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Maple Decline: *Various factors*

Introduction

Maple decline affects primarily sugar maple (*Acer saccharum*), Norway maple (*A. platanoides*) and red maple (*A. rubrum*) in the Northeast. The problem is not a new one; stagheaded maples were described as early as 1917 in Massachusetts. At that time, dieback was attributed mainly to drought and to the poor conditions for tree growth afforded by the urban environment. However, reports of the incidence and severity of maple decline have increased markedly in recent decades and now include trees in urban, sugarbush, and forest environments.

In forests, maples usually begin decline after several successive years of defoliation by insects. Affected trees not only lose their first set of leaves to these insects, but will often use up valuable food reserves to produce a second set. During and after "refoliation", chemical changes occur in the tree that increase its susceptibility to secondary pathogens. *Armillaria mellea* (root rot), *Nectria cinnabarina* (branch canker) and *Steganosporium ovatum* (twig blight) are three fungi that frequently attack and may kill trees weakened by defoliation and refoliation.

In sugar-bushes, predisposing stresses include drought, heavy grazing, over-tapping, and/or heavy traffic by farm machinery. Seriously affected trees are often over-mature and have been heavily tapped for many years. Tapping holes, animal-damaged roots, and machine-damaged roots are all routes for entry of wood decay organisms. If this scenario is followed by insect defoliation as previously described, the result is often mortality of the stressed trees.

In urban sites principal stress factors in maple decline include drought, de-icing salts and/or road and sidewalk construction. These stresses also facilitate invasion by secondary organisms including root rots, decays and twig blights which greatly reduce chances of recovery from original stress(es).

No matter which of the three environments maple decline occurs in, the sequence of events is similar. Healthy trees are stressed repeatedly, the stresses alter the tree's internal chemistry to allow repeated attack by secondary organisms, and the trees ultimately die.

Figure 1: Early symptoms of off color foliage.

Symptoms and Signs

Reduced twig growth. Yearly twig growth varies considerably between trees and even within the canopies of individual trees. If the distance from bud scar to bud scar is less than or equal to five cm on a non-shaded twig, the tree may be in trouble.

Reduced foliage growth. Keep in mind the normal, healthy appearance of the particular maple species' foliage. Foliage that is sparse, light green and/or scorched signals that the tree may be declining. Scorching may also be due to water stress, exposure to de-icing salts, or infection by a bacterium, *Xylella fastidiosa,* the causal agent of Bacterial Leaf Scorch.

Early fall coloration (Fig.1). Maples normally begin showing fall color after the first frost or in mid-to-late September. When fall color develops earlier than normal, in late July or early August, the maple may be suffering from decline. Where individual larger branches exhibit premature fall color, and leaves are noted to be small however, that may be evidence of Verticillium Wilt. Analysis of symptomatic branch tissue by a diagnostic lab may be required however to confirm that diagnosis.

Figure 2: Dieback in crown with tufted foliage at tips of branches.

Dead branches in upper canopy (Fig. 2). Small dead branches seen in tree tops in late spring or early summer are indicative of decline. Over time, larger, more visible branches and limbs will dieback. The more numerous the dead twigs or branches are, the more severe the decline condition.

Poor root condition. If roots can be examined, look for reduced occurrence of small feeder rootlets and/ or brittle roots. Also examine the lower stem and buttress roots for any evidence of wounding or decay. Wounds to buttress roots may help open up weak trees to colonization by wood decay organisms.

Management Strategies

By the time symptoms are noticed, the tree may be beyond being restored to its original splendor. Although once a tree is in decline, it may not be cured, providing good cultural care may help prolong the life of a declining maple. Keep in mind that these practices are to prolong the life of trees not already in a severe state of decline,, and may allow an opportunity for another tree to be planted which will eventually replace the declining maple. In this way the newly planted tree will have a few years to grow prior to the removal of the declining maple. Plant young maple trees away from roads to avoid future de -icing salt problems.

First be certain to provide adequate water during dry periods, This means you may need to thoroughly water trees every one or two weeks during extended periods of dry weather. Trees can be watered with a slow stream from a hose or using drip irrigation. You may want to avoid using a sprinkler if it will wet the bark or exposed buttress roots as that may encourage decay. Move the hose periodically to soak the entire soil area under the tree's branches to a depth of about six inches.

Provide adequate nutrition. There are a couple of options. You can have a soil test done to determine the optimum rate and type of fertilizer to use, or you can fertilize trees with a complete fertilizer in the spring and/or late fall. The general recommendation is 2 to 4 lbs fertilizer per inch of tree diameter (0.35 to 0.7 kg per cm of tree diameter at 1.5 m above ground). Broadcast the fertilizer over the root zone, but note that fertilizer burn of nearby turf may occur at the higher rates.

Remove dead wood. Proper pruning to remove larger dead branches in the crown may promote increased vigor in the remaining growth. This may also lower the hazard potential should a large dead branch fail. Pruning is best done in the early spring, prior to bud break, to promote healing of the pruning cuts. For large specimens, major pruning may require hiring a licensed professional with the proper equipment to do the job.

Protect the tree from de-icing salt. The impact of exposure to salt used on roads can be reduced by use of a barrier (curb, berm, ditch, etc.) which will catch and/or divert the spring runoff water which often contains copious amounts of salt. If soil and foliar analyses have been run and high sodium or chloride concentrations were found, then leaching the soil with fresh water in the spring, or applying gypsum to improve the soil structure or texture may be useful.

As defoliation can be a triggering factor in decline, pay close attention to developing insect issues on your trees. Although forest tent caterpillar populations may not be high every year, severe defoliation by these or other pests may trigger decline or result in the death of an already weakened tree. In years when pest issues may be high, an insecticide treatment may help to protect your tree(s).

The success of treatment to declining maples depends primarily on early detection of maple decline, the health of the tree prior to treatment, and/or its ability to respond to treatment. Positive diagnosis will often depend on "on the spot" examination or the amount of information obtainable from the person submitting a sample. However, the prescribed treatments of fertilizing, watering and pruning will not damage healthy trees, and may also be beneficial to trees suffering from other issues such as Verticillium Wilt.

References:

Sugar Maple Decline: An Evaluation, by Arthur H. Westing, Economic Botany. vol. 20, no. 2, April-Jun., 1966, pp. 196-212.

Recognizing and Preventing Maple Decline, James W. Walters, North Central Experiment Station: Northern Hardwood Notes 7.02.

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READ THE LABEL BEFORE APPLYING ANY PESTICIDE! Changes in pesticide regulations occur constantly. All pesticides distributed, sold, and/or applied in New York State must be registered with the New York State Department of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide use in New York State should be directed to the appropriate Cornell Cooperative Extension Specialist or your regional DEC office.

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