Understanding field drainage

By Dr. Andrew McNitt

Imagine you're one of the grounds managers out there with a water problem, puddles recurring on your field after a rain. What's the best way to fix the problem?

Some choose what seems a logical approach. Dig a trench across the field, lay in some drainage pipe, cover it with gravel, then backfill with the spoil and wait for the next rain to watch your water troubles drain away.

But all you may have done is succeed in draining your maintenance budget. If there's a puddle on the surface, a pipe 10 feet underground isn't going to make it go away. The water can't move through the first two inches of the soil. If it could, you probably wouldn't have the puddle. This type of "fix" is too typical when trying to solve a drainage problem.

You can eliminate puddles on your field.

The mistake some managers make is running pipe under a native soil field and capping the last six inches of the trench with the topsoil they removed. I found many of these systems seldom conduct water through the pipes for very long. Once that surface soil becomes compacted, the water can no longer make it to the drainage pipe.

A better solution is to improve the surface drainage. Put a good crown on a natural soil field to move the water to the sidelines and then collect and get rid of it. I know this is an expensive solution, but it's the best solution. Fight hard for a 1.5% slope. Don't let the architect lean the field from one side to the other. You want to move the water the shortest distance possible off the field and you want the high wear areas to be the highest, and driest, areas of the fields. If you are draining a football only field, you can "turtle hump" the field. That means that you

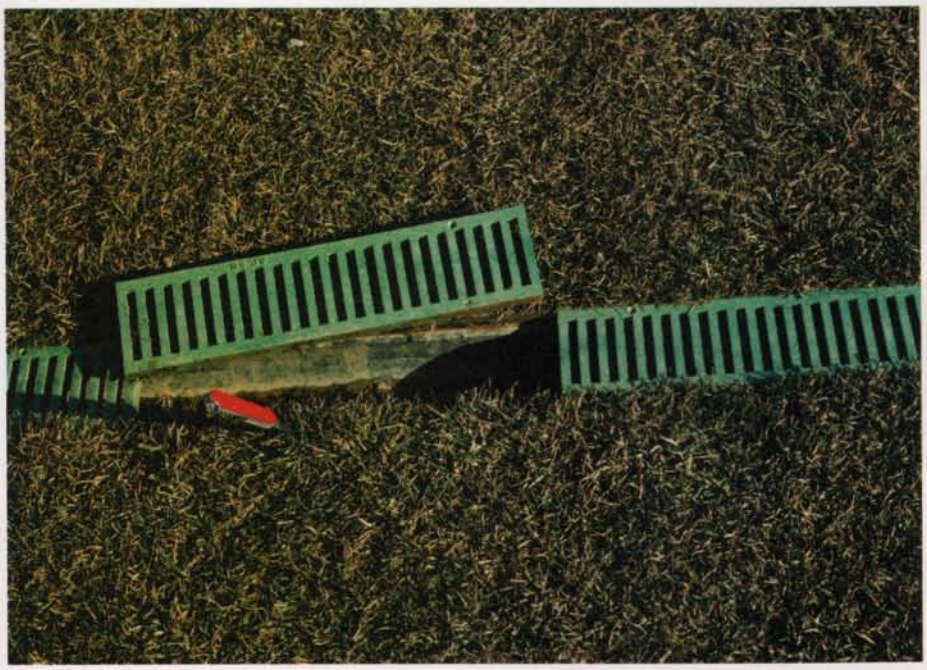
run the traditional crown on the field until you reach the 20-yard line. Then the shortest distance off the field is to run the water out through the end zone. This is not a good idea for any sport that uses a goal, i.e. soccer, field hockey, lacrosse. If a goal sport is to be played on the field, run the crown the entire length of the field. You don't want to run water toward the goalmouth. You want the goalmouths to be sitting on the highest part of the field.

Unless there's a high water table, most fields will not be helped by a subsurface drainage system. If you're in the rare situation that calls for subsurface drainage, find an expert such as a hydro-geologist or civil engineer with experience in draining high water tables. One thing about draining a high water table: You want the pipes as close together and as deep as you can afford. Remember, draining a high water table will help in the spring or other times the water table is high but will not necessarily take care of surface water problems caused by a passing thundershower. Good surface drainage is still needed.

Finding a way out

Of course moving the surface water to the sidelines is only part of the answer. Once there, the water should be collected and drained away.

Behind the bench area at Beaver Stadium (photo is pre-expansion!).



Close-up of split PVC and grate system at Beaver Stadium.

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If you just put three or four small grates along each sideline, the water sometimes has a tough time finding the inlets. The grates sometimes end up being 4 inches higher than the surrounding turf and the water can't get into it even if it can find the grates. Beaver Stadium on the Penn State campus has drains behind the benches that run the length of the field and work well. These Jiffy Drains are essentially PVC pipes that has been split in half and set only a couple inches into the ground forming a ground level rain gutter. The gutter is then covered with a grate. The channel connects to an outlet, which leads the water to a storm sewer. Initially, the grounds crew was worried that frost would heave these gutters out of the ground each winter. That has not been the case. This system has been in place for 12 years and continues to function well. Each spring the crew pulls the grates to hose out debris in the channel.

Slit trenching

Another solution for improving drainage that is useful is installing drainage lines using one of the many slit trenching system now available. Be sure the trenches are constructed so that the coarse aggregate (sand) comes the whole water to the playing surface. The coarse aggregate cannot be topped with soil or the system will fail. The trenches these systems create should run perpendicular to the way the water flows, end zone to end zone, in order to catch the water as it runs off the crown. Contractors don't always like to do this because they have to create more fall in the trench. Running the length of the field means now they need 65 yards of fall, but going sideline to sideline means they only need 25 yards or so. A herringbone system is a workable compromise. Collection pipes run the length of each sideline and the slit trenches run at a 45-degree angle off of each collection pipe.

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A common mistake made is installing a slit trench system and then maintaining the field as you had in the past. When core aerating, if you bring the cores to the surface and then drag them back into the field, eventually you are going to dirty the sand in those drainage channels and plug them up. You will eventually "cap" the trenches with soil. Once the slit trench system is installed, it's time to start sand topdressing and removing aeration cores. I suggest topdressing immediately after the slit trenching is installed. To be ready for fall sports, you should put down about 3/8 inch of straight sand across the whole system in spring. Run some test strips in the field surrounds until you become calibrated. This is a lot of sand. It looks like you are burying the grass. The grass will grow through the sand and in 4 days you'll be mowing again so don't be too concerned. You shouldn't plan on playing on the newly topdressed turf for some time. The grass needs time to "secure" this new sand topdressing.

In addition to straight sand topdressing, when it's time to aerate, harvest the cores each and every time and then topdress with sand again. You'll be treating the field like a push-up green and you must sand topdress every year and you must pick up the cores. You build up that layer of sand on the surface with the trench system under the sand. This can provide you with the best of both worlds. A quick draining firm surface but the roots will still be able to find the native soil underneath for nutrients and water. This approach is a great way to go but it does require more money to maintain the field. You'll need to purchase sand every year, you'll need a large capacity topdresser, and one of the new core harvesters. It moves you to a higher level of maintenance, but remember the worst thing you can do is spend money on a trench system and maintain the field the way you always did. If you don't core aerate, or you do core aerate and drag the plugs back into the field, eventually the trench system will clog and stop working.

Editor's note: For more detailed information about correct drainage procedures and tips for proper installation, be sure to attend Dr. McNitt's workshop in San Antonio in January at STMA's annual conference.

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Installing a grid drainage system.