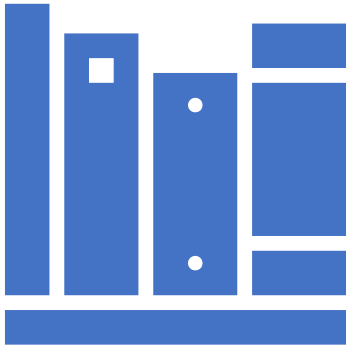


Landscape Plant Problem Diagnosis

2019 IPM Training Seminar for Landscape Professionals

Abiotic Causal Agents

Environmental

- Water deficit/excess
- Planting depth
- Sunburn/sunscald
- Light issues
- Pollution
- Aeration deficit
- Cold & hail injury

Mechanical

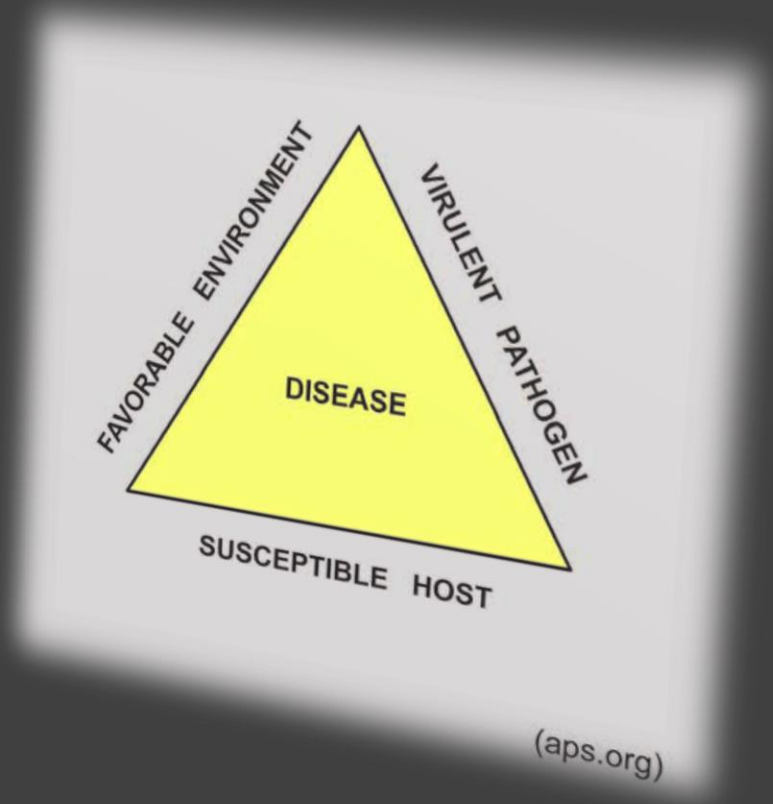
- Root & stem girdling
- Damage from equipment/vandalism
- Poor pruning cuts
- Poor staking
- Soil compaction
- Root injury

Chemical

- Nutrient deficit/ excess
- Pesticide/herbicide damage–accidental or deliberate
- Salinity

Biotic Causal Agents

- Fungal
- Bacterial
- Viral
- Insects
- Mites
- Nematodes
- Animals
- Snails/slugs




60 in


Ziploc
Easy Open Tabs
38
STORAGE
GALLON


Okularis


Sharpie
FINE POINT
Permanent Marker


Nikon
Nikon

Use systematic, investigative, question based process

?

Remedy & treatment plan

Plant

Site

Diagnosis

Testing

Research

Identify the plant

1

Liquidambar styraciflua ‘Variegata’

https://kiginursery.com/sweet-gum/liquidambar-styraciflua-variegata-variegated-sweet-gum/

Genus & species of the specific plant? Cultivar?

Origin?

