THE PURDUE LANDSCAPE REPORT

Issue: 22-13
August 23, 2022

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Look Below Before Blaming Above

(Lee Miller, turfpath@purdue.edu)

Recently, home lawns have been maligned in several media outlets as a waste of time and resources. Mismanagement by using too much water or misplacing fertilizer may compound the issue by straining environmental resources or serving as pollutants. While not going into all the defenses for turfgrass use on home lawns, (remember "right plant, right place"), one of the major benefits lies a little further beneath your feet… the soil.

A nice start to a house for people, but not so suitable for plants. Photo credit – Dr. Bill Wiebold

With its dense cover and extensive fibrous root system, turfgrass is undoubtedly one of the best defenses against soil erosion. Much publicity goes to human-applied pesticides and fertilizers as major contributors to environmental pollution, but often overlooked is the actual movement of soil. When soil moves, all of its properties – including pollutants, move along with it. Combined with its low growth habit, reduced cover for pests like rodents, ticks and mosquitoes, and lower heat retention compared to concrete, grass is the logical choice as a base plant species for open areas like roadsides and lawns to prevent soil erosion.

As a turfgrass pathologist, my position is partly to serve as a coroner. Working with the Purdue Plant and Pest Diagnostic Lab, we investigate various cases of decline of turfgrass from golf courses, sports fields and home lawns. Surprising to some, the primary cause in most of these instances is not a turfgrass disease, but is instead an abiotic disorder such as lack of fertility, mowing during drought, traffic, compaction, salt, etc. Many of these issues tie back to the soil – the foundation of the plant itself.

Nitrogen (N), is the most limiting nutrient for turfgrass, and in many cases home lawn submissions are deficient. Nitrogen is dynamic in the soil and constantly removed by mowing, so unfortunately can't be guided effectively by soil tests. Instead, on older lawns consider applying 1.5 – 2 lb N/1000 sq ft a year to match growth and N removal by mowing. Critics may balk that this fertilizer amount is excessive, but required N amounts for corn and soybean are often 200-250 lb N/A depending on yield goal, which equates to approximately 4.5 – 5.7 lb N/1000 sq ft. A bit more N (0.5 – 1 lb) may be needed the first few years on younger seeded lawns to make up for the lack of microbial activity and nitrogen cycling. If the lawn is sodded, this may be overcome by the residual nitrogen applied at the sod farm and microbial activity brought in with the adhering topsoil.

In new home construction, much of the topsoil is removed, and if the homeowner is fortunate a portion of it may be returned. Life was lived in this topsoil, meaning organic matter, nutrient cycling and the microbial community primed it for the success of plant growth. These characters are devoid in a subsoil, which is often gray or light colored, clayey, resists water infiltration, has severe nutrient deficiencies and is susceptible to compaction. That turfgrass often overcomes these deficiencies in any capacity is a testament to its resiliency, (also witnessed recently in regard to drought tolerance). The plant itself becomes the driver of organic matter accumulation and topsoil regeneration.

Soil testing is a step often neglected by homeowners regarding lawn care. A soil test can guide application of phosphorous, potassium, calcium and other macro and micronutrients, as well as give important information regarding soil pH, CEC and organic matter amount. A soil test may indicate that a subsoil type still persists in the lawn, and light applications (e.g. topdressing) of organic matter or topsoil may aid in rebuilding the soil and turfgrass density.

If your lawn continually struggles, consider getting a soil test (see below) to determine if a major nutrient deficiency or chemical/physical parameter is an underlying cause.

A list of soil testing laboratories can be found at https://ag.purdue.edu/department/btny/ppdl/_media/publications/miscellaneous/4-soil-testing-labs.pdf.

Lamentable Lilac Leaf diseases

(John Bonkowski, jbonkows@purdue.edu)

Lilacs (*Syringa* spp.) are some of my favorite plants alongside Ginkgo (males, at least) and while I could wax poetic about their great aesthetic characteristics I will just say that they have beautiful spring flowers and they smell great, too. However, they do have a handful of problems that cause them to look a little shabby throughout the season: bacterial blight, powdery mildew and fungal leaf spots.

