

Preventing Soil Compaction to Preserve Infiltration

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To prevent increasing the runoff from the pervious areas of a construction site, it is important to maintain the existing infiltration capabilities. Earthmoving can substantially reduce the infiltration capabilities of soils by compacting the soil. Experiments on a variety of soil types, both sand and clay, show a 70 to 99% reduction in infiltration capacity after being compacted.

The amount of topsoil compaction is related mostly to ground contact pressure of the earthmoving equipment. To reduce ground contact pressure on the soil, reduce the tire pressure, use large or dual tires or tracked vehicles.

The amount of upper subsoil (12" – 20" deep) compaction is related to the ground contact pressure and the axle load, while the amount of lower subsoil (deeper than 20") compaction is determined only by the axle load. A single axle load of less than 7 tons compacts the soil to an approximate 20" depth (upper subsoil). An axle load of 10 tons compacts the soil to 26" (lower subsoil). To prevent deep compaction, increase the number of axles or use a lighter vehicle. For example, a Caterpillar D4 dozer weighs 9 tons. Some additional methods to prevent compaction are limiting the area of disturbance, directing repeated travel into a traffic lane that can be remediated later, and driving faster to reduce equipment time upon the soil.

Wet soil is compacted to greater densities and depths than dry soil. Soils that have drained for two to three days after a rain are at field capacity. Soils at or below field capacity have drained water from the larger pores and are less prone to compaction. Silt loam and clay loam soils above field capacity form a soft plastic ball that leaves a heavy, continuous mud coating on your fingers when you squeeze it. Free water is visible on the soil surface after squeezing the ball. Compaction resistant soils below field capacity will not show free water on the surface of the squeezed ball; the ball will be slightly firmer and will leave an uneven, thin coat of mud on your fingers. If you want to try this method or find the weight of your construction equipment, consult the references listed at <http://montgomeryconservation.org>.

To more efficiently remediate compaction, add lime to help stabilize the soil structure and temporarily stabilize with grass. Vegetation will dry the soil, making surface tilling and deep ripping more effective. Working wet soil is unlikely to have any benefits. It is important to prevent compaction because it is not possible to completely reverse it with tilling and subsoil ripping. Soil compaction efforts will pay off with increased infiltration, less erosion and healthier vegetation.