A2510

Shade trees disorder: Decline, dieback, or early senescence

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"Decline" is a general term that describes deterioration in a tree's crown or an overall reduction of tree vigor. It encompasses a variety of symptoms and has many specific causes. Although "decline" and "dieback" often are used as synonyms, decline refers more often to an overall reduction in vigor, with uniform symptoms throughout the crown. Dieback indicates more localized symptoms, with healthy branches adjacent to dead or dying ones.

Symptoms and effects

Trees of all ages may be affected, but decline and dieback usually happen to trees of significant size and maturity. Symptoms develop slowly and subtly, and affected trees may survive indefinitely. But they may die within a year or two after the first symptoms are noted.

The crowns of affected trees often thin out. Terminal branch growth becomes limited, and branches may die, beginning at the top of the tree and progressing downward. Leaf scorch (the browning of leaf edges) frequently accompanies the syndrome, too. However, leaf scorch symptoms can result from minor problems, as when the tree loses more water than its roots can take up.

Three characteristics of this tree indicate decline: sparse foliage, leaves in tufts, and branch dieback.

This tree's early fall color and leaf drop indicate that it is in decline. Compare it to the fully green trees in the background and to the left.

Decline and dieback may cause premature fall coloration and leaf drop, or "early senescence." This condition becomes progressively worse each season as leaves become smaller and fewer. This is typical of maple decline. Abnormally large seed crops sometimes are associated with decline, but occasional heavy seed crops are not necessarily detrimental.

If you are concerned with declining maples, consult Extension publication *Maple Decline: Collar Rot and Basal Canker Complex* (A2532).

Cause

A variety of factors can cause decline or dieback. Affected trees require careful examination for proper diagnosis and treatment. The primary causes of tree decline include:

- Any physical injury
- Construction injuries such as root cutting and soil fill
- Significant bark damage
- Soil compaction
- Drought
- Changes in the underground water table
- Gas injury
- Repeated defoliation
- Root girdling
- Graft union failures
- Fertility problems
- Herbicide injury
- Salt injury (See Extension publication *Salt Injury to Landscape Plants* [A2970])
- Fungal root and trunk rots (See Extension publication *Oak and Numerous Other Species Disorder: Armillaria Root Rot* [A2542])

Decline and dieback can occur under many conditions, but certain situations are especially amenable. Construction damage, wherever it occurs, often leads to slow tree death. Oak trees are probably more vulnerable to construction damage than any other tree. Moisture changes have also caused tree troubles throughout the state. The record rainfall in 1971 and 1972, for example, saturated the heavy soils of southeast Wisconsin. Oaks and some other trees declined severely for the following two years. In contrast, drought severely damaged many trees in 1976. By 1977, maples and other trees appeared "stagheaded"; many subsequently died. The 1988 drought had similar effects.

Accumulating evidence suggests that fungi cause Wisconsin's most persistent decline problem—the sugar maple decline found in urban areas—by affecting trees' lower trunks and buttress roots. In fact, root damage precedes most instances of decline or dieback. First the root system deteriorates or is blocked, then crown injury becomes obvious. Mineral deficiencies, pollutants, or serious depletion of sugars through severe and sustained leaf damage also can induce decline and dieback. Before you conclude that root deterioration, mineral deficiency, pollutants, or defoliation has caused decline, eliminate leaf disorders such as scorch and anthracnose, and vascular diseases such as Verticillium wilt as possible causes.

Examination procedure

Accurate diagnosis of the causes of decline and dieback usually requires on-site examination of the entire diseased tree. This allows inspection for trunk and root problems and assessment of environmental factors. Laboratory examination of diseased branch or leaf specimens may confirm that a general decline problem exists, but only rarely can it pinpoint the cause. In some cases, precise diagnosis cannot be made without sacrificing the tree so that the root system and trunk interior can be thoroughly examined.

