

DISEASES AND PESTS OF NORTHWEST NATIVE PLANTS

Clay Antieau, MS, PhC
Botanist, Horticulturist

Seattle Public Utilities

2019 City of Seattle Pesticide
License Recertification
Seminar

October 29 2019



GREATER CAMAS
(*Camassia leichtlinii*)

OR

***AN OVERVIEW OF SIGNIFICANT OR INTERESTING
DISEASES AND FEW INSECT 'PESTS' OF
NORTHWEST NATIVE PLANTS PRIMARILY IN
CULTIVATED LANDSCAPES
—EXCLUSIVE OF WOOD ROTTS,
SILVICULTURALLY IMPORTANT ROOT DISEASES,
AND ECOLOGICALLY CATASTROPHIC
INSECT INFESTATIONS***

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DISCLAIMERS

- 1. Clay is neither plant pathologist nor entomologist!**
- 2. Diagnosis of plant disease / insect damage can be complex, difficult. Most problematic diagnoses should include consultation with professional plant pathologists / entomologists.**

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>
- **Plant Disease Management Handbook (PDMH)**
<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/>

NATIVE PLANT LITERATURE

Franklin, J. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press.

Jacobson, Arthur Lee. 2001. Wild Plants of Greater Seattle. Self-published.

Kozloff, Eugene N. 2005. Plants of Western Oregon, Washington, and British Columbia. Timber Press.

Kruckeberg, Arthur. 1982. Gardening with Native Plants of the Pacific Northwest; an Illustrated Guide. University of Washington Press.

Pojar, Jim and Mackinnon, Andy. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska. Lone Pine Publishing.

Turner, Mark and Gustafson, Phyllis. 2006. Wildflowers of the Pacific Northwest. Timber Press.

GOALS FOR THIS SESSION?

1. Explore a good working definition of native plants
2. Know symptoms, importance, and treatment of common diseases and pests 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

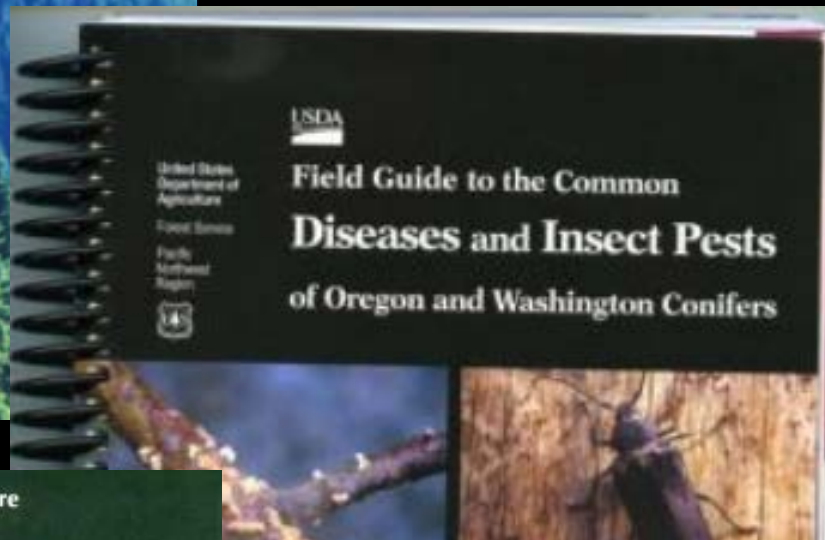
Introduced to NW Coastal Peoples by Spanish explorers circa 1774 (Juan Pérez)



Managing Insects and Diseases of Oregon Conifers

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

EM 8980 • June 2009

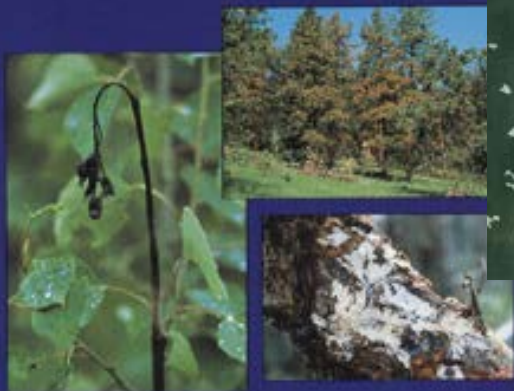


Common Tree Diseases of British Columbia



United States Department of Agriculture
Forest Service
Agriculture Handbook 521

Diseases of Pacific Coast Conifers



Eric Allen, Duncan Morrison,
and Gordon Wallis

Canada
Natural Resources Canada
Canadian Forest Service

Canada
Ressources naturelles Canada
Service canadien des forêts

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 FLORA **OF THE PACIFIC NORTHWEST**

