Public Abstract
First Name:Janith
Middle Name:Madusanka
Last Name:Chandrasoma
Adviser's First Name:Ranjith
Adviser's Last Name:Udawatta
Co-Adviser's First Name:Stephen
Co-Adviser's Last Name:Anderson
Graduation Term:SS 2015
Department:Soil, Environmental & Atmospheric Sciences
Degree:MS
Title:Soil Hydraulic Properties as Influenced by Prairie Restoration

Prairies have been important living systems in various ecosystems. These complex living systems play a vital role both biologically and ecologically in the environment and support a large amount of wildlife. Prairie restoration is an ecologically friendly way to restore prairie land that was lost due to various reasons. This study evaluated a native prairie and a restored prairie to assess the influence of prairie restoration on soil hydraulic properties. Samples were collected from two prairie sites, a continuous no-till site (NT), a long-term timothy grass site (TM) and a row-crop (RC) field. Prairie Fork (RP) was restored in 1997, and the native prairie (Tucker prairie (NP) has never been tilled. NT and TM are located at historical Sanborn field in Columbia, and the row-crop field is located at Centralia, Missouri. All sites have Mexico silt loam (fine, Smectitic, mesic, Vertic Epiaqualfs) soil series. Soil cores (76 × 76 mm) from six replicate locations from each treatment were sampled to a 60 cm depth at 10 cm intervals. Samples were analyzed for bulk density, saturated hydraulic conductivity (Ksat), soil water retention and pore size distribution. In-situ saturated hydraulic conductivity was also measured at each location using a constant head permeameter by subsurface soil horizons with five replications. RETC computer program version 6.02 was used for parameter estimation. Bulk density was significantly lower for the NP site, and the RP site was significantly higher than NP. Bulk density was significantly lower for the first depth (0-10 cm) for all the sites and the second and third depths (10-20 cm and 20-30 cm) had the highest values. The in-situ Ksat was lower than all other treatments for the RP site when averaged across soil horizons while the Ksat it was significantly higher for the first horizon. NP had significantly higher laboratory measured Ksat when averaged across all depths and it was almost 4 times higher than RP. The first depth (0-10 cm) of all sites had significantly higher Ksat other depths and the sixth depth (50 – 60 cm) showed the lowest Ksat. NP had the highest macroporosity and fine-mesoporosity, while RP had the highest microporosity. NP had significantly higher water retention at saturation while RP had the highest water retention for soil water pressure of -33 kPa, -100 kPa and -1500 kPa. Soil water retention was significantly higher in NP for -0.4 kPa to – 10 kPa soil water pressures, and at -20 kPa NP, RP and RC had significantly higher retention. NP treatment had higher soil water content than the other sites for the first (0 – 10 cm), second (10 -20 cm), third (20 -30 cm) and sixth (50 – 60 cm) depths at soil water pressures less than -20 kPa. The fourth (30 – 40 cm) and fifth (40 – 50 cm) depths of RP had higher soil water content at all soil water pressures. The soil water characteristics for all sites and depths were well described by the van Genucheten relationship with $r2 > 0.90$. The n values for all treatments were less than two. RP showed significantly higher alpha values for depth 2 (10 – 20 m), depth 3 (20 – 30 cm) and depth 4 (30 -40 cm). There were significant differences in alpha and n parameters among treatments, however significant differences for soil depth were shown in only the n parameter. From these results it is apparent that the prairie restoration does significantly influence some hydraulic properties in claypan soils; however, it is unlikely to achieve the original prairie soil characteristics due to the erosion of the top soil.

Key words: bulk density, hydraulic conductivity, native prairie, pore size distribution, parameter estimation, RETC, restored prairie, soil water retention, silt loam, van Genucheten