THE UNSEEN KILLER

Subsurface drainage is one of the keys to keeping grass, trees and shrubs healthy. But without a few 'tricks of the trade' suggested here, it's difficult to monitor.

by Ricks H. Pluenneke, Ph.D.

Too often when the importance of internal soil drainage is mentioned, people misunderstand. That includes some professional engineers and landscape specialists. They tend to think in terms of the water they can see moving across the surface. So they work hard to improve that water's exit from properties with concrete-lined ditches, proper slopes and surface improvements.

They don't realize that water is also slowly flowing downslope beneath the surface where it can run into concrete curbs and other obstacles that act as dams in its path, causing it to accumulate and kill plants growing there.

Ricks Pluenneke is a plant science consultant to industry and institutions with an office and laboratory in the Dallas/Fort Worth, Texas, area. He is also a Certified Professional Agronomist, Certified Professional Chemist and Certified Professional Crop Scientist.

Plants as traps

Concrete ditches and drains help, but they still don't directly address some of the drainage problems we often build into our landscapes. Water often lies trapped in subsurface depressions. These are created by digging holes in tight soils like clay, and then backfilling them with mixtures of sandy loam, organic material, gravel and all kinds of "improved" backfill combinations. These traps are often freshly-dug tree or shrub pits, recessed flower and groundcover beds, and similar areas in turf that have been "improved" by backfilling with "better" soil.

Soils, to varying degrees, are composed of organic material (humus), clay, sand and silt. The particles that make up clay are about 1,000 times smaller than those in a sand. Clays retain both the good (fertilizers) and bad (salts) extremely well. Sand does not.

Taking a look at the roots

How can you best cope with a situation where young tree roots are rotting from a lack of oxygen? Consider using raised beds for the shrubs or plant on slopes. Don't plant the trees quite so deep. Back off an inch or two, or even plant them in a raised-bed fashion. (I've named two approaches to this planting style "New Orleans" and "Semi-New Orleans," which is pictured here. Forgive me, New Orleans.)

Inspection tube

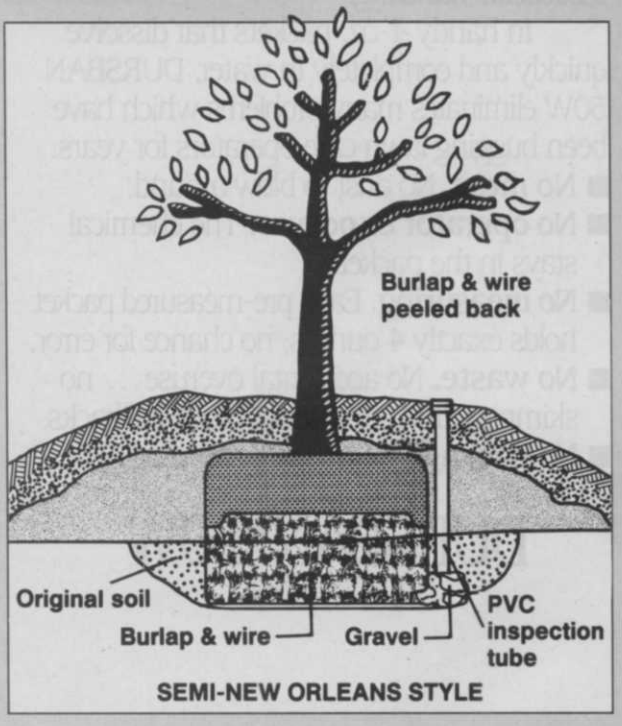
Install a PVC inspection tube beside each tree when planting them so you can see if water is standing around the roots. Otherwise you may never know what's killing the plants. Water need only be present for 48 hours before damage begins. You may not see actual foliage damage until next spring or summer when those extra roots are needed by the plant. I've probably reinvented the wheel with PVC inspection tubes, but I've been on a crusade for them for years, trying to get landscape professionals to use the tubes more in tight, poorly-drained soils. They're simple, cheap and effective. I use another version on containerized plants too.

Cut a piece of PVC pipe (some people use four-inch diameter, others use smaller) to a length so that it will reach from the bottom of the hole to the surface, and preferably a couple of inches beyond. Put an end cap on it. Leave it white, paint it brown or green, etc. They are easy to put in at planting time, but hard to put in as an afterthought. Smaller versions are helpful in shrub beds and at other places in the landscape.

