GARDENING SERIES

Colorado MASTER GARDENER

Diagnosing Tree Disorders 7.881

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Outline. . .

Colorado State University Cooperative Extension

Putting Knowledge to Work

Skills Essential to the Diagnostic Process

Judiciously examine the tree – Many homeowners have a difficult time describing their plants and plant problems. For example, the description "leaves are yellow" is so generic that nothing can be diagnosed without more details. When it comes to insects, a typical homeowner says they have "black bugs". What do they mean by "bug"? Are they saying they have a black insect? This is so generic that no diagnosis is possible without additional details.

Read – Part of the diagnostic process is to read, comparing the symptoms and signs of the problems with details in references. No one can remember it all.

Ask questions – Diagnosis requires extensive two-way conversations. Often the horticulturist trying to diagnose the problem has not been on site and has to rely on a description. In this situation, diagnosis is difficult to impossible. Even with good samples or when visiting the site, questions about the care of the plant, history of the site and progression of symptoms are needed in the diagnostic process.

Practice – Diagnostics is far more than some knowledge that can be read in a book. The diagnostic process requires the integration of years of gardening wisdom and knowledge. It is learned by practice.

Patients – Diagnosing plant disorders is a process, not a simple answer to a question. It takes time and patience to work the process. Never jump at answers just because it seems easy. Never guess. Rather, take the time to work the process, asking lots of questions.

In pest management, the first step is to diagnose the problem and then discuss management options. Homeowners often jump to the management question without diagnosing the problem. Because management options are pest specific, correct diagnosis of the problems must be completed before management can be discussed.

Steps in the Diagnostic and Management Process

Diagnosis

1. Identify the plant.
2. Identify the problem(s)
   a. Define the problem by describing the signs and symptoms.
   b. Distinguish between possible causes by comparing signs and symptoms with details in reference information.
   c. Determine probable cause(s) through comparison and elimination.

Management

3. Evaluate damage/stress potential
    a. What type of damage/stress does this disorder/pest cause?
    b. Under what situations are management efforts warranted?
4. Evaluate management options effective for this disorder/pest and when they apply.

Step 1 – Identify the Plant

There are hundreds of insects and diseases that attack landscape plants in Colorado. Additionally, only 15 to 25 percent of landscape plant problems have biotic (insect or disease) causes. Once the plant is correctly identified, the list of potential insects and diseases that attack the specific plant drops to a few.

Often, homeowners can't correctly identify plants in their yard. Many can't tell Maples from Ash, Elm or Honeylocust. Few can distinguish between pine, spruce, fir and Douglas-fir.

As CMG volunteers, we need to start the diagnostic process by identifying the plant. When the client says they have a Maple (for example), work the process as a Maple; but keep in mind that the plant ID could be wrong. If things don't readily match up in the diagnostic process, backup and verify the plant identification.

Step 2 – Identify the Problem(s)

Step 2a – Define the problem by describing the *signs* and *symptoms*.

Take a close look at the plant and surroundings. A detailed description of the problem is essential for diagnosis. In situations where we can't work with the details, diagnosis cannot be complete. Many landscape problems can't be diagnosed!

Symptoms are changes in the plant's growth or appearance in response to the causal factors.

Signs are the presence of the actual organism or direct evidence of the casual factors.

Terminology used to describe common *symptoms* include:

Blight – A rapid discoloration and death of twigs, foliage or flowers.

Canker – Dead area on bark or stem, often sunken or raised.

Chlorosis – yellowing – Chlorosis is so generic that without additional details diagnosis is impossible.

Decline – Progressive decrease in plant vigor.

Dieback – Progressive death of shot, branch or root starting at the tip

Gall or **gall-like** – Abnormal localized swelling or enlargement of plant part. Could be caused by insects, mites, diseases, or abiotic disorders.

Gummosis – Exudation of gum or sap

Leaf distortion – The leaf is twisted, cupped, rolled, or otherwise deformed

Leaf scorch – Burning along the leaf margin and into the leaf from the margin

Leaf spot – A spot or lesion on leaf

Necrosis – dead tissue – Necrotic areas are also so generic that without additional details, diagnosis is impossible.

Perennial canker – A canker that enlarges annually

Vascular discoloration – Dark streaking in vascular tissues

Wilt – General wilting of the plant or plant part.

Witches broom – Abnormal broom-like growth of many weak shoots

Terminology used to describe *signs* include:

Fruiting bodies – Reproductive structures of fungi; could be in the form of mushrooms, puffballs, pycnidia, rusts or conks.

Insects and **mites** are common signs.

Mycelium – A mass of fungal threads (hyphae) on the plant surface.

Rhizomorphs – Shoestring-like fungal threads found under the bark of stress and dying trees caused by the *Armillaria* fungi. They may glow!