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

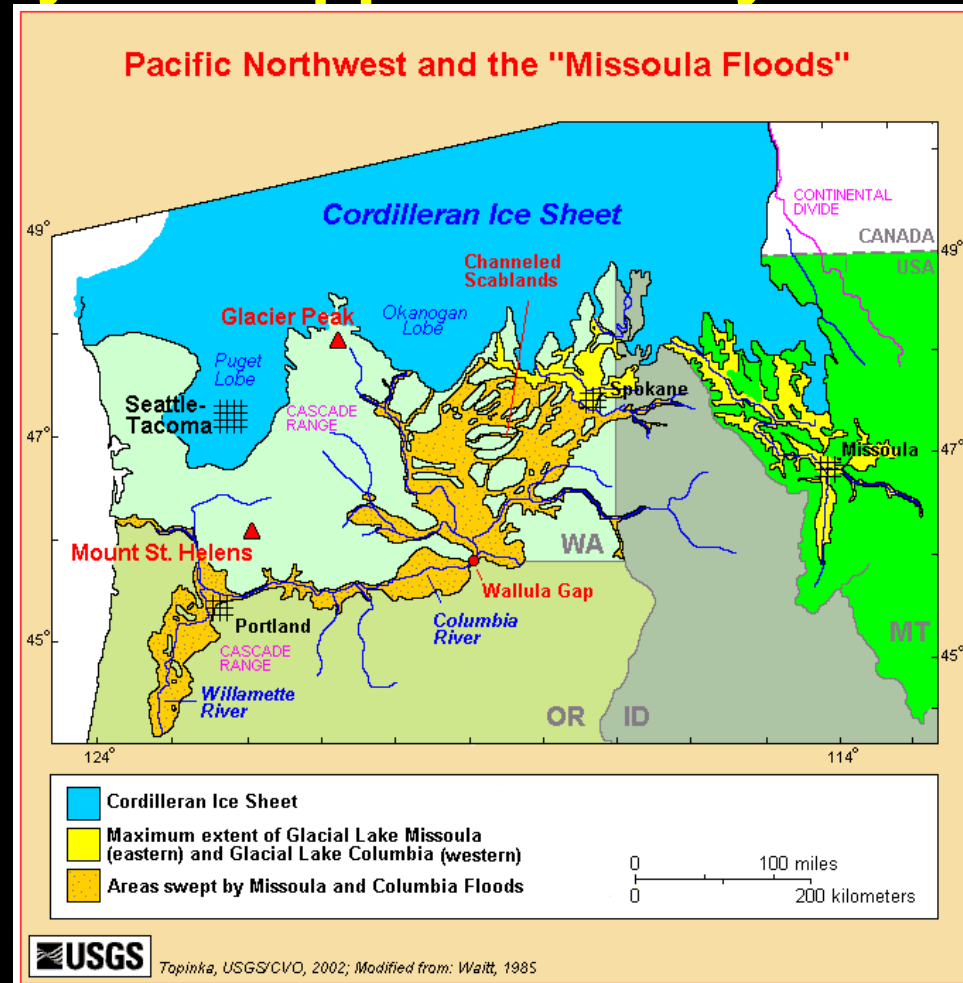
FUN FACTS: AGE OF THE FLORA OF THE PACIFIC NORTHWEST

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)

Native plants and their
diseases and pests have
been co-evolving for a *very
long time!*



DISEASES OF NORTHWEST NATIVE PLANTS

RUSTS:

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

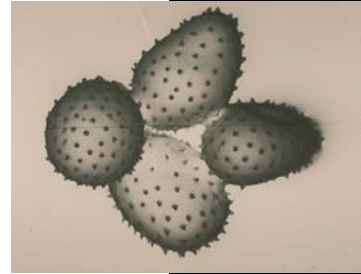
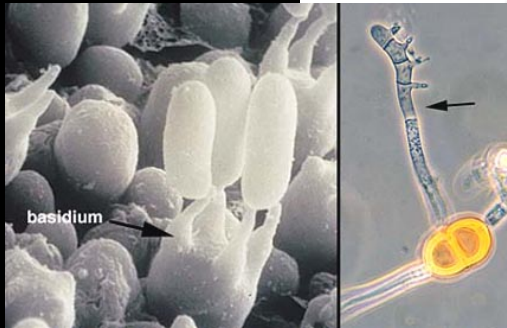
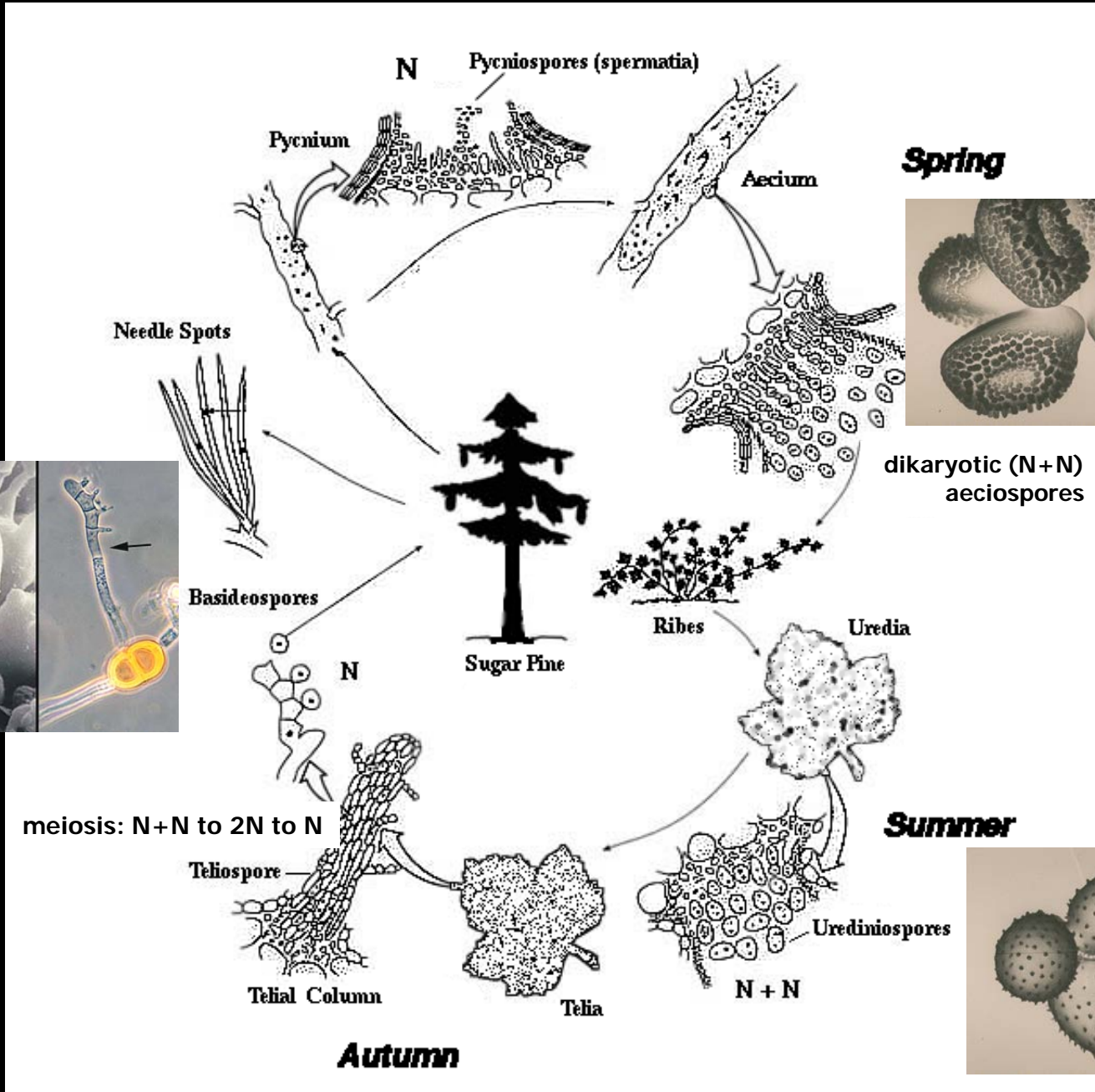
Basidiomycota (“club fungi”),
Puccinales (syn. Uredinales): most
rusts require two host species to
complete their sexual life cycle (2+
years) and can produce up to five
different types of spores....



