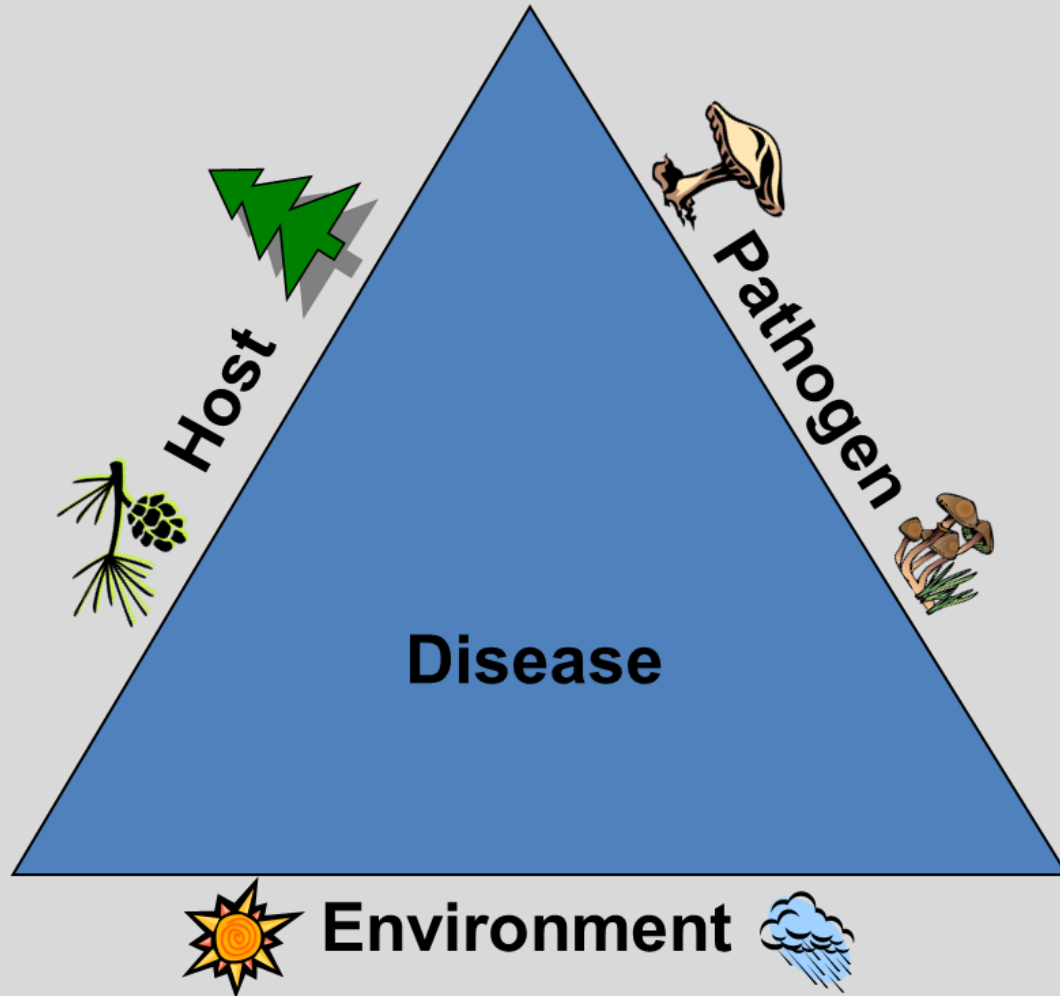


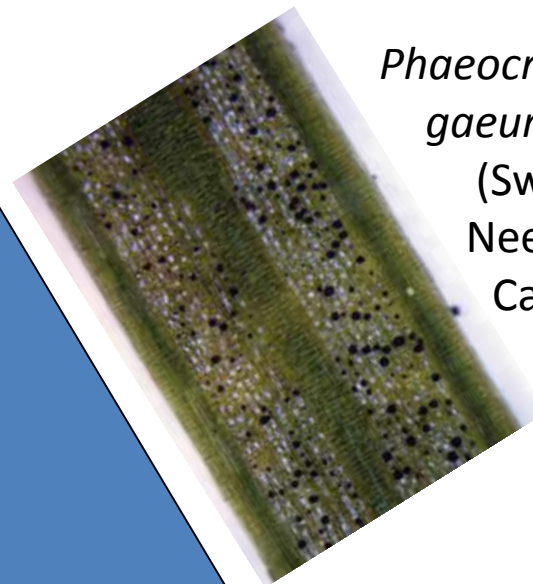
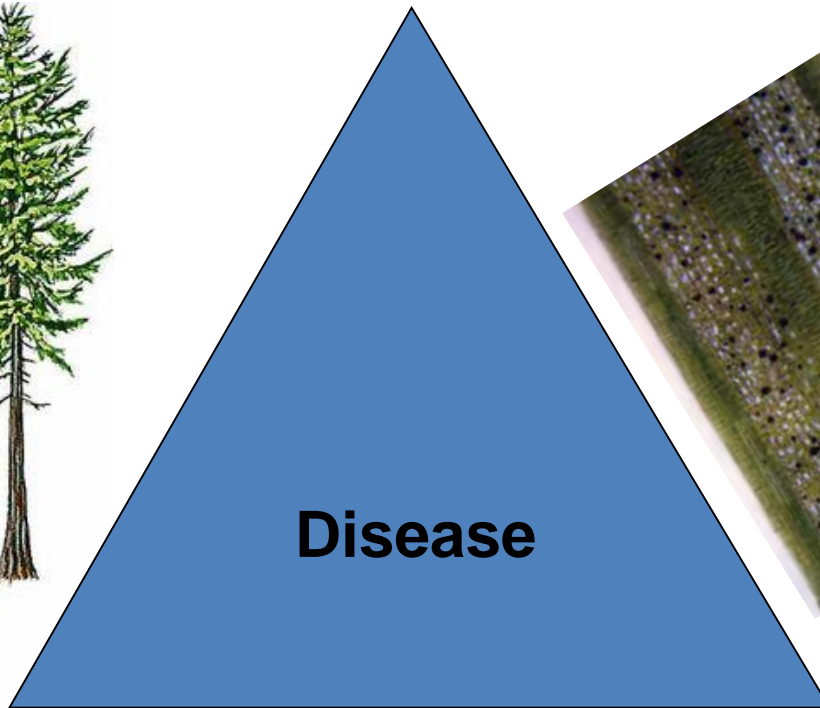
# Conifer Diseases in Washington: Identification, Management and Weather Influences

Amy Ramsey  
Forest Pathologist  
WA Dept. of Natural Resources  
[amy.ramsey@dnr.wa.gov](mailto:amy.ramsey@dnr.wa.gov)

The disease triangle is integral for understanding tree diseases.



