

DISEASES OF NORTHWEST NATIVE PLANTS

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Botanist, Horticulturist**

**2020 Urban Natural Areas
Seminar**

January 29, 2020

**CONIDIA IN CHAINS ON SHORT
CONIDIOPHORES; POWDERY MILDEW
ON BARLEY LEAF, Roger Wepf,
University of Queensland**

OR

***AN OVERVIEW OF SIGNIFICANT OR CURIOUS
DISEASES OF NORTHWEST NATIVE PLANTS IN
CULTIVATED LANDSCAPES,
EXCLUSIVE OF WOOD ROTTS AND
SILVICULTURALLY IMPORTANT ROOT DISEASES***

DISCLAIMERS

- 1. Clay is not a plant pathologist.**
- 2. Diagnosis of plant disease damage can be complex and difficult. Most problematic diagnoses should include consultation with professional plant pathologists.**

RESOURCES

HERBARIA

- **University of Washington Herbarium**
<http://biology.burke.washington.edu/herbarium/imagecollection.php>
particularly “Image Gallery” link for plant photos

DIAGNOSTICS

- **Pacific Northwest Insect Management Handbook**
<https://pnwhandbooks.org/insect>
- **On-line Guide to Plant Disease Control**
<https://pnwhandbooks.org/plantdisease>
- **Johnson, W.T. and H.H. Lyon. 1991. *Insects That Feed on Trees and Shrubs*, 2nd ed., Cornell University Press.**
- **Analytical Laboratories and Consultants Serving Agriculture in the Pacific Northwest. [WSU Extension Bulletin EB1578E (Daniels 2003)]**
<http://analyticalabs.puyallup.wsu.edu/analyticalabs/instructions>
- **WSU Cooperative Extension *Puyallup Plant Clinic*, 7612 Pioneer Way East, Puyallup, WA 98371-4998. Fees required. 253-445-4582**
<https://puyallup.wsu.edu/plantclinic/>

GOALS FOR THIS SESSION?

1. Explore a good working definition of native plants
2. Know symptoms, importance, and treatment of common diseases afflicting native plants. Focus on cultural controls (due primarily to level of concern and lack of pesticide registration)
3. Cover some alternative plant selections, when available and appropriate

NATIVE PLANTS

Plants found in a **specific area** prior to **Euro-Asian settlement (approximately 1850 in the Pacific Northwest¹)**, and which grow and reproduce without the aid of humans

¹ Donation Land Act of 1850: orderly and legal ownership of property in Oregon Territory; granted every white settler and "American half-breed Indian" above the age of 18 already living in the Territory a free half-section of land (if single) or a full section (640 acres, if married), with half in the wife's name. Residence and cultivation for four years was required. Settlers arriving after 1850 were granted half a section if married, or one-quarter of a section if single.

See also: Homestead Act of 1862; Railroad Land Grant Act of 1866

MAKAH, OZETTE, or INDIAN POTATO

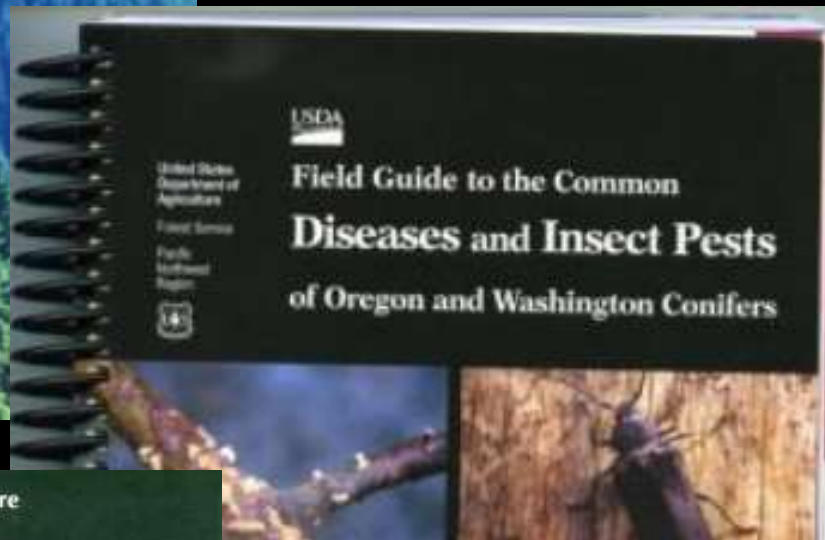
Introduced to NW Coastal Peoples by Spanish, since 1774 (Juan Pérez)



Managing Insects and Diseases of Oregon Conifers

D.C. Shaw, P.T. Oester, and G.M. Filip

EM 8980 • June 2009



Common Tree Diseases of British Columbia



United States Department of Agriculture
Forest Service
Agriculture Handbook 521

Diseases of Pacific Coast Conifers



Eric Allen, Duncan Morrison,
and Gordon Wallis



Natural Resources Canada
Canadian Forest Service
Ressources naturelles Canada
Service canadien des forêts

Canada

Aerial Signatures of Forest Insect and Disease Damage in the Western United States

Forest Health Technology
Enterprise Team

Technology Transfer
Forest Health

FHTET-01-06
May 2006

FUN FACTS:

AGE OF THE PACIFIC NORTHWEST FLORA

When was the flora of the Pacific Northwest established essentially as it appears today?

