Symptom Identification and Scouting for Disease in the Nursery

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Plants get sick too!

Abiotic

- Weather
  - Drought
  - Freezing
- Management practices
  - Chemicals
  - Mechanical damage
- Soil conditions
- Water
- Nutrients

Symptoms tend to involve the whole plant

Biotic

- Insects
- Mollusks
- Vertebrates
- Diseases
  - Viruses
  - Fungi
  - Bacteria
  - Nematodes
  - Oomycetes
  - Others

Symptoms tend to only involve certain plant parts

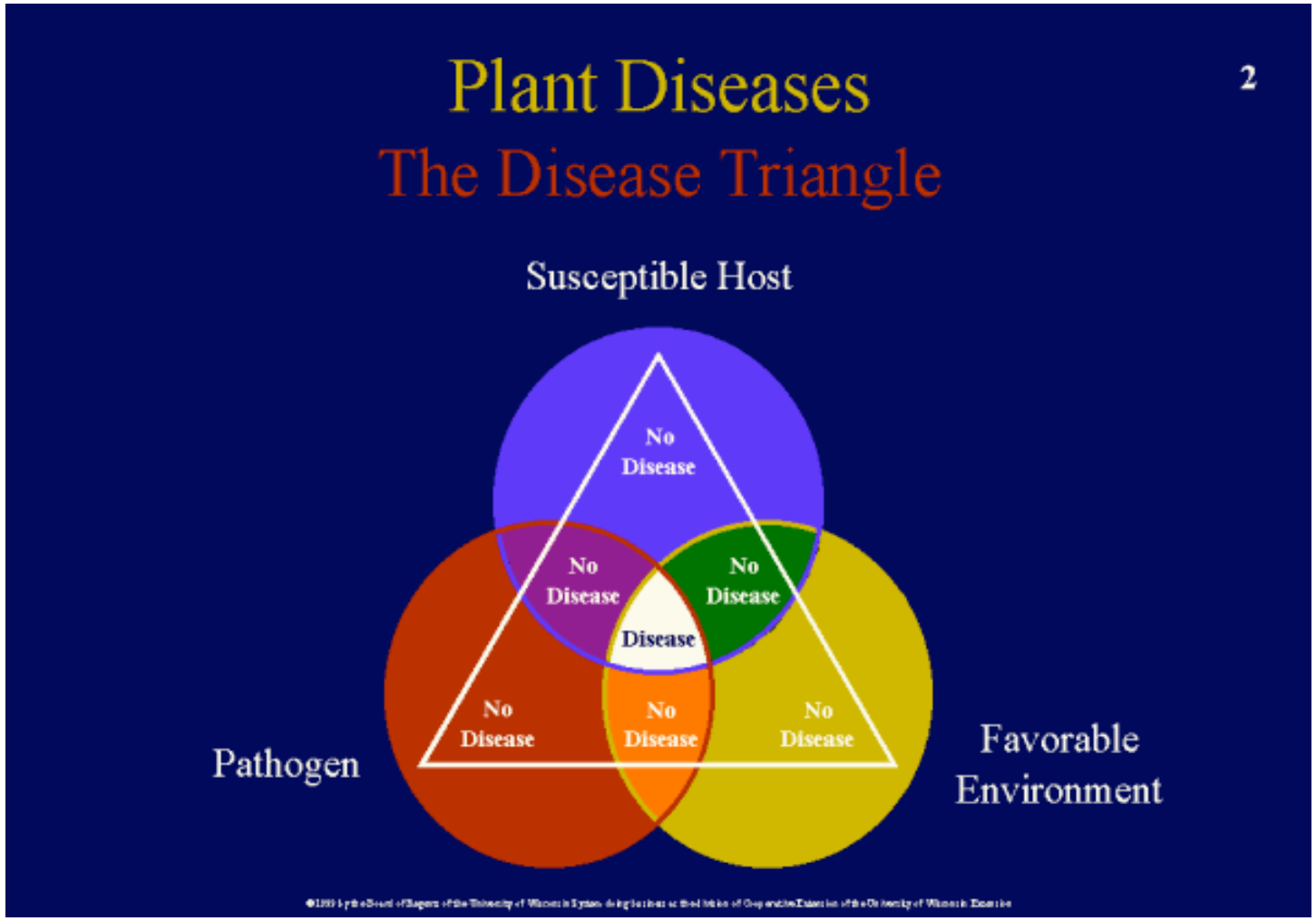
Invasive plant diseases

- Chestnut blight (*Cryphonectria parasitica*) on American chestnut
- White pine blister rust (*Cronartium ribicola*) on Western white pine
- Dutch elm disease (*Ophiostoma ulmi*) on American elm
- Sudden oak death (*Phytophthora ramorum*) on tanoak