# Swiss Needle Cast



*Phaeocryptopus  
gaeumannii*  
(Swiss  
Needle  
Cast)



warm and wet  
in winter-early  
summer



# Swiss Needle Cast

Fungus: *Phaeocryptopus geumannii*

Host: Douglas-fir

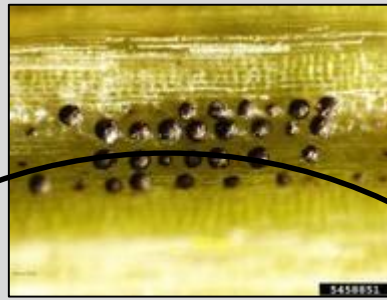
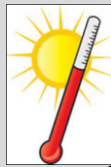
Underside  
of  
needle



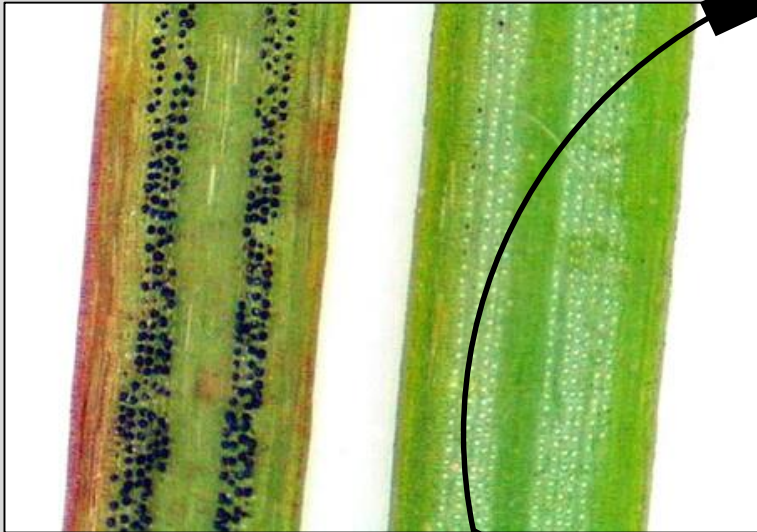
Pseudothecia  
(fungal  
sporulating  
structure)



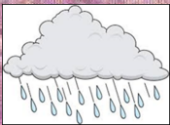
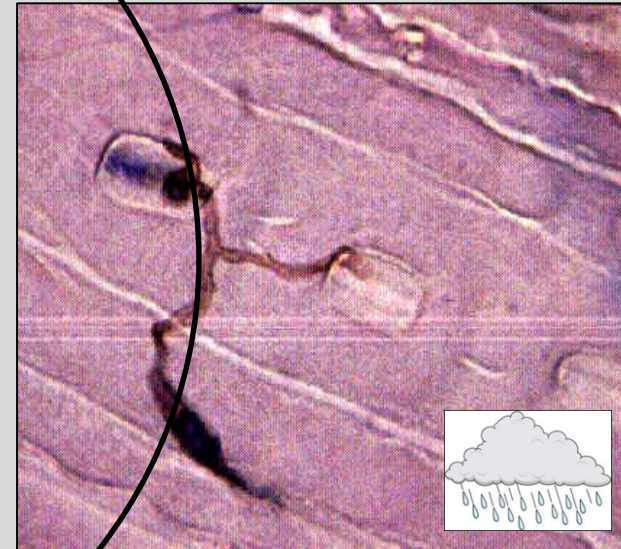
Pseudothecial fruiting bodies emerge from the needle stoma in early winter.



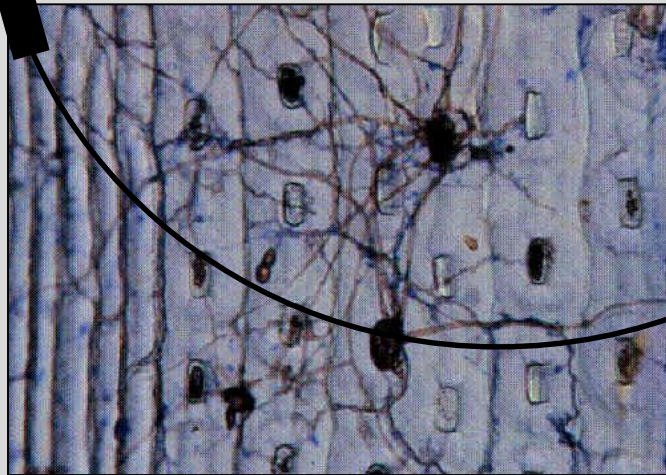
Pseudothecia ripen & release ascospores from March-June. Sporulation continues through August