Figure 1: Bacterial blight of lilac Photo Credit: William Jacobi, Colorado State University, Bugwood.org

Bacterial blight, caused by *Pseudomonas syringae* pv. *syringae*, occurs early in the spring after budbreak and usually after there is winter injury or frost. Bacteria need a natural opening or a wound to enter the plant and frost injury is usually the most common. Symptoms associated with bacterial blight include small water-soaked spots that expand from a pinprick to about 1/8th of an inch in size. Multiple spots in an area can coalesce to create larger blighted areas of on the leaf, sometimes even causing what looks like marginal leaf scorch. As the disease spreads into the stems, symptoms can look similar to fireblight on pear, leading to drooping or shepherd's crook-like growth at the branch tips and black lesions on the stems (Figure 1). The pathogen can overwinter in the affected tissue, so pruning out and raking up affected plant parts will be important to prevent carryover into the next spring.

Figure 2: Powdery mildew on lilac foliage Photo Credit: Penn State Department of Plant Pathology and Environmental Microbiology, Archives Penn State University, Bugwood.org

Powdery mildew, caused by *Erisyphe syringae*, occurs in late spring and into summer, but harm to the plant overall is mostly cosmetic. The sign, or evidence of the pathogen, is the white powdery fungal coating of the foliage. Some leaves may only have small dusty spots while others may be completely coated (Figure 2). Sure, if you want the tree to look as green as possible, then you might want to take some measures to manage it, but it is largely regarded as an aesthetic issue and not going to cause major harm to the shrub. If a lilac is already stressed or powdery mildew is present with another problem, it could be contributing to some defoliation. In my experience, you can reliably find it on lilacs in shaded areas, so planting in full sun will reduce the amount of disease. Since the fungus overwinters on host tissue, raking up and removing fallen leaves in the fall will reduce overall inoculum for the following year. Horticultural oil and neem oil can help inhibit powdery mildew, but if you are looking for a more targeted fungicide, I recommend checking out the Diseases of Landscape Plants factsheet BP-5-W.

In late Spring and Summer, different foliage fungal diseases can be observed which are caused by *Septoria* and *Pseudocercospora*. Both fungi cause similar angular to irregular shaped leaf necrotic leaf spots that will coalesce to create large areas of blighted tissue (Figure 3). Under severe disease pressure, these fungi can lead to significant leaf loss which can affect shrub vigor if it is a chronic problem (Figure 4). Both leaf spot diseases usually develop in the lower canopy and move upward as the season progresses under humid and wet conditions (Figure 5), which promote sporulation and movement of the spores (Figure 6). Purdue Extension Educators have been seeing more severe Septoria leaf spot this Summer following periods of cool and rainy weather. The *Septoria* and *Pseudocercospora* that attack lilac only infect the leaves, so raking up fallen leaves will reduce inoculum, like with the disease issues above, but if significant leaf blighting is already occurring in early summer, fungicides may be needed to protect the foliage from new infections and prevent further defoliation. Generally speaking, stressed plants will be hit harder by foliar problems than a healthy shrub. If you are seeing significant leaf spotting, blighting or loss, I would recommend examining the rest of the plant for other issues (cankers, scale insects, stem borers, etc.) and managing them if present.

Figure 3: Angular and irregular leaf spotting and blighting of lilac caused by Septoria. Photo Credit: Nikky Witkowski, Purdue University Extension Educator, Porter County

Figure 4: Leaf spots and blighting developing in the lower canopy while the upper canopy shows no obvious spotting. Photo Credit: Nikky Witkowski, Purdue University Extension Educator, Porter County

Figure 5: Leaf spots and blighting developing in the lower canopy while the upper canopy shows no obvious spotting. Photo Credit: Nikky Witkowski, Purdue University Extension Educator, Porter County

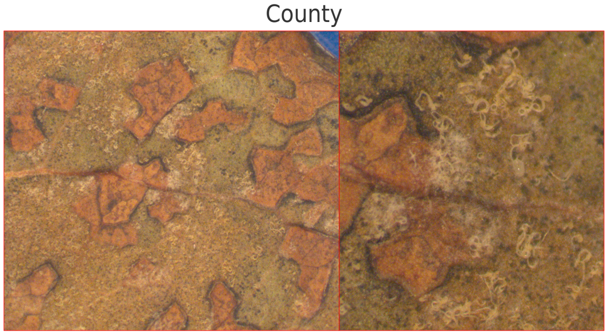


Figure 6: Dissecting scope image of Septoria infected lilac leaf. Cirrhi (spore horns) developing out of fungal fruiting structures. Image on right shows magnified image of spores in coils and ready to be spread by water. Photo Credit PPDL

Using Pneumatic Digging Equipment to Correct Root Deformations, Deep Planting, and Compaction on Established Trees

(Kyle Daniel, daniel38@purdue.edu)

