Amelioration of Compacted Subsoils by Chemical and Physical Amendments

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Abstract:
Subsoil compaction resulting from disturbance during construction activities can result in greatly reduced infiltration capacity leading to increased runoff from re-vegetated areas such as lawns, athletic fields and golf courses. Typical construction practices include removal of topsoil and reshaping the subsoil to conform to a landscape design, followed by addition of a limited depth of topsoil and seeding. The reshaping with heavy machinery and loaded trucks leads to smearing, pulverizing and general loss of soil structure, including elimination of macropores such as earthworm channels and decayed plant roots. Although the topsoil may over time develop a reasonable infiltration capacity, a wetting front upon reaching the compacted subsoil will be impeded, resulting in saturation of the topsoil and high runoff rates of additional rainfall. The greatly reduced infiltration capacity not only results in increased runoff, but usually leads to water quality impairment in the form of higher sediment, nutrient and pesticide loads to receiving waters.

Five different amendments: wood chips, compost, straw, short plastic tubes and cross linked polyacrylamide (CLP), were added to packed columns at three different volumetric rates and packed at a uniform effort to simulate a compacted subsoil. Bulk densities and hydraulic conductivities were determined in the laboratory and compared to controls with no amendment. A second experiment compared the root penetration and growth of fescue among the treatments and control. Two amendments (CLP and plastic tubes) increased the hydraulic conductivities of packed soil columns by a factor of about 20 or more, while the other materials (wood chips, compost and straw) showed little or no increase in hydraulic conductivity. Root penetration and general turf quality was also much higher in the CLP and tube treatments compared to the other treatments and control.

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