## SNC Disease Cycle

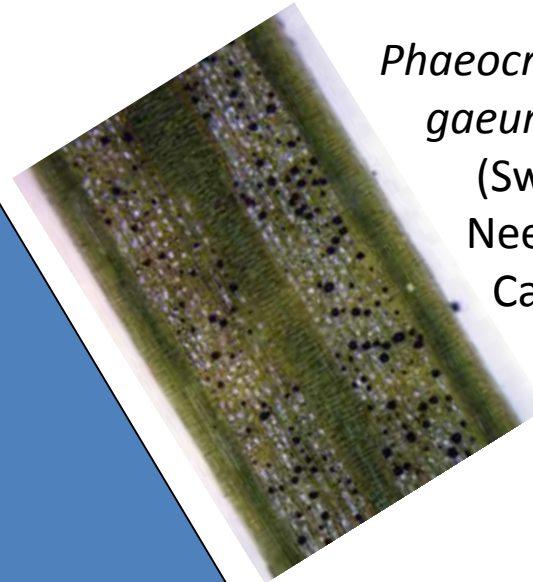
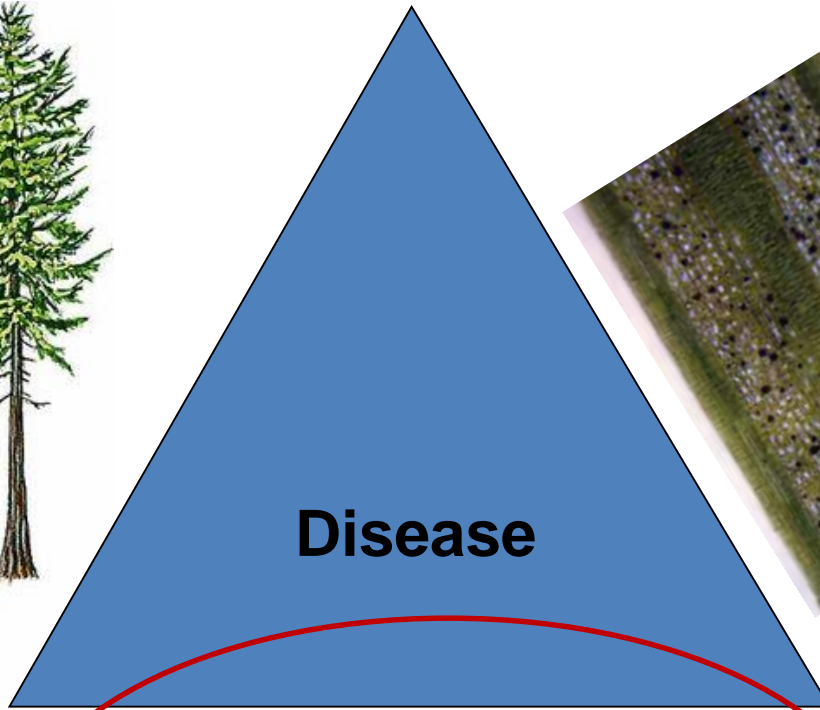


Spores land on needle surface, germinate & penetrate through stomates

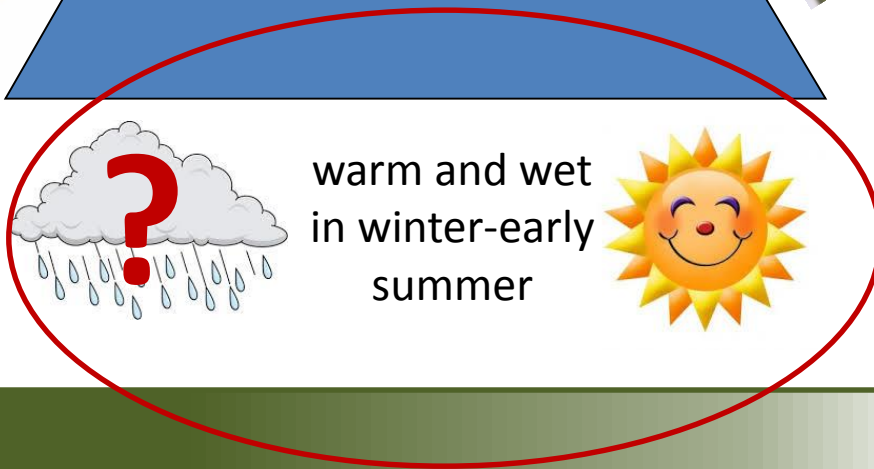


Fungal hyphae grow throughout the needle from summer through winter

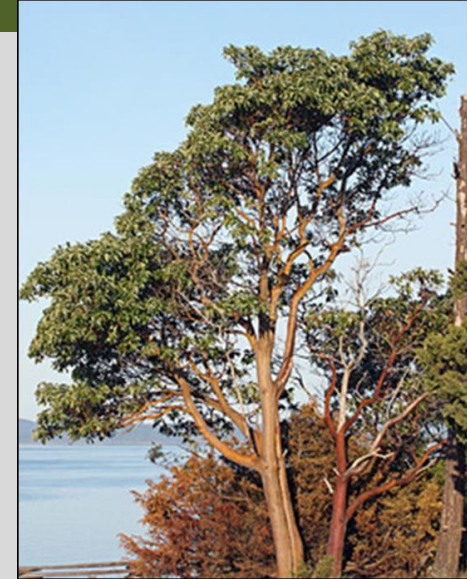
# Swiss Needle Cast



*Phaeocryptopus  
gaeumannii*  
(Swiss  
Needle  
Cast)



Spring



Summer

Pacific Madrone  
*Arbutus menziesii*  
Life cycle



Fall



**Table 1. Diseases of madrone.\***

| Disease category                | Pathogen  | Disease name                      |
|---------------------------------|---|-----------------------------------|
| Root rots                       | <i>Pythium</i> spp.   | Damping-off                       |
|                                 | <i>Phytophthora cactorum</i>  | Collar rot <i>or</i> basal canker |
|                                 | <i>Phytophthora cinnamomi</i> **  | Phytophthora root rot             |
|                                 | <i>Armillaria</i> spp.  | Armillaria root disease           |
|                                 | <i>Heterobasidion annosum</i>   | Annosus root rot                  |
| Twig dieback and branch cankers | <i>Neofusicoccum arbuti</i><br>( <i>Natrasia mangiferae</i> ,<br><i>Fusicoccum arbuti</i> ,<br><i>Hendersomula toruloidia</i> ) | Madrone canker                    |
|                                 | <i>Botryosphaeria dothidea</i><br>( <i>Fusicoccum aesculi</i> )   | Madrone twig dieback              |
| Wood-decay fungi                | <i>Phellinus igniarius</i>  |                                   |
|                                 | <i>Fomitopsis cajanderi</i>   | Brown top rot                     |
|                                 | <i>Poria subacida</i>   | Yellow root rot                   |
| Foliage diseases                | <i>Ascochyta hansenii</i>   | Leaf spot                         |
|                                 | <i>Coccomyces quadratus</i>   | Tar spot                          |
|                                 | <i>Cryptostictis arbuti</i>   | Leaf spot                         |
|                                 | <i>Didymosporium arbuticola</i>   | Leaf spot                         |
|                                 | <i>Diplodia maculata</i>  | Leaf spot                         |
|                                 | <i>Disaeta arbuti</i>   |                                   |
|                                 | <i>Elsinoe mattirolianum</i>  | Spot anthracnose                  |
|                                 | <i>Exobasidium vaccinii</i>   | Blister blight                    |
|                                 | <i>Mycosphaerella arbuticola</i>  | Madrone foliage blight            |
|                                 | <i>Phyllosticta fimibriata</i>  | Leaf spot                         |
|                                 | <i>Pucciniastrum sparsum</i>  | Rust                              |
|                                 | <i>Rhytisma arbuti</i>  | Speckled tar spot                 |



