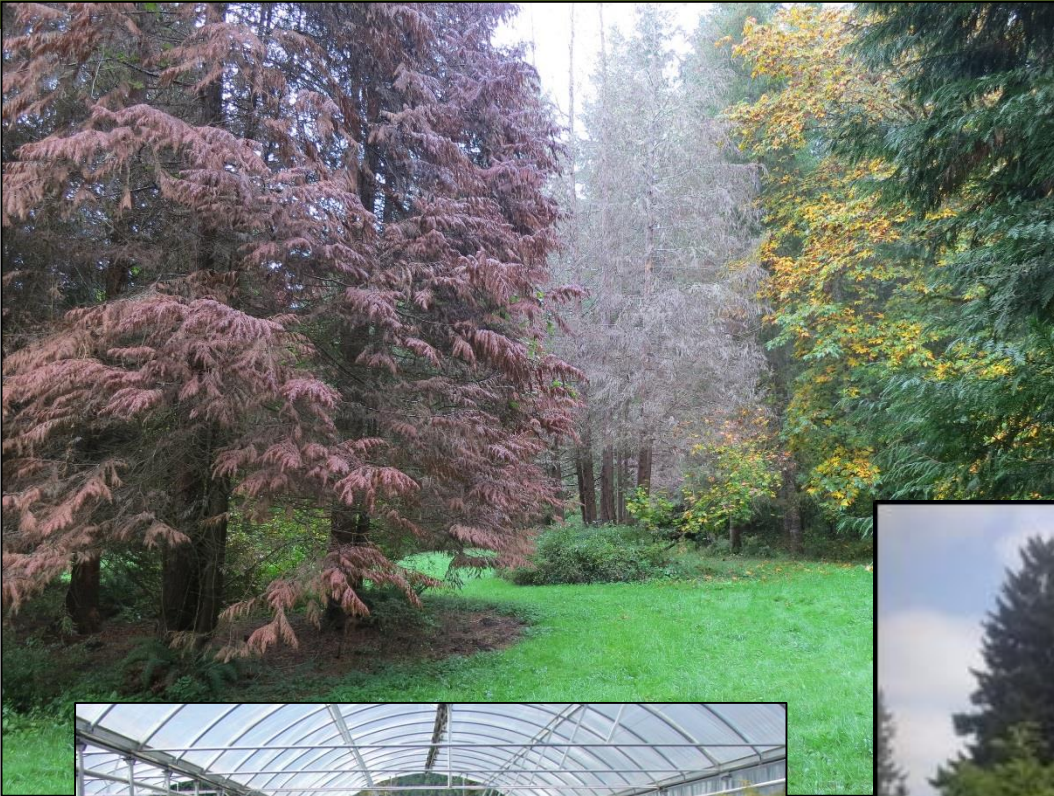


- Stump staining
- White decay with black flecks
- Hollow stumps



Phytophthora's as root diseases

Host: Port Orford Cedar
(*Chamaecyparis lawsoniana*)
Fungus: *Phytophthora lateralis*



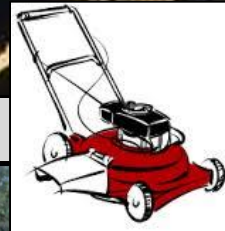
General management recommendations for root diseases