rust on soy (*Glycine max*)

telial host = primary host
aecial host = secondary or alternate host

WHITE PINE BLISTER RUST LIFE CYCLE (2+ years)



Other Primary Hosts?

Pedicularis?
Castilleja?

WESTERN WHITE PINE (*Pinus monticola*)



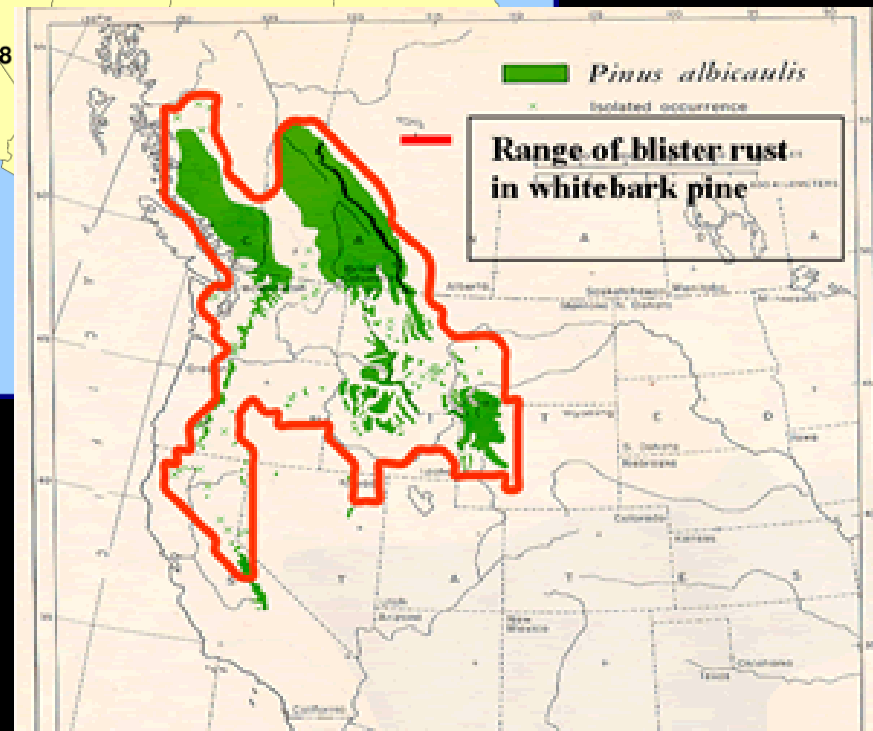
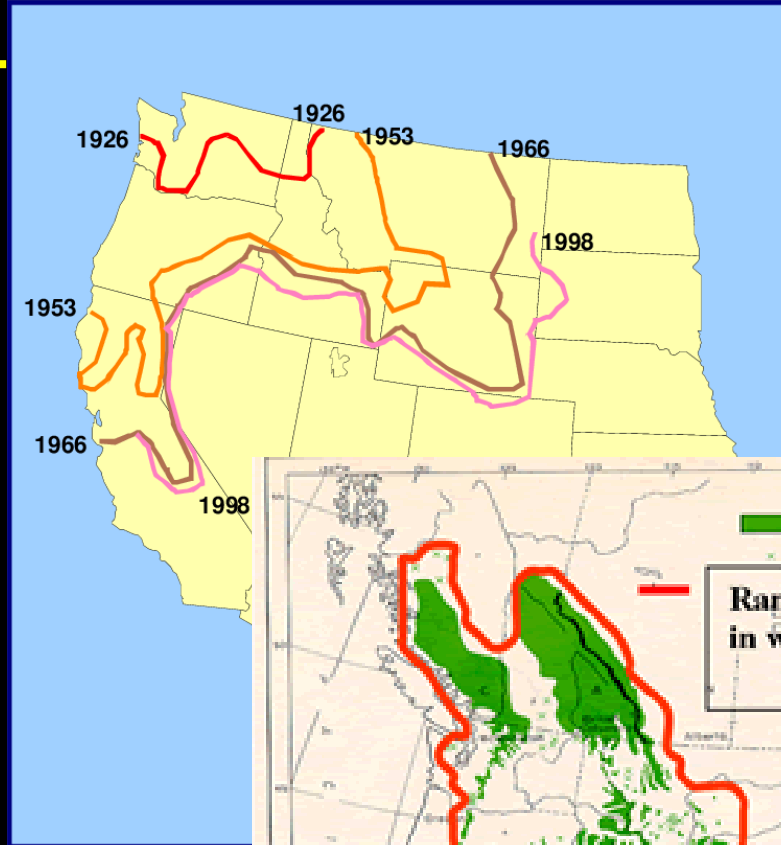
...aecia on *Pinus*