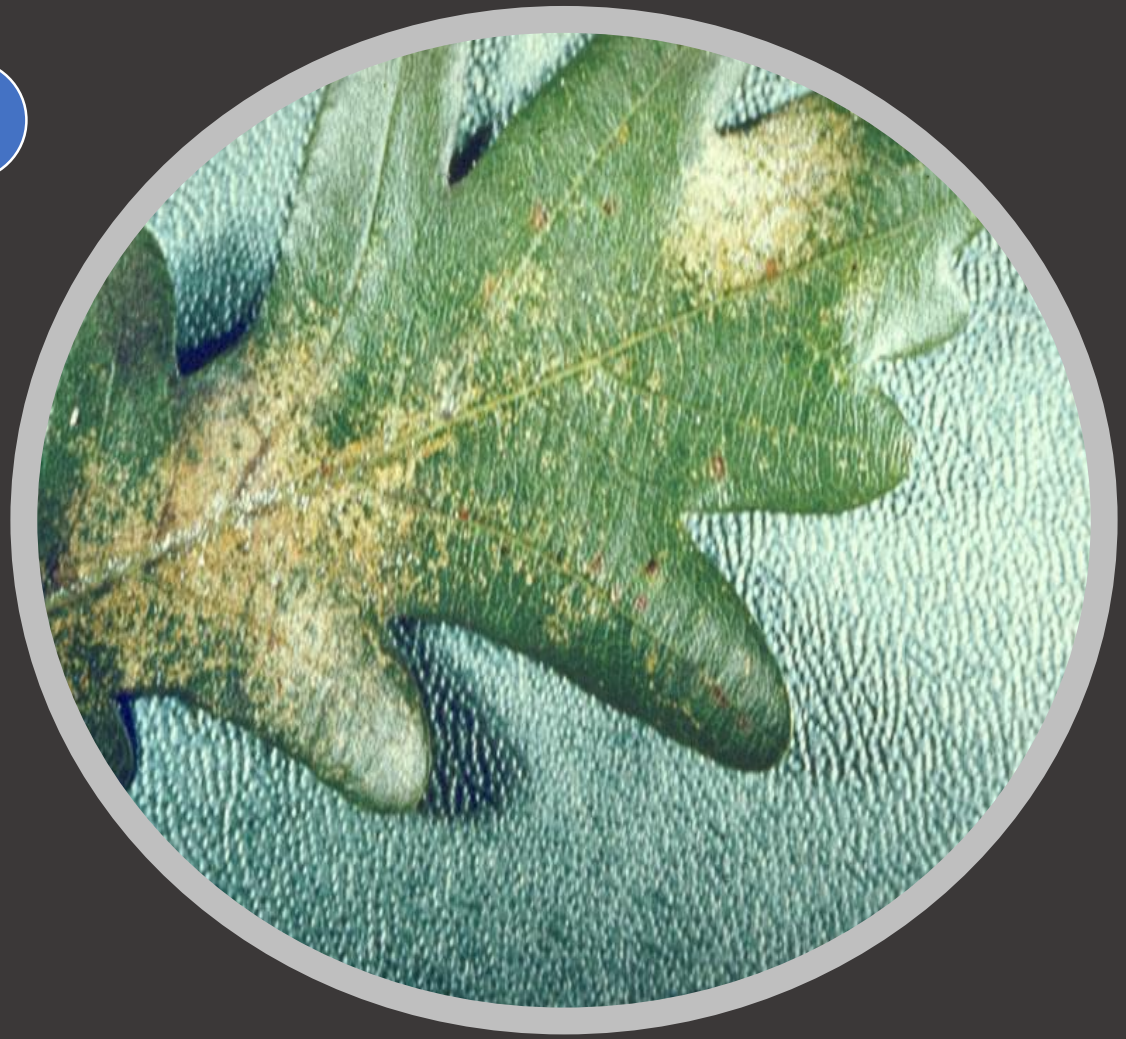
Normal appearance?

Are its cultural needs being met?

- Sun/shade
- Soil texture/pH
- Drainage
- Climate zone appropriate

Identify the symptoms

2



Spider mite damage on *Quercus*

John A. Weidhass, Virginia Polytechnic Institute and State University, Bugwood.org

Examine the affected portions

Describe symptoms using standard and consistent terminology.

Note the following:

Where are the symptoms located? Size, shape, color?

