Know your soil

Realizing the importance of healthy soil can help you diagnose and treat its problems

BY JOHN FECH

Soil is the lifeblood of landscapes. Even though it provides nutrients and water and serves as anchorage for plants, it's taken for granted and commonly overlooked by the general public and landscape professionals alike. This article will point out the fallacy of that assumption and show that soil is one of the most important components of a healthy landscape.

Good soil/bad soil

Good soil is so crucial to landscape health that it's usually the first factor I consider during pest diagnosis inspections. A soil probe, bucket and screwdriver are helpful in determining soil attributes and how it stacks up against the ideal. Trees, shrubs, annuals/perennials, grasses, bulbs and groundcovers growing in well-drained, fertile, slightly acid soils normally perform well, with attractive flowers and green leaves, providing beauty and function for the property.

When plant roots are forced to grow in poor soils, they not only grow slowly and develop abnormally but are susceptible to insects and disease infestation. Pests are repeatedly attracted to weakened, stressed out turf and ornamentals. The same is true in the animal kingdom; when watching one of those animal shows on The Discovery Channel, you learn that the lioness always sets her sights on the sickest or oldest wildebeest. As such, good soils are a hallmark of Integrated Pest Management, as trees and turf growing in a healthy medium will be able to resist a higher level of pest activity than weak ones growing in poor soils.

What's the problem?

So why do we have this problem of poor soils — soils with extreme pH, heavy clay, excessively well-drained, low on nutrition — in the first place? Many fingers can be pointed at the housing and construction industry because construction disturbs soil dramatically. It seems the larger the equipment, the more the soil is messed up.

The two most common disruptions are soil profile changes and soil particle compaction.

When a basement is dug or extensive grading is performed, soil that was in one place is moved to another. Careless equipment operators often bring subsoil to the surface and redistribute it as a final grade for the landscape professional to use for plant installation. Subsoil is low in fertility and is usually either sticky clay or rocky chunks, neither of which support good plant growth.

Conscientious construction companies direct their operators to remove the topsoil for stockpiling off-site, then excavate what's needed for the basement. After the rough grade, the topsoil is then redistributed and spread out, and the final grade established.

If soil profile changes aren't to blame for poor soil, it might be compaction, which is caused by heavy construction equipment pressing soil particles together and eliminating essential voids, or air spaces. These air spaces provide oxygen to the roots and avenues for excess water to drain out of the root system. Compaction is more likely to occur if the soil is wet when the equipment moves over it and/or if it's mostly comprised of clay or silt.

Let it drain

Ideally, soil would be comprised of half air spaces and half mineral

RAISING PH WITH LIMESTONE

(pounds of ground limestone per 1,000 sq. ft.)

change in pH desired	sandy soil	silty soil	clay soil
4.5 to 6.5	50	160	200
5.0 to 6.5	40	130	150
5.5 to 6.5	30	90	100
6.0 to 6.5	15	50	55

LOWERING PH WITH SULFUR

(pounds of elemental sulfur per 1,000 sq. ft.)

change in pH desired	sandy soil	silty soil	clay soil
8.5 to 6.5	45	60	70
8.0 to 6.5	30	35	45
7.5 to 6.5	10	20	25
7.0 to 6.5	3	5	7

Masonry work, especially around the foundation of a house, can cause problems with soil pH.

components. When compaction occurs, soil particles are pressed together, causing just about anything with a root to suffer. Why?

All plants have an optimal amount of water and air they need for root growth. In poorly drained soils, the voids between soil particles fill up with water faster than it can flow out, and the roots don't get the oxygen they need. If this condition continues for an extended period, the roots will rot or stop growing, causing the plant to wilt or take on a scorched appearance.

Another common drainage issue is that of the perched water table, which occurs when horizontal layers of soil are created, each with different soil characteristics such as organic matter, large air spaces, clay content and pH. The most dramatic difference is when a layer of soil with large air spaces exists over one that has small air spaces. The laws of soil physics prevent water from the top layer to pass quickly into the second layer. Instead, the rate of downward water movement is dramatically slowed, forcing most of the water to rise vertically.

The downside to a perched water table is that the roots are wetter than they need to be, and they decline. Ironically, this is what happens when misguided landscape professionals add a layer of compost, sand or peat moss on top of a heavy clay layer in an attempt to improve the site's drainage. "Fixing" these problems is discussed under the section on soil modification at www.landscapemanagement.net.

Good soil mix

Over the years, various soil types' attributes have been fairly well-documented. Clays hold water and nutrients tightly, and tend to produce fertile landscape soils that drain

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Construction activities can cause pH changes as well as soil compaction and layering. This creates difficult growing conditions for turf and landscape plants near the foundation of a building or house where considerable amounts of concrete, gypsum and other materials can accumulate.

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poorly. Sandy soils allow for excess water drainage, yet can cause plant stress from drought and lack of nutrients. Silty soils are somewhere in between these two extremes, usually on the clay side in terms of drainage and nutrient-holding capacity.

Extreme soil types present challenges to landscape professionals, but soils with low levels of organic matter pose even more difficulty. Organic matter is deposited in soils over time, filtering in from the decomposition of tree leaves, thatch and other plant remains. It serves as a loosening agent in heavy soils, and a holding agent in well-drained soils. A desirable level is between 3%-5% of the total soil volume.

Application and incorporation of compost helps with the aeration of soil.

The relative alkalinity or acidity (soil reaction) of a soil is another component to consider. The optimal level of pH for most landscape plants is between 6.0-6.7. Exceptions include clematis, azaleas, holly, rhododendron, blueberry and many conifers, but for the most part, optimal growth is observed when the level is slightly acid or neutral.

It's common for construction activities to cause pH changes as well as soil compaction and layering. This can create difficult growng conditions for turfs and landscape plants near the foundation of a building or house, where considerable amounts of concrete, gypsum and other materials being mixed can spill. These building products tend to be alkaline, and can create "hot spots" in soil, especially in the areas where portable concrete mixers and wheelbarrows were parked.

At pH levels above or below optimal, certain nutrients such as iron, phosphorous and manganese become unavailable to plants. Plants growing in soils with these pH levels appear stunted, chlorotic or misshapen and distorted. The classic problem of pin oak chlorosis falls into this category, with high pH soils tying up the iron needed by the plant. The result is yellow leaves produced on stunted-looking stems. Left unchecked, many plants suffering from iron chlorosis eventually die.

Soil modification

If your soil isn't up to snuff, you may want to offer soil modification. More details are available on-line at www.landscapemanagement.net. LM

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