← ...uredia on
Ribes

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

WESTERN WHITE PINE (*Pinus monticola*)
WHITEBARK PINE (*Pinus albicaulis*)
LIMBER PINE (*Pinus flexilis*)



white pine blister rust
(*Cronartium ribicola*)

MANAGEMENT RECOMMENDATIONS

White Pine Blister Rust (*Cronartium ribicola*)

LEVEL OF CONCERN: High

CULTURAL CONTROL:

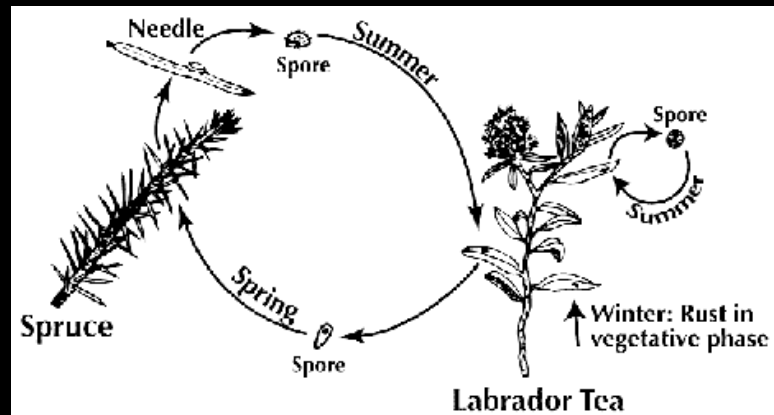
- pruning naturally regenerated white pine 8-10 feet up from the ground decreased blister rust mortality by nearly 50% over 20 Years
- plant resistant stock
- do not plant white pine near cultivated or native currants / gooseberries

CHEMICAL CONTROL:

See PDMH



SITKA SPRUCE (*Picea sitchensis*)



aecia on grand fir (Photo: A. Ceska)



...uredia on Labrador-tea

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

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



aecia on grand fir



telia on evergreen
huck (witches'
brooms)

...a uredinial state
has not been found



fir rust
(*Pucciniastrum goeppertianum*)



INCENSE-CEDAR (*Calocedrus decurrens*)

Alternate Hosts: pear, apple, crabapple, hawthorn, mountain-ash, quince, serviceberry

telia on incense-cedar

uredia on European pear



Jim Chatfield, OSU Extension©

Management:

- good sanitation; collect and discard infected leaves and fruit
- remove, discard infected woody parts
- many chemical controls (see PDMH)
- if incense cedar is on your property, consider removing it