Example: Minute yellow stippling on upper leaf surface, esp. along veins

Inspect the entire plant

3

Magnesium deficiency on *Phoenix robelenii*

Examine whole plant, not just affected parts. ID overall symptoms.

- Trunk & root flare, roots if necessary
- Branches/stems/vascular tissue
- Canopy/shoots/leaves
- Flowers/fruit

Damage isolated to one part or distributed throughout plant/canopy?

Is plant size, growth rate and development normal?

Are physical signs present?

Tim Broschat, Symptoms of Palm Diseases and Disorders, USDA APHIS PPQ, Bugwood.org

Examples of Signs

Frass

Conks

Webbing

Cankers

Mines

Honeydew

Gummosis

Examples of Symptoms

Chlorosis

Necrosis

Wilt

Distortion

Blotch

Galls

Rot

Inspect and evaluate the site

4

Thoroughly examine growing environment

- Soil
  - Texture
  - pH
  - Drainage
  - Moisture levels
  - Compaction
- Soil coverings/mulch/amendment
- Hardscape and growth obstructions
- Microclimates
- Terrain/slope/low areas
- Irrigation type
- Surrounding plantings

Look for patterns

5

Verticillium wilt on *Cotinus coggygria*. Random branches dying, others healthy

Is damage on one side, one part, old growth, new growth, scattered? Is symptom isolated to an area with damage?

Is there a pattern within the environment? Low or high areas, wind, adjacent to infrastructure or hardscape?

Is damage uniform throughout plant or landscaped area?
Irregular patterns of different species?
Possibly abiotic

Is damage random throughout plant or tissue? Regular patterns of same species or family?
Possibly biotic

University of Illinois Plant Clinic, Home, Yard & Garden Pest, Issue 11, http://hyg.ipm.illinois.edu

Review plant maintenance & site history

6

Ask lots of questions! Be a keen observer

- Planting age, method, size at install
- Past maintenance practices–pruning, mulching, pest mgmt., etc.
- Chemical & fertilizer use – accidental/deliberate
- Irrigation duration & frequency
- Water source and quality
- Evidence of recent construction

Tree planted too deep, amendment added, on turf irrigation, small well

Condense field data

7 Synthesize information gathered in field
Look up susceptibility of species http://ipm.ucanr.edu/
Determine if likely causal agent is abiotic or biotic

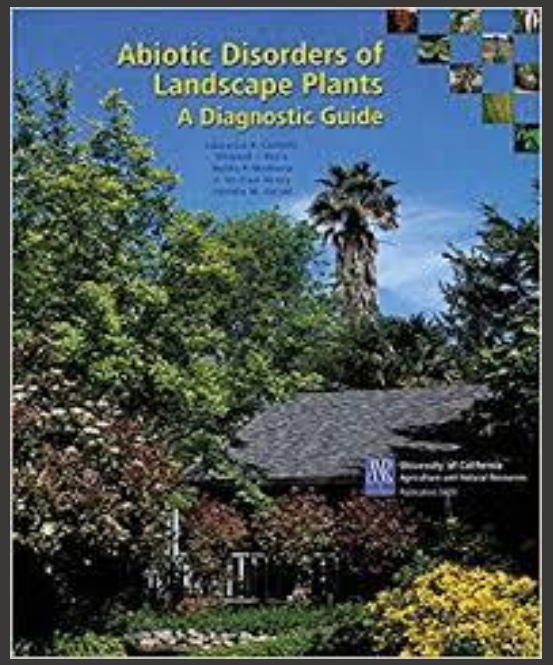
Damage uniform throughout plant or landscape. Irregular patterns of different species. Signs not present.