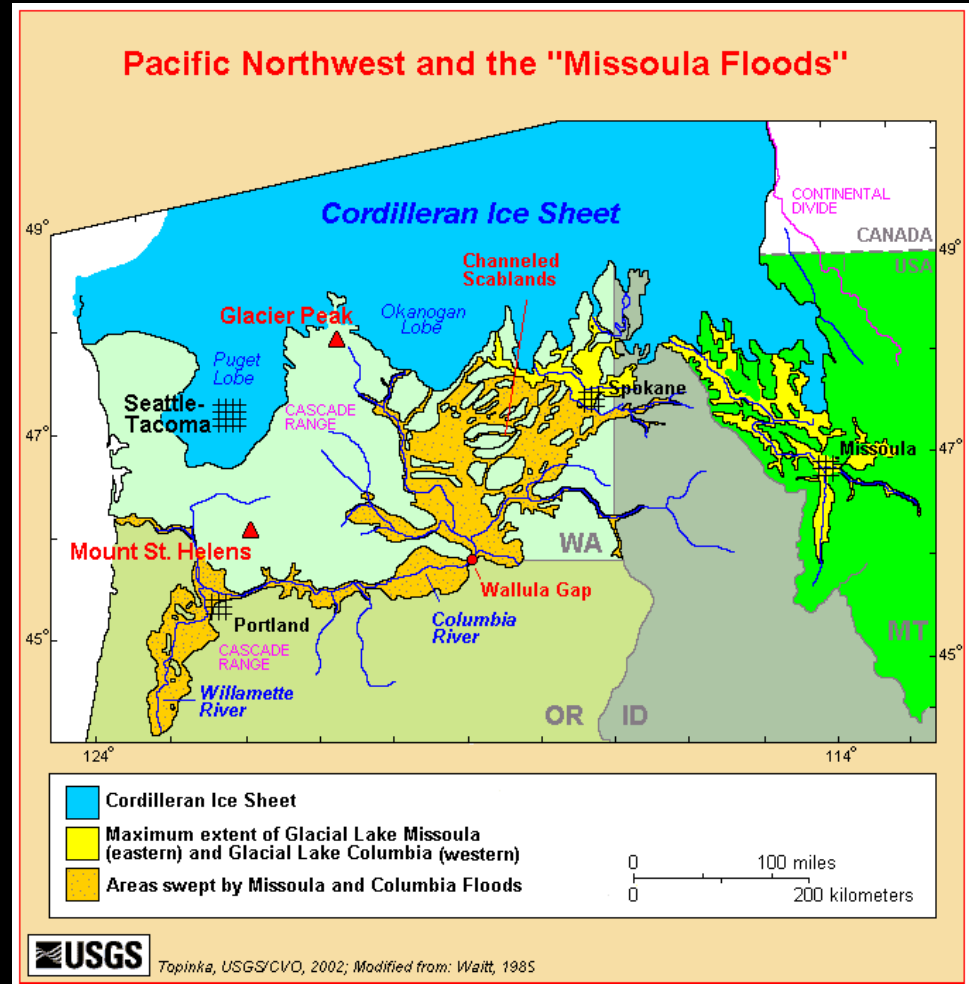
FUN FACTS:

AGE OF THE PACIFIC NORTHWEST FLORA

When was the flora of the Pacific Northwest established essentially as it appears today?

By the Early
Pleistocene—
1.5 million
years ago!

(Waring and Franklin 1979)



DISEASES OF NORTHWEST NATIVE PLANTS

RUSTS:

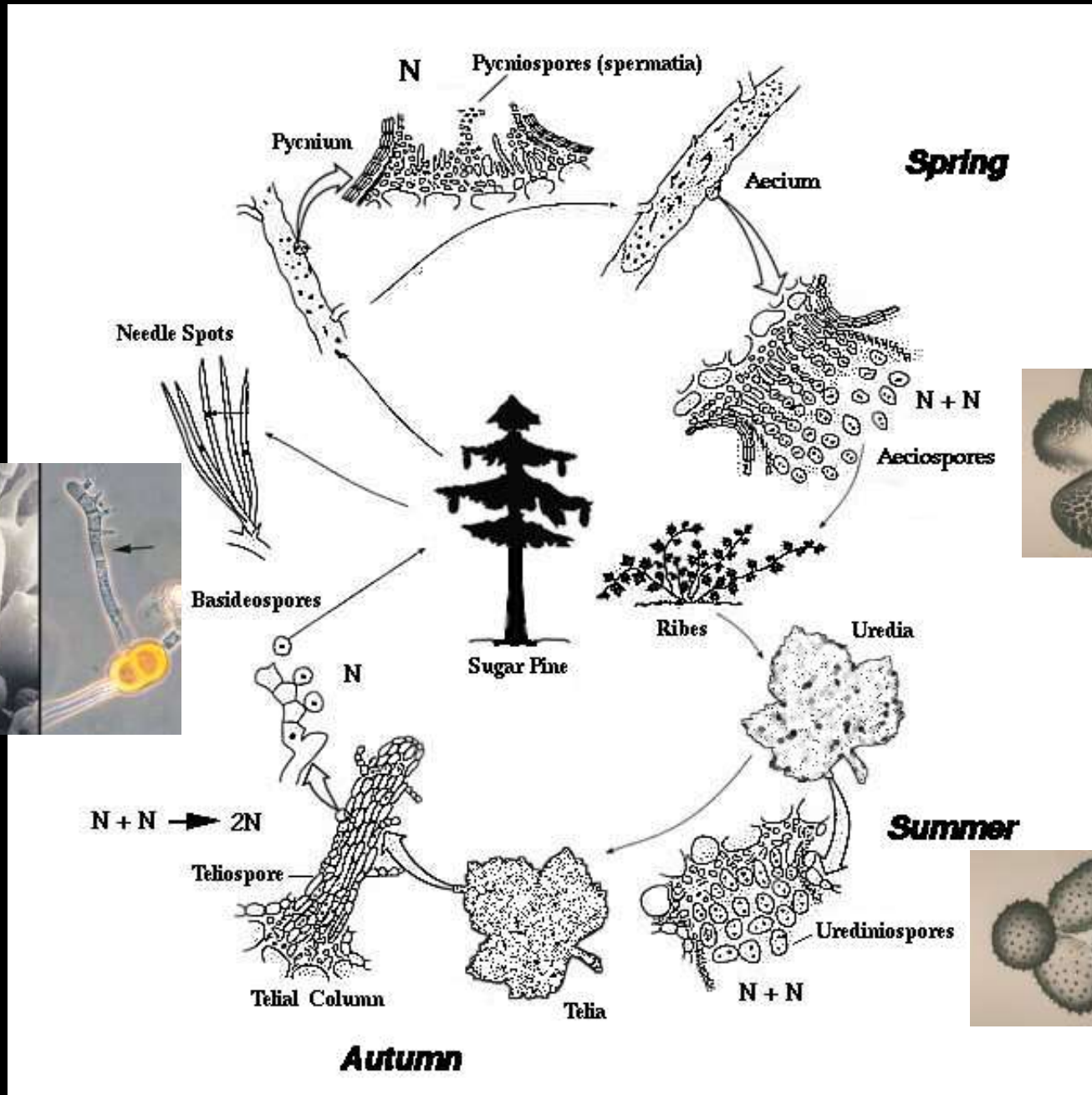
large group of specialized fungi obligately parasitic on ferns, gymnosperms, and angiosperms