Right tree in the right place

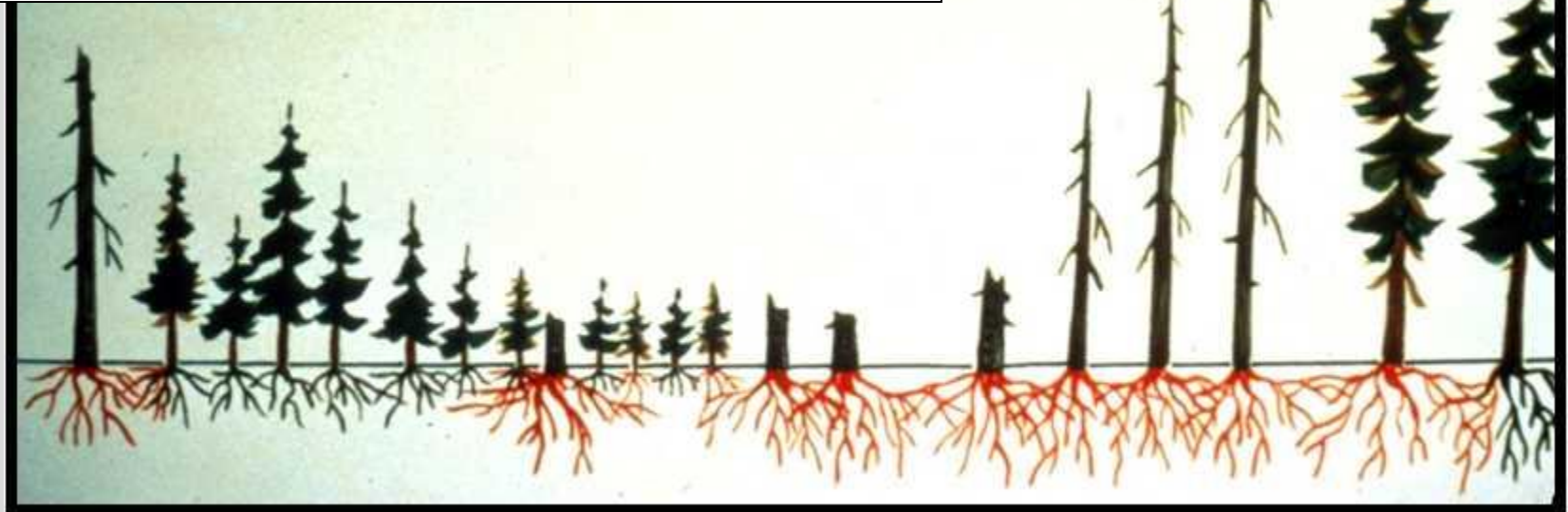
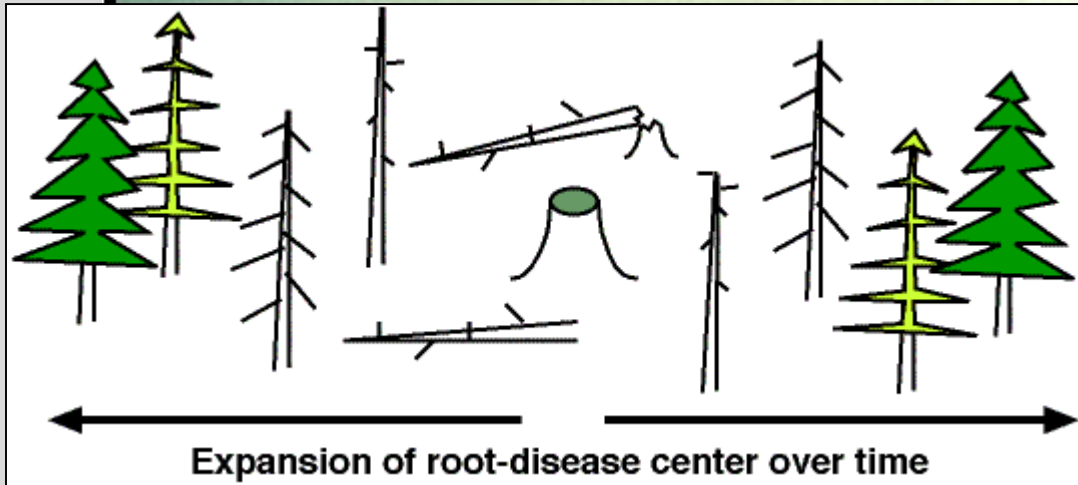


Avoid damaging roots or stem of tree:

- soil compaction
- construction damage
- landscaping equipment damage
- severing roots



- Root disease centers are usually localized.
- All sizes of susceptible trees can be affected.



General management recommendations for root diseases

- Alternative species:
plant or encourage
least susceptible
species
 - Match seed zone
of stock to site
 - Expect some
mortality unless
planting
completely
resistant or
immune species



Heart rots and stem decays



Bark removal allows decay fungi to enter the tree and cause decay.



Phellinus (Porodaedalea) pini usually affects older trees.



- Red ring rot
- white speck rot

Heart rots and stem decay management strategies.

- Always depends on objectives
 - wildlife
 - merchantable wood
 - safety
- Prune when branches are small so wounds seal quickly
- Minimize damage to trees



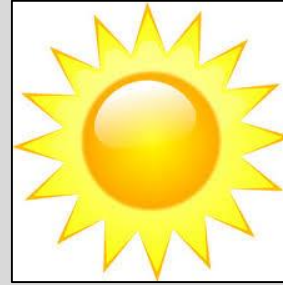
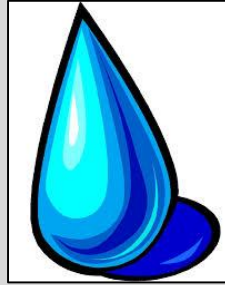
General Tree Disease Management Recommendations

-Right tree in the right site

-water

-sunlight

-growing space



-Generally greater stress on trees moving forward

- consider species

-more water needed

-less water available

-Develop vegetation management plans for moving forward

-Individual trees

-Urban forests

-Green belts

Conclusions



- Lot's of biotic and abiotic tree damaging agents
- Know the common ones and know where to report the unusual
 - Get help with identification if unsure
 - Get help with agent specific management options
- Overall tree stress is likely to increase with warmer, drier conditions
 - Likely increase in root disease damage
- Expect the unexpected moving forward



Contacts and Additional Information

CONTACTS AND RESOURCES FOR TREE INSECT AND PATHOGEN TECHNICAL ASSISTANCE: Washington and Oregon