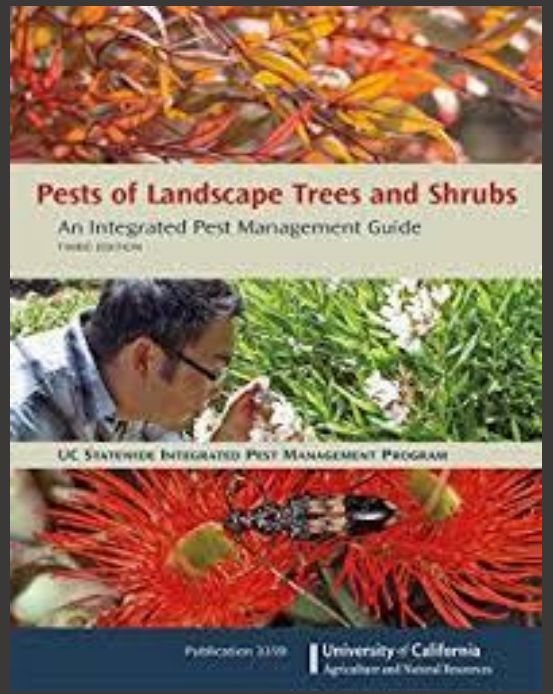
Possibly **Abiotic**

Damage random throughout plant or tissue. Regular patterns of same species or family. Signs may be present.

Possibly **Biotic**

Use diagnostic tables in abiotic or biotic book





Symptom	Possible cause	Pattern of symptoms	How to diagnose	Page
		Leaves, cont.		
Leaf necrosis	**B. Toxicity, cont.**			
	3. Herbicide (e.g., diuron, atrazine, dalapon, borates)	Sudden, overall symptoms affecting entire planting.	Determine possible herbicide category, and test.	188–192
	C. Severe iron deficiency	Overall, gradual development of symptoms on entire planting. Symptoms most severe on new growth. Tolerant species may not show damage.	Check for interveinal chlorosis.Test soil for carbonates, pH to determine if it is alkaline; test foliage for iron.	76–79, 118–119
Tip	**A. Air pollution**	Tip of young, expanding conifer needles turn red-brown, progressing to brown color.	Determine recent air quality and species sensitivity.	167–168
	B. High soil salinity	Overall, gradual development of symptoms on entire planting. Necrosis most severe on older leaves. Tolerant species may not show damage.	Test soil for salinity, chloride. Determine history of salt application for snow and ice control.	81–82
	C. High boron content	Overall, gradual development of symptoms on entire planting. Necrosis most severe on older leaves. Tolerant species may not show damage. May appear as small necrotic spots along margin rather than entire margin.	Test soil, irrigation water, and/or plant tissue for boron.	82
Blotch	**A. Water deficit** See "Leaves-Wilting-Water deficit."	See "Leaves-Wilting-Water deficit."	See "Leaves-Wilting-Water deficit."	52
	B. Too much sun for species	Sudden symptoms on outside of canopy affecting sun-sensitive plants. May start with yellowing on tips and margins of leaves.	Determine exposure, reflected heat, and plant tolerances. More severe when coupled with low soil moisture. May appear following pruning, removal of adjacent plant, or increased exposure.	142
	C. High temperature	Entire planting usually affected, especially heat-sensitive species. Symptoms develop suddenly. Plants with greatest sun and wind exposure, sow soil moisture show most severe symptoms.	Determine weather conditions.	139, 142
Spot	**A. Herbicide** (e.g., paraquat, bentazon, diphenyl-ethers, oxadiazon, diquat, fluazifop, cyclohexenone)	Sudden symptoms with greatest damage on outer leaves present at the time of exposure. Spots usually uniform in size, color, and distribution, with sharp margin.	Determine what herbicides have been used nearby. Submit leaf samples to laboratory for testing.	188–192
	B. Air pollution	Sudden or gradual symptom development, depending on level and type of pollutants. Affects entire planting of sensitive species.	Determine recent air quality and species sensitivity.	167–168
Interveinal	**A. Air pollution**	Sudden or gradual symptom development, depending on level and type of pollutants. Affects entire planting of sensitive species.	Determine recent air quality and species sensitivity.	167–168