These steps may help determine the cause of tree decline:

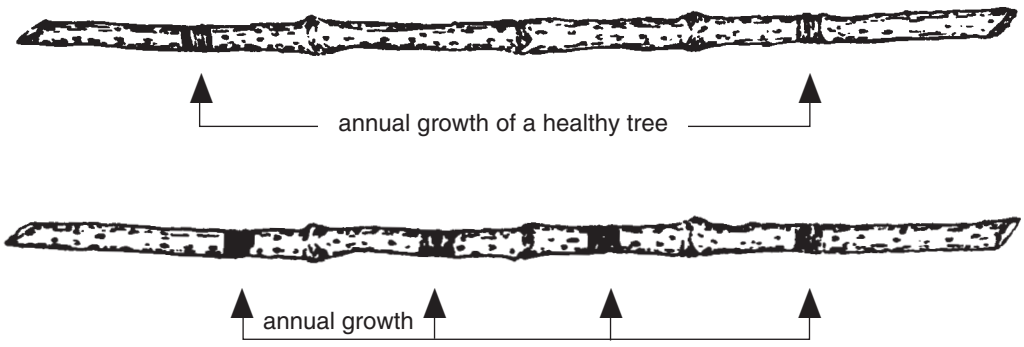
1. Consider the tree's recent life history: Has severe and repeated defoliation from hail, insects, or foliage disease occurred? Have severe drought or other adverse weather factors affected the tree? Has there been construction work near the tree in recent years causing soil compaction, soil deterioration, or damage to roots or stem? Has there been soil or root removal? Has the water table in the area changed? Has there been soil fill? If you don't know, observe whether the trunk flares at the soil line, as is normal. Soil above the buttress roots should not be deeper than 3 inches.
2. Examine adjacent vegetation: Is there any evidence of injury to surrounding vegetation that suggests a general environmental or toxic condition?
3. Consider chemical treatments to the tree or nearby: What is the history of pesticide use, particularly herbicides?

4. Consider other sources of toxins: Is there a sewage disposal field or gas leak near the root system?
5. Consider salt use patterns: Is the tree's root system subject to salt accumulation from ice control along adjacent roads or sidewalks?
6. Examine leaves for foliage insects or diseases.
7. Eliminate the possibility of vascular diseases such as oak wilt, Verticillium wilt or Dutch elm disease by considering the pattern of symptom development and examining for internal sapwood coloration.
8. Determine the normal period of tree stress by examining the tree's growth characteristics. If possible, examine the growth of annual rings over the last several years with an increment borer and check the pattern of annual branch elongation to determine whether growth has slowed or stopped.
9. Examine branches and trunk for extensive cankering that may be the cause, or may be developing in association with the problem.
10. Examine trunks and buttress roots for any evidence of injury such as sunscald or mower injury. Look for loose bark by tapping the bark and exposed roots. Listen carefully for the tell-tale hollow or dull sounds when you tap. Look for mushrooms or other fruiting structures of root-decaying fungi especially during the spring or fall.
11. By careful excavation, examine the root system for evidence of fungal decays, girdling roots or similar problems.

Control

If possible, determine a specific cause for the disorder and take action to control it. Prevent decline in trees that are now healthy by taking the following preventative or corrective measures.

- Maintain tree vigor. Fertilize your trees occasionally and water them often during droughts. Do not fertilize or water them in late summer or early fall, as such treatments could delay dormancy. You should apply fertilizer in the spring but may also do so in late fall after leaf drop.
- Avoid changes in soil grade around the tree. Soil fill will induce dessication, reduce soil aeration, and lead to root invasion by decay organisms. Soil removal will also remove roots and inflict injuries that increase the chance of root and trunk rot. If fill is absolutely necessary, be aware that the tree will suffer and may subsequently die. Follow recommended procedures of establishing trunk and root wells to minimize injury.
- If the soil is compacted, loosen it to provide aeration.
- Prevent wounds. Avoid pruning so severely that the crown opens excessively and increases trunk exposure. Do as much of your pruning as possible when branches are still small because smaller wounds will heal much faster and more completely than larger ones. Wrap young maple trunks to reduce sunscald and forest cracks. Repair all wounds properly and promptly by making clean cuts between diseased and healthy tissue.



The lower branch shows the slowed growth of a stressed tree.

- If decline symptoms appear and no specific cause can be determined, try fertilizing and watering the tree. Judicious pruning may also reduce the stress on the root system and encourage renewed vigor. To avoid transmitting disease-causing organisms, thoroughly clean and disinfect tools before using them on another tree. Wood alcohol is a satisfactory disinfectant.
- If trees have been defoliated recently by insects, hail or disease, take extra precautions to prevent repeated defoliation or injury. Most established trees tolerate one defoliation. Repeated defoliations during the same or the succeeding year may cause fatal decline. Consequently, foliage insects and diseases—even those normally of minimal concern except for their effect on the tree's appearance—should be controlled as completely as is practical.

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