Public Abstract
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Title:EVALUATING REMOVAL OF NUTRIENTS, VOLATILE ORGANIC COMPOUNDS, AND NICOTINE BY BIORETENTION SOIL MIXTURES WITH BIOCHAR AMENDMENT

Urbanization results in reduced infiltration contributing to potential urban flooding and stormwater contaminants. Urban stormwater pollutants, including total suspended solids (TSS), nutrients, heavy metals, oil and grease and microbial contaminants are a concern for local water bodies. One of the most popular stormwater best managements, bioretention, has shown the capability of pollutant retention, but efficiencies are not consistent. This study introduced biochar into bioretention soil media to enhance removal of nutrients, nicotine and volatile organic compounds from synthetic stormwater runoff. Biochar is produced from the pyrolysis process by heating biomass with little to no oxygen at 500 to 900 degrees centigrade. Studies have suggested that biochar increases soil cation exchange capability (CEC), as well as provides huge surface areas. In this study, four types of bioretention soil mixtures were prepared based on the recommendations in State of Missouri, with different biochar content (0, 2%, 5%, and 10% volume percentage). Triplicate soil columns were set for each treatment to ensure statistical reliablity. The biochar used in this study was purchased from a local biochar company called Terra Char.

Biochar reduced nitrate leaching, and both 5% and 10% biochar showed significant differences from the traditional bioretention soil mixtures. However, no nitrate removal s were seen between 5% and 10% biochar. Additional 2% biochar improved ammonium removal for the first two storms, but this advantage was not long lasting. Adding additional biochar did not improve phosphate retention.

Nitrate leaching occurred at the beginning of the storms. Ammonium removal took place from the beginning to the end of the tests. Phosphate retention occurred at the beginning of the storms. About 87±11.4% of the VOCs were retained in the soil. Biochar enhanced VOCs retention, and bioretention soil mixtures had great nicotine reduction. Most samples showed more than 99% nicotine removal for all four treatments. Additional biochar did not increase nicotine removal.