Diseases, pests, and emerging issues affecting the health of Pacific madrone

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American Forests “Famous and Historic Tree” at Magnolia Bluffs, Seattle, WA

1996

2004

2014

Factors affecting tree health

Environmental

- Climate
- Management practices
  - Fire suppression
  - Urbanization

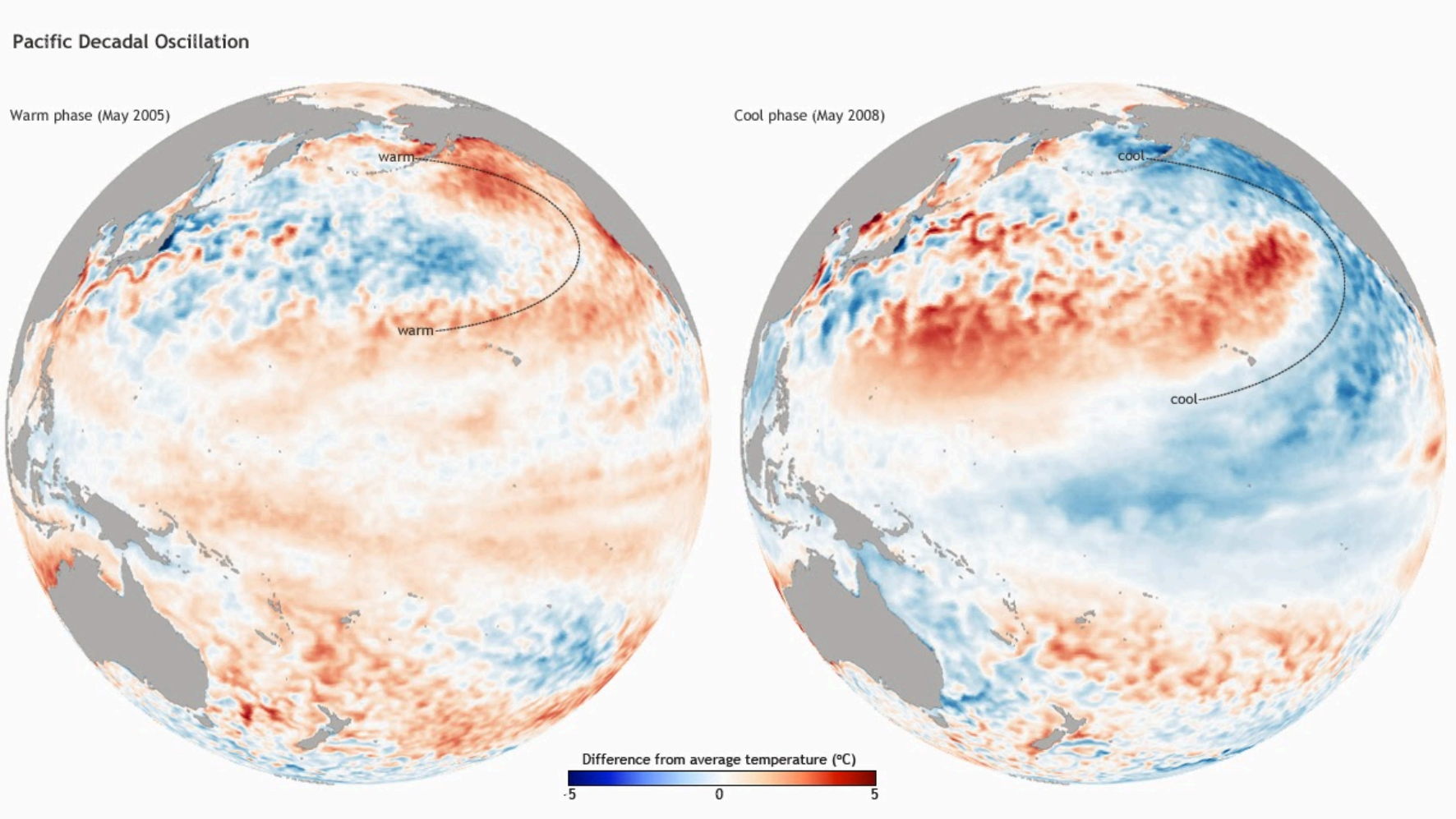
Biological

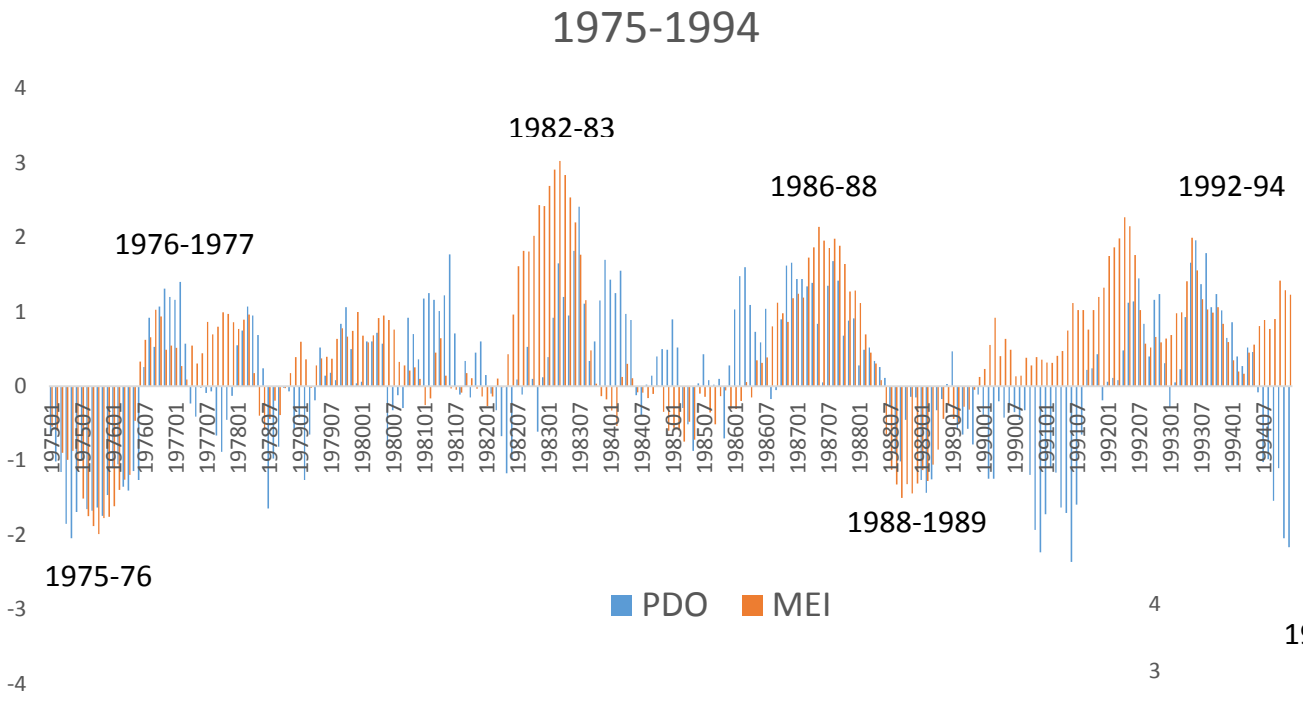
- Fungi and oomycetes
- Insects
- Wildlife
- Introduced pests and pathogens