Symptom	Possible cause	Pattern of symptoms	How to diagnose	Page
		Shoots		
Wilting and/or dieback	**A. Water deficit** See "Leaves-Wilting-Water deficit."	See "Leaves-Wilting-Water deficit."	See "Leaves-Wilting-Water deficit."	52
	B. Low temperature: Frost	Sudden, overall symptoms on young shoots of all cold-sensitive species in planting.	Determine recent temperatures.	133–134
	C. Gas release in soil (leaks, landfill)	Overall, gradual wilting and dieback of young shoots of all plants in affected area. Some species more sensitive than others.	Check soil for foul odor and blue-gray or black color. Test soil atmosphere for gas. Cut into root and trunk tissue to check for blue or brown streaks in wood.	163–165
	D. Soil aeration deficit 1. Flooding, poor drainage, high water table, overirrigation	Gradual development of symptoms affecting entire planting. Some species may be more sensitive than others.	Use soil probe or shovel to check moisture and color of soil. Blue or gray color and foul smell indicate anaerobic conditions.	60–65
	2. Fill soil over roots, compacted soil	Gradual development of symptoms affecting entire planting. Some species may be more sensitive than others.	Excavate soil at base of plant to determine depth to original trunk flare.	63–66
Distortion	**A. Herbicide** (e.g., thiocarbamates, 2,4-D, dicamba, glyphosate, dalapon)	Symptoms on new growth throughout planting.	Thiocarbamates are applied to soil; submit soil samples to laboratory for testing. 2,4-D and dicamba may be in fertilizers and weed control mixtures applied to turf.	188–192
	B. Fasciation	Symptoms usually on only one or a few branches, and only one plant.	Abnormal flattening and coiling of stem due to mutation in cell.	36, 49
Witches' broom	**A. Cell mutation**	Symptoms usually on only one or a few branches, and only one plant.	Eliminate other causes.	49
	B. Herbicide (e.g., glyphosate)	New growth develops with deformation of young leaves and proliferation of new buds without elongation. All plants within treated area affected.	Determine what chemicals have been applied. Glyphosate injury may not be seen until spring following fall application.	188–192
		Branches, Trunk		
Sunken, discolored bark	**Sunburn or sunscald**	Symptoms on portions of trunk exposed to afternoon sun.	Check for cracked and loose bark only on the southwest side of trunk; location is generally diagnostic.	139–140, 144–145
Wound-wood formation	**A. Mechanical damage or failure**	Isolated area at point of impact or injury. Gradual development.	Inspect plant for damage.	181–185
	B. Sunburn or sunscald	Symptoms on portions of trunk exposed to afternoon sun.	Check for cracked and loose bark only on the southwest side of trunk; location is generally diagnostic.	139–140, 144–145

Ligustrum spp. (continued)

