

Tree Diagnosis and Plant Disorders : Objectives

- Be able to distinguish between plant problems caused by living and nonliving disorders.
- Understand the principles of a systematic approach to the plant diagnostic process.
- Explain how stress can weaken a tree, predisposing it to additional problems.
- Learn to recognize the signs and symptoms of tree disorders.
- Learn the various physiological disorders and injuries that can affect trees, and learn what treatments are appropriate.
- Become familiar with various types of insect and disease problems and their impact on trees.

Tree Diagnosis and Plant Disorders

- Diagnosing plant problems requires a combination of knowledge, experience and keen observation.
- Usually diagnosis is not simply identifying a disease or insect.
- Diseases and insect problems are usually secondary, and occur on weakened trees.
- Diagnosis is often the first step, followed by making the appropriate recommendations.

General Diagnosis

- The history of the tree and its environment is of the utmost importance.
- How long? Early symptoms? Construction, excavation, chemical treatments?
- Plant health problems can be categorized into two major groups: biotic & abiotic.

Diagnosis is a systematic process that involves gathering information, keen observation and logical analysis.

1. **Accurately identify the plant species.** Knowing the plant can limit the number of suspected causes (host specificity).
2. **Look for a pattern of abnormality.** Comparisons between an affected tree and a healthy species can help. Non-uniform damage can be indicative of biotic agents. Abiotic damage may have a clear border or occur uniformly over a large area or on several plant species.
3. **Carefully examine the site.** Check the contour and note structures present.
4. **Note the color, size and thickness of the foliage.** Many disorders become apparent in the leaves.

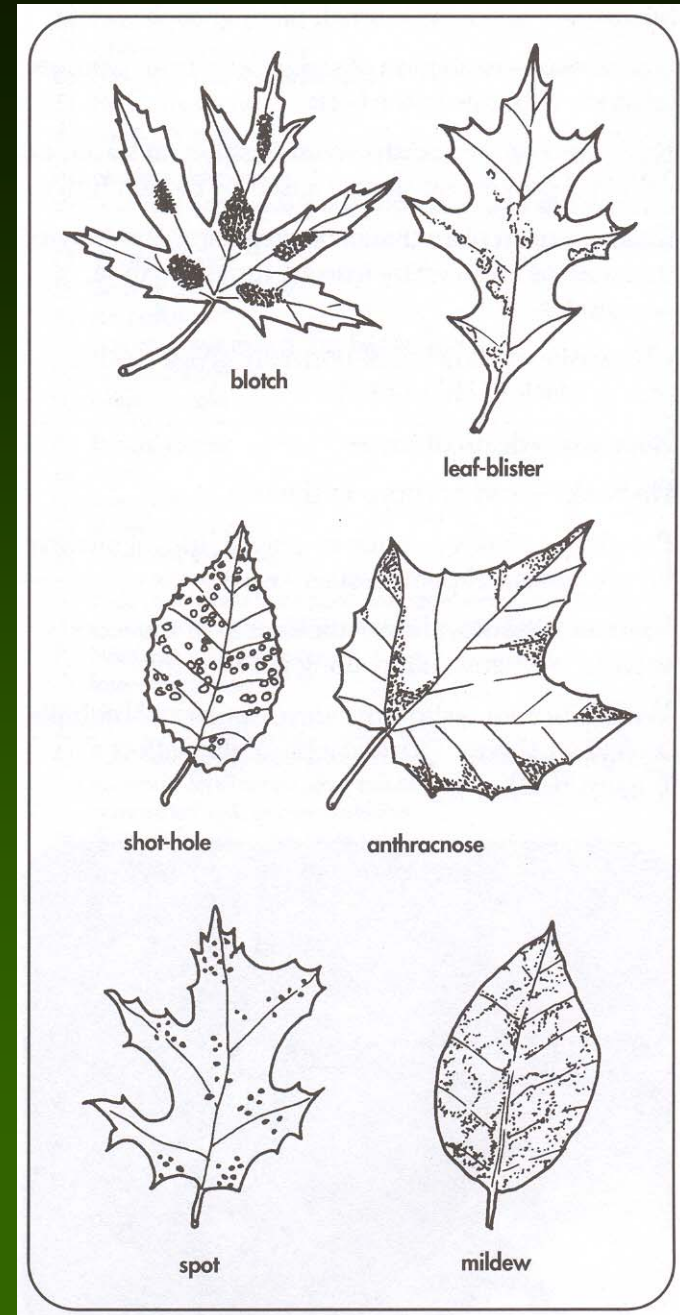
General Diagnosis Continued

5. **Check the trunk and branches.** Wounds provide entrances for canker and wood-rotting organisms. Small holes may indicate borers or bark beetles. Watersprouts may indicate a variety of stresses.