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



**WESTERN SERVICEBERRY
(*Amelanchier alnifolia*)**

aecia



**serviceberry rust
(*Gymnosporangium* spp.)**

Alternate Hosts: *Thuja*, *Juniperus*

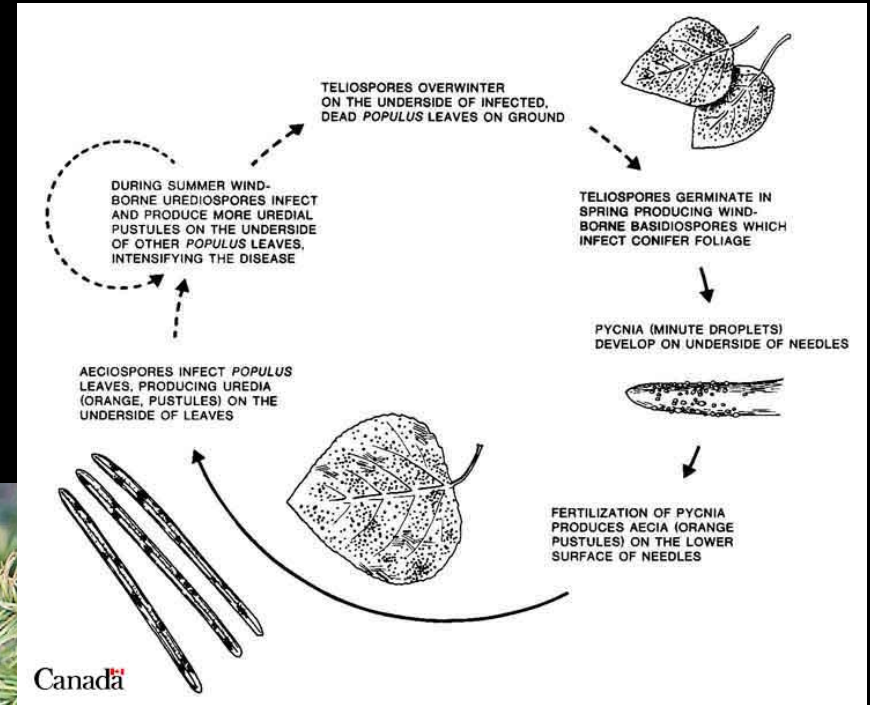
uredia



COTTONWOOD (*Populus trichocarpa* and hybrids)



cottonwood rust
(*Melampsora* species)



Alternate Hosts:
conifers

**DISEASES OF
OF NORTHWEST NATIVE PLANTS**

ANTHRACNOSE FUNGI

MADRONE
(*Arbutus menziesii*)



Photo: Ben Legler



MADRONE (*Arbutus menziesii*)

Bennett and Shaw 2008

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)

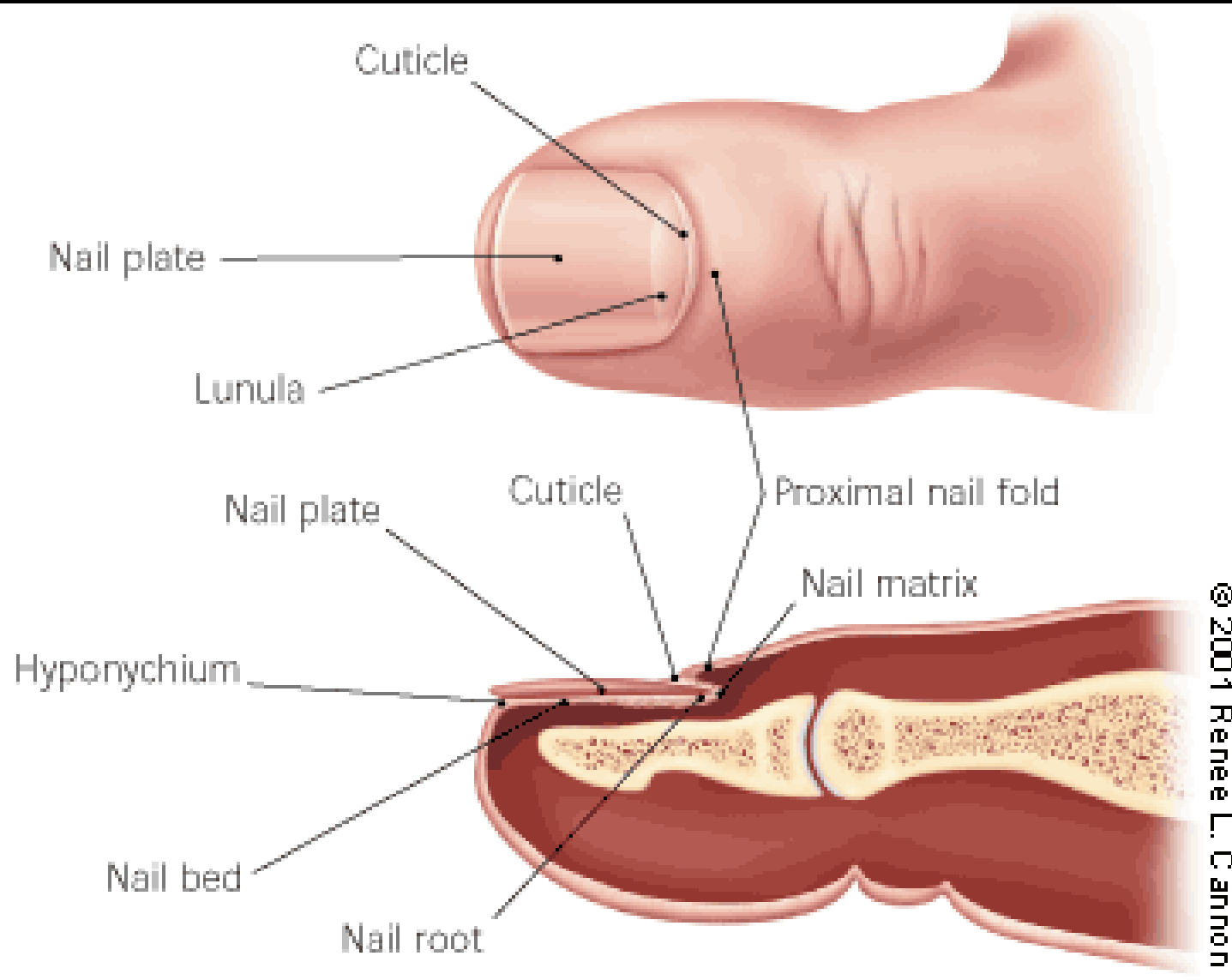
** Hansen (unpublished)

MADRONE (*Arbutus menziesii*)



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

TOENAIL FUNGUS DISEASE (*Nattrassia mangiferae*)



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 PDMH



ALTERNATE?