Slime Flux or Ooze – A bacterial discharge that oozes out of the plant tissues, may be gooey or a dried mass.

Define What's Normal Versus Abnormal

It's common for homeowners to suddenly observe normal characteristics of a plant and mistakenly attribute it to an insect or disease. For example, on evergreens:

- Needle problems and dieback on the *new needles at the branch tip* is abnormal.
- *Dropping of older needles from the inside of the tree* is normal. The number of years that needles are retained is a factor of plant genetics and stress. Under stress, needles may drop sooner.

Other examples of "normal" often confused as problems include:

- Fuzz on underside of leaves
- Male pollen cones on pine or spruce are mistaken for insects or disease
- Less conspicuous fruit, such as juniper berries
- Mushrooms
- Bluegrass going to seed
- Spores on the underside of fern fronds
- Flowers and fruit on potatoes (potato fruit look like cherry tomatoes)
- Tomatoes dropping blossoms after a cool night
- Male squash blossoms
- June drop of apples and other fruit
- Aerial roots on tomatoes
- Seed stalk on rhubarb and onions

Steps to Systematically Evaluate a Tree

Sometimes we are given only an insects or a leaf sample from a tree. Other times we need to systematically evaluate the entire tree as part of the diagnostic process. Professional arborists use a formal process in tree evaluation.

1. **Macro-look at tree**
   - Walk completely around the tree looking for things that stand out. These may be clues for other steps. For example, decline from the top down is typical of root problems and/or drought. Give extra attention to the soil and roots in step 3.
   - To get an understanding of tree vigor, look at several branches around the tree and compare twig length between the annual growth rings for recent years. Determine what's typical for each year, not what's longest or shortest. Significant changes in annual growth clues years where stress factors occurred and is a great indication if stress levels are improving or getting worse.
2. **Macro-look at surroundings** – Insects and diseases are often host specific. If symptoms are found on a variety of plants, it suggests abiotic disorders. Abiotic problems (like soil compaction) may also affect surrounding plants. How's the lawn under the tree doing? It shares the same soil problems.
3. **Soil and rooting area** – Soil problems contribute to 80 percent of the problems in the landscape. While we can't see the root system, other clues will help evaluate the root system. Examples of things to look for include:

- How is the lawn doing? It shares the same soil growth limiting factors.
- Push a screwdriver into the soil. Being easy or hard to push into a moist soil provides an estimation of soil compaction.
- With a soil probe, take some cores from the rooting area. It may indicate issues about soil texture changes and rooting.
- Surface roots indicate soil compaction or wet soils as the roots develop closer to the surface where oxygen is available.
- The lack of a trunk flare suggests that the tree was planted too deep or that soil has been added over the root system.
- Girdling roots can lead to root decline (starvation). Girdling roots often result from planting too deep in a narrow planting hole.

4. **Trunk** – Things to look for include:
   - Cankers that go into the ground are always actively growing
   - "Lawn mower decline" (bark damage at ground level from lawn mowers) is common in many landscapes. If the bark is removed down to the wood, more than 50 percent around the tree, the tree is considered to have no value.
   - Cankers are symptoms of internal decay. Look for evidence of decay in large size pruning cut. A drum-like hollow sound when the trunk is tapped with a wood mallet is a symptom of extensive internal decay.
   - Ridges and valleys along the trunk are symptoms of internal problems and decay.
   - Borer exit holes indicate stress issues.
5. **Major branches** (scaffold branches or secondary trunks) – Things to look for include:
   - Cankers
   - Evidence of storm damage (indicates the possibility of internal decay)
   - Borer exit holes indicates stress issues
6. **Minor branches and limbs** – Things to look for include:
   - Scale and other twig insects
   - Borer exit holes indicate stress issues
   - Cankers
   - Galls
7. **Foliage** – Things to look for include:
   - Leaf spots and other foliage diseases – typically more serious on the lower inner foliage where humidity is higher.
   - Leaf feeding insects
   - Leaf sucking insects and mites
   - Galls
   - Leaf scorch and dieback from the top down is a symptom of root problems and/or drought.
   - Leaf scorch on a specific side suggests abiotic disorders coming from that side.

Step 2b – Distinguish between possible causes by comparing the signs and symptoms observed with descriptions in reference materials.

The reading will often send you back to the tree to look at more details.

A key in the back of the Colorado State University Cooperative Extension publication *Insects and Diseases of Woody Plants* makes this step easy for insects and diseases of landscape trees. The key is very good for most insects and fair for diseases (diseases are hard to describe in a few words). It does NOT include abiotic disorders.

Step 2c – Determine probable cause(s) through comparison and elimination.