 6. **Examine the roots and root collar.** Stress caused by poor site conditions, bad planting practices and human-made site changes or management practices account for most of the initial plant health care problems in urban sites. White vs. brown vs. black root colors.
- ▶ 70-90% of all plant problems result from adverse cultural and environmental conditions such as soil compaction, drought, moisture fluctuations, temperature extremes, mechanical injuries or poor species selection. Usually the cause of plant problems is a combination or complex of nonliving stresses and living contributors.

Symptoms and Signs

- Symptoms are effects of the causal agents that are apparent on the tree, or how the tree responds to the disorder.
- A problem can rarely be diagnosed by a single symptom.
- Signs are direct indications of primary or secondary causal agents, or something “left behind” by the agent.
- Patterns of damage on the foliage can indicate the possible cause of the tree’s problems.
- Many symptoms are nonspecific and must be analyzed in combination with specific information about the tree and the site.



- Diagnostic guide for landscape plants exhibiting nonspecific symptoms.

SYMPTOMS	POSSIBLE CAUSES
1. Brown or scorched leaves; progressive dieback of branches	A) Poor root health from poor drainage, excessive soil dryness, excessive fertilizer, compaction, and poor water penetration into soils or girdling roots B) Specific nutrient toxicities or imbalances C) Excessive heat or light reflected onto leaves from driveway or buildings D) Pesticide or mechanical injury E) Air pollution. F) Winter drying G) Vascular fungal or bacterial infection
2. Leaf spots, blotches, blemishes, blisters, or scabby spots	A) Excessive soil dryness coupled with high temperatures B) Frost injury C) Chemical spray injury D) Fungal or bacterial infections E) Herbicide injury F) Insect damage
3. Foliage yellow-green	A) Nutrient deficiencies B) Poor root health due to compacted soil, poor drainage, or girdling roots C) Winter drying D) Root or crown injury E) Air pollution F) Soil pH lower than 5.0 or higher than 8.0 G) Herbicide injury H) Mites or scale
4. Foliage of one branch dying	A) Fungal canker B) Injury C) Insect damage D) Winter damage E) Chemical spray injury
5. Leaf drop	A) Poor root health from poor drainage, excessive dryness, excessive fertilizer, compacted soil, or girdling roots B) Heat and drought stress C) Insect infestation D) Herbicide injury
6. Wilting or drooping of foliage	A) Poor root health from poor drainage, excessive dryness, excessive fertilizer or other soluble salts in the soil, compacted soil, or overwatering B) Toxic chemical poured into soil C) Fungal or bacterial infection of vascular system D) Fungal cankers E) Insect infestation
7. Leaves with tiny yellow speckling or yellow banding of needles	A) Mite infestation B) Air pollution C) Insect infestation D) Fungal or bacterial infection
8. Deformed or misshapen leaves	A) Herbicide injury B) Late frost or freeze C) Insect infestation D) Anthracnose E) Spray injury

To more correctly determine causes of landscape problems, compile lists or sets of symptoms. Look for specific symptoms associated with these nonspecific symptoms.