Climate Indices

Pacific Decadal Oscillation (PDO) – Northern Pacific

Multivariate ENSO Index (MEI) – Tropical Pacific

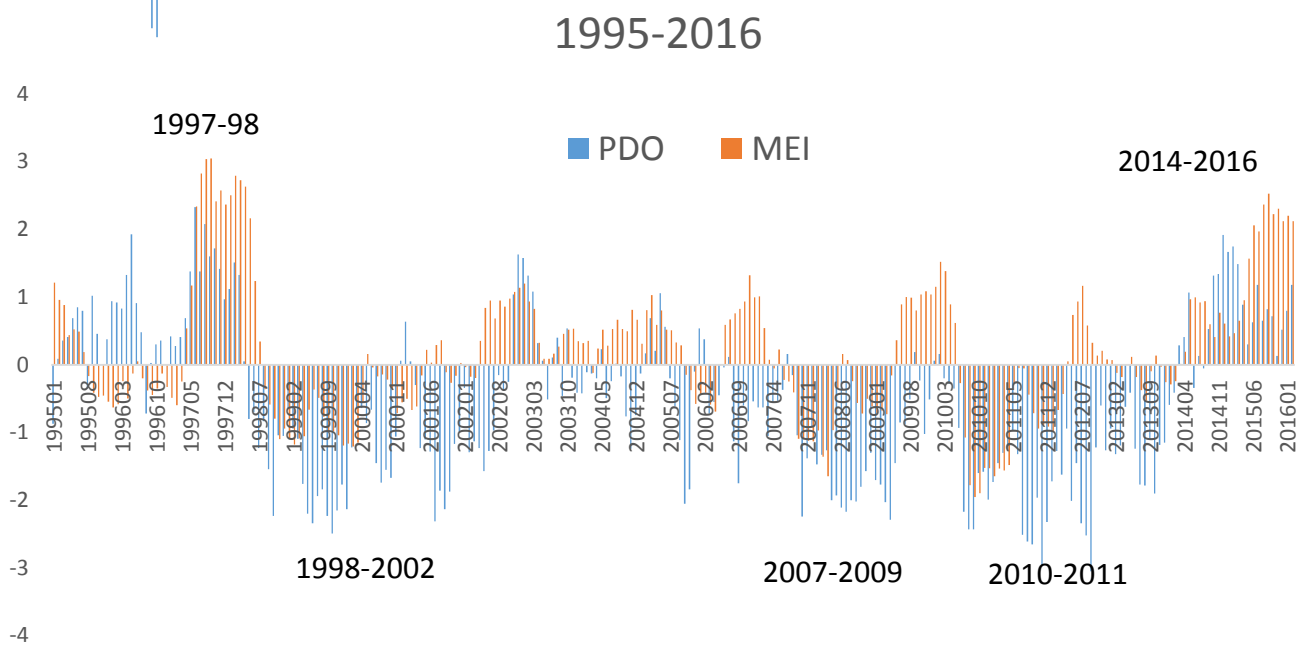




Positive values – warm, dry

Negative values – cool, wet

When both indices are in phase the effects are stronger