Basidiomycota (“club fungi”),
Puccinales (syn. Uredinales): most
rusts require two host species to
complete their sexual life cycle (2+
years) and can produce up to five
different types of spores....



rust on soy (*Glycine max*)

WHITE PINE BLISTER RUST LIFE CYCLE (2+ years)



WESTERN WHITE PINE (*Pinus monticola*)



← ...on *Ribes*

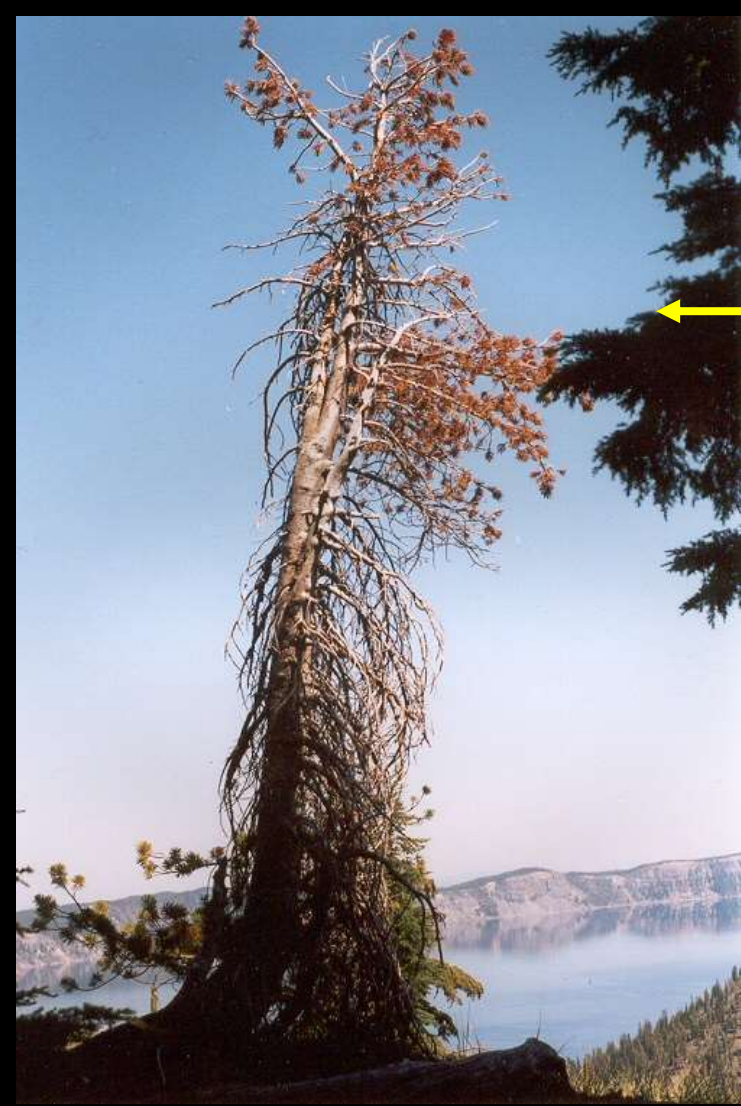
Pedicularis spp.?
Castilleja spp.?

**white pine blister rust
(*Cronartium ribicola*); non-native**

WESTERN WHITE PINE (*Pinus monticola*)

and now

WHITEBARK PINE (*Pinus albicaulis*)



**white pine blister rust
(*Cronartium ribicola*)**

MANAGEMENT RECOMMENDATIONS

White Pine Blister Rust (*Cronartium ribicola*)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

- pruning naturally regenerated white pine 8-10 feet up from the ground decreased blister rust mortality by nearly 50% over 20 Years
- plant resistant stock
- do not plant white pine near cultivated or native currants / gooseberries

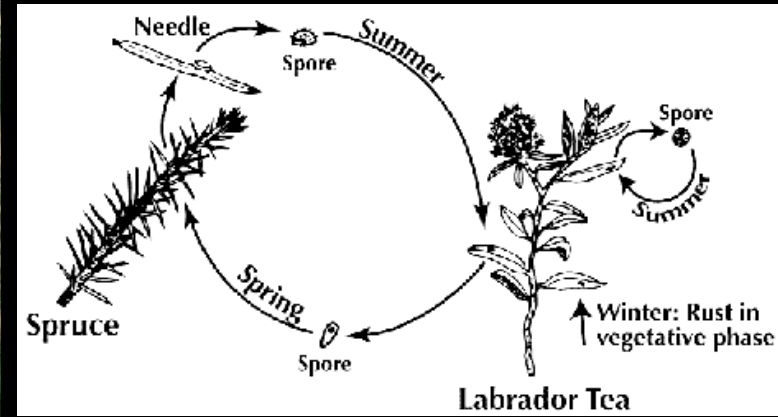
CHEMICAL CONTROL:

See *OSU On-line Guide to Disease Control*

<https://pnwhandbooks.org/plantdisease>



SITKA SPRUCE (*Picea sitchensis*)



aecia on grand fir (Ceska)

Spruce-Labrador-tea rust (*Chrysomyxa ledicola*)



...on Labrador-tea

**EVERGREEN and
RED HUCKLEBERRIES**
(*Vaccinium ovatum*; *V. parviflorum*)



Aecia on grand fir



**Telia on evergreen
huck (witches'
brooms)**



fir rust
(*Pucciniastrum goeppertianum*)

WESTERN SERVICEBERRY
(*Amelanchier alnifolia*)



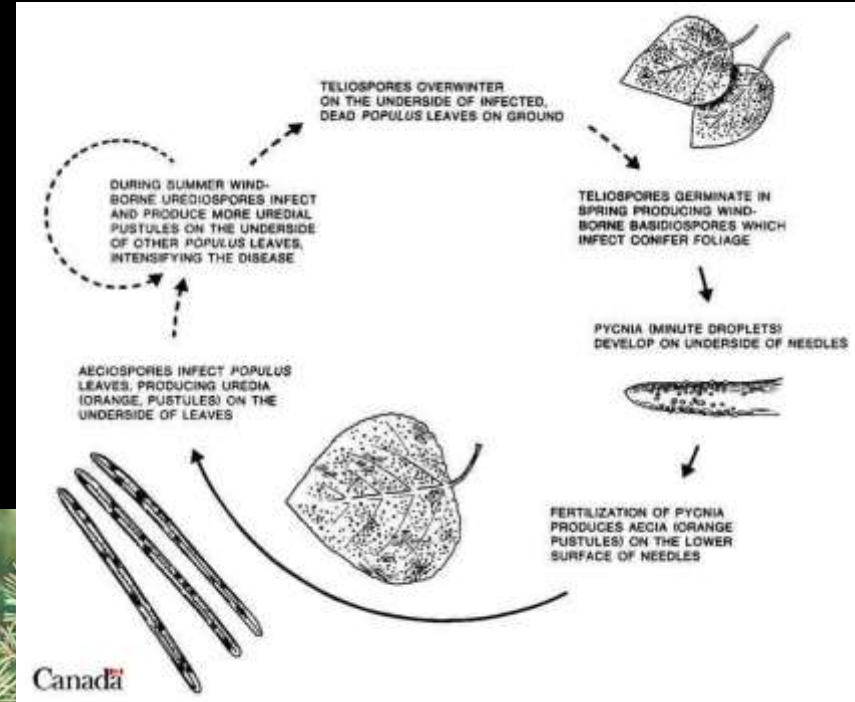
serviceberry rust
(*Gymnosporangium* spp.)

Alternate Hosts: *Thuja*, *Juniperus*

COTTONWOOD (*Populus balsamifera* and hybrids)



**Cottonwood Rust
(*Melampsora* species)**



**Alternate Hosts:
conifers**

**DISEASES OF
OF NORTHWEST NATIVE PLANTS**

ANTHRACNOSE FUNGI

MADRONE (*Arbutus menziesii*)

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> (<i>Nattrassia mangiferae</i> , <i>Fusicoccum arbuti</i> , <i>Hendersonula toruloidia</i>)	Madrone canker
	<i>Botryosphaeria dothidea</i> (<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	

*Adapted from Elliott (1999)