These are capable of eliminating certain host species from an ecosystem

Chestnut blight caused by the fungus *Cryphonectria parasitica*

5. Disease triangle concept



Symptoms

- The same symptoms can have different causes
- Plants can have more than one problem

B. Merle Shepard, Clemson University, www.forestryimages.org

Sooty mold often accompanies a whitefly or aphid infestation

Abiotic symptoms

NOT FROM A BIOLOGICAL SOURCE

Leaf Scorch

Herbicide damage

Construction damage

Winter injury

utahpests.usu.edu

Drought

clemson.edu

Biotic symptoms

ALL BIOLOGICAL ORGANISMS

treetec.net.au

Insects

Plant pathogens

kentcoopextension.blogspot.com

Weeds

Human damage

Animal damage

What is “normal”?

- Know what plant you have
- Recognize what a healthy plant looks like
- Compare problem plants and healthy plants
- What part of the plant is affected?

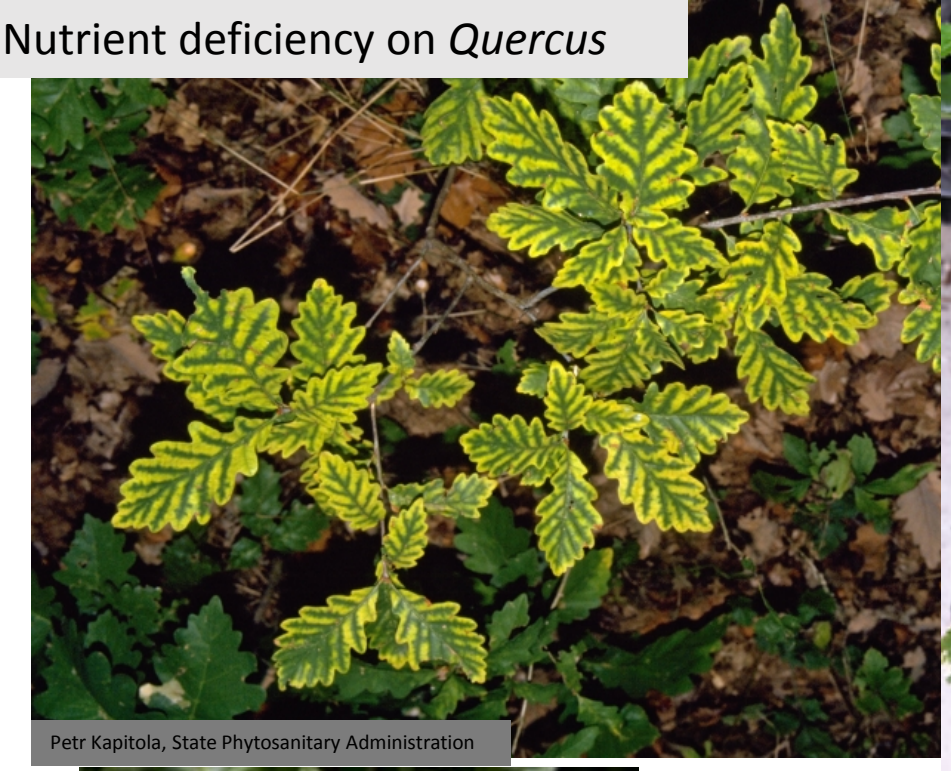
“Wilting” in rhododendrons can be a reaction to cold temperatures

Buffalonews.com

Or a symptom of root disease

www.walterreeves.com

Nutrient deficiency on *Quercus*



Petr Kapitola, State Phytosanitary Administration

Madrone seedling with variegated foliage – virus?

www.jfschmidt.com

Cornus kousa ‘Samzam’

