Hydraulic Conductivity Measurements of Spodic Horizons in Southeast Florida

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Some years before the start of the St. Lucie County Soil Survey (Florida), it was noted that certain drainage systems were not performing as expected. It was speculated that the poor performance of these systems was due to slow permeability rates of the spodic horizon in these soils.

A study of the in-place saturated hydraulic conductivity of spodic horizons was included in the soil survey work plan. Other properties of the "spodic," such as color, consistency, cementation of the entire horizon or subhorizon, thickness, and structure were also studied.

The method used for field measurements of saturated hydraulic conductivity was the piezometer method as described by Boersma (1965). The method required about 12 inches of water above the spodic horizon. A small diameter pipe was sealed into the spodic horizon. A small cavity was augered below the pipe to allow water to enter the system. The rate or rise of water in the cavity and pipe was measured. The hydraulic conductivity rate was calculated using Darcy's Law. Figure 1 illustrates the method used.

Table 1 gives the saturated hydraulic conductivity rates for the spodic horizons or subhorizons of spodic horizon for selected Haplaquods in St. Lucie County. As can be seen, hydraulic conductivity rates range from near zero to .7 inch per hour. These rates are significantly slower than currently estimated for the soils tested.

A comparison of the hydraulic conductivity rate and consistency of the spodic horizon or subhorizon is given in Table 2. Note that the firmer the consistency, the slower the hydraulic conductivity rate. There does not appear to be a correlation between total thickness of the spodic horizon and the conductivity rates.

Two piezometer studies were performed to determine the presence of a perched water table on the spodic horizon. The first study involved two soils. The equipment used included three pieces of PVC pipe and a rain gauge. One PVC pipe, which was 80 inches long with a 1-5/8 inch outside diameter, was driven into a 1-1/4 inch auger hole extending below the spodic horizon. The soil was squeezed outward and formed a seal between the pipe and spodic horizon. The second pipe was sealed into the spodic horizon. The third pipe was set above the spodic horizon; a few holes were drilled into the side of the pipe. A rain gauge was installed nearby to monitor rainfall at the site. All the pipes were located within an area of 3 square yards. The water table was read every working day for a month during the summer rainy season. Water never rose above a depth of 72 inches in the pipe extending through the spodic horizon in either soil. The

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