"Federation Corner" column
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Treating soil compaction will improve health of streams
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Most Montgomery County residents have heard that stormwater runoff causes problems in our streams, rivers, and in the Chesapeake Bay. Many have learned about the pollution problems associated with "impervious surfaces" such as buildings, sidewalks, and roads. By covering the landscape with impervious surfaces, we have disrupted the natural water cycle. Instead of rainwater filtering into the soil to replenish groundwater and maintain the flow of streams in dry weather; it runs over the surface, picking up pollutants on its way to the nearest stream.

A major focus of stormwater management now, is to reduce or "disconnect" impervious surfaces. Green roofs, rain barrels, and rain gardens are among the techniques used to slow stormwater down, spread it out, and let it soak in. But infiltration practices are only as good as the soils they are in. It turns out that many of the unpaved open spaces in urban and suburban areas are not truly pervious.

How do soils become compacted? A major cause is current construction practices. Usually, a developer will strip away the natural topsoil as part of the initial grading process. Once construction is complete, a thin layer of topsoil is applied and turf grass seeds or a skin of sod is laid on top. Thus you have a carpet of sod on a thin "rug pad" of soil over compacted subsoil.

Construction of athletic fields (in areas that are not already level) is done the same way. Heavy foot traffic, repeated mowing, or the use of heavy equipment will also cause soil compaction. Scientists are increasingly documenting athletic fields and other grassed areas with runoff rates as high as some pavements. Even lightly-used ornamental lawns that have been in turf for decades can be compacted. This is why good lawn maintenance firms recommend yearly aeration of lawns.

So what defines a compacted soil? It's all about space. Healthy soil is composed of sand, silt, and clay particles. These particles are loosely held together into "crumbs" (sometimes referred to as soil structure). In between the crumbs are pore spaces. Some pores contain air, some contain water, and some have both. The final component to a healthy soil is a complex community of living organisms that recycle energy and materials through the system.

When a soil gets compacted, it loses pore spaces and the structure collapses. This means less oxygen and water in the soil environment and thus fewer soil-dwelling animals. Plants cannot grow as well in compacted soil as roots need air, water, and partnering microorganisms to flourish.

Thus, a lawn on compacted soil becomes like a hospital patient on life support, requiring frequent applications of water and nutrients. Because it is stressed, it is also more likely to fall victim to pests and diseases, thus prompting the application of pesticides. At the same time, because compaction prohibits infiltration, stormwater, fertilizer and pesticides are more likely to run off.

So, it turns out that compacted turf areas complicate stormwater management. Clearly we can't focus all our attention on the paved areas, nor can we assume that lawns will soak up the rainwater we direct there, or that infiltration practices will function equally in all soils. Water infiltrates the thin skin of sod and soil, but then has nowhere to go. It's easy to spot these areas because you can see water leaking out sideways after a rain. Sometimes a nearby path or parking lot will show a thin sheet of water for days after a rain, as the water simply travels horizontally just below the sod rather than over it.

So what can be done? In turns out that deeply incorporating low-nutrient compost into soils shows great promise. This can be done in a number of ways. Using an agricultural machine called a soil ripper to break up the subsoil and mix in compost is one technique, called “subsoiling”. Another technique uses a trenching tool to cut deep drenches across a property. The trenches are then packed with low-nutrient compost or “pine fines” that will slowly build soil.

It is estimated that using these types of techniques throughout a small watershed could reduce runoff from lawns up to 74%. These approaches are also likely to be more lasting than the typical, expensive, field renovation which can be ruined by just one game played in the rain. This is great news, because it means that all the turf in developed areas could in fact become truly pervious.

Of course, ideally we would change the development process so that either soils are preserved during construction (by minimizing grading and moving soil in lifts) or subsoiling would become the last stage of grading. This could be encouraged by providing stormwater management credits for these practices. Lots of details need to be worked out, including how and if such credits would transfer once the site was developed, and how to ensure the land does not become re-compacted by overuse and/or poor maintenance practices.

Still, subsoiling and similar practices are clearly worth “digging into” as the County and MNCPPC strive to meet their stormwater permits.

The views expressed in this column do not necessarily reflect formal positions adopted by the Federation. To submit an 800-1000 word column for consideration, send as an email attachment to theelms518@earthlink.net