Fungal diseases are affected by climate conditions

Cold, wet winter/spring:

Symptom expression –
cold damage, foliar blight

Warm, wet spring:

Fungal sporulation,
germination, infection

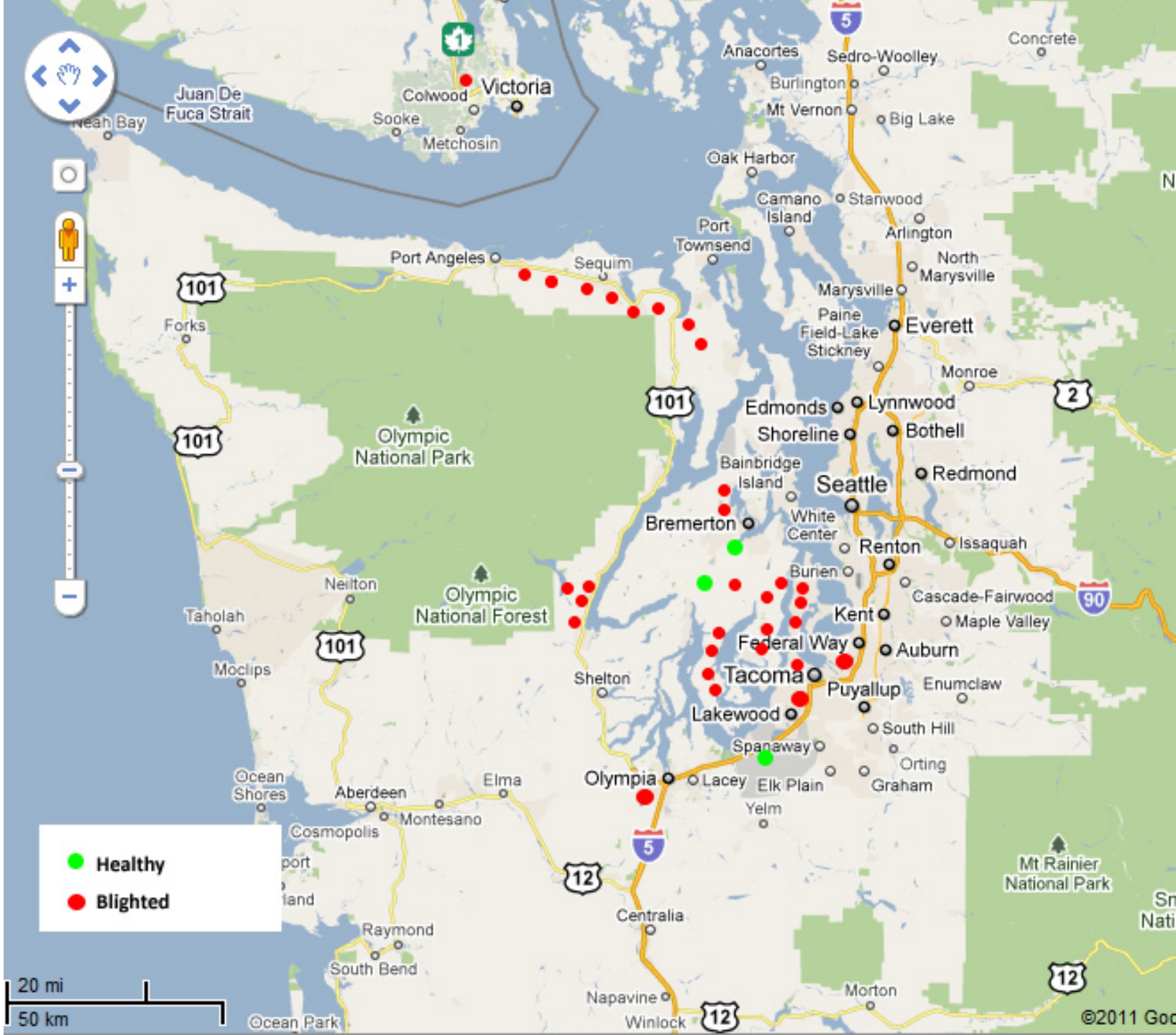
Warm, dry summer:

Drought
Symptom expression –
canker, dieback, root disease

Temperature and precipitation are expected to increase in PNW. This will affect insect pollinators and diseases of Pacific madrone.

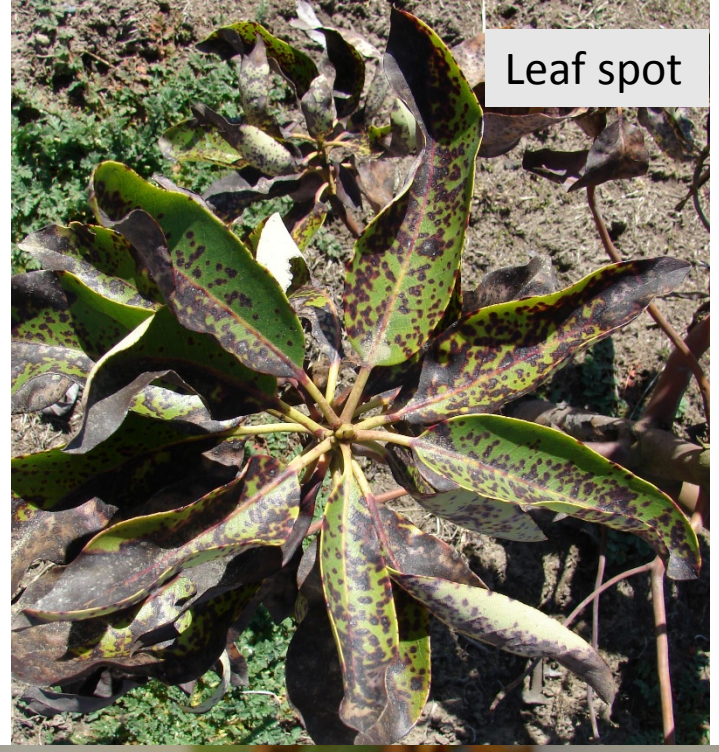
2011 Leaf Blight

- Severe leaf blight and some mortality
- Online survey
- Mapping of areas with severe and (rarely) healthy trees