Trees with variegated foliage

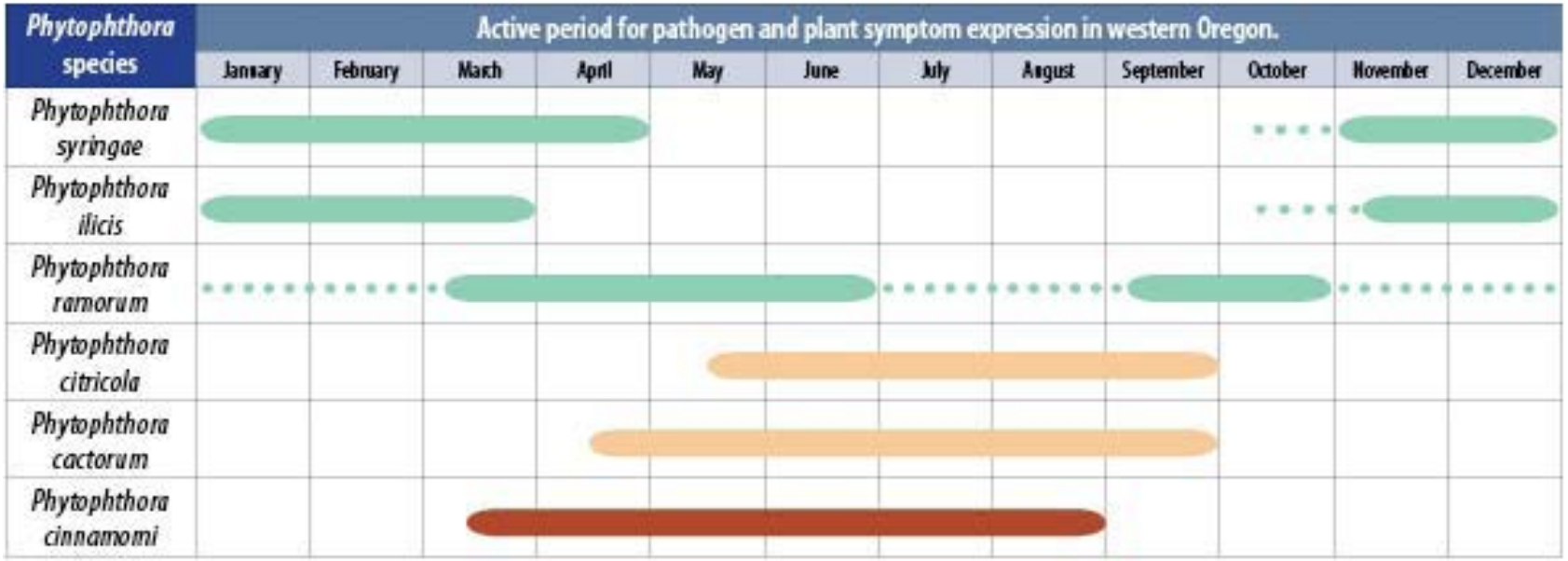
Phytophthora Seasonal Activity

What time of year is *Phytophthora* active?

