

Dr. Ishi Buffam, Assistant Professor in Department of Biological Sciences and Dominic Boccelli, Assistant Professor at the College of Engineering and Applied Science at the University of Cincinnati progressed in completing an Ohio Water Resources Center funded project via joined USGS 104(b) and OWDA subaward. This project titled “**Assessment of a Novel Application of Biochar to Improve Runoff Water Quality from Vegetated Roofs**” aims to improve nutrient retention of vegetated roofs using biochar. Vegetated roofs are becoming increasingly more important as a part of green-engineered solutions for stormwater management in urban areas.

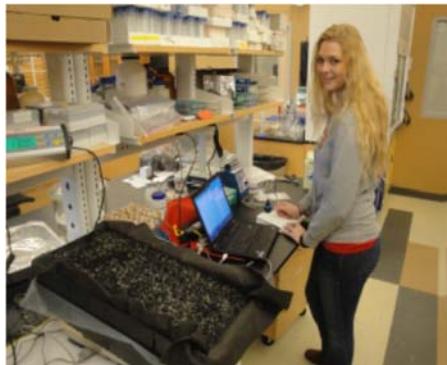


Figure 1 Caitlin Shaw overseeing plot and scale setup for continuous recording of weight changes due to evaporation from biochar-amended vegetated roof substrate.

The integration of biochar is a potential breakthrough in reducing water quality degradation by green roof runoff, but very little is known about the sensitivity to variation in the proportion of the biochar amendment, or the dynamics of sorption kinetics or equilibria. We conducted laboratory column and batch experiments as well as pilot green roof test plots experiments (Figure 1). The laboratory column experiments showed that when averaged over the 5-day experiment, the volume-averaged mean nutrient concentrations (directly proportional to total flux) were reduced in the high-biochar treatment (14 % w/w) by up to 75% for ammonium and 17% for nitrate, while all columns were a slight net source of phosphate regardless of biochar amendment. Furthermore all three different types of biochar substrate (raw, sifted, blended) had about three times higher the water holding capacity when adjusted per mass than traditional green roof substrate. These results are now

being tested in the pilot green roof plots and will be incorporated into modeling. Preliminary results show improvements in water retention capacity, but not an impact on the rate of evaporation or length of water retention (Figure 2). The research demonstrates the water quality improvements associated with a biochar-amended green roof, but will also result in a modeling component that can be used within an integrated assessment framework both within and beyond the Ohio River Valley.

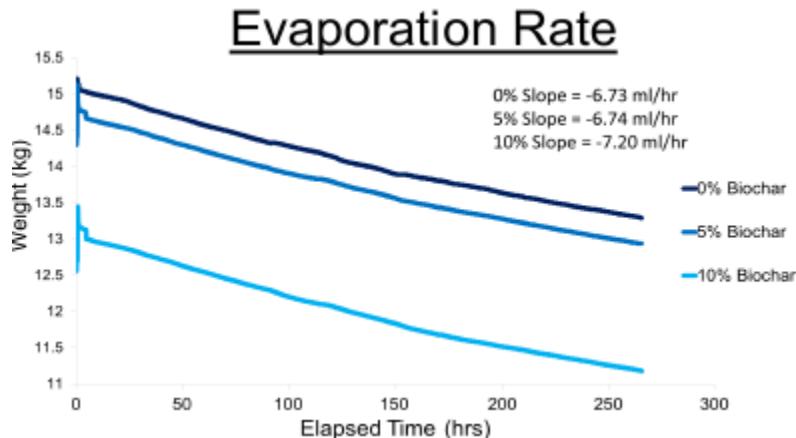


Figure 2 Weight change of each green roof plot (vegetated roof substrate alone, 5% biochar mix, 10% biochar mix) during 11 day incubation period. Evaporation rates were similar for all three treatments.

Researcher Profile: Dr. Ishi Buffam is an ecosystem ecologist and aquatic biochemist. He uses a combination of field vegetation and soil surveys, lab-based water and soil chemistry/biogeochemistry analysis, empirical modeling and GIS-based modeling to evaluate the relationship between landscape/watershed characteristics and surface water chemistry and biotic communities. Many of his current projects are centered on quantifying ecosystem services and potential disservices associated with green (vegetated) roofs, since little is known about the direct biogeochemical functions of green roofs.