Foliar fungi

- Leaf spot
- Leaf blight
- Blister blight
- Rust
- Sooty mold



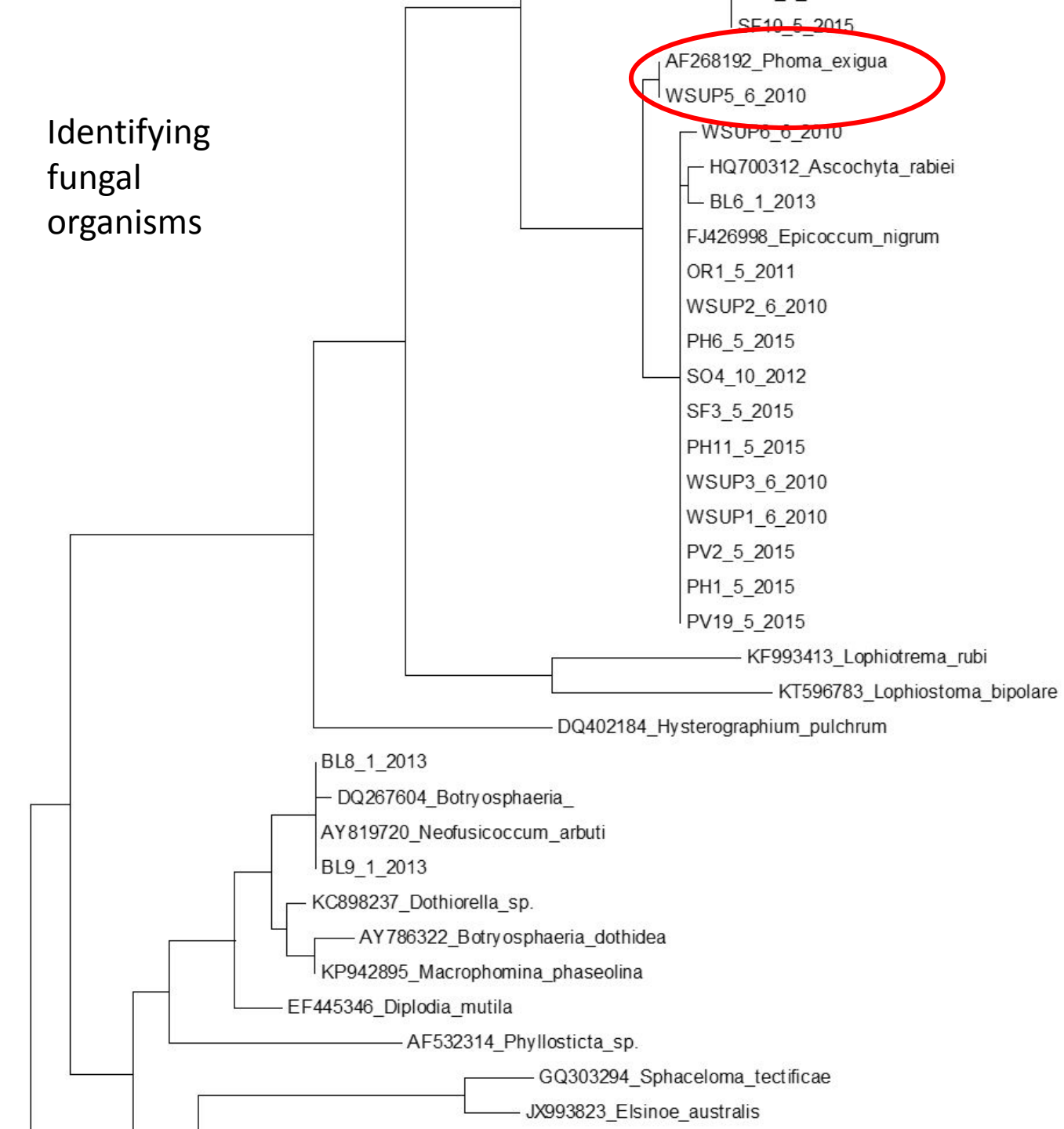
Leaf spot

Rust

Exobasidium vaccinii on fruit

"At least 19 different fungi are associated with leaf spots on madrone"
Byther, 1999