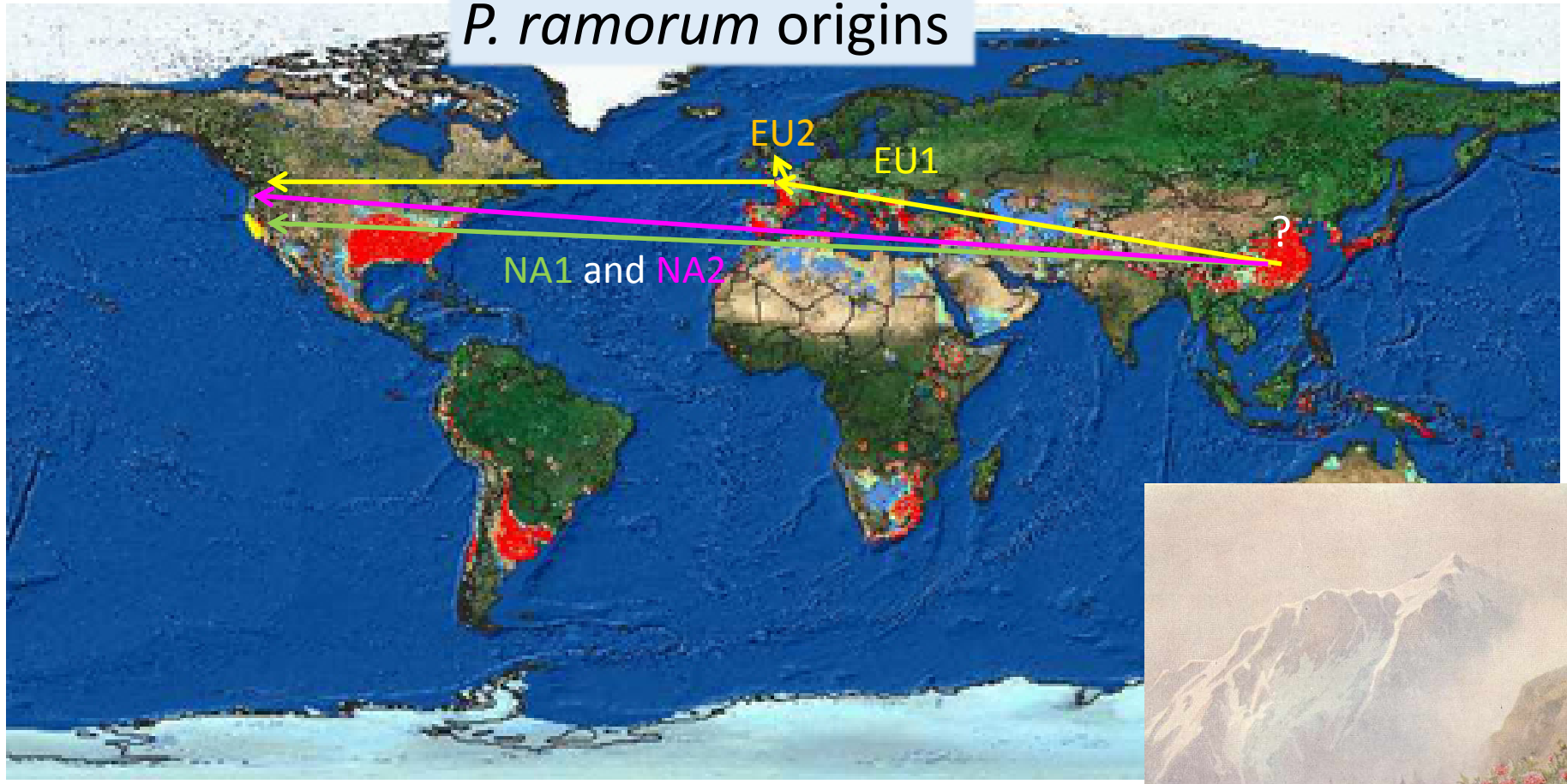
- Not all species are active at the same time
- Germination and infection
- Symptom expression

Seasonal Activity

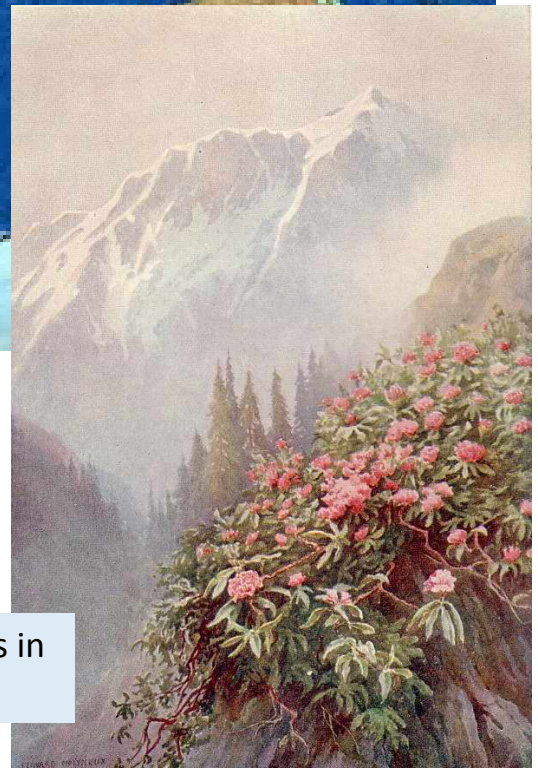
Phytophthora species are well adapted to the diverse environments that they encounter in different seasons.



P. ramorum origins



High risk areas for Sudden Oak Death with suitable climate and native plants are shown in bright red.