Washington Resources for Forest Insect and Disease Information (non-federal lands):

DNR - Resource Protection Division, PO Box 47037, Olympia, WA 98504-7037
Dan Omdal, Forest Pathologist (360) 902-1692 dan.omdal@dnr.wa.gov
Amy Ramsey, Forest Pathologist (360) 902-1309 amy.ramsey@dnr.wa.gov
Glenn Kohler, Forest Entomologist (360) 902-1342 glenn.kohler@dnr.wa.gov
Melissa Fischer, Forest Entomologist, Colville (509) 684-7474 melissa.fischer@dnr.wa.gov

Oregon Resources for Forest Insect and Disease Information (non-federal lands):

ODF - Forest Health, 2600 State Street, Salem, OR 97310-0340
Alan Kanaskie, Forest Pathologist (503) 945-7397 alan.kanaskie@oregon.gov
Sarah Navarro, Forest Pathologist (503) 881-3645 sarah.navarro@oregon.gov
Christine Buhl, Forest Entomologist (503) 945-7396 christine.j.buhl@oregon.gov
Wyatt Williams, Invasive Species Specialist (503) 945-7472 wyatt.williams@oregon.gov

Resources for Forest Insect and Disease Information (federal lands):

USDA Forest Service - Wenatchee Service Center

Forestry Sciences Laboratory, 1133 N Western, Wenatchee, WA 98801
Darci Dickinson, Forest Entomologist (509) 664-1724 darcimdickinson@fs.fed.us
Brennan Ferguson, Forest Pathologist (509) 664-9215 brennanferguson@fs.fed.us
Betsy Goodrich, Forest Pathologist (509) 664-9223 agoodrich@fs.fed.us
Connie J. Mehmel, Forest Entomologist (509) 664-9213 cmehmel@fs.fed.us

USDA Forest Service - Westside Service Center

Mount Hood National Forest, 16400 Champion Way, Sandy, OR 97055
Kristen Chadwick, Forest Pathologist (503) 668-1474 kichadwick@fs.fed.us
Holly Kearns, Forest Pathologist (503) 668-1475 hkearns@fs.fed.us
Beth Willhite, Forest Entomologist (503) 668-1477 bwillhite@fs.fed.us

Washington State University (WSU) Plant Pest Diagnostic Services

WSU operates two Plant Pest Diagnostic Clinics, in Puyallup and in Pullman. The Puyallup Clinic generally handles samples from western Washington, while samples from eastern Washington are usually submitted to Pullman. Both Clinics offer diagnosis of plant diseases and disorders, insect and arthropod identification, and plant/weed identification. Identifications and diagnoses are accompanied by management recommendations when appropriate. Services provided by the WSU diagnosticians are fee-based. The WSU Clinics are able to process samples from Washington State, but not from other areas of the country.

<http://plantpath.wsu.edu/diagnostics/> (509) 335-3292 plant.clinic@wsu.edu



Wind storm damage in eastern WA

More in depth presentations
about tree diseases and abiotic
issues:

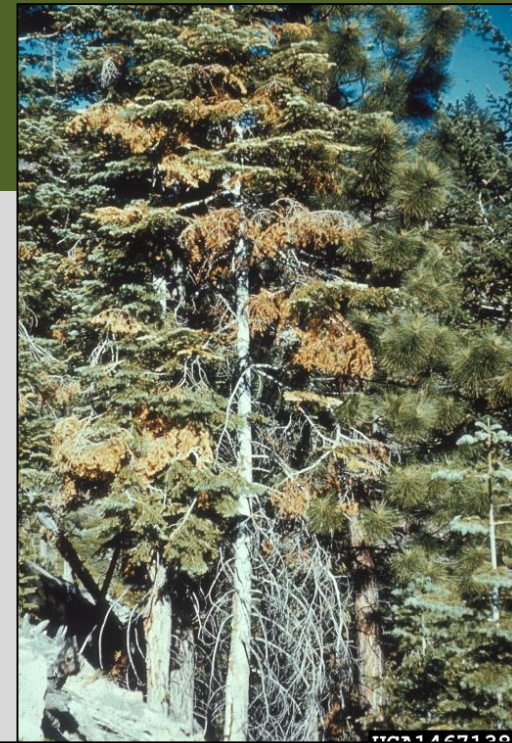
<http://forestry.wsu.edu/fsu/>

With changing climatic conditions, secondary pathogens and associated damage may become more common, with drought as a primary driver.

Cytospora canker

Fungus: *Cytospora* spp.

Hosts: maple, spruce, willow, hemlock, poplar, cherry, Douglas-fir, true fir, pear, mulberry, walnut, peach, larch, sycamore and many others



Nectria canker and twig dieback

Fungus: Nectria galligena

Hosts: may occur on over 60 species of trees and shrubs including apple, ash, birch, dogwood, elm, sweet gum, holly, maple, pear and walnut

