Kentucky Division of Forestry

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FOREST HEALTH BULLETIN

Figure 1. Thinning crown

Figure 2. Lichen growth

TREE DECLINE

INTRODUCTION

Tree decline is a term used to describe the progression of a tree toward a less healthy condition, and in many cases toward death. Tree decline can have one major cause, or it can be the result of several factors working together. The spring and early summer growing seasons are the best times to notice conditions of decline, because the condition of the crown is easily noticed that time of year. It's not always easy to determine the cause of tree decline, but with some investigative work, you can come up with some possibilities.

SYMPTOMS

Thinning crown

A thinning crown (Fig. 1) is one of the most common symptoms of a tree in declining health. If a tree doesn't have the capacity to put out new leaves or branch death results in reduced leaf area, it is usually caused by root or vascular problems. Sometimes this isn't recognized when it initially begins and if there is a slow decline, it may require multiple seasons before it is easily recognized.

Heavy lichen growth

Many times, someone will notice lichen growth (Fig. 2) on a declining plant and believe that it is the culprit, thinking that it is some kind of fungus. However, lichen growth often occurs on perfectly healthy trees, although in a much smaller amount. Some attribute the heavier lichen growth to a thinning crown which allows more sunlight to reach the trunk and the branches. However, heavy lichen growth is sometimes seen on a declining tree that had little canopy to begin with, such as on a young tree.

Yellowing foliage

Yellowing foliage can manifest in a variety of patterns depending on the cause. In regard to some causes of tree decline, this can be characterized by a normal green color near leaf veins and yellow or pale color away from the veins. This can be a symptom of nutrient deficiency (Fig. 3).

CAUSES

Site conditions

Often, trees are planted in inappropriate locations and face hardships such as high or low nutrient availability, compacted soil or extreme soil moisture conditions. Different tree species can require different levels of nutrients, so in some cases, lower nutrient levels at a site will not support mature trees. In other cases, a planting site may have a soil pH that prevents existing nutrient from being available for uptake.

Compacted soils are often the result of equipment use in an area whether urban or woodland, although there can be other causes. This can lead to smaller air spaces in the soil which can make it difficult for roots to grow. Also, this can result in reduced oxygen availability and water holding capacity because of smaller pore spaces between soil particles. This problem of oxygen and nutrient availability can be made worse during excessively wet soil conditions, because the soil doesn't drain as well.

Weather

Extended dry soil conditions around fibrous roots can lead to their death as there is no oxygenated moisture in contact with them. In dry soil conditions, excess air spaces between the soil and roots has the same effects as leaving a bare-root tree lying uncovered on the ground. Flooding can also lead to root death due to the lack of oxygen available to the roots because of saturated soils. Multiple drought or flooding events can reduce the amount of live roots needed to sustain a tree, but there are also occasions of drought followed by flooding or vice versa which has the same effect.

Soil conditions are not the only problem related to weather; extended periods of high heat can lead to scorched foliage and even premature leaf drop. Scorch usually occurs when a root system cannot deliver enough water to the foliage to meet its needs. This can be due to a problem with the roots but also due to excessive hot, dry air conditions. This can cause a reduction in photosynthesis, and when

working in conjunction with root death or hindered root growth, the stress to the tree is greatly increased.

Injury

Tree injury is one of the most common causes of tree decline and occurs in numerous situations such as lawn maintenance, construction and logging operations. Each of these often causes damage to tree trunks and roots by affecting its internal transport system or reducing its uptake ability due to fewer available roots. Other practices such as tree topping are equivalent to injury, and salting roads can lead to root damage after too much accumulation and even damage to the crown when salt drift lands on buds, stems or needles. Girdling roots which is the result of improper planting practices and site conditions can also cause considerable injury but will often not show up for several years after tree establishment.

Insect and/or disease

Insect borers can cause significant damage and can work in conjunction with certain fungi and other conditions to cause tree decline and death. Pests such as the emerald ash borer, bronze birch borer, pine bark beetles and ambrosia beetles can be primary pests, meaning that they are the primary reason for a tree's decline, and fungi can work in the same way as is seen with chestnut blight and butternut canker. Many times though, these organisms work together such as pine beetles working with blue stain fungi, Dutch elm disease (Fig. 4) being transported by beetles and thousand cankers disease of walnut is also a insect/fungal complex. Problems can occur in the above or below ground portion of a tree, but the effect on the tree is usually the same.

SUMMARY

Ultimately, trees decline and die when they have trouble undergoing the necessary processes of photosynthesis and respiration. In a nutshell, photosynthesis creates fuel and respiration turns that fuel into energy. The major obstacles that affect this are: 1) anything that reduces a tree's leaf area, 2) anything that damages a tree's roots and reduces its ability to uptake necessary nutrients, water and oxygen and 3) anything that reduces the movement of water, carbohydrates and nutrients inside a tree.

Figure 3. Nutrient deficiency

Figure 4. Dutch elm disease vascular staining

PHOTO CREDITS

Figure 1— Robert L. Anderson, USDA Forest Service, Bugwood.org

Figure 2— Jody M. Thompson

Figure 3— Joseph O'Brien, USDA Forest Service, Bugwood.org

Figure 4— Fabio Stergulc, Universita di Udine, Bugwood.org