Identifying fungal organisms



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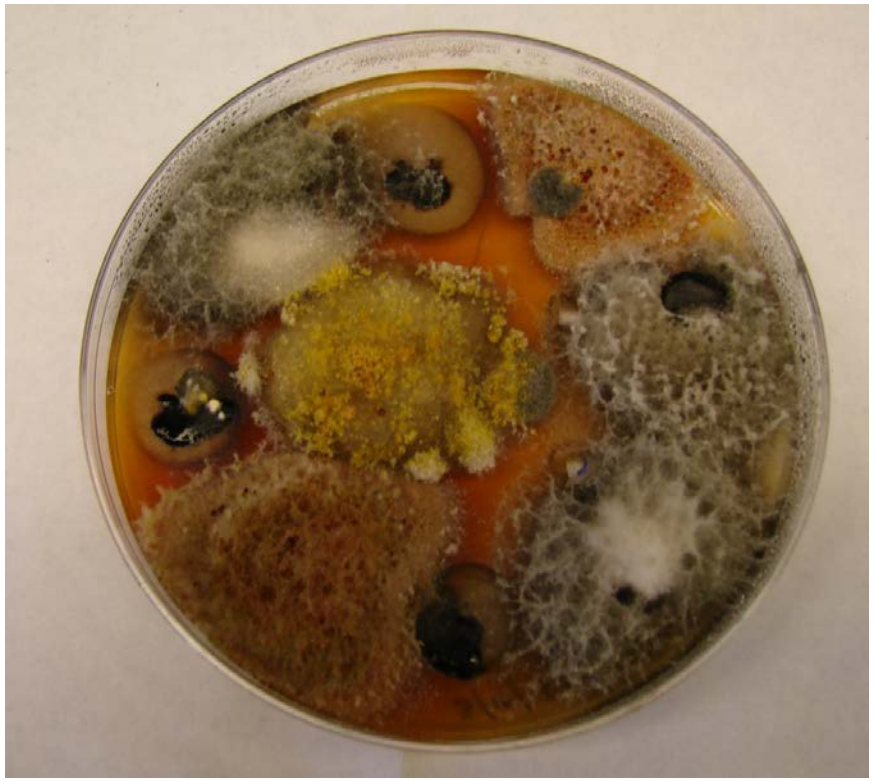
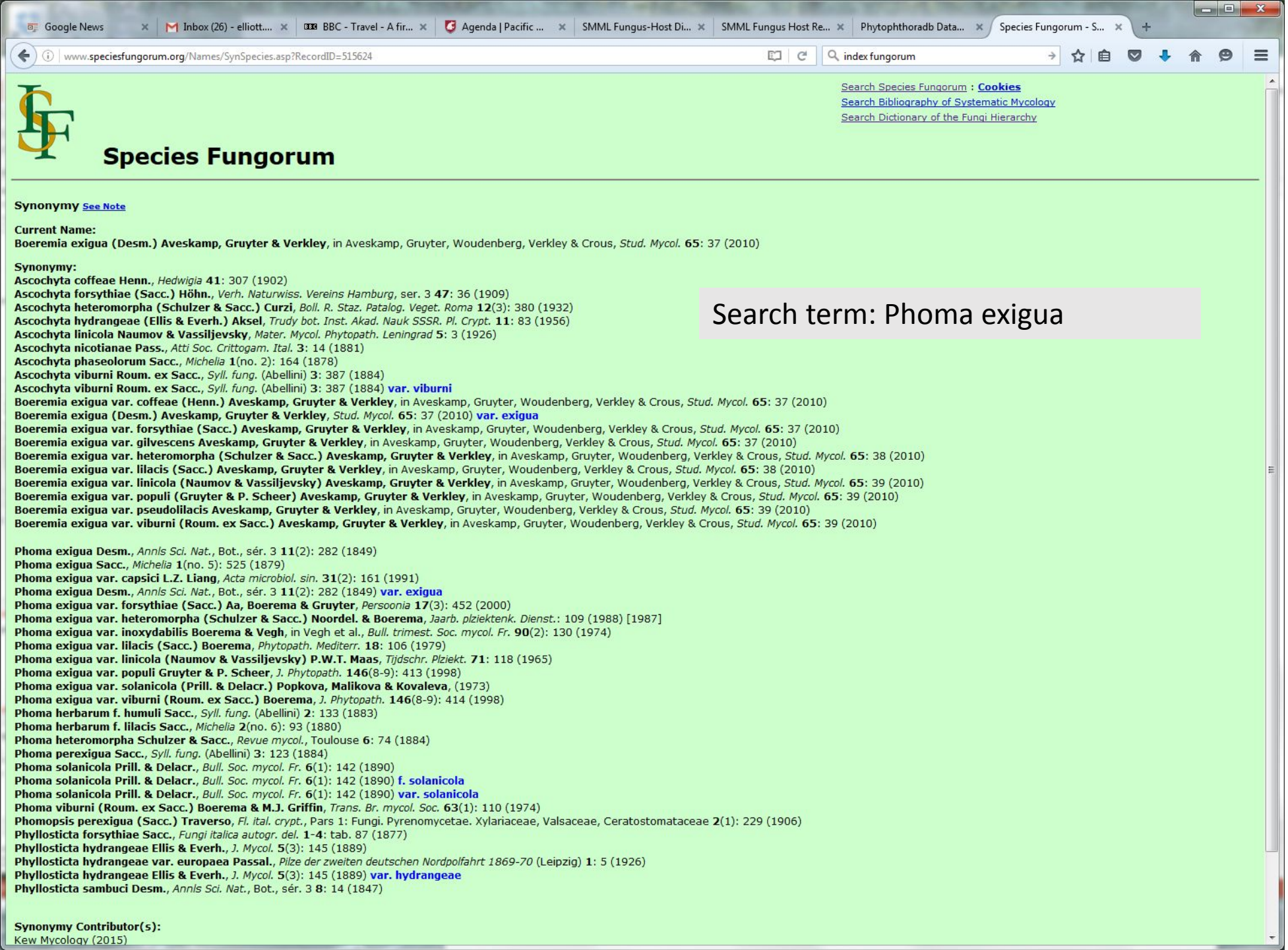