** Hansen (unpublished)



Photo: B. Legler

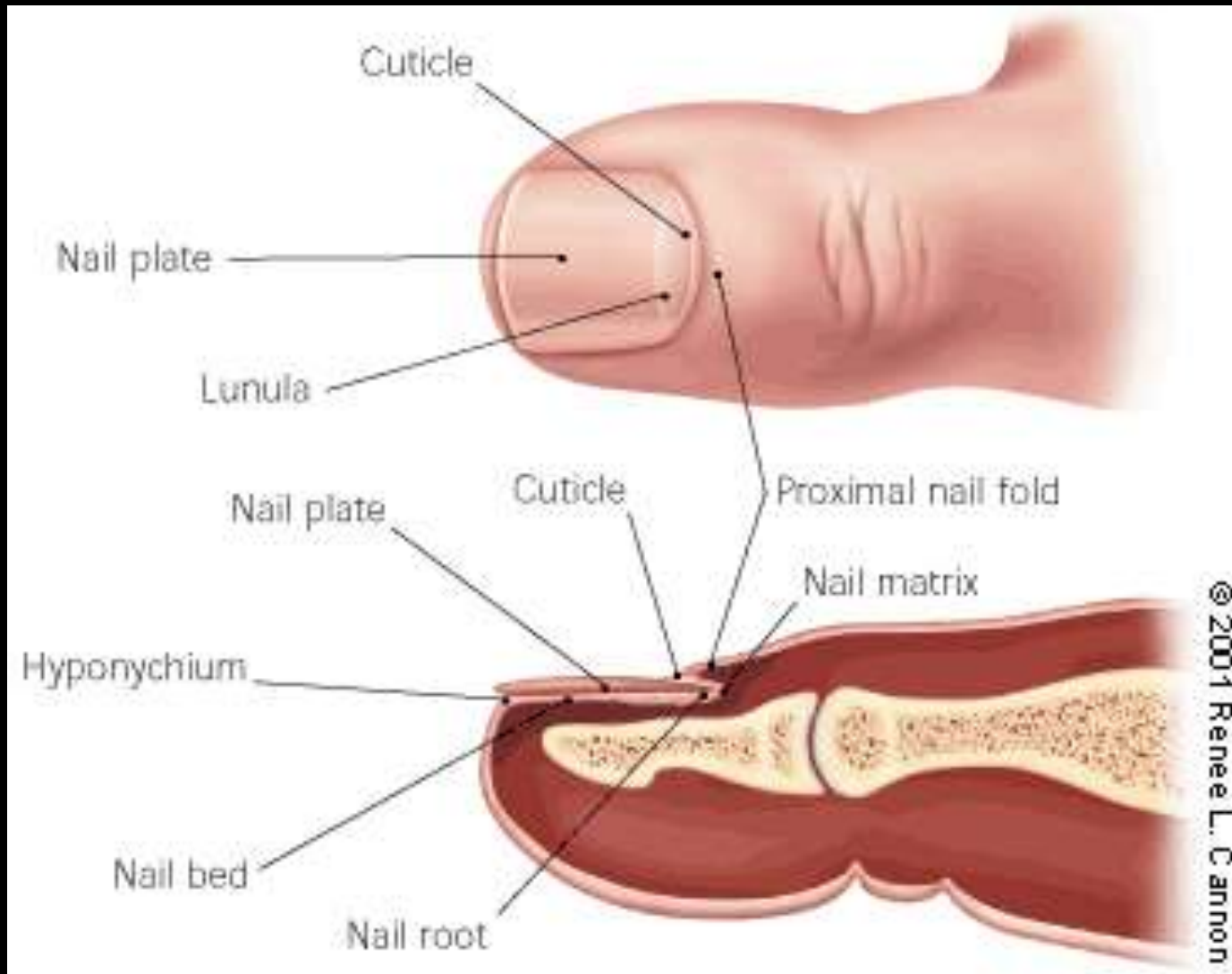
Bennett and Shaw 2008

MADRONE (*Arbutus menziesii*)



- madrone canker (*Neofusicoccum arbuti*; *Nattrassia mangiferae*)
- die-back (*Botryosphaeria dothidea*; *Fusicoccum aesculi*)
- madrone leaf spot (*Phacidiopycnis washingtonensis*; *Mycosphaerella arbuticola*, *Coccomyces quadratus*, *Rhytisma arbuti*, et al.)

TOENAIL FUNGUS DISEASE (*Nattractasia mangiferae*)



Relatively few fungal pathogens of vertebrates—only 200-300 species!

MANAGEMENT RECOMMENDATIONS

Madrone Anthracnose (leaf spot, twig dieback, canker)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

- Avoid wounding trees
- Avoid disturbing root zone with grade changes and compaction
- Avoid shading trees
- Plant only in well drained areas; correct drainage if necessary
- Do not irrigate
- Prune out and destroy cankered or dead branches
- Remove, destroy infected plants / fallen plant debris (leaves, twigs)

CHEMICAL CONTROL:

See *OSU On-line Guide to Disease Control*

<https://pnwhandbooks.org/plantdisease>



ALTERNATE?

**Golden chinquapin
(*Chrysolepis chrysophylla*)**

Mature specimen; Dupont, WA

**WESTERN DOGWOOD
(*Cornus nuttallii*)**



**Anthracnose
(*Discula destructiva* and
others)**

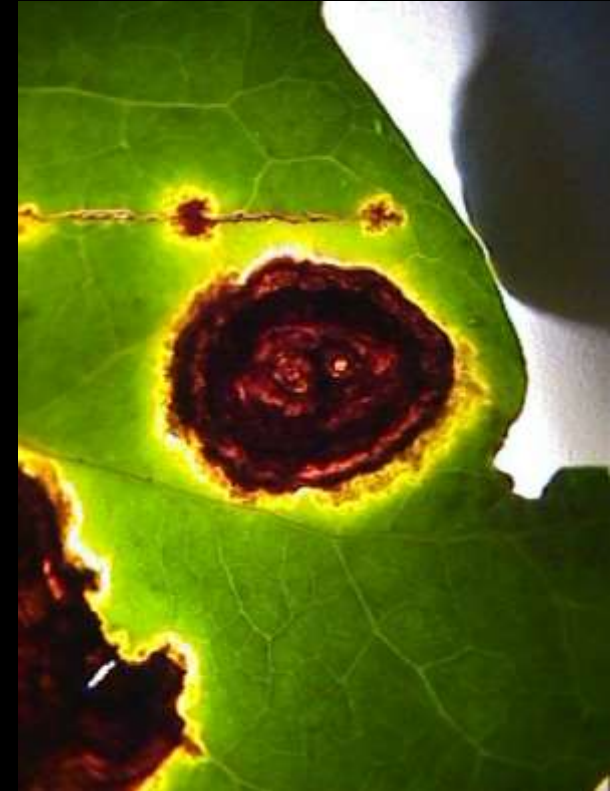
DIAGNOSING BACTERIAL VERSUS FUNGAL SPOTS AND LESIONS



**Fungal Lesions on
Western Dogwood**



**Fungal Lesion on
Grape**
*dry-ish; red pigment;
fruiting bodies*



**Bacterial Lesions on
English Ivy:**
*water-soaked;
yellow halo; confined
by major veins*

MANAGEMENT RECOMMENDATIONS

Dogwood Anthracnose (*Discula destructiva*)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

- Avoid wounding trees
- Avoid disturbing root zone with grade changes and compaction
- Avoid shading trees
- Plant only in well drained areas; correct drainage if necessary
- Do not irrigate
- Prune out and destroy cankered or dead branches
- Remove, destroy infected plants / fallen plant debris (leaves, twigs)

CHEMICAL CONTROL:

See *OSU On-line Guide to Disease Control*

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ALTERNATE?
***Cornus* x 'Eddie's White Wonder'**

**DISEASES OF
OF NORTHWEST NATIVE PLANTS
ROOT DISEASE (SOIL-BORNE) FUNGI**

PORT ORFORD-CEDAR
(*Chamaecyparis lawsoniana*)



**Root rot (*Phytophthora*
lateralis; *P. cinnamomi*)**

MANAGEMENT RECOMMENDATIONS

Phytophthora Root Rot (*Phytophthora lateralis* and *P. cinnamomi*)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