WHAT THE PROBLEM LOOKS LIKE	PROBABLE CAUSE	COMMENTS
Leaves chewed. Plant can be extensively defoliated.	**Indian walking stick**. Brown, twiglike insects up to 4 inches long, easily overlooked.	In California in at least the Central and South Coast. *See* 166.
Twigs distorted, swollen, and pitted. Leaves dwarfed. Shoots may die back.	**Pit-making pittosporum scale**, *Planchonia* (=*Asterolecanium*) *arabidis*. Brown to white insects, ≤1/8 inch long, on twigs, often in pits.	In California, an occasional problem in the north. Management not investigated. *See* similar Oak Pit Scales, 198.
Liquidambar spp., Liquidambar, Sweet gum		
Limbs drop, usually during or after hot weather.	**Summer limb drop**. Abiotic disorders caused by tree injury or stress, such as drought.	Protect trees from injury. Provide good growing conditions and appropriate cultural care. Have tree inspected by arborist.
Leaves discolor and wilt. Branches or treetop dying. Branches may canker or exude reddish pitch.	**Botryosphaeria canker and dieback**. Fungus primarily affects injured or drought-stressed trees.	Provide proper irrigation. *See* 98.
Leaves turn yellow then brown. Upper canopy dies back. Entire plant dies rapidly or slowly over several years.	**Bacterial leaf scorch,** or **Oleander leaf scorch**. Bacteria spread by certain leafhoppers, especially glassy-winged sharpshooter.	*See* 112.
Dieback of leaves, twigs, and limbs, progressively.	**Dieback**. Unexplained malady resembling dieback from Botryosphaeria canker.	Occurs at least in Marin County. Frequency and severity of symptoms vary greatly year-to-year.
Bark exudes white, frothy material, often around wounds, has pleasant odor.	**Foamy canker**. Unidentified cause, possibly a bacterium.	Foamy material appears for only short time during warm weather. *See* 101.
Bark may have lesions that are dark, dry, crusty whitish, oily looking, or water-soaked. Foliage yellows and wilts. Branches or entire plant dies.	**Fusarium dieback**. Fungal disease spread by the polyphagous shothole borer, an ambrosia beetle, or bark beetle.	Occurs at least in southern California. *See* 115.
Leaves may discolor, wilt, and drop prematurely. Bark may have bracketlike or fan-shaped fungal fruiting bodies. Branches or plant may die. Trees may fall over.	**Wood decay**, or **Heart rot**, including *Ganoderma* spp., *Schizophyllum commune*, *Stereum* spp., *Trametes* spp. Fungi that attack injured, old, or stressed trees.	*See* 66, 111.
Leaves with dark or discolored blotches. Leaves may drop prematurely.	**Leaf spots**, including *Cercospora* spp. Fungi favored by wet conditions.	*See* 86.
Sticky honeydew and blackish sooty mold on foliage. Trees may decline and eventually die.	**Calico scale**. Adults globular, black with white or yellow spots.	Can be a serious pest on liquidambar. *See* 193.
Chewed foliage. Webbing or tents on branch terminals.	**Fall webworm**. Larvae white to yellow, hairy, ≤1 inch long.	*See* 152.
Leaves chewed, may be tied with silk. Plant may be defoliated.	**Fruittree leafroller, Tussock moths**. Larvae green or hairy, ≤1 1/2 inches long.	*See* 149–152.
Chewed foliage. Typically only single branches are defoliated.	**Redhumped caterpillar**. Larvae ≤1 inch long, with red head, body yellowish with reddish and black stripes.	*See* 150.
Foliage may be notched around margins. Some roots stripped of bark or girdled near soil. Young trees may wilt or die.	**Black vine weevil**. Adults are black or grayish snout beetles, about 3/8 inch long. Larvae are white grubs with brown head.	Larvae feed on roots. Adults hide during day and feed at night. *See* 160.
Liriodendron tulipifera, Tulip tree, Tulip poplar, Yellow poplar		
Leaves wilt, discolor, and may drop prematurely. Branches die back. Entire tree may die. May be white fungus beneath basal trunk bark.	**Armillaria root disease**. Fungus present in many soils. Favored by warm, wet soil. Persists for years in infected roots.	*See* 120.
Leaves discolor, stunt, wilt, or drop prematurely, often on one side of plant. Stem xylem discolored. Stems or entire plant may die.	**Verticillium wilt**. Fungus persists in soil, infects through roots.	*See* 117.

Hedera spp. (continued)