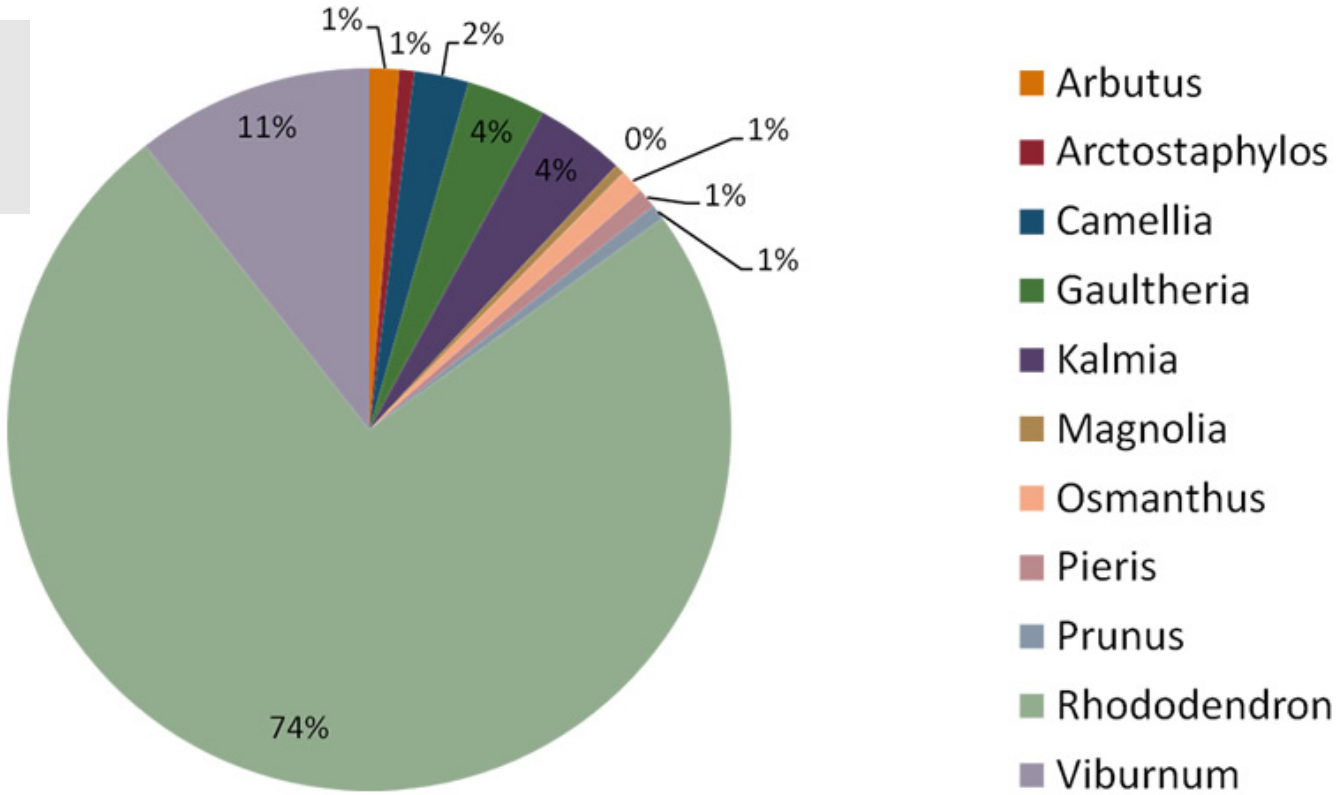


Wild rhododendrons in Kashmir, India

Tankersley, Boyce, Dunn, Christopher, Henderson, Min, Vieglais, David, Riccardi, Greg, Allenstein, Pam, AND Kappe, Dietrich. "PlantCollections - A Community Solution" *First Monday* [Online], Volume 13 Number 8 (13 August 2008)

Host material

Most Pr detections in WA nurseries are on Rhododendrons



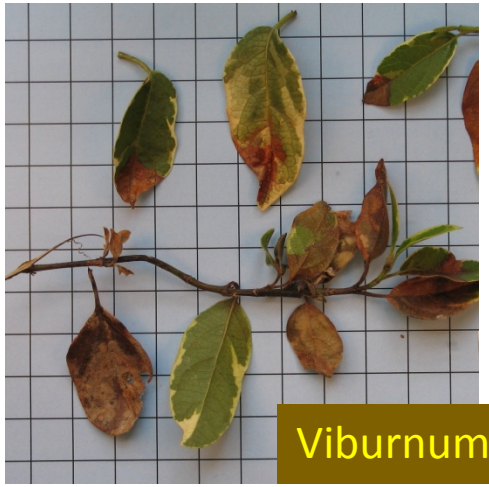
2004-2010

Data from WSDA

The ‘filthy five’