Backfilling helpful

When planting trees, consider putting the original soil back in the holes around the balls (and an inspection tube). Put a shovelful of gravel around the bottom of the inspection tube. Use your organic mulch, peat moss or pine bark on the soil surface, surrounding the planted tree and extending out past the edge of the ball six to 12 inches. Check the inspection tube during irrigation and wet weather to see if water is standing around the ball excessively. If it is, find a way to siphon it out and/or cut down on watering.

-Dr. Pluenneke



SEMI-NEW ORLEANS STYLE

Fertilizers and other salts are readily leached out of sands, so more frequent applications are normally needed. With regard to particle size, silt is intermediate to clay and sand, and has many of the good properties of both and fewer of the bad ones. The relatively large pore spaces in most sands allow water to be absorbed rapidly, but it's retained much longer by clay soils.

However, if a sandy soil is in a no-drain hole pot or has been used as "improved soil" in a poorly-drained hole in clay soil, salts cannot drain away. They will accumulate until they cause damage. In a properly constructed raised bed, they could freely drain away with excess water.

Water moves slowly through clay soil, since it has such small pore spaces between its tiny particles. It moves even slower if the soil has been compacted by equipment during construction, or even by excessive foot traffic (athletes, etc.), particularly when the soil is wet.

Low-salt diet

A high sodium content in the soil will cause clay to collapse and become more dense, decreasing water movement through it. Irrigating with soft water (high in sodium and low in calcium) can increase this problem.

Let's assume you're putting in a new landscape and the existing soil is mainly clay. There may be some areas in the landscape where water tends to stand, so you order a few loads of a good sandy loam and smooth it out across the property, giving it a nice 6- to 8-inch layer of topsoil. Then a sprinkler system and sod, St. Augustine for example, are put in.

During the season you also dig holes two feet deep to plant red oaks and replace the soil that came out of the holes with a nice mixture of loam, peat moss and sand. You also dig two long beds along the front of the new building, 12 to 18 inches deep, replacing the soil with the same improved soil and plant shrubs there.

A year passes. The grass is nice and green, but some of the red oaks have what looks like fall foliage—in April. Two die by the following spring. Several shrubs are looking sick, too. The boss says water them more, so you do. In one or two locations, the St. Augustine tends to develop disease problems in the spring. What's happening?

Let's make a slice down through the landscape so we can see what's happening. We find that beneath the surface, water stands for long periods in the porous soil of the tree pits like it does in a pot with no drain holes. It's practically impossible to overwater a plant that has reasonable drainage, but you have to water poorly-drained plants *very* carefully.

Water accumulation

Water accumulates in the tree pits, in this case from heavy irrigation of the lawn, and stands there for long periods during wet weather too. Young roots rot from lack of oxygen in the stagnant water. Disease problems may be favored, too. Similar things are happening in the shrub beds, where water from the roof adds to the situation. You can't see the problem, because the "improved" porous soil hides it. But it's there.

If you anticipate an excessively wet situation, plant trees and shrubs whose habitat normally includes wet sites along sloughs and creeks. The trees might include cedar elm, bald cypress, willows, sweetgum, birches and others.

The problem with the St. Augustine is from standing puddles (beneath the loam) that are contributing to disease problems. It's always better to fill in depressions in turf with soil similar to the original soil before putting the loam on top. Also, be sure to "scratch up" the surface of the original soil before applying the new one. This will help avoid an interface between the two.

We've gotten it into our heads that humans and animals use oxygen, but green plants make oxygen and use carbon dioxide. That's not right! Humans, animals *and* green plants use oxygen 24 hours a day. Green plants do use carbon dioxide and make oxygen when they have enough light to run photosynthesis. The roots of green plants constantly need oxygen—even to take up water.

That's why plants standing in a flooded field will commonly be wilted. It's also why the symptoms for overwatering and underwatering are often the same. It's practically impossible to overwater a plant *if* it has good drainage. If the roots remain in a supersaturated mess for even a day or two, some roots will likely die.

Don't underestimate the importance of a good constant oxygen supply to plant roots. Without it, root growth, proper nutrient and water uptake, and many other systems essential to the plant may be seriously affected. **LM**