Photos by Marianne Elliott, Gary Chastagner  
Table from Bennett and Shaw

\*Adapted from Elliott (1999)

\*\* Hansen (unpublished)



# Leaf blight

Fungus: *Phacidiopycnis washingtonensis*

Fungus present in twigs & leaf buds



Cold weather in winter or early spring



Warm, wet spring



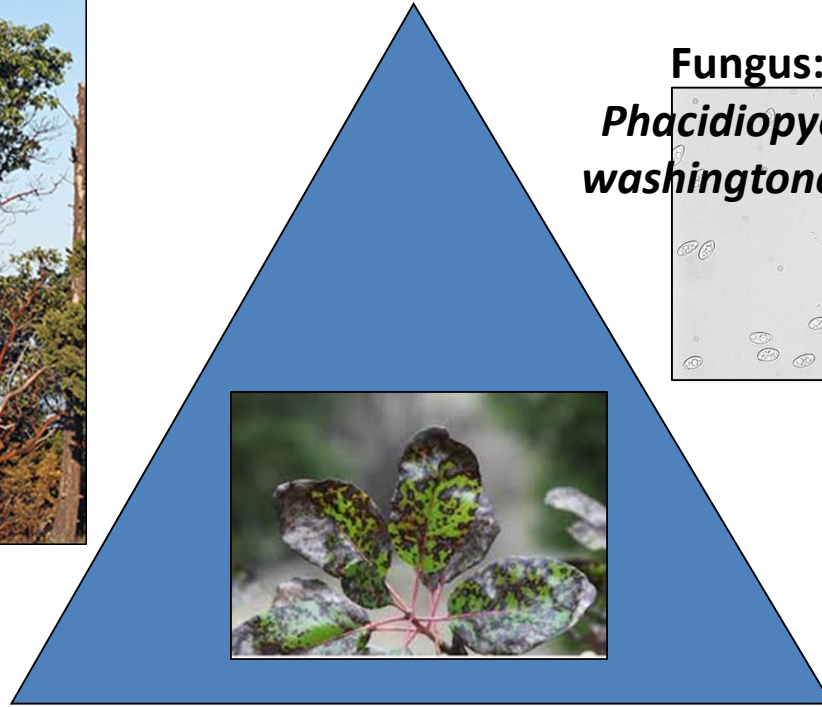
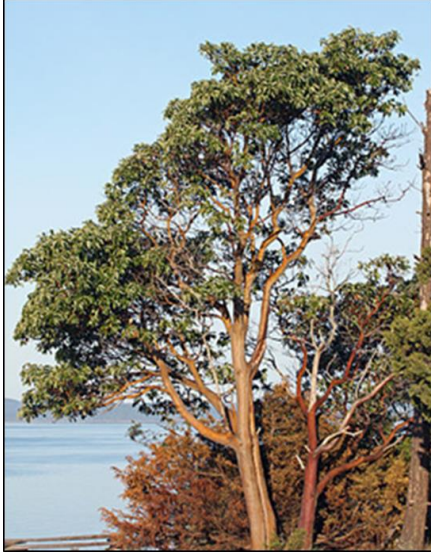
New infections in new foliage



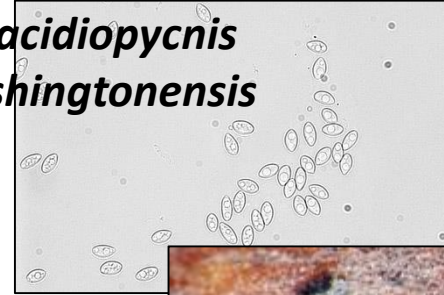
Symptoms observed in older foliage



# Madrone Leaf Blight



**Fungus:**  
*Phacidiopycnis*  
*washingtonensis*



winter



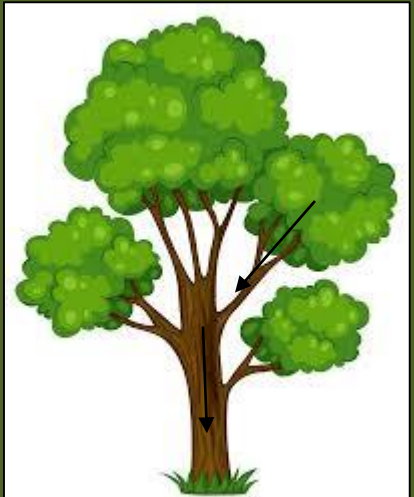
Spring, early summer



# Trunk Canker & Twig Dieback

Host: *Arbutus menziesii*

Fungi:  
*Neofusicoccum arbuti*  
(trunk canker, injury)  
*Botryosphaeria dothidea*  
(twig dieback, drought)



Photos by Bennett, Elliott

# Management Recommendations for *Arbutus menziesii* Health



# Keithia Blight

Fungus:

*Didymascella thujina*

Host: western red cedar (*Thuja plicata*)  
and cultivars



# Management of Keithia Blight

- Space nursery plants and time irrigation to promote rapid drying of foliage
- Do not grow susceptible cultivars downwind of infected hedges, windbreaks, or nearby stands of native western red cedar
- Thinning may reduce impacts in forested areas



# Red Needle Blight

Fungus:

*Dothistroma* spp.