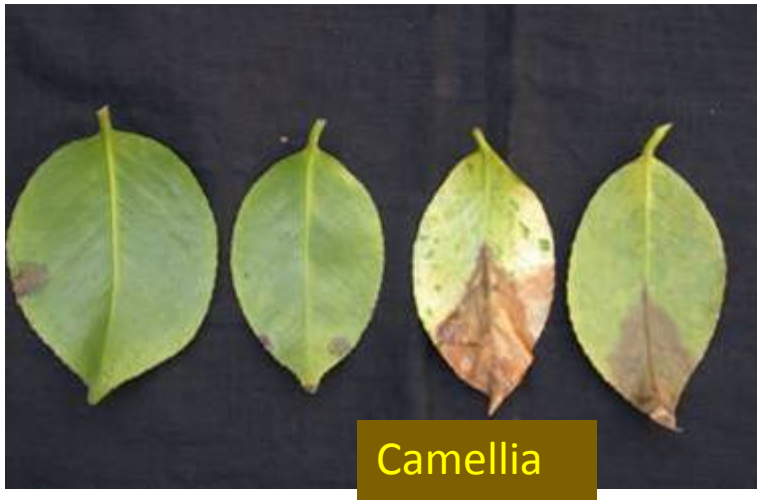
In nurseries, *P. ramorum* is most commonly found on these 5 hosts:

Rhododendron



Viburnum

Pieris



Camellia

Kalmia

Foliar diseases Symptoms

- Leaf lesions which first appear as dark greenish-black wilted areas of the leaf.
- With time, these lesions become tan or brown.

- Different plant pathogen species could produce similar symptoms.

P. ramorum infection on the leaves of California bay laurel (Umbellularia californica) Joseph O'Brien, USDA-Forest Service.

Phytophthora leaf and shoot blight

P. citricola

P. cactorum

P. syringae

P. ramorum

P. kernoviae

P. foliorum

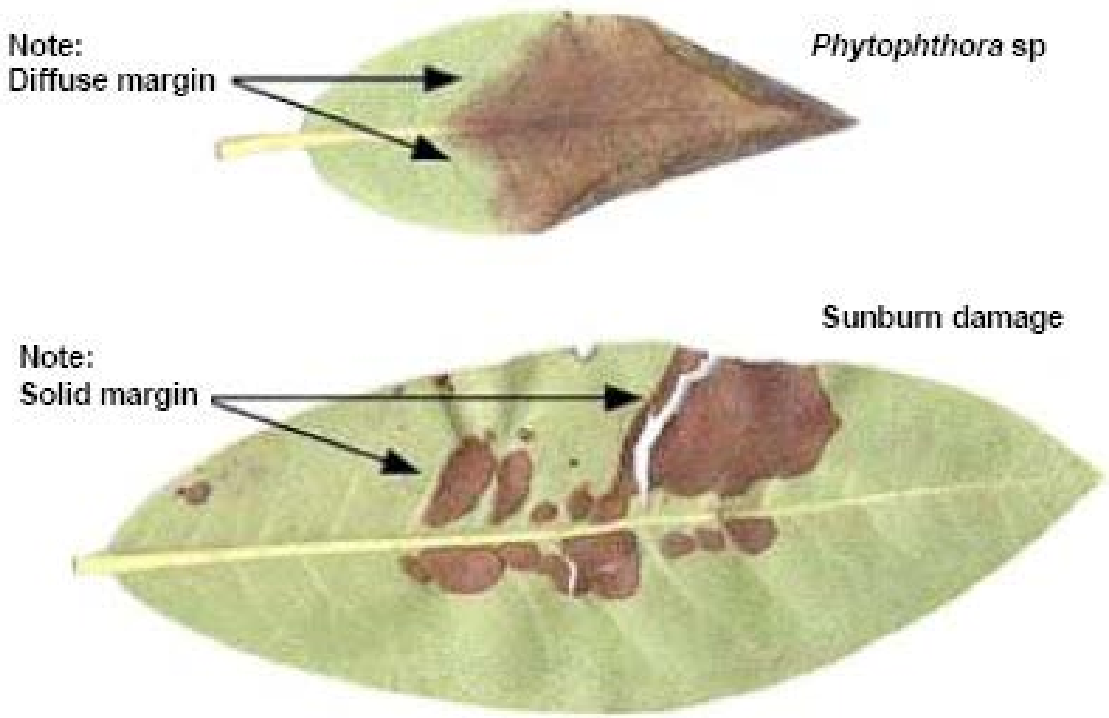
Symptoms all look the same!