When the description of the disorder matches the details in the reference materials, diagnosis is complete. If often care reading of fine details. When things don't match, backup. Is the plant correctly identified? Work through the process again paying attention to details missed.

If you are using *Insects and Diseases of Woody Plants*, remember that it is good for insects, fair for diseases and does not include abiotic disorders. Abiotic disorders are generally more difficult, if not impossible, to diagnose. Abiotic disorders occur in 75 to 85 percent of the time and often predispose the tree to insects and diseases.

Step 3 – Evaluate Damage/Stress Potential

Step 3a – What type of damage/stress does this disorder/pest cause?

The primary question here is to determine if the disorder/pest is only cosmetic, adds stress to the tree or is potentially life threatening. This may vary on the general health of the tree before the disorder/pest started.

Step 3b – Under what type of situations would management efforts be warranted?

On healthy stress-free trees, most insect and disease problems are only cosmetic. However, trees under stress are much less tolerant of addition stress factors.

Aphids on shade trees are generally only cosmetic and normally don't warrant management efforts, unless they become a nuisance (like dripping honeydew on the car or patio table). However, under a water stress situation (due to drought, dry site, or non-established newly planting) the aphid feeding adds to the water needs of the tree creating a potentially serious stress issue. With water stress, mechanical (hosing off the tree with water), bionaturals (adding beneficials to feed on the aphids) or insecticidal management efforts would be warranted to protect the tree.

As a rule-of-thumb for leaf chewing insects, healthy trees can tolerate the lost of 1/3 of the total leafing surface before stress become a management issue. Tolerance is much less for trees with growth limiting factors such as poor soil tilth, limited rooting space, dry non-irrigated sites, previous defoliation, etc.

However, predicting the potential population for a caterpillar or sawfly larva is difficult to impossible. Generally speaking, populations rarely remove more than 1/3 of the leafing area. However, outbreaks of some pests could leave the tree leafless.

Evergreens are much less tolerant since the needles last for multiple years. For example, a sawfly larva outbreak that takes off all the new needles will have an impact over multiple years; this will bring a healthy tree to threshold where management is warranted.

Step 4 – Evaluate management *options* effective for this disorder/pest and when are they applied.

Management options may take many forms or directions. For example, on many insect pests, hosing off the tree with a strong force of water may be an effective mechanical option. In other situations, an insecticide may be needed.

Management efforts may take the approach of dealing with soil issues, such as lawn aeration to reduce soil compaction issues around a tree.

Other management efforts may go in the direction of irrigating a dry site during hot dry weather or reducing the over-watering with better irrigation system design and management.

Management options are far more than just spraying an organic insecticide. On trees, less than 4 percent of the insect pests warrant insecticides.

Timing of management effort is another important consideration. Often times, the effective spray window is past before the pest is observed.

Ask Questions and Gather Information

Some disorders can't be diagnosed. We can only complete a diagnosis when detailed information is available. Generic descriptions, like "yellow leaves" or "poor growth" are inadequate!

Diagnosis must be done in context of the tree's environment. For example, is the tree in a routinely-watered lawn or a site with limited irrigation? Does the site have an open area for root spread or is the root system limited by poor soils or hardscape features?

For example, a client calls with concerns that a tree looks wilted. Does it need more water? After asking question, the context is that the tree is located in a construction site and most of the root system is cut. Understanding the context of the root damage is essential to address the watering issue.

Questions asked may not reflect the real issues. Homeowners frequently don't know what questions to ask. In the diagnostic process, CMG volunteers must often help frame questions as well as answers. For example, in the situation above about the tree in the construction site, an important question is the stability of the tree to wind since most of the roots have been cut.

A tool in diagnosing trees is to visualize the tree, that is to paint a mental picture of the tree and surroundings. As you paint the picture, ask questions for details. Every detail must be verified. For example, don't paint a nice green lawn until it's verified with questions. Painting creates a long list of questions to help bring forth the details needed for diagnosis. Explaining to the caller that you are trying to paint a mental picture of the tree encourages them to more patiently provide the needed information.

In working with clients, repeat back in your own words their descriptions. This helps clear up miscommunications about symptoms.

In working with clients, verbally state how you rule out possible causes. This helps the client move on with you and may clarify miscommunication about symptoms.

As previously stated, diagnosis is not possible when generic symptoms are all we have to work with.

Management should only be addressed AFTER the diagnosis is complete. Since disorders generally arise from a combination of factors, management must look at predisposing factors and inciting factors in the management discussion. For details on predisposing, inciting and contributing factors (the *PIC Cycle*) refer to Colorado State University Cooperative Extension Fact Sheet 7.860, *Plant Health Care*.

Colorado Master Gardener training is made possible, in part, by a grant from the Colorado Garden Show, Inc.

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