Dealing With Dead Spots in Native Soil Putting Greens

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Native soil putting greens, known to many as "push-up" greens, took a beating this past winter and spring in many parts of the state. Patches of dead grass ranging in size from one to several square feet in size have been common. For many superintendents this is a perennial problem. In most years, scarifying the soil surface and overseeding resolves the issue for yet another season.

But 1996 has been different. Many found that when they overseeded, the bentgrass germinated, only to die out quickly after germination. Why has 1996 been different? Is there a quick-fix solution? Have years of dumping magical cures on these areas finally caught up with some people?

The uniqueness of the spring of 1996 is nothing more than a manifestation of the underlying cause of annual grass loss — insufficient surface and subsurface drainage. Without adequate drainage, soil remains at or near saturation for long periods of time. Microbes and whatever plant roots remain quickly deplete the soil of oxygen, replace it with carbon dioxide, and , when anaerobic bacteria move in, with phytotoxic gasses such as ethylene. Regardless the exact cause, no grass can survive in this environment.

In most springs, there is sufficient drainage in winter injured areas of putting greens to restore aerobic conditions, at least in the top few inches of soil. This year, May and June brought torrential downpours that maintained saturated soil much longer than normal. Repeated overseedings with bentgrass failed and even *Poa* couldn't take hold so that golfers could putt on something green rather than dead grass and bare soil.

When you experience failure of overseeded bentgrass to survive, the most prevalent cause is saturated soil. However, you and/or some of your golfers may want assurance that the problem does not involve some type of chemical toxicity brought on by overzealous past use of some type of elixor. In this case, you can do one of two things. You can send a soil sample off to a chemical analysis laboratory. The problems with this are that you have to tell the lab what to analyze for, the lab has to be equipped to do the analysis, someone has to be able to interpret the results of the analysis, and you're talking $250 or more per soil sample. I advocate something you can do yourself at no cost — a bioassay.

A bioassay is an analysis in which you use a living organism such as a plant to tell you whether or not it can grow in your soil. Bioassays are easy to run and cost virtually nothing. To do one, begin by collecting several cores of soil from both bad and good spots in the putting green. Spread the cores out somewhere to air-dry. Periodically try to crumble the cores with you hands. When the soil has dried to the point where it can be crumbled, do so and pack some of each soil sample into small containers such as styrofoam coffee cups. Seed both with bentgrass, moisten the soil (do not saturate!), and loosely cover the two cups with other cups or pieces of plastic sheeting. Place the cups on a window sill where you can easily examine them. Depending on temperature, you may see signs of germination in 4 to 5 days. If after 10 to 14 days there is no difference in grass growth in the two cups, you can be assured that your problem is drainage and not chemical toxicity. Air-drying the soil restores aerobic conditions but only very rarely would the chemical toxicity be resolved.

Should there be substantially less bentgrass growth in the cup of soil taken from the problem areas on the putting green, then you do have to suspect chemical toxicity. You can then spend a lot of time and money trying to identify the culprit, or focus on restoring bentgrass on your putting green. The solution is to remove the contaminated soil. This brings up the question of to what depth? I'll venture to say that in the majority of cases, removing 4 inches of soil will do the job. If you want to confirm this first, repeat the bioassay with soil taken from different depths.

In the large majority, if not in virtually all cases, the failure of overseeding results from inadequate soil drainage. The solutions vary in time, cost and permanency. The least intensive approach is to eliminate pockets and depressions in the putting green where water accumulates. These are easy to identify because that's where you find badly weakened or dead grass each spring. Filling in the depressions with soil is seldom more than a single season solution to the problem. All you generally accomplish is moving the surface runoff to an adjacent part of the green. A more permanent solution is strip the sod from the offending part of the green or the entire green and recontour the green so that there is continuous slope in all directions off the green. If you take this route, you may as go one step further and install tile drainage as well. In doing so, keep in mind that this is native soil, not a USGA sand-peat mix. The drain lines need to be down at least 12 inches or so and spaced fairly close together--as little as 4 feet apart in clay soil.

You might also try vertical drainage. By this I mean pulling large cores or drilling to a depth of several inches and backfilling with a coarse, rapidly draining material such as coarse sand or one of the porous ceramic products on the market. But be aware that the long-term success of this approach is highly variable. How well the vertical drains function depends on where your drainage problems arise, the drainage characteristics of the soil where the drains deadend, and the severity of the problem.

Many times, native soil greens drain satisfactorily for a time after construction, but then problems develop. The most common causes are uneven settling that creates depressions and surface compaction. Vertical drainage that in effect by-passes the compacted zone generally results in a dramatic improvement in putting green quality for as long as the vertical drains are functional. In-filling of the backfill material in the vertical drains with native soil or sealing of their surfaces with native soil reduces the effectiveness of the vertical drains over time.

Should you be so lucky as to have coarse, sandy or gravelly soil under you native soil greens and are able to connect to this from the putting green surface with vertical drains, vertical drains may very well be the final answer to your drainage problems. Unfortunately, I've yet to find this "ideal" situation. More likely, the vertical drains will deadend in the same type or even a finer texture of soil than that from which the greens are constructed. In this instance, there are definite limitations on how much and how rapid drainage will occur through the vertical drains. Without some testing, the degree of limitation is almost impossible to judge. You can get an idea of this by removing a soil core with a soil sampler to the depth of drilling or coring. Fill the hole with water and see how fast the level subsides in the hole. Repeat this several times in succession to simulate drainage rates at different soil moisture contents. If, as I've found in some areas of our native soil green at the Noer Turfgrass Research Facility, water stands at a depth of 2 inches or less from the surface for 24 hours or more after a good rain, the chances of vertical drainage being your salvation are not very good. Tile drainage is required.

How well vertical drains function also depends on rainfall patterns and your irrigation practices. The less you have to depend on the vertical drains, the better they function! In years of low rainfall, the vertical drains may effectively serve as temporary reservoirs for drainage water. But their capacity to do so is limited — on the order of 0.25 to 0.45 inches of water at any one time. The bottom line here is that vertical drains are not equally effective in all years. They have capacity limitations that can be exceeded.

Of course the ultimate solution to native soil putting green drainage problems is reconstruction. For many, this is the only long-term way to overcome the two D's of native soil putting greens — drainage and dead spots. The two are inextricably linked together.