Plant problem diagnosis: a systematic approach

Huge diversity of plant and other enquiries

Many abiotic and biotic sources of problems
- Cultural
- Environmental
- Disease
- Insect
- Other biotic causes

Needed: a curriculum that gave a framework for diagnosis
A Systematic approach to diagnosing plant damage

Adapt the “systematic process” to gardens

http://horticulture.oregonstate.edu/system/files/onn130601.pdf

Oriental Arborvitae (Platycladus orientalis): Berckman’s Blight (Sennatosprium berckmansii)
Plant problem diagnosis

Flowering crabapple (Malus sp.): Scab (Venturia inaequalis)

1. Determine that a "real" problem exists
   - What are the characteristics of the plant?
   - How does it display them through the year?

Japanese Cedar (Cryptomeria japonica)
with Incense Cedar (Calocedrus decurrens)

2. What is the "population" of the plants?

Boxwood (Buxus sp.)
The "population" refers to the number of plants of the species of interest that are present.

Dwarf Alberta Spruce (Picea glauca 'Conica')

Boxwood (Buxus sempervirens), with Hebe (Hebe sp.)

Azalea cultivars (Rhododendron spp.): Powdery mildew (Erysiphe azaleae)

Kinnikinnick (Arctostaphylos uva-ursi)

3. And...how many of the plants are affected?
4. What is the pattern of damage within the population?

Red Alder (*Alnus rubra*)

**Normal**

**Uniform pattern**

1. Entire population uniformly affected

**Abnormal**

Usually the result of non-living, environmental causes

- Occurs over the entire population of plants, or discrete groups

Periwinkle (*Vinca minor*)

**Uniform pattern**

2. Same part of entire population affected

**Abnormal**

Arborvitae (*Thuja occidentalis*)
Uniform pattern = abiotic factors (non-living)

Random pattern = biotic factors (diseases/pests)

Noble Fir (Abies nobilis)

Kinnikinnick (Arctostaphylos uva-ursi); Black Root rot?

Turf; Cranefly (Tipula sp.) damage

Random pattern

- Occurs because of progressive spread of a living organism
Don’t overanalyze “uniform” versus “random”

5. What part or parts of the plant are affected?

Arborvitae (Thuja occidentalis) near La Grande, OR

Flowering Dogwood (Cornus florida)

What part or parts of the plant are affected?

Flowering Dogwood (Cornus florida)

Flowering Dogwood (Cornus florida)

Just leaves?

Manzanita (Arctostaphylos x media): Leaf gall aphid (Tamalia coweni)

Red Maple (Acer rubrum): Anthracnose (Kabatiella sp.)

Manzanita (Arctostaphylos x media): Leaf gall aphid (Tamalia coweni)

Red Maple (Acer rubrum): Anthracnose (Kabatiella sp.)

Leaves and fruit?

Apple (Malus sp): Scab (Venturia inaequalis)

Japanese Maple (Acer palmatum): Verticillium wilt (Verticillium dahliae)

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Twig or branch dieback?

Black walnut (*Juglans nigra*): Thousand Cankers Disease (*Goesmithia morbida*)

The whole plant?

Escallonia (*Escallonia sp.*)

The whole plant?

Deodar Cedar (*Cedrus deodara*)

6. What is the pattern of damage within the plant...

Normal
Abnormal Uniform pattern=abiotic factors (non-living)

Dwarf Alberta Spruce (Picea glauca 'Conica'): sunburn

Rhododendron (Rhododendron sp.): Nitrogen deficiency

Abnormal Random pattern=biotic factors (diseases/pests)

Rhododendron (Rhododendron sp.): Iron deficiency
7. What is the pattern on the plant part?

- Normal
- Abnormal

Uniform pattern = abiotic factors (non-living)

Dwarf Alberta Spruce ('Picea glauca 'Conica')

Weeping Cherry: ('Prunus sp. ')

Blueberry ('Vaccinium corymbosum'): drought stress
8. When did the symptoms appear?