WHAT THE PROBLEM LOOKS LIKE	PROBABLE CAUSE	COMMENTS
Plant has sticky honeydew, blackish sooty mold, and whitish cast skins. Foliage may yellow.	**Aphids**, including **Bean aphid; Green peach aphid; Ivy aphid**, *Aphis hederae*. Small pear-shaped insects, often green, yellowish, or blackish.	*See* 175.
Plant has sticky honeydew, blackish sooty mold, and cottony material (egg sacs). Foliage may yellow.	**Grape mealybug**, *Pseudococcus maritimus*. Oval, soft, powdery, waxy insects, ≤1/8 inch long.	*See* Mealybugs, 185.
Foliage has sticky honeydew and blackish sooty mold. Leaves may yellow and wither. Tiny, whitish, mothlike adult insects.	**Whiteflies**, including **Citrus whitefly**. Oval, flattened, translucent, yellow to greenish nymphs and pupae.	*See* 182.
Leaves chewed. Foliage may be rolled or tied together with silk.	**Omnivorous looper**. Tan to brownish adult moths and yellow, green, or pink larvae, ≤1 1/2 inches long, with green, yellow, or black stripes.	*See* 150.
Foliage or shoots chewed, ragged, or clipped. May be slimy or silvery trails on or around plants.	**Snails**. Mollusks move slowly on slimy, muscular foot and have a spiraled shell.	*See* 251.
Leaves chewed. Plant can be extensively defoliated.	**Indian walking stick**. Brown, twiglike insects up to 4 inches long, easily overlooked.	In California in at least the Central and South Coast. *See* 166.
Heteromeles arbutifolia, Toyon, Christmas berry		
Sudden wilting, then shriveling and blackening of shoots and blossoms. Plants appear scorched.	**Fire blight**. Bacteria enter plants through blossoms.	*See* 84.
Leaves with brown, light green, yellow, or dead spots or blotches. Twigs and stems may canker, ooze, or die back.	**Ramorum blight**, *Phytophthora ramorum*. Pathogen spreads via airborne spores and contaminated plants and soil.	Primarily a problem in wildlands, killing many oaks there. *See* Sudden Oak Death and Ramorum Blight, 105.
Foliage discolored, wilted, stunted, drops prematurely. Discolored bark may ooze sap. Branches or plant may die.	**Phytophthora root and crown rot**, *P. cactorum*. Pathogen favored by excess irrigation and poor drainage.	*See* 122.
Tiny, reddish to brown leaf spots, may have yellow halos. Larger, dark areas on leaves. Leaves may drop prematurely.	**Entomosporium leaf spot**. A fungal disease promoted by wet foliage.	*See* 87.
Dark scabby or velvety spots on leaves or fruit.	**Scab**, *Spilocaea photinicola*. Fungal disease promoted by moist spring.	*See* 88.
Foliage may discolor and wilt. Dieback of branches or entire plant.	**Pacific flatheaded borer**. Whitish larvae with enlarged head in tunnels.	*See* 227.
Terminal leaves severely curled and twisted. Damage occurs early in season.	**Toyon thrips**, *Rhyncothrips ilex*. Tiny, slender, black (adult) and orangish (immature) insects in new terminals.	Insect has one annual generation. Tolerate damage. Keeping soil bare beneath plants may reduce damage. *See* 209.
Stippled, bleached leaves with varnishlike specks on undersides.	**Greenhouse thrips**. Tiny, slender, black adults or yellowish nymphs.	*See* 210.
Stippled, bleached leaves with varnishlike specks on undersides.	**Lace bugs**, *Corythucha* spp. Adults ≤1/8 inch long, wings lacy. Nymphs spiny.	*See* 207.
Sticky honeydew and blackish sooty mold on leaves and twigs. Tiny, white, mothlike insects (adults) present.	**Ash whitefly; Crown whitefly; Iridescent whitefly**, *Aleuroparadoxus iridescens*. Tiny, oval, flattened nymphs, often white wax on fringe or back.	Conserve natural enemies, no other control generally recommended, plants tolerate. *See* Whiteflies, 182.
Sticky honeydew and blackish sooty mold on foliage. Possible plant decline or dieback.	**European fruit lecanium**. Brown to yellow, flat or bulbous, immobile scale insects on leaves and twigs.	*See* Lecanium Scales, 195.
Chewed leaves. May be silken tents or mats of silk in plant.	**Western tent caterpillar, Western tussock moth**. Hairy caterpillars, ≤2 inches long, dark or colorful.	*See* 151–152.

Samples and testing

8

County Ag. Dept., area Extension Office, private lab. Follow their instructions for sampling, labeling, storage, transport

Research! Read! .edu sites

If needed, confirm your diagnosis with lab testing.

