



Landscaping Committee Doverbrook Association

Maple Decline Symptoms

Leaf Scorch:

Maple leaves often show a browning or drying at the outer margin of the leaf or in the areas between the veins in mid to late summer. The areas near the veins generally remain green; however in extreme cases the entire leaf may dry and fall prematurely. This may lead to scorch caused when leaves lose water more rapidly than moisture can be replaced from the soil. This can be caused by too little water in the soil or a physical restriction of the root.

The symptoms of leaf scorch usually appear during hot, dry, windy weather. Trees growing along streets or in areas where the roots are restricted seem to suffer most. Scorch itself seldom kills a tree, but may weaken it to the point where insects or disease can further injure it. Leaf scorch is best controlled by deep watering during dry periods.

Girdling Roots:

If a tree shows symptoms of poor vigor such as small leaves, death of small limbs, top dieback or leaf scorch, the condition could be due to a girdling root. This problem occurs when a root entwines around another large root or the base of the tree and prevents or hinders water and nutrient movement. Often the girdling root occurs below ground level, indicated by a lack of root flare at the base of the trunk, but can only be confirmed by careful digging around the base of the tree. Norway maple is often affected by girdling roots.

Not all girdling roots need correcting. Only if the tree shows a decrease in vigor should action be taken. Remove the portion of the root that is girdling the tree; the open wound can then be treated with wound paint prior to covering with soil. Fertilization of the tree after root removal will help recovery. The use of proper planting techniques, especially making the hole large enough to accommodate the roots, will minimize the likelihood of girdling roots.

Salt Injury:

Damage to street side maples can often be attributed to the use of de-icing salts. Symptoms can vary from marginal leaf browning (similar to scorch) to yellowing of leaves to branch dieback. The problem is often more severe on sugar maple than the other maples. Trees near intersections or on major streets where greater amounts of salt are applied or low areas where run-off water collects will often show the most injury.

Salt damage results from two sources. Windblown spray from passing automobiles causes most damage to the lower branches of the tree, while salt uptake by roots from run-off water is usually evident in the upper portion of the tree. Soil tests seldom show excessive salt concentrations, as

salt leaches readily from the soil. The best indicator is chemical analysis of the foliage where excessive chloride concentrations will usually be associated with de-icing salt injury.

Salt damage on existing trees is difficult to control as long as the practice of applying salt to the roadway continues. Future plantings made 30 feet away from the roadside will have less injury. The use of sand and the more judicious use of salt is the best long-term solution.

Nutrient Imbalances:

Street and yard trees often grow in soil that has been disturbed by construction. Such soil may not contain the proper nutrients necessary for tree growth, or the pH of the soil may not allow nutrients to be taken up by trees. Likewise, leaves are often removed from the soil each year, giving the tree little chance to change the soil conditions. The trees may look fine for years and then suddenly show the effects of lack of growth nutrients.

A characteristic symptom of nutrient problems is a yellowing of the leaf while the areas along the veins remain green. Other symptoms can be marginal leaf browning, smaller leaves and reduced twig growth.

Nutrients lacking in the tree are often present in the soil but are not readily available to the plant because of high soil pH. Application of soil amendments such as sulfur to lower the pH often gives promising results, but is difficult and expensive over a large area. Improvement has also been found with the application of foliar nutrients; however, when the leaves fall, most of the fertilizer falls, too, and the application must be repeated yearly. Trunk implantation of fertilizer capsules has also given excellent results, although this too is probably a short-term solution. As with most tree problems, proper care and maintenance of a tree throughout its life will lessen the likelihood of nutrient problems. When planting in poor soil, use trees tolerant of a wider variety of soil conditions.

Soil Compaction and Paving:

Maple tree decline can often be attributed to soil compaction and paving. Areas around driveways and along non-curbed streets are often used for parking, causing considerable soil compaction beneath trees. If a tree is completely surrounded by a paved area, there is little room for water and air exchange in the soil, resulting in a buildup of carbon dioxide. This condition is especially critical if the paving was done after the tree had already established its root system. Symptoms of soil compaction and paving include marginal browning of leaves, twig dieback, summertime yellowing of leaves and smaller leaf size. These symptoms are often similar to girdling roots and construction damage. Frequently, more than one of these conditions exist on an individual tree. The effects of pavement are difficult to correct without removing the pavement for a distance of at least 8 feet from the base of the tree. Sidewalk and curb construction damage can be decreased by fertilization prior to root damage so that the tree is growing vigorously when the roots are cut. If soils are compacted, aeration and fertilization will help the tree recover. The source of compaction must be eliminated for long-term recovery.

OTHER FACTORS CONTRIBUTING TO DECLINING MAPLES:

In addition to the most common environmental problems already discussed, there are additional factors that can stress trees:

A. Grade Changes

Soil fill on top of root systems of living trees can cause serious damage. As little as 4 to 6 inches of fill can be damaging to some maples and other tree species. The typical symptoms of fill damage are yellowing of foliage and branch dieback. These symptoms may not be expressed until several years after the grade change was made. There are ways to fill around trees without causing serious damage, such as using coarse gravel for the lower fill under the topsoil. The use of a well around the trunk can be helpful to the tree as well. Soil removal around trees is also damaging because very little soil can be removed without root destruction; delayed symptom expression is again common. Terracing is one way to avoid removing large quantities of soil.

B. Frost and Wind Damage

Leaves can be damaged in late spring by frosts. Young leaves may suddenly turn brown or black several days after a frost, or the edges of the leaves may curl. If the leaves are not killed, they often are left with jagged open spaces similar to feeding holes made by certain insects.