Sun Scorch of rhododendron

Sun scorch, lesion does not extend down leaf midrib

Gray blight can develop on sun scorched rhododendron leaves

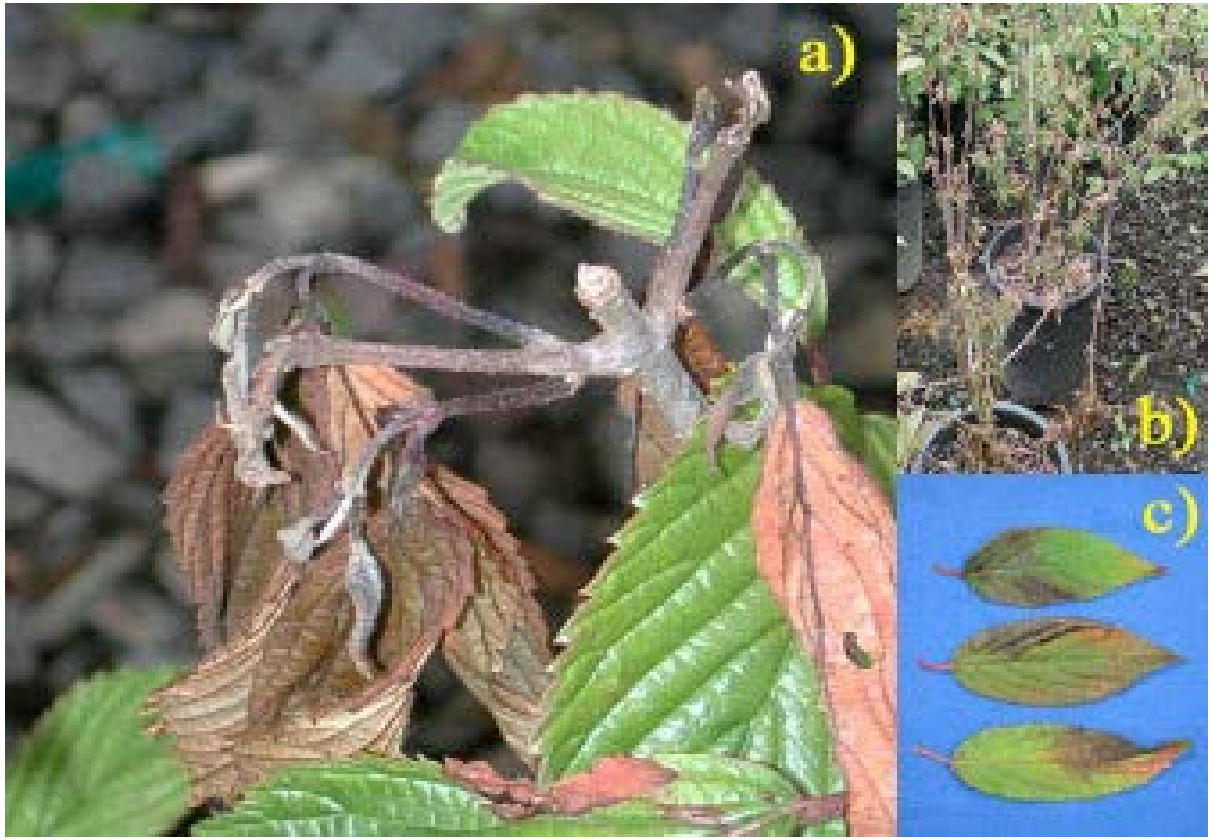
Photo: Rich Regan, Oregon State University



A comparison of leaf lesions caused by *Phytophthora* spp. compared to abiotic factors such as sun scorch. (Tim Tidwell, CA Dept of Food and Agriculture).

Dieback

a) Shoot dieback of Rhododendron infected with *Phytophthora ramorum* (image Everett Hansen, Oregon State University)
b) underside & c) top of leaves infected with *Phytophthora ramorum* (images Bruce Moltzen, Missouri Dept. of Conservation)



a) Shoot dieback of *Virburnum* sp. infected with *Phytophthora ramorum* (image Oregon Department of Agriculture),
b) Seedlings in pots killed by *P. ramorum* (image Oregon Department of Agriculture), and
c) Leaf symptoms (image Jennifer Parke, Oregon State University),

Root diseases - Symptoms

www.omafra.gov.on.ca

- *Phytophthora* is one of the main causes of root rot , stem and crown rot in ornamental crops.