Many names for the same fungus

Older records based on morphology, host

Newer records include DNA sequence

Foliar blight

- *Phacidiopycnis washingtonensis*
- *Phomopsis vaccinii*

P. washingtonensis symptom expression may be related to cold temperatures

Phacidiopycnis washingtonensis

"Large, dying branches appear to have a necrotic leading front similar to a cambial killing canker…Limited isolations from such cankers have yielded a species of *Phacidiopycnis.* This fungus was not pathogenic in healthy madrone."
Hunt, 1999.

The fungus was also isolated from leaf spots on emerging foliage, lesions on green shoots, and the petiole and leaf blade of dead, attached leaves.

Shoot dieback fungi

- *Neofusicoccum arbuti (Botryosphaeria spp.)*
- *Phomopsis vaccinii (Diaporthe eres)*
- *Phacidiopycnis washingtonensis*

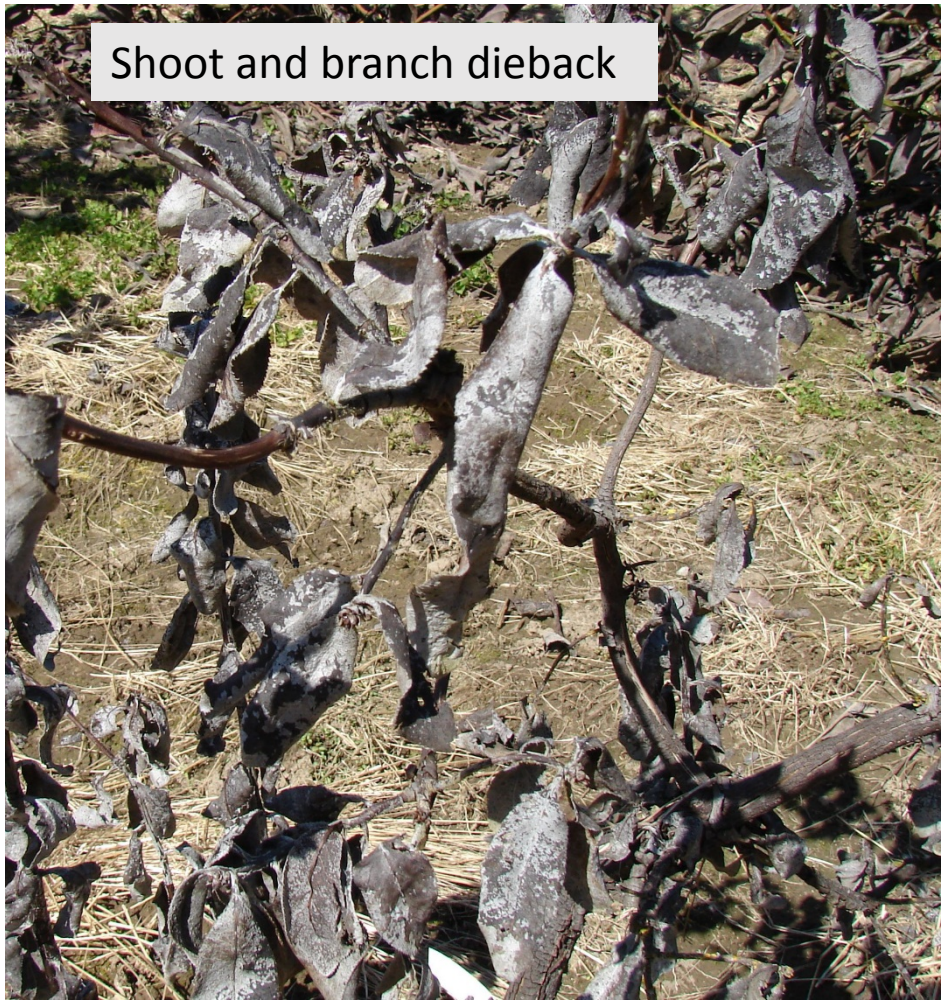
Madrone canker

Fusicoccum arbuti = Neofusicoccum arbuti

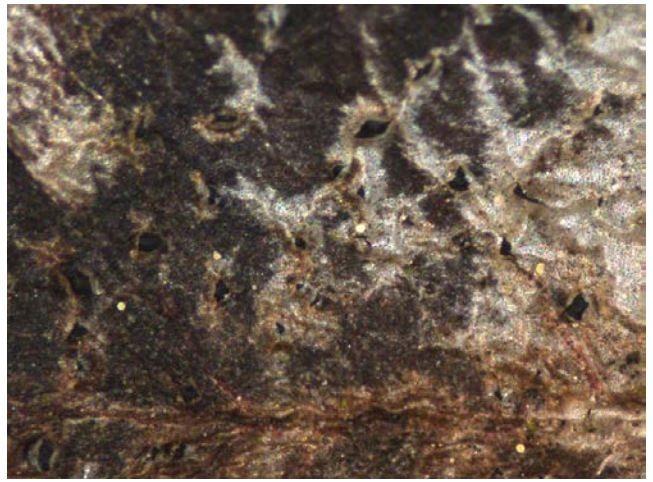
Older names:
Hendersonula toruloidea = Neoscytalidium dimidiatum
Nattrassia mangiferae = Neofusicoccum mangiferae

Neither of these fungi causes madrone canker

Botryosphaeria spp.



Branches look “burned” or sooty



Pycnidia erupting through leaf cuticle

Root disease

- *Phytophthora* (*P. cactorum, P. cinnamomi*)
- *Armillaria* (*A. gallica, A. mellea*)
- *Heterobasidion occidentale*

Mushrooms of *Armillaria* spp. inside a madrone tree.

Phytophthora root disease

Insects

Serpentine leaf miner
(*Marmara arbutiella*)

Wood boring beetle
(probably *Buprestidae*)

Fall webworm (*Hyphantria cunea*)

Damage commonly seen in summer months in SW Oregon.

Wildlife

- Deer
- Rodents

Chewing damage and undermining by rodents, probably mountain beaver

Introduced pests and pathogens

- *Phytophthora cinnamomi*
- *Phytophthora ramorum*

P. cinnamomi on Pacific madrone, CA

P. ramorum infecting madrone under bay laurel canopy in California

Causes of decline in Pacific madrone

Climate-related

1975-1998 – warm phase – drought, canker, dieback, *Armillaria* root disease, *P. cinnamomi* root disease

1999-2014 – cool phase – leaf blight, cold damage, *Phytophthora* root disease

2014 – warm phase

Anthropogenic

Urbanization
Fire suppression
Exotic pests and pathogens (*P. cinnamomi, P. ramorum*, others)

Any questions?

Website

http://ppo.puyallup.wsu.edu/pmr/

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