Tree Stress

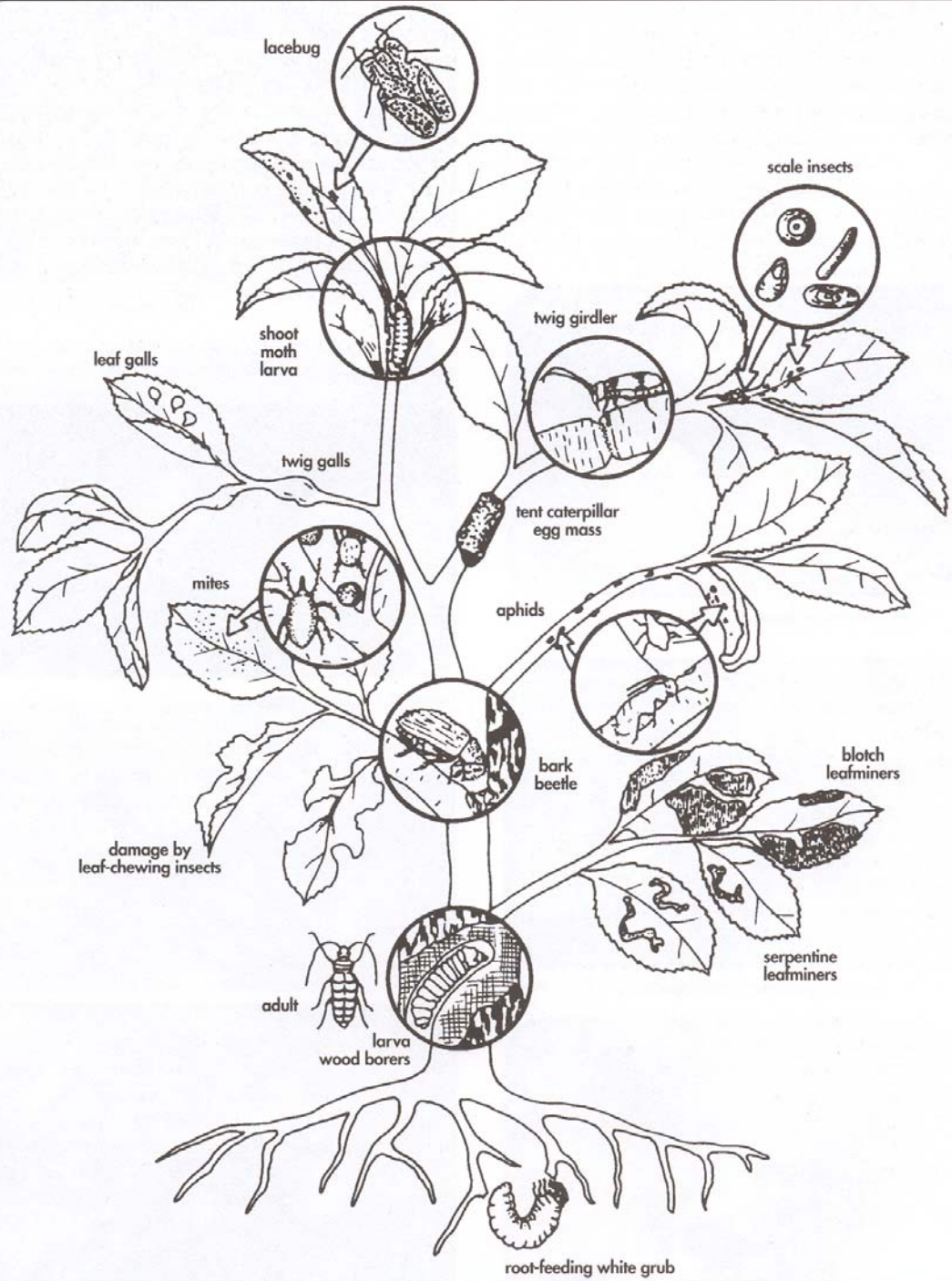
- Stress is a term used to describe any condition that causes a decline in tree health.
- Water, temperature, light and minerals are all needed in a proper balance to promote plant health.
- Acute stress occurs suddenly and causes almost immediate damage.
- Chronic stress takes a longer time to affect plant health.
- The most common causes are site and environment related.
- Stress can sometimes be reversed.

Abiotic Disorders

- Many agents of abiotic disorders are primary stress factors and are often the first stage in the mortality spiral.
- Soil and site problems – planting problems, soil compaction.
- Physical and mechanical injuries – occur relatively fast and the full extent of the injuries cannot be immediately assessed.
- Temperature extremes – high or low. Sunscald and frost cracks.
- Competition and allelopathy – light and nutrient competition. Allelopathy is the chemical inhibition of growth and development of one plant by another.
- Pollution damage – acute toxicity occurs with exposure to high concentrations over a relatively short period of time. Chronic injury is due to longer exposures to lower concentrations. Sulfur dioxide, fluoride, ozone, peroxyacetyl nitrates (PAN).
- Chemical injury – herbicides, especially systemic ones.

Biotic Disorders – Insects and Other Pests

- Some insects are host specific.
- Knowledge of the insect's life cycle is important in identification and treatment.
- It is critical to know the amount of damage that can be tolerated.
- Most damage is from feeding or egg-laying.
- Feeding damage is characterized by the type of mouthparts the insect has.
- Chewing insects: caterpillars, webworms, beetles, weevils, Eastern tent caterpillars, cankerworm, leafminers, borers.
- Piercing and sucking insects: aphids, adelgids, leafhoppers, true bugs, scales, mites.
- Some insects can be vectors: Dutch elm disease.



Biotic Disorders – Nematodes

- Nematodes are microscopic roundworms.
- There are hundreds of species and not all are plant parasites.
- Nematodes are important in natural nutrient cycling.
- Pathogenic nematodes enter through roots, wounds, stomata or even directly through the plant cells.
- Nematode feeding can cause swelling, deformation of plant parts, blockage of vascular tissue and death.

Biotic Disorders – Diseases

- Four requirements are necessary for a tree disease to become serious: a susceptible host, a pathogenic organism, an environment suitable for disease development and the right timing.
- Site of infection can be indicative of the severity of the disease.
- The vast majority of disease is caused by fungi.
- Bacteria (fire-blight, crown gall).
- Viruses (ring spot, some stunt diseases).
- Control of disease is best done through prevention.

Getting Laboratory Assistance

- Diagnostic labs can isolate pathogens, identify pests and provide information about potential problems of the season.
- A detailed description of the problem, the host plant and the surrounding conditions should accompany the sample.
- The real problem is rarely a simple matter of isolating a fungus or identifying a pest.
- Plant disease diagnostic laboratories:
<http://www.ca.uky.edu/agcollege/plantpathology/PPAExten/ppPDDL.htm>
- Submitting plant specimens for disease diagnosis:
<http://www.ca.uky.edu/agc/pubs/ppa/ppa9/ppa9.htm>