Tomato (*Solanum lycopersicum*): blossom-end rot

Rhododendron (*Rhododendron sp.*): powdery mildew (*Erysiphe azaleae*)

Maple (*Acer sp.*): bladdergall mite (*Vasates quadripedes*)

Alstroemeria (*Alstroemeria sp.*): frost damage

Photo: Luanne Whitaker
Symptoms appear early in the year?

Rosemary (Rosmarinus officinalis): cold injury

Cherry Laurel (Prunus laurocerasus): Shothole (Thyrostroma carpophilum)

Symptoms appear later in the year

Flowering Dogwood (Cornus florida): heat stress?

Lilac (Syringa vulgaris): Powdery Mildew (Erysiphe syringae)

Symptoms appear after specific event

Birch (Betula sp.): exposure to phenoxy herbicide

9. Are the symptoms spreading, improving or constant?
Port Orford Cedar (Chamaecyparis lawsoniana): Phytophthora root rot (Phytophthora spp.)

Aspen (Populus tremuloides): Leaf scorch

Common Lilac (Syringa vulgaris)

Symptoms stay the same

Al嗉a Berries 'N Cream™
10. Are any signs of a pest present?

Damage from non-living factors will induce symptom development, but there will be no signs of a pest.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Problem</th>
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</thead>
<tbody>
<tr>
<td>Rhododendron (Rhododendron sp.)</td>
<td>Sunburn</td>
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<tr>
<td>Holly (Ilex sp.)</td>
<td>Leaf discoloration</td>
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<tr>
<td>Western Spicebush (Calycanthus occidentalis)</td>
<td>Leaf spots</td>
</tr>
<tr>
<td>Redbud (Cercis canadensis)</td>
<td>Leaf distortion due to phenoxy herbicide</td>
</tr>
<tr>
<td>European Pear (Pyrus communis)</td>
<td>Fruit distortion (likely true bug feeding)</td>
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</tbody>
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**Symptoms**: Physical characteristics of a problem expressed by the plant.

Include:
- wilting
- leaf discoloration
- leaf spots
- leaf distortion
- defoliation
- galls
- cankers
- rots/dieback
- “plant decline”
Fraser Photinia (Photinia x fraseri): defoliation by Leaf Spot (Diplocarpon mespili)

Birch (Betula sp.): gall

Forsythia (Forsythia sp.): Stem Gall (Pseudomonas savastanoi)

Oak (Quercus sp.): mite galls

Alder (Alnus rubra): cankers (undetermined cause)

Tomato (Lycopersicon esculentum): rot caused by Late Blight (Lycopersicon esculentum)

Kousa dogwood (Cornus kousa): Plant decline
**Signs: evidence of the actual causal agent**

**Diseases:**
- fungal fruiting bodies
- fungal mycelia

**Insects:**
- the insect itself
- boring holes or tunnels
- sawdust
- frass...

**Other...**
- rodent mounds/holes
- slug trails

Golden chain tree (**Laburnum x watereri**): aphids

**Signs: evidence of the actual causal agent**

Sunflower (**Helianthus annuus**): Sclerotinia wilt (**Sclerotinia sclerotiorum**)

Apple (**Malus domestica**): Rust (**Gymnosporangium sp.**)

Big-leaf maple (**Acer macrophyllum**): Tar spots (**Rhytisma punctatum**)

Apple (**Malus domestica**): Leaf roller (species undetermined)

Rhododendron (**Rhododendron sp.**): Azalea Lace Bug (**Stephanitis pyrioides**). 
Hebe (Hebe sp.): Meadow spittle bugs (Philaenus spumarius)

Rhododendron sp.: leaf notching due to root weevils

Colorado Blue Spruce (Picea pungens): White Pine weevil (Pissodes strobi)

Apple: (Malus domestica): frass of the Apple-and-thorn skeletonizer (Choristoneura arbutana)

Slug trails
Vole burrows

Some signs cannot be seen without magnification

Red raspberry (Rubus idaeus): RBDV

The End!