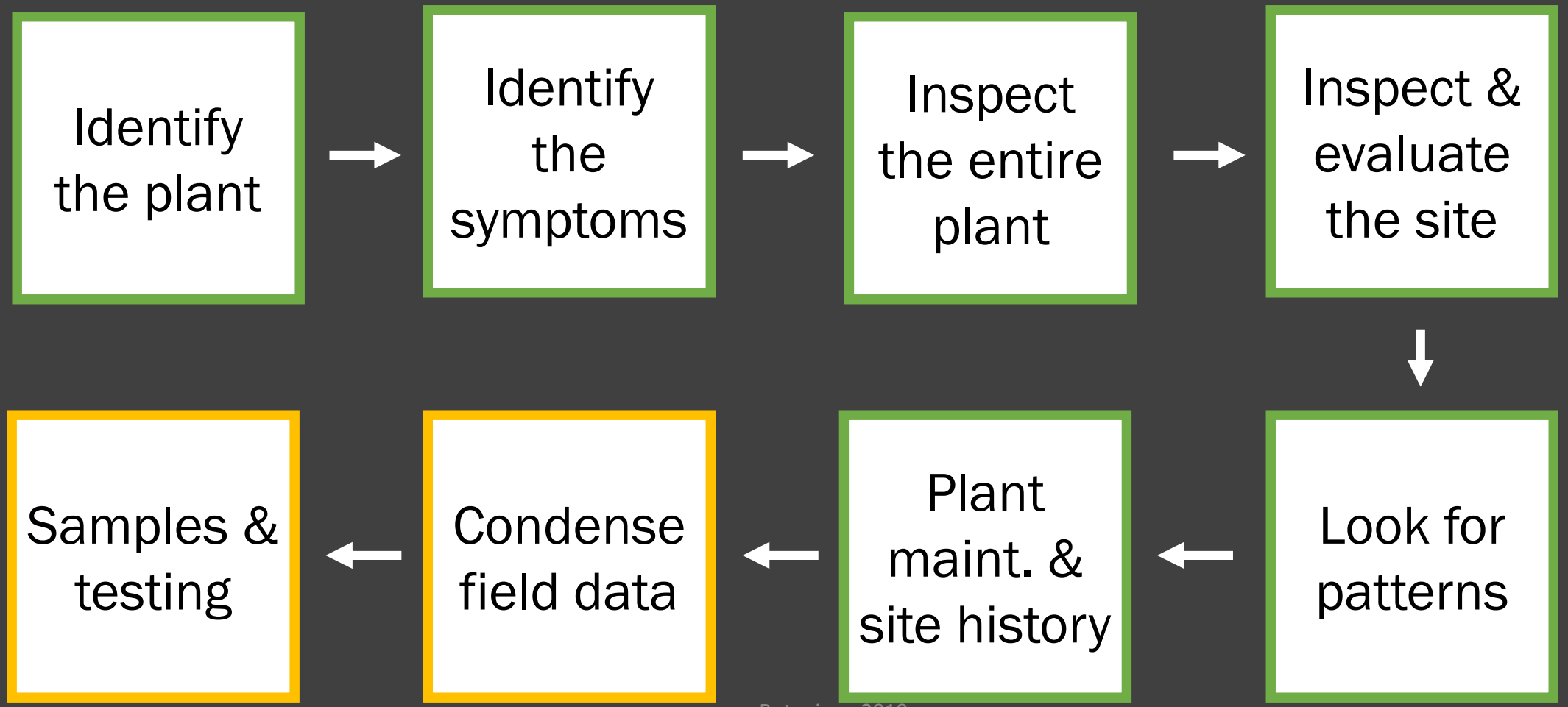
Plant tissue – diseases, nutrient deficiency/excess

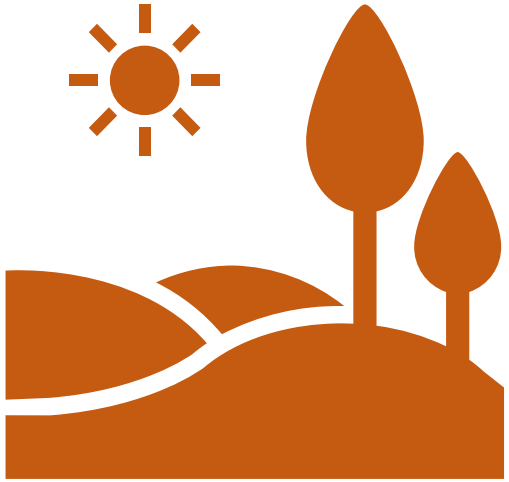
Water – salinity, nutrient deficiency/excess

Soil – pH, texture, OM %, nutrient issues

Insects for ID

8 DIAGNOSTIC STEPS



Questions? Thank you