- Do not plant in soil with poor drainage or in areas that receive drainage from roads
- Plant healthy seedlings in soil known to be free of the pathogen
- Prevent wounding at the base of trees or to roots from construction or landscaping operations
- Avoid extensive gardening (mulching and planting susceptible flowering plants) underneath (may hasten disease development)
- Do not transfer soil from diseased areas to uncontaminated areas

MANAGEMENT RECOMMENDATIONS (cont'd)

Phytophthora Root Rot (*Phytophthora lateralis* and *P. cinnamomi*)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

- Promptly remove and destroy dead and dying trees to help protect other trees in the area
- Plant resistant species in contaminated ground
- Plant resistant *C. lawsoniana* (forest restoration stock now available)

CHEMICAL CONTROL:

See *OSU On-line Guide to Disease Control*

<https://pnwhandbooks.org/plantdisease>

ALTERNATE?

INCENSE-CEDAR
(*Calocedrus decurrens*)



ALTERNATE?

**INCENSE-CEDAR
(*Calocedrus decurrens*)**



Damon Tighe

**Pacific Coast pear rust
(*Gymnosporangium libocedri*)**

ALTERNATES??

Alaska yellow-cedar (*C. nootkatensis*);
intermediate in susceptibility

Other species of *Chamaecyparis* are
considered resistant including
C. obtusa , *C. pisifera*



Chamaecyparis nootkatensis



Chamaecyparis pisifera

OREGON-BOX
(*Paxistima myrsinites*)



phytophthora root rot

**DISEASES OF
NORTHWEST NATIVE PLANTS
FUNGAL LEAF SPOT DISEASES**

OREGON ASH
(*Fraxinus latifolia*)



5366778

William Jacobi, Colorado State University, Bugwood.org

Leaf spot
(*Mycosphaerella fraxinicola*
and *M. effigurata*)

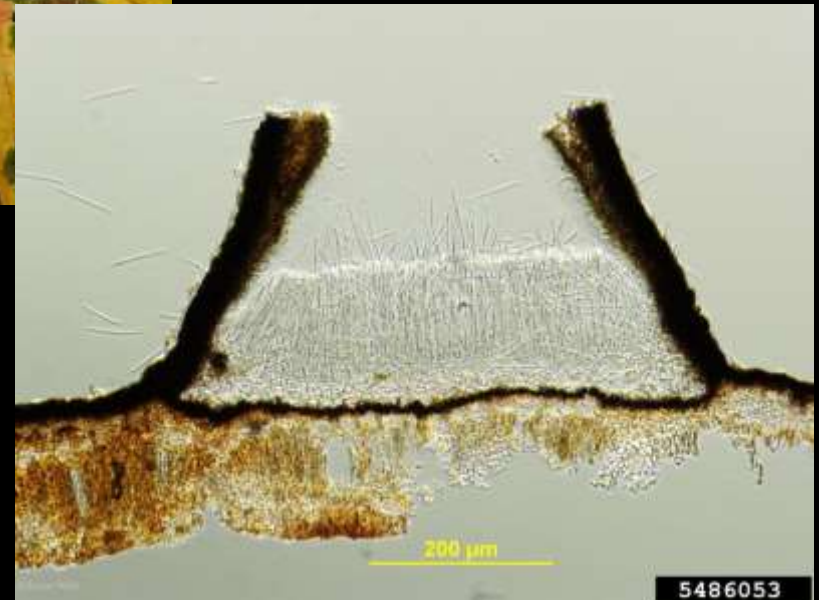
**BIG-LEAF MAPLE
(*Acer macrophyllum*)**



**Tar Spot
(*Rhytisma punctatum*)**

controls:

- sodium lauryl sulfate
- trisodium phosphate



Vertical cross-section of apothecium with ascospores emerging. Bruce Watt, Univ. Maine

BIG-LEAF MAPLE (*Acer macrophyllum*)