Wind damage may also appear on young leaves, especially on newly transplanted trees. Symptoms of wind damage are also jagged, torn leaves not unlike some insect damage to leaves. Little can be done to control wind and frost injury. Most trees will recover if they have been well maintained and are in good health.

C. Herbicide Damage

Trees in lawns occasionally show a leaf curl and distortion from indiscriminate use of herbicides. Combinations of fertilizers and weed killers, or weed killers alone, should be avoided under the canopy of trees, as they can cause serious damage or defoliation of trees. In some circumstances, misuse of herbicides can kill trees. If damage is already evident, a thorough watering and fertilization is the best way to promote recovery.

D. Diseases

There are several maple diseases that may cause symptoms similar to those caused by adverse environmental conditions. Verticillium wilt, a fungal disease, can cause a sudden wilting and dying of branches; in a mild form the only symptoms may be poor vigor and sparse growth. The wood of affected plants often shows gray to olive-green streaks when the bark is peeled from recently affected limbs. Positive identification, however, can be made only by laboratory tests.

Anthracnose is distinguishable from scorch because the browning occurs along the veins or in irregular areas on the leaf, while scorch occurs along the leaf margin. Anthracnose occurs during cool, wet spring weather, and scorch generally occurs during hot, dry summer weather.

There are several root and butt rots that can cause branch dieback and leaf browning. There may be loose bark at the base of the tree under which strands of a fungus can be found, or there may be fruiting bodies (mushrooms) or a fungus present at the base of the tree. Once infected, little can be done to control these rots, but trees kept in a healthy, vigorous condition are less likely to be infected. Care should be taken to avoid wounding trees, which provides openings where rot fungi can enter.

Additional Considerations:

Soil Conditions

Sugar maples grow optimally in well-drained, acid soil that is neither too wet nor too dry. They respond negatively to soil compaction or exposure to salt. Since urban and suburban soil is usually non-acidic, highly compacted from construction, and contaminated with road salts, sugar maples do poorly in these areas. But sugar maple decline also can be seen in more natural environments. Many authors have looked for correlations between areas of decline and the nutritional statuses of the trees and soil. For example, Drohan et al. (2002) found that foliage from declining plots had significantly lower base cations (K, Ca, and Mg) and higher Mn as compared to that from non-declining plots. Soils in declining plots had lower base cations and pH, a Ca:Al ratio of less than or equal to 1, lower percent clay, and higher percent sand and rock fragments than soils on non-declining plots. Declining sugar maple plots in their study occurred at higher elevations on sandstone-dominated geologies. Soils were found to be base poor-sandy soils that contained high percentages of rock fragments. Soils below 50 cm on declining plots had lower soil pH and foliar chemistry indicative lower foliar base cations. Mohamed et al. (1997) found that Al in stem xylem was significantly higher in declining trees relative to the healthy trees from those acidic sites in which Al was freely available in the soil. Horsley et al. (2000) concluded that the most important factors associated with sugar maple health were foliar levels of Mg and Mn and defoliation history (see also Watmough et al., 1999). The vigor of vesicular arbuscular mycorrhizae do not seem to be markedly different in areas of maple decline (Ouimet et al., 1995).

Anthropogenic Causes

Anthropogenic pollution, especially acid rain, and forest decline are major environmental issues that many scientists have tried to link causally (Bell et al., 1998; Sharpe, 2002). Certainly, maple stands growing in acidic soils are at greater risk for decline (e.g. Liu and Tiree, 1997; Duchesne et al., 2002). However, there are numerous examples of past declines in the condition of individual species within forests or of the entire forests themselves. Many of these declines are natural, being brought about by a variety of factors, including stand dynamics, pests, and diseases. The emphasis that has been placed on air pollution in recent declines may not necessarily be justified, although air pollution has undoubtedly brought about the decline of forests at some locations (Innes, 1992). Bauce and Allen (1991) reported that a steady growth decline of all dominant trees during the last 30 years was significantly correlated with adverse climatic conditions and that high levels of stand density (competition) appeared to predispose sugar maple trees to adverse affects of climatic (winters with periodic thaws and sparse snow cover, summer drought, low autumn soil water recharge) stresses. They concluded that in some cases, sugar maple decline may be part of a natural stand density regulatory process. Based on analyses of tree ring data, Payette et al. (1996) concluded that there had been 3 major growth depressions of sugar maple trees in the last 100 years. In their view, the major growth depression the early 1980s was due to a synergistic combination of natural disturbances affecting stand dynamics, in particular drought and defoliation by insects such as the forest tent caterpillar (*Malacosoma disstri*), and to a lesser extent, severe winters. An apparent rebound in the health of sugar maple stands in there area of study after the 1980s suggested to them that the severe maple decline in the 1980s was not due to anthropogenic pollution. Studies that have examined the effects of altering the soil pH on the progress of maple decline have yielded mixed results. Liming (e.g. Moore et al., 2000) and K fertilization (Ouimet and Fortin, 1992) increase the vigor and growth of sugar maple in an acid soil, poor in available Ca and Mg. Four years after the lime application, improvements in foliar concentrations of N, P, Ca, and Mg were noted. Liming also increased the radial growth of sugar maple compared with control trees. Acidifying fertilizer, however, did not produce the visual symptoms of maple decline (Hutchinson et al., 1998). Thus, while acid rain may be contributing to the stress and decline of sugar maple, it may just be one of many factors.

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