**golden chinquapin
(*Chrysolepis chrysophylla*)**

mature specimen; Dupont, WA

WESTERN DOGWOOD (*Cornus nuttallii*)



anthracnose
(*Discula* spp. and others)

DIAGNOSING BACTERIAL VERSUS FUNGAL SPOTS AND LESIONS



Fungal Lesions on
Western Dogwood:
red, purple, or yellow
halo



Fungal Lesion on Grape:
fruiting bodies; "dry"
texture; not constrained
by leaf veins



Bacterial Lesions on
English Ivy: yellow
halo with dead water-
soaked tissue; often
constrained by leaf
veins

MANAGEMENT RECOMMENDATIONS

Dogwood Anthracnose (*Discula* spp.)

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 PDMH



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



ALTERNATE?

Kousa dogwood (*Cornus kousa*)

**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 *PDMH*



ALTERNATE?

INCENSE-CEDAR
(*Calocedrus decurrens*)

ALTERNATES??

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

Other species of *Chamaecyparis* are resistant
including Hinoki false-cypress (*C. obtusa*) and
Sawara false-cypress (*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

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

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

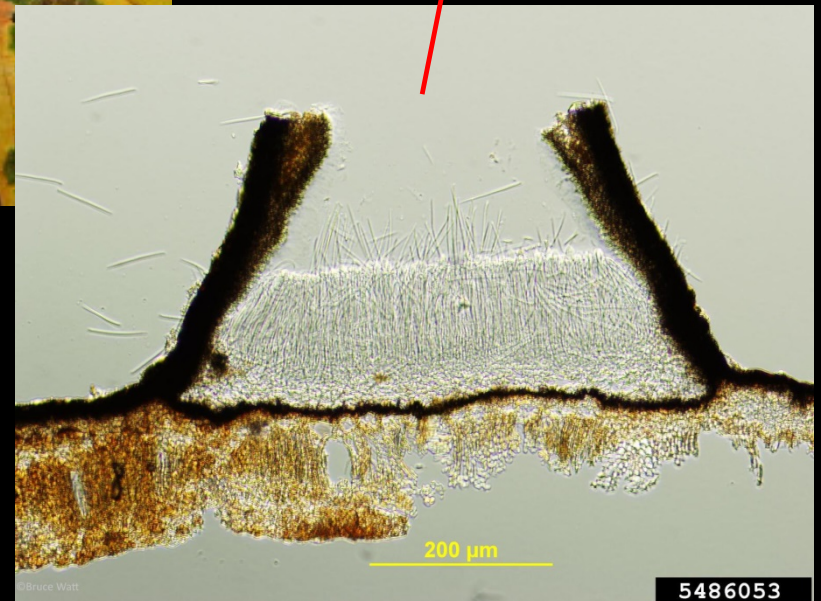
BIG-LEAF MAPLE (*Acer macrophyllum*)



tar spot
(*Rhytisma punctatum*)

controls:

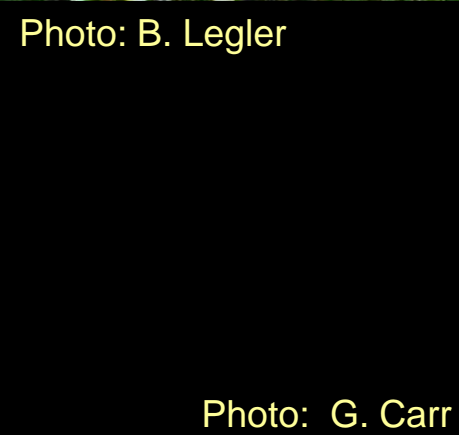
- sodium lauryl sulfate
- trisodium phosphate
- clean cultivation



Vertical cross-section of apothecium with
ascospores emerging (Bruce Watt, U. Maine)

5486053

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



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

Photo: G. Carr

Photo: B. Legler



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



PONDEROSA PINE *(Pinus ponderosa)*

SHORE PINE *(Pinus contorta)*

- Two- and three-needle pine species
- Infection in late summer
- Symptoms appear early spring of following year
- Needles turn red/brown and die
- Fungus can become systemic, often stimulating formation of small, open and tufted witches' brooms
- Fruiting bodies are small dark streaks on dead foliage