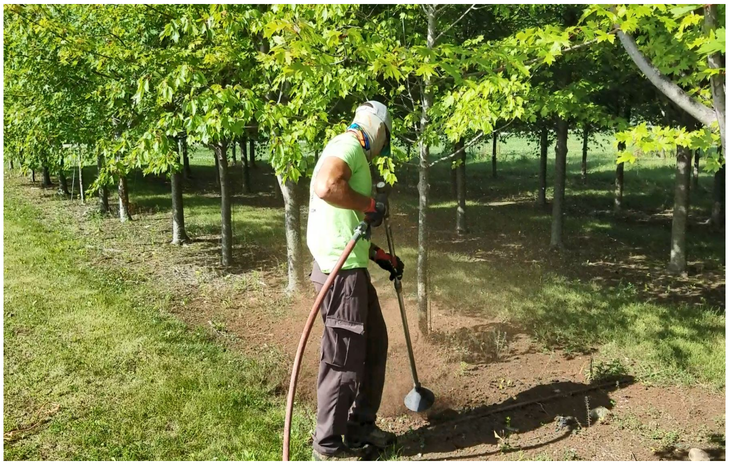
When transplanting trees, it is important to consider the long-term viability. Since the typical life span of an urban tree is 7-20 years (USDA), proper establishment techniques are very important to decrease this mortality rate. When a tree becomes established, it is much more difficult to correct below ground problems.

Root deformations can occur for many reasons in established trees, but the most common are due to not making corrections prior to transplanting. Plants that have girdling and circling roots must be addressed at the time of planting. If this issue is not addressed many problems may ensue when the tree is established, which includes decline, tree failure, blow-overs, and more.

Figure 1. Compacted soils can be alleviated by pneumatic digging tools.

Another common problem that occurs at transplanting is deep planting. In the past, plants were often planted deep in the nursery for two main reasons: 1) cold protection of the roots and root flare and 2) prevent the use of staking. In fields that are cultivated, the soil often mounds around the trees which can increase the depth of the root flare. Additionally, when planting into the landscape, trees can be planted too deep, exacerbating the problems associated with planting too deep.

Deep planting can cause an increase in disease, insects, decreased tolerance to flooded soils, adventitious roots, and root circling/girdling. Day and Harris (2008) found that there is significantly more girdled root at 30 cm below grade than at grade or 15 cm below grade. They also found that excavated trees at 30 cm had more girdling roots than non-excavated roots at 30 cm.



Compaction can become an issue when trees are located in high traffic areas. Compaction will cause a decline in trees over time and become more susceptible to increased insect and disease pressure.

Excavating the root system with a pneumatic digger is a method that can be used to correct all of these problems. Removing soil around the tree will allow root deformations to be located and corrected. Removing the soil around the collar to correct planting depth and girdling roots will increase the longevity of the tree. Compaction can be reduced by using a pneumatic digger to remove the soil from the root hairs that are typically located in the top 6 inches of soil for most trees (Morris, et.al., 2009).

Figure 3. Exposing roots by using a pneumatic digger can allow a tree care manager to correct root deficiencies and girdling roots around the trunk.

In addition to correcting root problems, this type of root excavation can also be used as a way to install under pipes and irrigation without substantial damage to the roots (Gross and Julene, 2002).

Many certified arborists are familiar with this tool to reduce stress and increase the life span of trees. You can find a certified arborists at https://www.treesaregood.org/findanarborist.

For more information on correcting root problems after a tree becomes established:

Stem Girdling Roots:
https://www.purduelandscapereport.org/article/stem-girdling-roots/

Root Growth on Urban Trees:
http://hort.ifas.ufl.edu/woody/roots.shtml

Tree Root Problems:
http://www.mortonarb.org/trees-plants/tree-and-plant-advice/horticulture-care/tree-root-problems

Air Digging Trench or Loosening Soil:
https://hort.ifas.ufl.edu/woody/air-spade.shtml

Tree Planted Too Deeply:
https://extension.umd.edu/resource/trees-planted-too-deeply

Roots and the Pneumatic Soil Excavation Tool:
https://tcimag.tcia.org/equipment-technology/roots-and-the-pneumatic-soil-excavation-tool/

Tree Preservation Efforts:
https://www.scottarboretum.org/tree-preservation-efforts-hydrovac-excavation/

Getting Roots Right:
http://www.actrees.org/files/Research/mortonarb_getting_roots_right.pdf#page=50

Supersonic Air Jets Preserve Tree Roots in Underground Pipeline Installation: https://www.fs.usda.gov/treesearch/pubs/26138

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environment. Proceeding of the 2009 Georgia Water Resources Conference.

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