Maples: Environmental Stress
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Maples: Environmental Stresses

Since the demise of the American elm, maples of several species comprise the majority of shade and ornamental trees in Michigan. In many urban areas and villages, maples comprise up to 90% of the street, park and yard trees. Species and varieties of maples are popular because of their fast growth rate, ease of transplanting, spectacular fall color and because they have relatively few insect and disease problems. Maples, however, whether in a lawn or along a street, are in a rather foreign habitat and are, thus, subject to stresses that trees in a forested situation seldom encounter. They are planted in disturbed soils, subject to salt and air pollutants, and many are just growing old.

The stresses associated with growing maples under less than ideal conditions can be observed by smaller leaves, leaf browning and death of branches or limbs. This collection of problems is often described as maple decline. However, maple decline is not a contagious disease, but is a collection of most problems that are found on maple which result in a decline in tree vigor.

This publication describes some of the more common problems found on maples and suggests remedies to correct or prevent these problems. Even though the stresses are described on maples, they do occur on other trees. The procedure for prevention or care would be the same for other shade trees.

Fig. 1. Maple leaf showing symptoms of leaf scorch. The area closest to the veins remains green, while the leaf margin and the area between the veins is brown.

Leaf Scorch

Often in mid to late summer maple leaves show a browning or drying at the outer margin of the leaf or in the areas between the veins (Fig. 1). 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.

Usually the symptoms 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. Also, an early spring application of fertilizer containing large quantities of potash, which stimulates root development, has been found to be helpful. If scorch is severe early in the season, a judicious pruning will help increase the supply of water to remaining leaves.

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 (Fig. 2). 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 seems to be most affected in Michigan, but other maples can also have girdling roots.

Fig. 2. Aboveground girdling roots. Two roots that are pictured encircle the base of the tree which may clow or stop nutrient and water flow in the tree. Often girdling roots are below ground and not visible unless exposed by digging.

Not all girdling roots need correcting. Only if the tree shows a decrease in vigor should action be taken. The portion of the root that is girdling the tree should be removed. The open wound can 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 such as making the hole large enough to accommodate the roots will minimize the likelihood of girdling roots.

Salt Injury

Quite often damage to streetside maples can be attributed to the use of de-icing salts. Symptoms can vary from marginal leaf browning (similar to scorch) and 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 (Fig. 3). Soil tests seldom show excessive salt concentrations since it readily leaches 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. Likewise, the planting of salt tolerant species such as Norway maple instead of the more susceptible sugar maple may lessen the problem. 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 which has been disturbed by construction. This 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 removed from the soil each year so the tree has 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 with the areas along the veins remaining green (Fig. 4). Other symptoms can be marginal leaf browning, smaller leaves and reduced twig growth.

Studies in Michigan and nearby states have shown that often the nutrients lacking in the tree are 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 has given 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 next year the application needs to be repeated. Trunk implantation of fertilizer capsules has also given excellent results. However, 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 such as little-leaf linden or honey-locust.

Soil Compaction and Paving

Many maples in Michigan are in stressed condition due to soil compaction and paving. Areas around driveways and along non-curbed streets are often used for automobile parking which causes considerable soil compaction beneath trees. Parking lots, sidewalks, streets and other pavings often have an effect on trees, especially when the pavement is put next to the trunk of the tree. If a tree is completely surrounded, 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. For long term recovery the source of compaction must be eliminated.

OTHER FACTORS CONTRIBUTING TO DECLINING MAPLES

In addition to the most common environmental problems already discussed, there are additional factors which 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. Likewise, the use of a well around the trunk can be helpful to the tree. There are publications describing the various techniques useful in successfully filling around trees.

Soil removal around trees is also damaging because very little soil can be removed without root destruction; here again delayed symptom expression may occur. 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; also, curled leaf edges may be present. If the leaves are not killed, they often have jagged open spaces which are 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, however, can be done to control wind and frost injury. Most trees will recover and put on new healthy leaves, if they have been maintained and are in good health.

Fig. 3. Top dieback often exhibited by trees under stress. This symptom can result from salt damage or any other type of root injury such as girdling roots, compaction and soilfill damage.

C. Herbicide Damage

Occasionally, trees in lawns 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 action to promote recovery.

Fig. 4. Nutrient deficiency in a leaf. The area immediately next to the veins are green, while the other tissues are yellow.

D. Diseases

There are several diseases affecting maples that may cause symptoms similar to those caused by adverse environmental conditions. Verticillium wilt, a fungus disease, can cause a sudden wilting and dying of branches; if in a mild form the only symptoms may be poor vigor and sparse growth. Often the wood of affected plants shows gray to olive-green streaks if the bark is peeled from recently affected limbs. Positive identification, however, can be made only by laboratory tests. Anthraenose is distinguishable from scorch because the browning occurs along the veins or in irregular areas about the leaf while scorch occurs along the leaf margin. Also, anthraenose occurs during cool, wet spring weather, while scorch generally occurs during hot, dry summer weather.

There are several root and butt rots that can cause symptoms such as branch dieback and leaf browning which are similar to symptoms caused by environmental stresses. Occasionally, there may be loose bark at the base of the tree under which are found strands of a fungus, 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. Also, care should be taken to avoid wounding trees which provide openings where rot fungi can enter.

CONCLUSION

Maples, like all trees, have many problems which are not easy to define. An individual tree may exhibit symptoms caused by a combination of factors. Also one stress may make a tree more susceptible to another stress, disease or insect problem. Not all tree problems can be corrected or controlled, but most can be prevented or avoided by selecting the tree species or variety best suited to planting site, followed by giving the tree proper care and maintenance. The conclusion should not be drawn that maples are unsuited to Michigan. If the proper species is selected for site conditions, a maple will do as well as most any other tree.

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