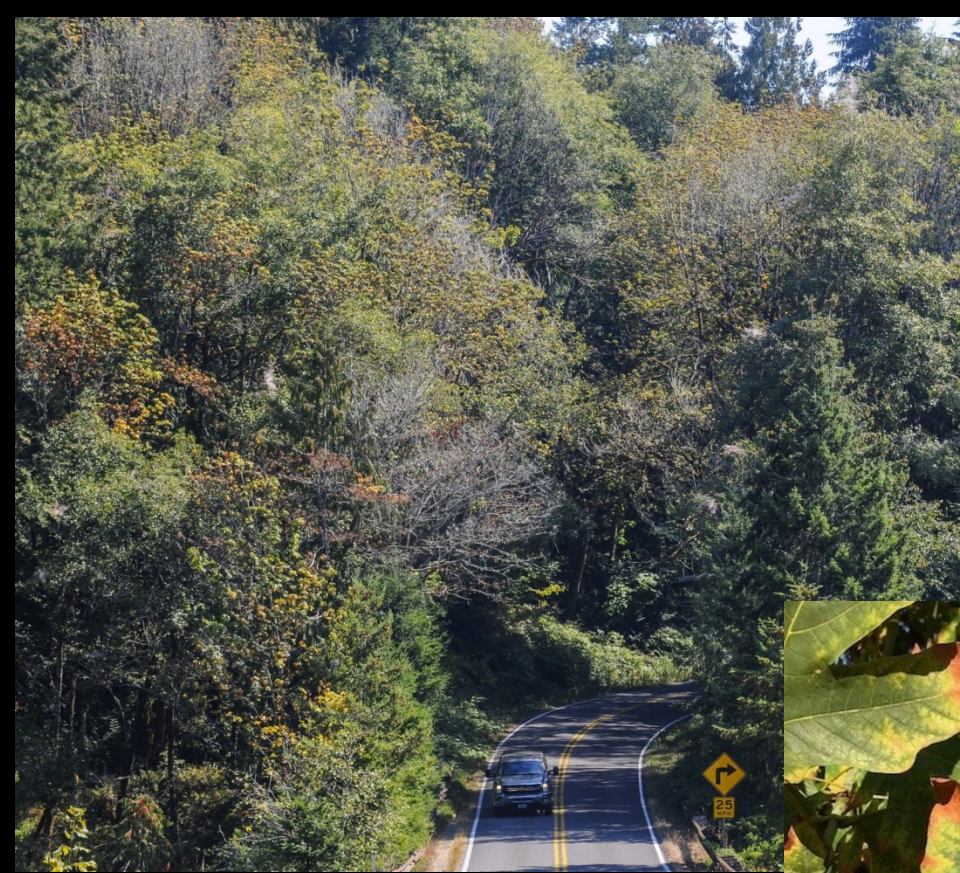
CULTURAL CONTROLS

- Good soil drainage
- Good air circulation
- Control weeds and vegetation around bases of trees
- For high-value trees, prune off and destroy witches' brooms

needle cast *(Elytroderma deformans)*

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

BIG-LEAF MAPLE (*Acer macrophyllum*)



Craig Sailor / The News Tribune (Tacoma)



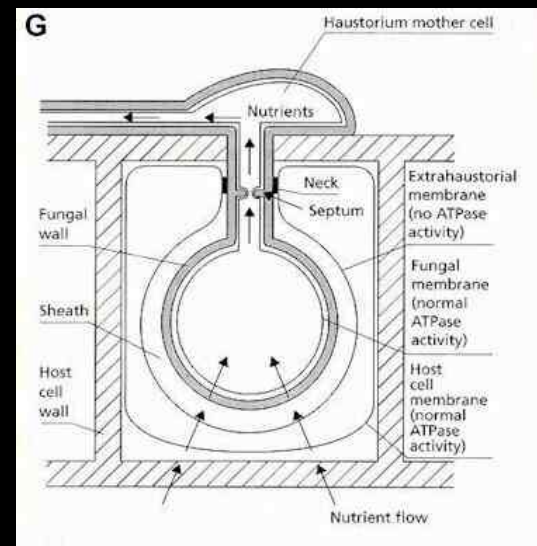
**big-leaf maple decline
(???)**



Peter Haley / The News Tribune
(Tacoma)

POWDERY MILDEW

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



Bigleaf maple (*Acer macrophyllum*)



Snowberry (*Symphoricarpos alba*)