Hosts: lodgepole,  
Austrian, ponderosa  
pines

Sporulation & new  
infections: May –  
October during wet  
conditions



# Foliar Diseases and Climate Change

- New foliar diseases being discovered as weather conditions change
- Greater incidence of some foliar diseases due to weather favoring the fungi and ability to infect host
- drought stress will likely influence symptom expression and premature foliage loss





# Management strategies for foliar diseases and climate change



- Dry late spring-summer may not favor current known foliar pathogens

- 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)

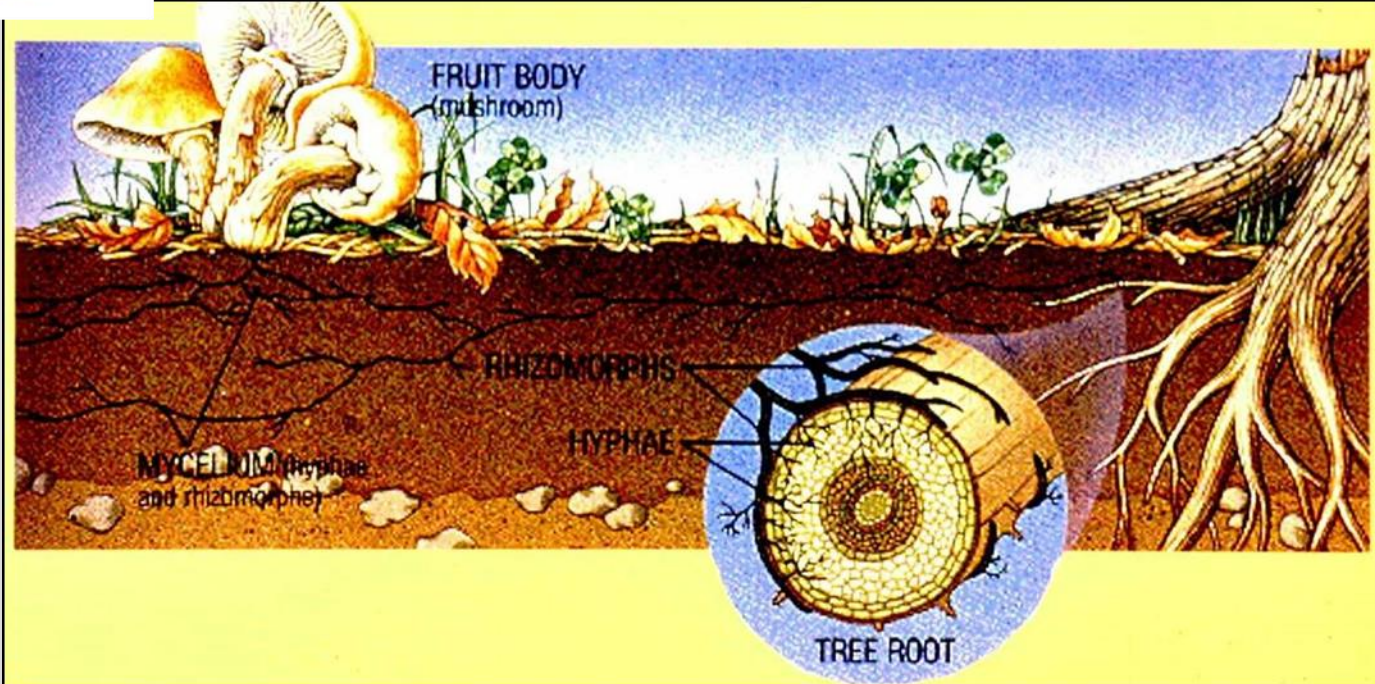
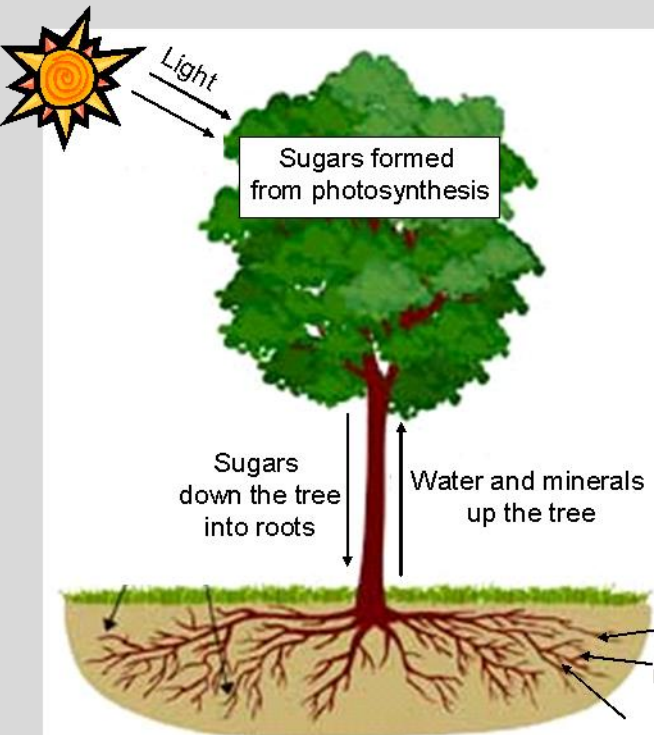
Root Diseases:  
Identification, Management and Climate Change Considerations

