Assessing Soil Compaction

by Steven Yergeau, Agriculture & Natural Resources Agent – Ocean & Atlantic Counties

Soil compaction is the hardening of soil due to continuous wheel or foot traffic, which squeezes the air from between the soil particles. Compacted soil has its density increased and its pore spaces reduced. Soil compaction negatively affects nearly all of the properties and functions of soils. Compacted soils inhibit the growth of plant roots affecting the health of crops, pastures, and landscape vegetation. Compaction can also decrease the ability of water to infiltrate through the soil into the ground. Compaction creates surface runoff that can carry pollution, creates standing water for mosquitoes, and increases flooding. Increased compaction of soils can occur during construction activities, crop planting, or installing and maintaining residential landscapes.

As landscape contractors, your role can be to manage compaction, but you first need to determine if soil health is at risk due to compaction and, if present, what is the extent of compaction. This risk can be evaluated through a combination of many different techniques: diagnosing compaction through visual clues, a simple test of the hardness of the soil, and the proper use of soil compaction testers. Possible solutions to remediate compaction in a yard can then be made if compaction is occurring.

Step 1: Look Around

There are some outward signs that you can observe to identify where soil compaction may be occurring in your yard or property.

- Look for areas that have obvious signs of heavy foot or vehicle traffic: exposed soil in pathways, persistent tire ruts, or a lack of vegetation.
- Look for areas that have shallow or surface roots (Figure 1). Note the type/species of plants or trees as some vegetation has naturally shallow roots (such as maple and ash trees).

Figure 1: Shallow, surface roots can be a sign of soil compaction. In addition, areas of bare soil where plants cannot grow may exhibit compaction. (Photo Credit: Steven Yergeau)

- Check for areas of water ponding, which can indicate locations where water cannot infiltrate (Figure 2).

Figure 2: Water ponding on the surface of the lawn can show compacted soils that are inhibiting infiltration back into the ground. (Photo Credit: Michael Gross)

These signs may also be related to other issues in the soil, so make sure you take additional steps to verify any compaction.

Step 2: Dig In

If there are any areas of your yard where compaction is suspected, the next step is to take a shove, spade, or trowel to the soil. Solid soil that is difficult to dig through or break up is experiencing compaction. When digging, look either for a surface crust or for platy soil structure (soil structure that resembles a stack of dinner plates). Any soil that clumps together in large pieces will also indicate soil compaction. When looking for compaction, make sure to dig up soil that is moist, but not muddy. Waiting 2-3 days after a rainstorm is best.

Step 3: Check Soil Hardness

Confirming the presence of soil compaction can be done by testing the soil hardness. This involves pushing a probe through the soil and measuring the distance the probe travels before stopping. The general idea is that the deeper the probe goes into the soil, the less compacted the soil. It is best to test for hardness when soils are moist, but not saturated.

One way to test for soil compaction is to use a penetrometer (Figure 3). A penetrometer consists of a pressure gauge mounted at the top of a pointed rod, which is pushed into the soil. The pressure gauge provides a measure of the resistance of the soil to penetration by the probe. The pointed tip of the penetrometer is designed to represent a plant root and "feel" the resistance from soil that a plant root would. The penetrometer is pushed into the soil until it no longer goes into

ROOTS

Watering New Sod in the Summer Heat

I remember well those sweltering Summer days years ago when I not only installed irrigation systems but also put down many acres of sod as part of my contracts. For years I installed turf on everything from small residences up to 5-acre homes, offices and small condominiums. I never used a sub-every stitch and seam was overseen or done by me and my employees as I took pride in a job well done.

The trick in the summer heat was to dress and grade peat moss as a base over the subsoil to act as a spongy surface to lay the sod onto. A quarter to a half inch was all it took. Sweating in the Summer humidity, we would all be covered in peat, but the results were excellent-I never had to replace any more than the occasional few square feet. That little trick, plus having the watering schedule in my control, produced the great results-no losses from lack of moisture.

About that watering schedule-I still implement watering durations and frequencies today for many landscape projects done by others-and run into ridiculous reasons for not using the schedule I recommend. Since all the turf needs is a heavy initial soaking, I put down ½ an inch as soon as the turf is down. After that 1/8 to ¼ of an inch daily for two weeks will keep the turf plump and juicy-but not TOO juicy-we don't want to rot the sod before it has a chance to root.

I usually use two start times-9 AM and 1 PM-yes during the day-not the early morning. This provides moisture just as the heat of the day begins and the second watering "syringes" the sod as the real heat sets in. Syringing is a common practice on golf courses during the Summer and it works well for new sod. To obtain the aforementioned ¼ inch of water use this general rule: For rotors the average precipitation rate is 0.5 inch/hour and for mist sprays 1.5 inches/hour. Thus, two water events of 30 minutes for rotors and 10 minutes for mist sprays will suffice.

Many landscapers raise Cain when I put this schedule in and I have to assure them that it will work perfectly well. They settle down quickly once I explain the science behind it and two weeks later the sod has put down roots for good. And then on to the next project!

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the soil. This process is repeated at various locations in a lawn. The distance that the rod penetrates the soil is measured with a tape measure and recorded, with deeper penetrometer depths indicating less compact soils. Many landscape contractors may already be capable of testing soil hardness with a penetrometer. When performing penetrometer tests, be sure to stay clear of any tree roots, underground pipes and wires, and irrigation lines.

Also, be aware of other factors that contribute to the level of resistance measured by the penetrometer such as soil texture and soil water content. If the procedures for using a penetrometer are part of your long-term lawn care, obtaining this additional information (soil texture, percent water) will help explain the level of resistance measured in your yard.

Figure 3: A static cone penetrometer, a.k.a. soil compaction tester. (Photo Credit: Steve Yergeau)

In summary, to manage compaction one first needs to determine if compaction is present and what the extent of compaction is in a yard. This understanding will help in the management of activities that can lead to compaction and provide possible solutions.

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