Phytophthora root rot causes reddish brown discoloration beneath the bark in the crown and lower cane.

www.forestpests.org/nursery

Rhododendron with wilting symptoms caused by *Phytophthora* root rot.

Azalea with chlorosis, leaf defoliation and small leaf formation caused by *Phytophthora* root rot.

Phytophthora root rot causing dead shoot on azalea (Rhododendron)

Symptoms of Phytophthora root rot on raspberry includes wilting of primocanes

Phytophthora root rot

Look for it where water collects – at the bottom of a slope or low-lying area.

Also areas with poor drainage or heavy clay soils.

Why is scouting important?

- Diseased plant material can be removed to avoid pathogen spread
  - If nobody is looking for problems, pathogens can spread across multiple growing areas
- Reduced crop loss can save money
- Monitoring plant health can also help reduce chemical applications

Early detection is important to stop epidemics before they start

Priority for scouting

- High risk hosts (HAP)
- Valuable plants
- All new plant material
- Returned plant material

Buy-ins and returned plants

- Inspect on arrival and then every week for six weeks before mixing with rest of stock.
- High risk plants during the dormant season and then every two weeks from April until September

Where to begin?

- Designate at least one staff member to be the scout
- Create a plan for the nursery
  - Does the nursery have an organized layout of plant material?
    - If not, map out nursery areas
  - If the nursery is large break up the nursery into “scouting sections”
  - Document where the HAP material is located around the nursery and identify high priority areas

Nursery plan

Remember to include the following as part of your scouting:

- Stock block areas
- Liners and propagation areas
- Landscape plants (display garden)
- HAP bordering nursery boundary

An aerial photo is useful for mapping large nurseries

Who should scout?

Anyone can be a scout but it is very important the person is properly trained and understands exactly what they are looking for

Maybe someone with an interest in plant pathology or a related subject

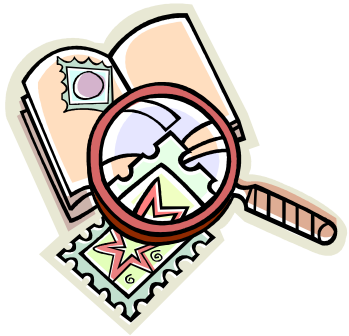
Establish a calendar

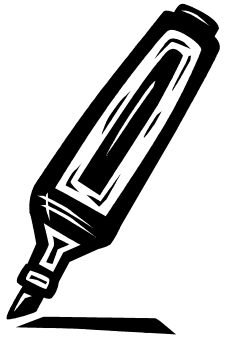
If there is more than one scout it is advisable to have a designated area for each of them:

- Each area will be scouted in the same manner
- Changes in plant material will stick out more
- Time can be saved when the same person monitors an area
- Keeping a regular schedule for scouting will be easier to maintain

Useful items for the scouting tool kit

- Pocket knife and pruners to collect samples
- Hand lens
- Counter
- Flagging
- Forms to record data
- Camera





Sample Collection

- ELISA kits
  - Document results with scout information
- Lab samples
  - Plant
  - Water
  - Media
- Make sure the scouts understand the correct procedures for lab submission

Documentation

Recordkeeping can create a history report for the nursery

- Can help with planning the scout calendar
- Problem areas can be corrected

Notes can be taken for other sanitation issues

- Leaf debris
- Garbage
- Insects
- Standing water

What to look for

- Problem areas
- Insect and other pests
- Weeds
- Diseases

Diseases

- It is often too late to control diseases when symptoms are apparent, but preventive action can be taken so the problem does not occur in the future
- Isolate or destroy diseased plants so healthy ones don't become infected

Phyllosticta leaf spot on rhododendron

Some diseases are not a threat to your nursery

Others, particularly *Phytophthora*, can be very damaging

Beginning the scout process

Look at the big picture

Scan entire nursery area for an overview of the beds

You can identify areas that do not look normal

Most of the time the plants will be healthy

Areas where disease problems are likely to occur:

Areas of standing water

Leaky irrigation lines

Use your monitoring records to help predict where diseases are likely to be a problem, and fix those problems

The presence of slugs, snails, fungus gnats or algae is a good indicator of wet conditions, and also diseases like *Phytophthora*

Slugs and snails are damaging in their own right and some are invasive.

Weeds

Can contain pests and pathogens

Can be invasive