# 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



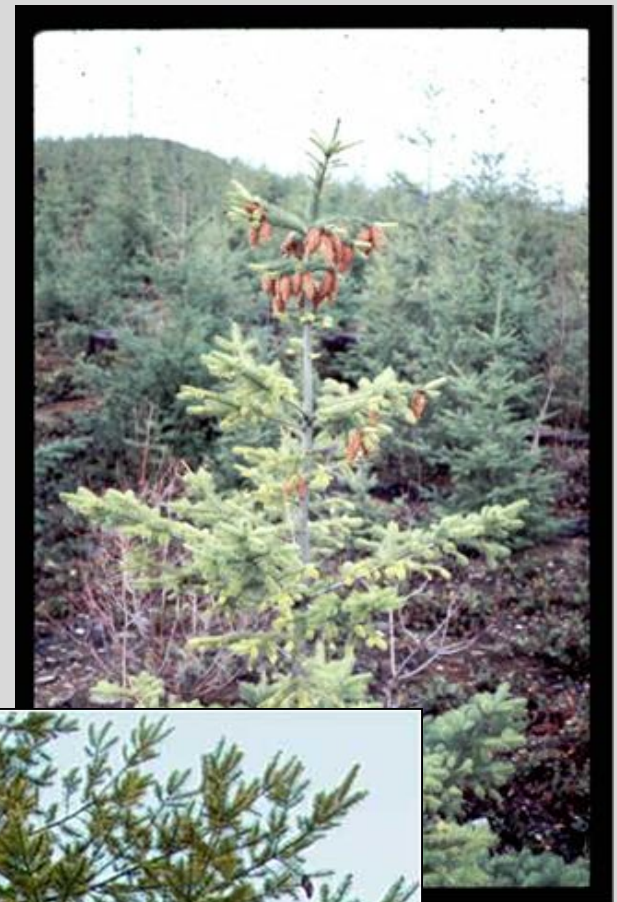
Symptoms may include:

- Trees with chlorotic foliage
- Trees with thinning foliage
- Trees with reduced leader growth



## Other symptoms may include:

- Trees with stress cone crops
- Dead trees adjacent to stumps



John Schwandt, USDA Forest Service

UGA1241666





Symptoms:  
“Basal resinosis” or  
excessive resin  
flow





# The Most Common Root Diseases



Schweinitzii  
root disease



Armillaria root disease



Phytophthora root diseases



Laminated root rot



Annosus root disease

# Schweinitzii root disease

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





# Armillaria root disease

| Species & Synonyms                       | Relative Pathogenicity | Primary Hosts |
|--|------------------------|---------------|
| <i>A. solidipes</i> = <i>A. ostoyae</i>  | High                   | Conifers      |
| <i>A. mellea</i>                         | High                   | Hardwoods     |
| <i>A. gemina</i>                         | Moderate?              | Hardwoods     |
| <i>A. calvescens</i>                     | Low                    | Mixed         |
| <i>A. sinapina</i>                       | Low                    | Mixed         |
| <i>A. gallica</i> = <i>A. bulbosa</i>    | Low                    | Mixed         |
| <i>A. alitmontana</i> (NABS X)           | Low                    | Mixed         |
| <i>A. cepistipes</i>                     | Low                    | Mixed         |
| <i>A. nabsnona</i>                       | Low                    | Hardwoods     |
| <i>A. socialis</i> = <i>A. tabescens</i> | Variable               | Hardwoods     |



# Armillaria signs & symptoms:

White mycelial fans



Basal resinosis



Rhizomorphs



UGA1301008

# Phytophthora's as root diseases

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

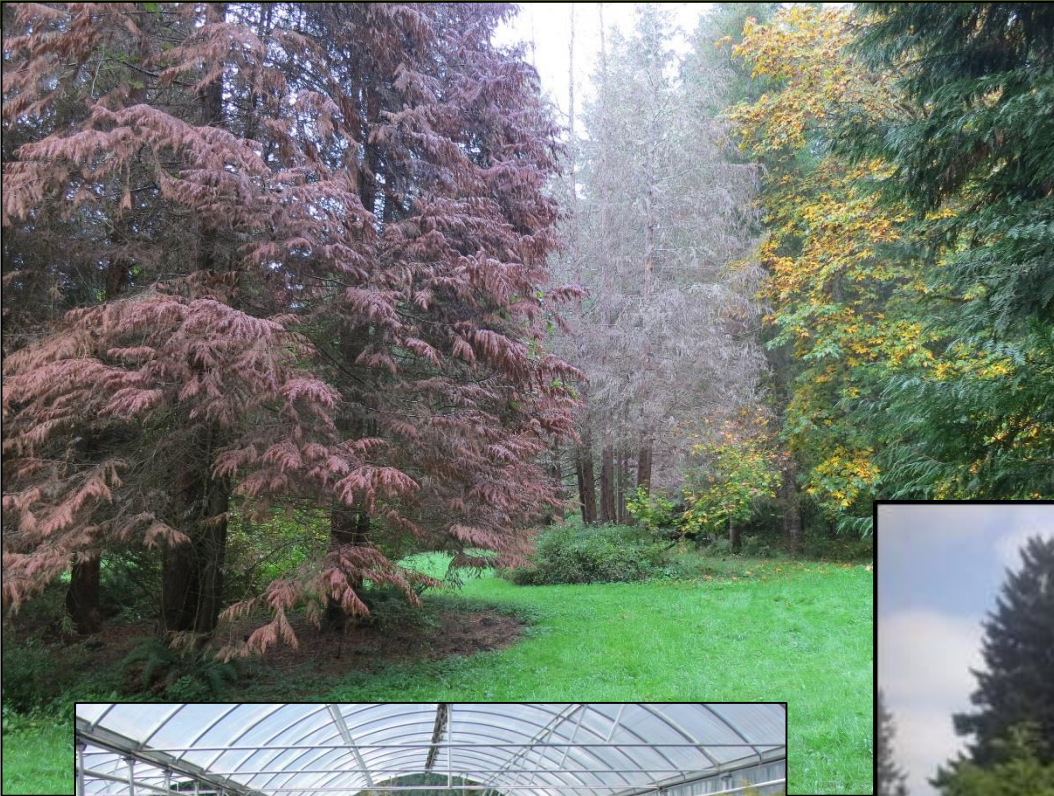






Photo: Thomas Jung, Bugwood.org

UGA2110008

Root and Collar Rots in Alder

Fungus: *Phytophthora alni*

Hosts: red alder (*Alnus rubra*)

Other ornamental hosts may include:

walnut (*Juglans regia*)

chestnut (*Castanea sativa*)