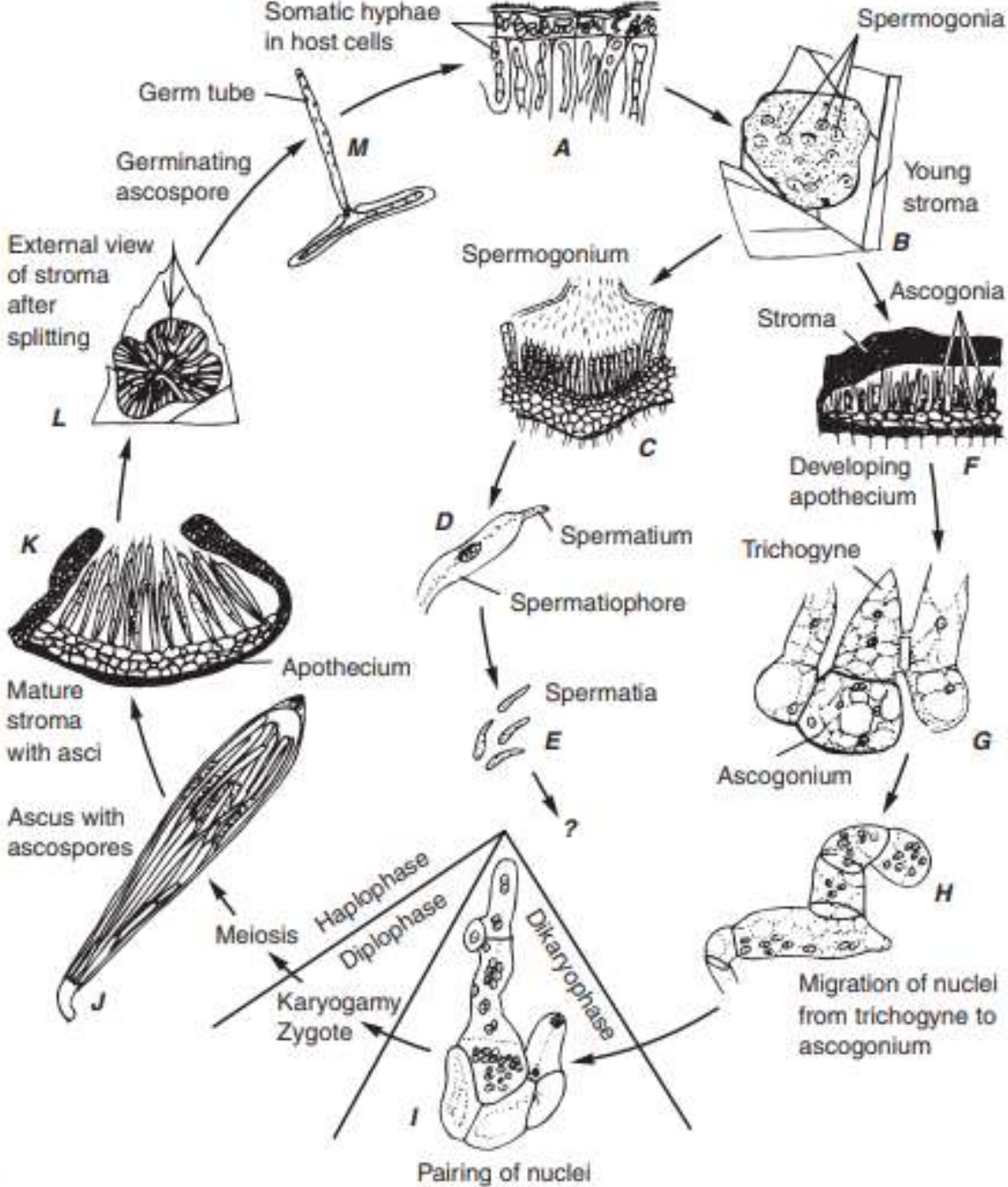


Figure 13.3
General life cycle of a *Rhytisma acerinum*, cause of large maple tar spot.

Tar Spot (*Rhytisma punctatum*)

**WHITE RHODODENDRON
(*Rhododendron albiflorum*)**



Photo: B. Legler



Photo: G. Carr



**Exobasidium leaf spot
(*Exobasidium* spp.)**

BIG-LEAF MAPLE
(Acer macrophyllum)



Craig Sailor / The News Tribune (Tacoma)



Big-leaf Maple Decline
(???)



Peter Haley / The News Tribune
(Tacoma)

KINNIKINNICK
(*Arctostaphylos uva-ursi*)



Leaf Spot

**(*Chrysomyxa arctostaphyli*, a rust;
Phyllosticta amicta; *Cryptostictis arbuti*)**

SALAL
(*Gaultheria shallon*)



Bloedel Reserve, Bainbridge Island, WA

Leaf Spot

**[*Dasyschypha* sp., *Mycosphaerella gaultheriae*
(very common), *Pestalopezia* sp., and several
Phyllosticta spp.]**

MANAGEMENT RECOMMENDATIONS

Leaf Spot [*Dasyschypha* sp., *Mycosphaerella gaultheriae* (very common), *Pestalopezia* sp., and several *Phyllosticta* spp.]

LEVEL OF CONCERN: Medium

CULTURAL CONTROL:

- **Remove infected, dead, and dying leaves on and near plants**
- **Avoid irrigation**
- **Space plantings and prune to improve air circulation**
- **Brush-cut salal to ground every couple of years to keep shoots vigorous and to remove old, disfigured leaves.**

CHEMICAL CONTROL:

None Recommended

MANAGEMENT RECOMMENDATIONS (cont'd)

Leaf Spot (*Chrysomyxa arctostaphyli*, a rust; *Phyllosticta amicta*; *Cryptostictis arbuti*)

LEVEL OF CONCERN: Medium

CULTURAL CONTROL:

- Plant resistant kinnikinnick cultivars such as 'Massachusetts' strain
- Avoid overhead irrigation
- Remove and destroy infected leaves from plants, where practical
- Space plantings and prune to improve air circulation
- Avoid planting in moist, shady areas

CHEMICAL CONTROL:

None Recommended

**SOME ADDITIONAL MISCELLANEOUS
FUNGAL DISEASES OF
NORTHWEST NATIVE PLANTS**

BRANCH DIEBACK

Phytophthora sp. ??

Botryosphaeria ribis ??

Kinnikinnick

(*Arctostaphylos uva-ursi*)

Manzanita

(*Arctostaphylos* spp.)

Salal

(*Gaultheria shallon*)



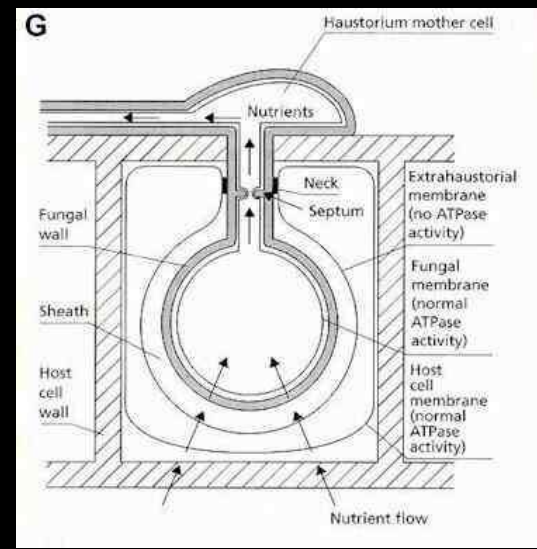
ALTERNATIVES?