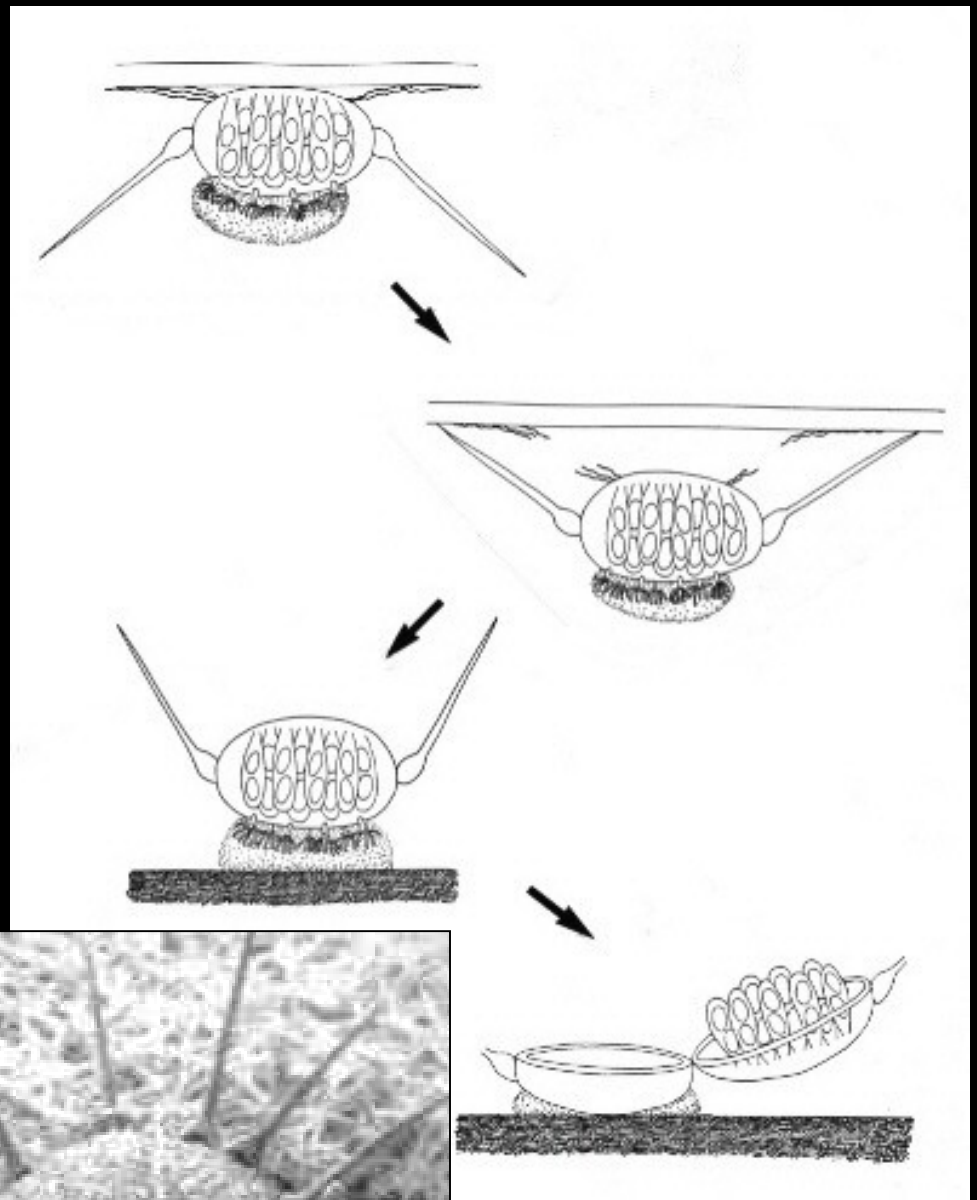
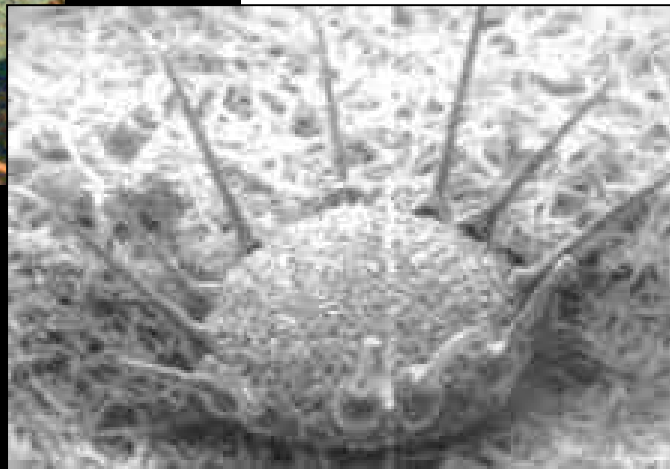
Kaligreen®:
a potassium bicarbonate fungicide

POWDERY MILDEW

Phyllactinia spp.



Red Alder
(*Alnus rubra*)



chasmothecium (ascocarp;
ascomatum; ascoma; perithecium)
with unique appendages

BRANCH DIEBACK
Phytophthora sp. ??
Botryosphaeria ribis ??

kinnikinnick
(*Arctostaphylos uva-ursi*)

manzanita
(*Arctostaphylos* spp.)

salal
(*Gaultheria shallon*)



ALTERNATIVES?

EVERGREEN STRAWBERRY
(Fragaria chiloensis)

Photo: J. Kehow cc



PT. REYES CEANOTHUS
(Ceanothus gloriosus)



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*)



INSECT PESTS OF NORTHWEST NATIVE PLANTS

CUPRESSUS AND JUNIPERS
(*Chamaecyparis*, *Cupressus*,
Cupressocyparis, *Juniperus*, *Thuja*)



cypress tip moth
(*Argyresthia cupressella*)
arborvitae leaf miner
(*A. thuiella*)

SUSCEPTIBILITY OF CUPRESSACEAE TO CYPRESS TIP MOTH IN CALIFORNIA (Univ. of California; Johnson and Lyon 1976)

Least Susceptible:

Juniperus chinensis var. *sargentii* 'Glauca'

J. scopulorum 'Erecta Glauca'

J. chinensis 'Kaizuka'

Thuja plicata

Moderately Susceptible:

J. sabina 'Arcadia' and 'Tamariscifolia'

J. virginiana 'Prostrata'

J. chinensis 'Pfitzerana Aurea'

More Susceptible:

J. virginiana 'Cupressifolia'

J. chinensis 'Pfitzerana' and 'Robust Green'

Chamaecyparis lawsoniana 'Allumii'

Most Susceptible: *Thuja occidentalis*

POPLARS AND WILLOWS (*Populus* and *Salix*)



poplar and willow borer
***Cryptorhynchus* spp. (non-native)**



C. lapathi (Photo: M. O'Donnell and A. Cline)

OREGON WHITE OAK
(*Quercus garryana*)



© Mark Leppin



Oregon oak gall wasp
(*Besbicus mirabilis*, adult)

Larew and Capizzi. 1983. Common Insect
and Mite Galls of the Pacific Northwest.

DISEASES AND PESTS OF NORTHWEST NATIVE PLANTS

Clay Antieau, MS, PhC
Botanist, Horticulturist

206-684-7413

clayton.antieau@seattle.gov

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