Grey alder, Europe

# Laminated Root Rot

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

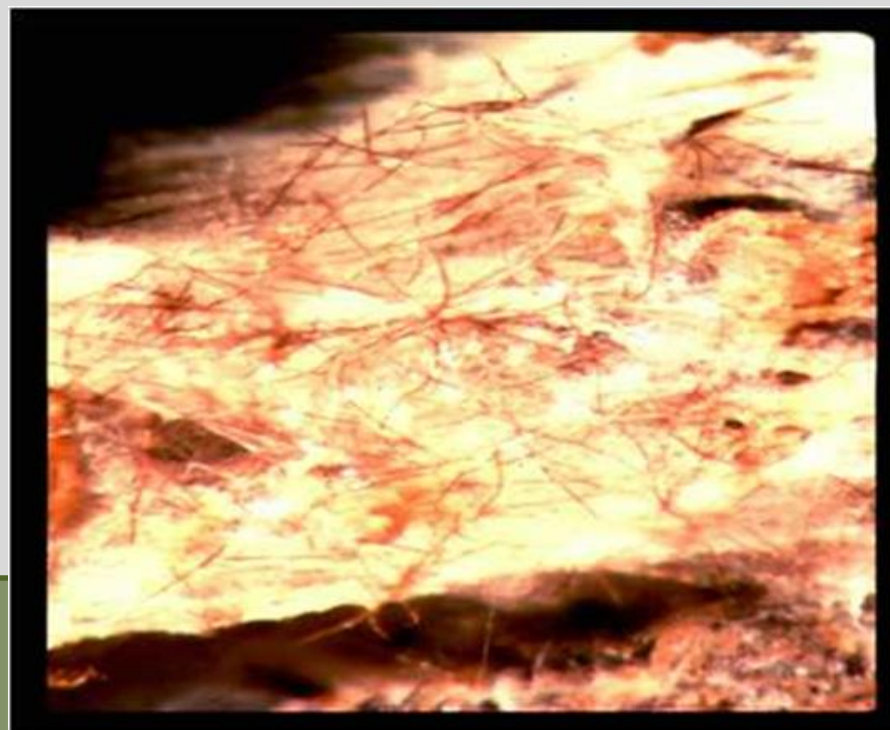
Host: most  
commonly  
Douglas-fir





Ecotrophic  
mycelium

Setal hyphae,  
red whiskers



# Annosus Root Disease

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

Hosts:

*Abies*

*Juniperus*

*Libocedrus*

*Pinus*

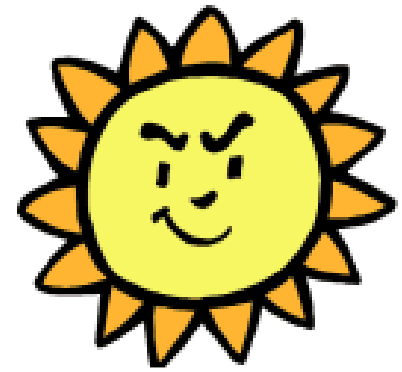
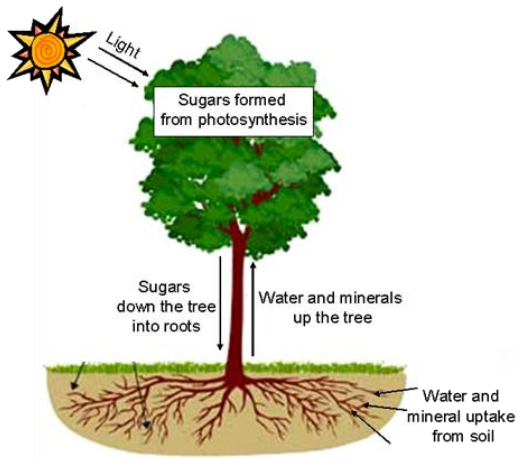
*Pseudotsuga*

*Sequoiadendron*

*Tsuga*







Tree vigor is key for keeping the scale balanced!

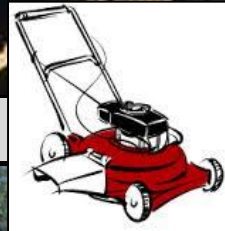
# General management recommendations for root diseases

Right tree in the right place



Avoid damaging roots or stem of tree:

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



# 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



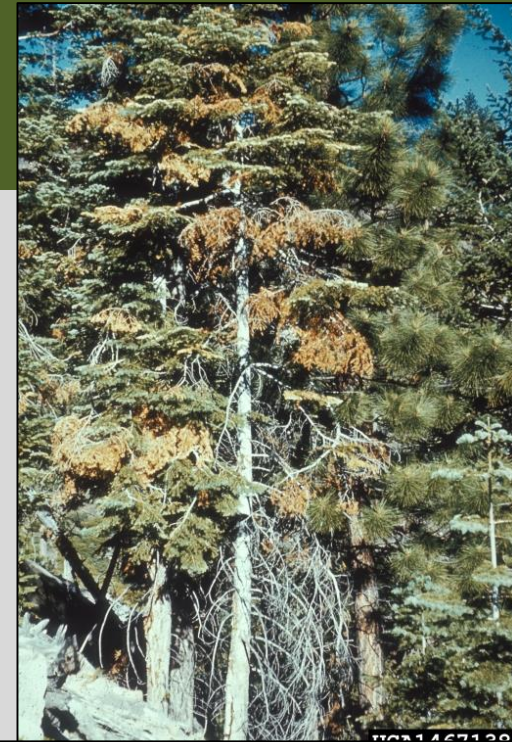


With changing climatic conditions, secondary pathogens and associated damage may become more common, with drought as a primary driver.