EVERGREEN STRAWBERRY
(Fragaria chiloensis)



POWDERY MILDEW

[*Phyllactinia guttata* (maple, alder, hazel);
Podosphaera clandestine (snowberry)]



Bigleaf maple (*Acer macrophyllum*)



**Snowberry
(*Symphoricarpos alba*)**

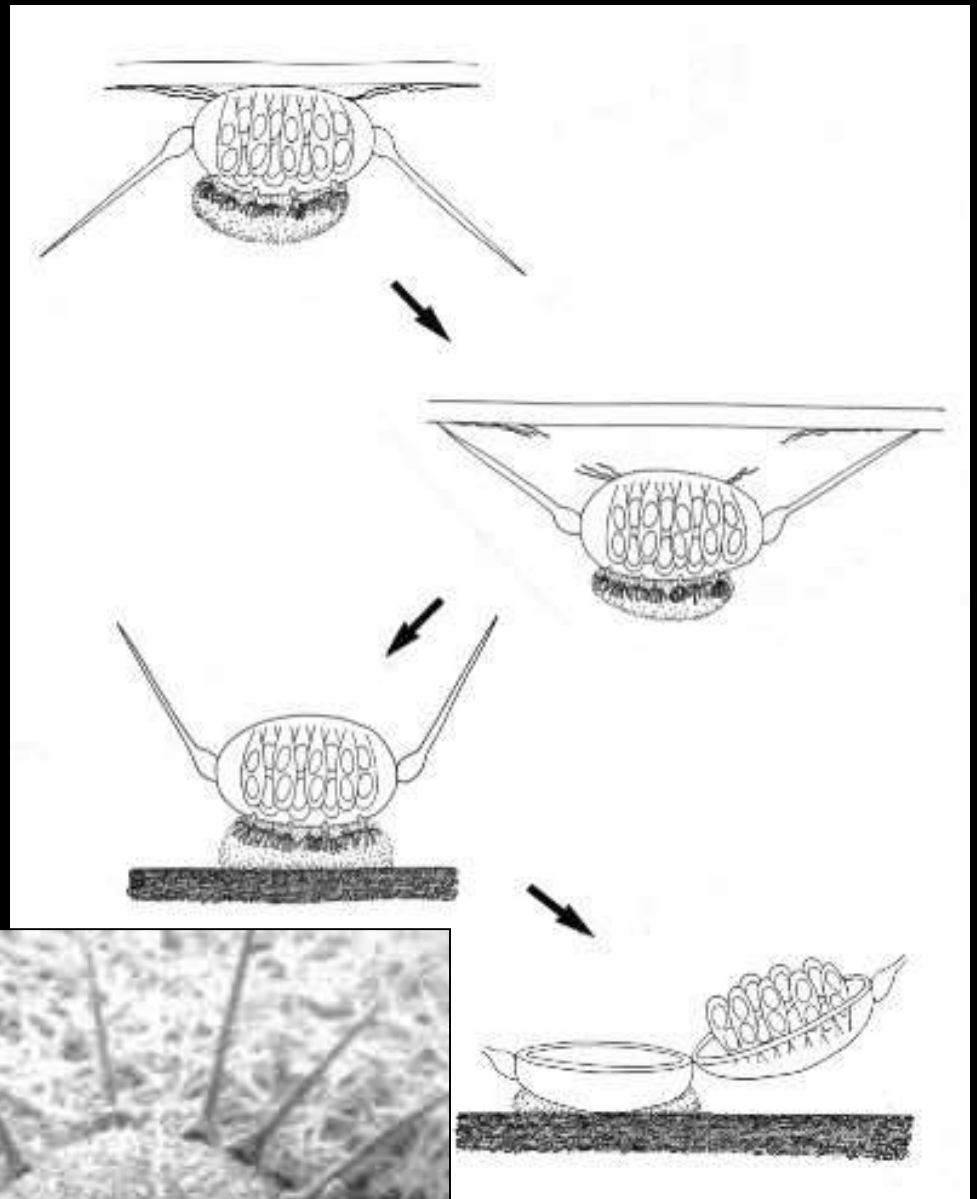
Kaligreen®:
a potassium bicarbonate contact fungicide

POWDERY MILDEW

Phyllactinia spp.



Red Alder
(*Alnus rubra*)



ascocarp (ascomatum; ascoma; perithecium) with unique appendages

ALDER TONGUE GALL
(*Taphrina amentorum*)– powdery
mildew relative found only on
catkins of red alder

Immature catkin scales or ovaries are
infected with the fungus, which later
generates spore-producing fruiting
bodies on gall surfaces



Red Alder
(*Alnus rubra*)

ASPEN
(*Populus tremuloides*)

**Photo: Mushroom
Observers**



Cytospora canker (*Valsa sordida* and others)

MANAGEMENT RECOMMENDATIONS

Cytospora Canker (*Valsa sordida* and others)

LEVEL OF CONCERN: Medium

CULTURAL CONTROL:

- Avoid wounding trees (e. g., line-trimmers)
- Keep trees growing vigorously
- Prune off and destroy cankered branches
- Sterilize pruning tools before and during pruning

CHEMICAL CONTROL:

None Recommended

**DISEASES OF
NORTHWEST NATIVE PLANTS**

**PHYSIOLOGICAL
OR ABIOTIC DISEASES**

ILL-ADAPTED-NESS

subalpine fir →
(*Abies lasiocarpa*)

Pacific silver fir
(*Abies amabilis*)

Lyall larch
(*Larix lyallii*)

Western larch
(*Larix occidentalis*)

white rhododendron
(*Rhododendron
albiflorum*)



**CONIFER CROWN
DIEBACK**

**Douglas-fir
(*Pseudotsuga menziesii*)**

**western redcedar
(*Thuja plicata*)**



REDCEDAR FLAGGING

western redcedar
(*Thuja plicata*)



NATIVE PLANT LITERATURE

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DISEASES OF NORTHWEST NATIVE PLANTS

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2020 Urban Natural Areas Seminar

January 29, 2020



SPRUCE AND LABRADOR-TEA RUST