

# PLANT HEALTH CARE REPORT

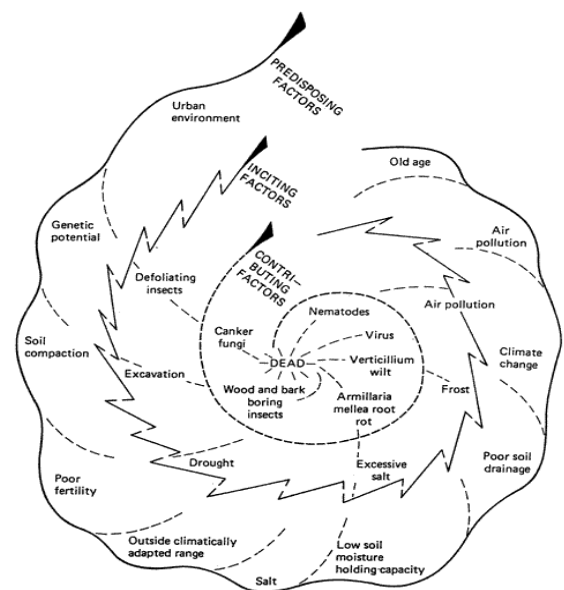


## Declining Tree

Mature trees decline when their limited energy supply is diverted from storage and growth to surviving multiple stresses, resulting in energy use that outpaces energy gain. While typically caused by a combination of factors, decline usually begins with a long-term stress. Also called a predisposing factor (see figure at right), examples in an urban site include limited rooting environment, soil compaction, or moisture stress.

If an inciting factor (or short-term stress) develops, the tree, already low on reserves, must expend additional energy in defense. Examples of inciting factors are a defoliating or boring insect, construction damage, salt injury, or an early frost. A healthy tree with energy reserves can overcome one of these stresses. However, a mature tree that has been defending against a long-term problem may not be able to recover. Mounting a defense redirects energy away from maintaining leaves and rejuvenating fine roots and when these two important functions are impeded, the ability to photosynthesize is reduced, and the decline spiral accelerates.

If conditions are not greatly improved at this point, the tree eventually dies. The period of decline may be short or long depending on the tree species, location, and factors involved with the decline. Generally, if a tree has more than 35% to 50% crown dieback from a decline syndrome, it cannot be saved.



[1] Paul Manion's disease decline spiral illustrates the predisposing, inciting, and contributing factors that lead to tree decline and death

## Observe symptoms

Early symptoms of decline are hard to detect because most long-term problems first affect the tree belowground. Drought, improper soil conditions, and construction damage can cause an overall loss in the number and health of fine roots. These smallest roots (< 2 mm diameter) absorb most of the water and nutrients. Beneficial fungi associations with these fine roots (mycorrhizae) can also degenerate. Mycorrhizae benefit the tree by protecting roots from disease and increasing the efficiency of water and nutrient uptake. When the roots and mycorrhizae are weakened, root-disease or decay fungi may successfully attack.



Eastern white pines with thin canopies. Competition for resources and climate change are predisposing factors; drought is an inciting factor in their decline

Early, aboveground symptoms include a reduction in twig elongation (length) and stem diameter growth and a lighter green color (chlorosis) in the leaves during the summer. Early fall coloration when compared to other trees of the same species, a later-than-normal flushing of new leaves in the spring, and a heavier than normal production of seed are common in stressed trees.

As the decline spiral deepens, symptoms become more noticeable. Often, twigs die during the winter and do not leaf out or candle (conifers) in the spring, resulting in twig dieback throughout the crown. Since there are fewer leaves to produce energy to keep the larger lower branches healthy, the branches begin to die. If the tree has a good year, it may produce sprouts at the edge of the healthy portion of the branch. Watersprouts and tufted growth are indicators of a history of decline.

## Diagnose and treat problems

An accurate diagnosis of factors involved in the decline is the first step toward treatment. If the predisposing factors of decline are known, the diagnosis should concentrate on the other factors involved such as secondary borers or cankers.

For trees where neither the initial cause nor secondary factors are known, a qualified arborist should follow a broader diagnostic procedure:

1. Take a soil sample for analysis to measure nutrients, pH, drainage and compaction. These soil factors are leading factors of decline.
  2. Take a root sample for evaluation of root diseases caused by *Armillaria*, *Phytophthora*, and nematodes.
  3. Perform a tree risk assessment.
  4. Diagnose aboveground problems, including recent site changes. Some pests may be identified in the field while others will need to be sampled for laboratory diagnosis.
- Accurate diagnosis is essential for proper treatment.

When the specific problem is identified, it should be targeted for treatment. If insect defoliators are present, they should be managed; if *Phytophthora* root rot is present, the saturated site conditions should be corrected and the soil treated. If severe soil compaction is identified, the soil in the root zone should be loosened and amended to encourage new root growth.



A declining European beech with a significant root and stem defect and wood decay. Actions taken to reduce soil compaction and risk of human injury and to improve soil moisture and tree vitality include 1) roping off access 2) widening the mulch area 3) supplemental irrigation

## Prevent disorders

In many cases, the soil can be treated to improve conditions for root growth and prevent long-term stress.

1. Mulch with 2–4” of wood chips from near the stem to near the dripline to moderate soil conditions, protect root collar, conserve moisture, and prevent further compaction.
2. Fertilize according to a soil analysis. Slow-release nitrogen fertilizer will increase root density. Inoculate low-fertility soils with mycorrhizae. The combination of fertilizer and mycorrhizae has been shown to double or triple fine root density.
3. Improve soil moisture. If a permanent irrigation system is not present, install soaker hoses within the mulch layer to provide water during droughts.
4. Apply a tree growth regulator, a chemical that inhibits elongation of the new twigs, to redirect energy from twig elongation to other parts of the tree.

5. Remove dead, dying, diseased, and broken branches to promote health. Prune declining trees lightly, minimizing live branch removal.

Decline of mature trees is caused by a combination of factors. It is important to identify these factors and treat them as soon as possible. Preventive programs that increase root growth are usually very beneficial for declining trees.

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[1] Paul D. Manion, *Tree Disease Concepts*, 2nd ed. Englewood Cliffs, New Jersey: Prentice-Hall, 1991.