# 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*

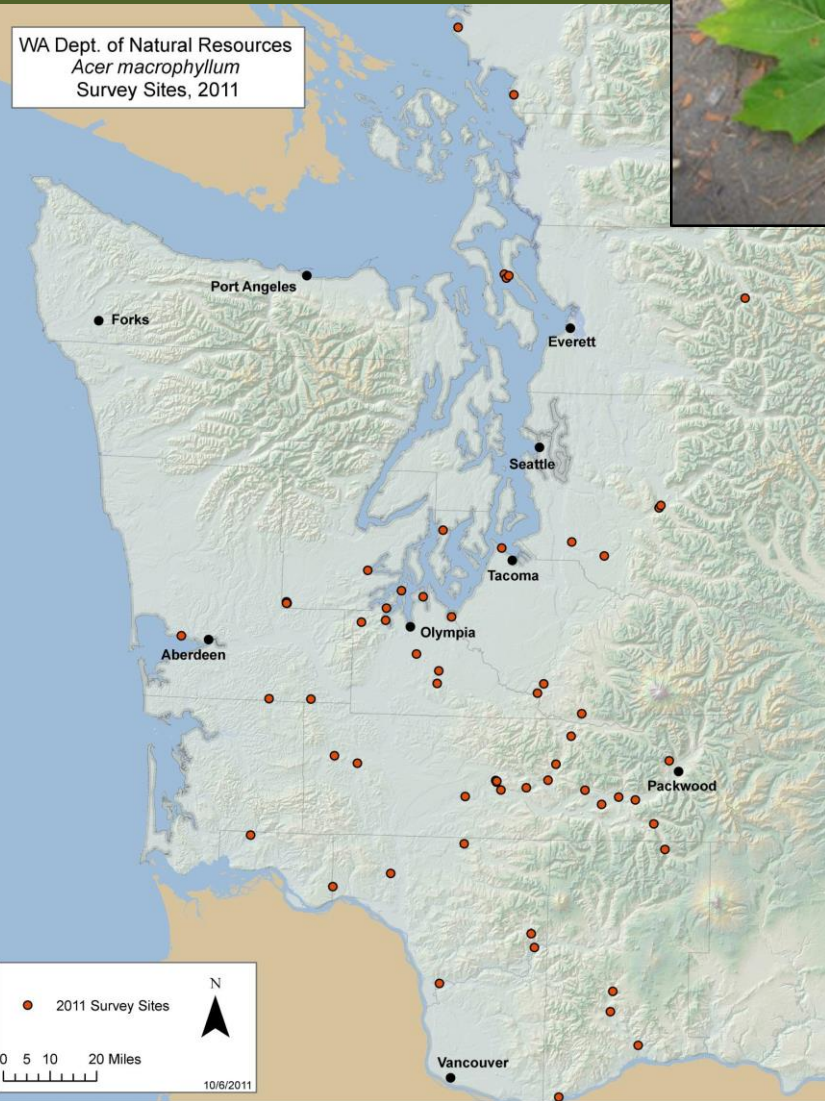
Hosts: may occur on over 60 species of trees and shrubs including apple, ash, birch, dogwood, elm, sweet gum, holly, maple, pear and walnut



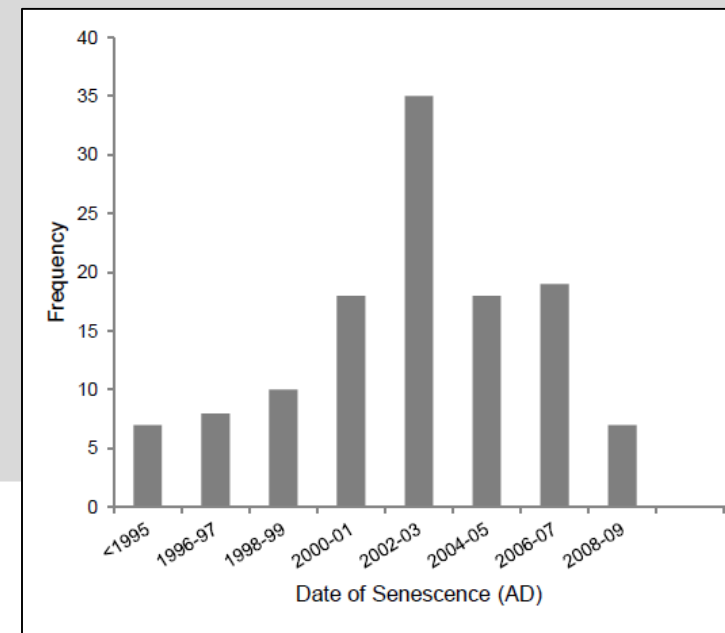
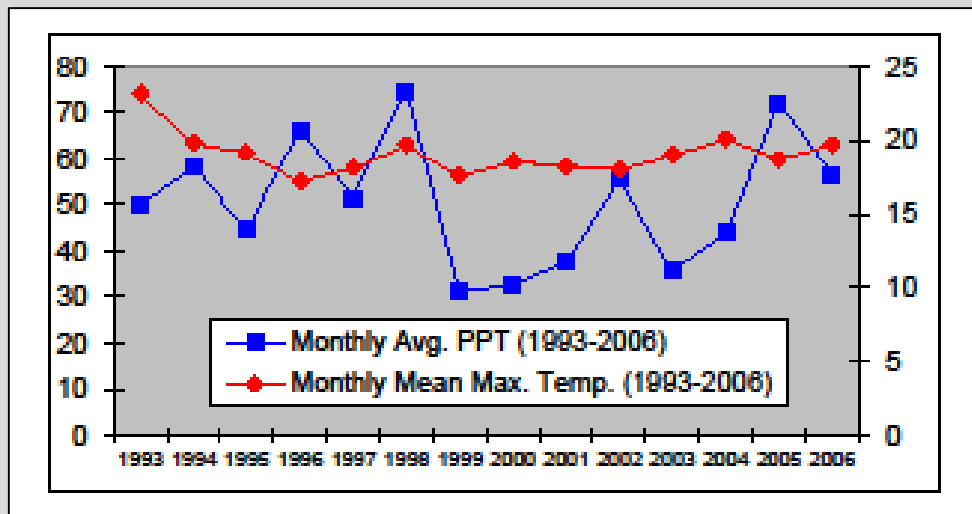
*Phomopsis* ssp.



# Big Leaf Maple Dieback and Decline



# Birch dieback and decline in British Columbia



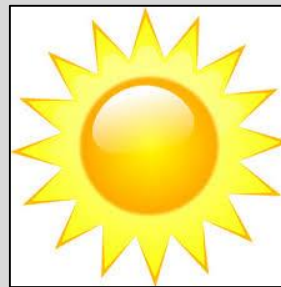
# General Tree Disease Management Recommendations

-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
- Foliar diseases are likely to increase if wet conditions transition into summer
- Overall tree stress is likely to increase with warmer, drier conditions
  - Likely increase in root disease damage
- Expect the unexpected moving forward