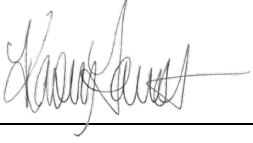


Green stormwater infrastructure is increasingly relied upon to improve the negative hydrologic and ecological impacts of urban development. Site scale strategies are often dependent on owners to adopt, manage, and fund. Although cities commonly offer rebate incentives, adoption rates remain correlated to high income residents and single-family homeowners. Renters unable to control property decisions, especially in multifamily apartments, are left behind by current programs that target owner occupied properties. Similarly, reductions to property fees offered for adoption provide little incentive to owners of rental properties who pass these costs onto renters. Important to this conversation is that flood risk often falls disproportionately on low-income residents and multifamily apartments, making the geography of adoption misaligned with flood risk that green stormwater infrastructure can mitigate. At best, current strategies lead to inefficient use of funds with limited impact, while at worst, the strategies deepen hydrologic and financial inequalities. This study investigates questions regarding untargeted rain cistern implementation strategies' technical performance relative to strategies that integrate cisterns for multifamily apartments, and a biofiltration pond. Survey data informs the renter and owner adoption rates used in this model. Multifamily scenarios are investigated under different impervious cover percentages, and increasing precipitation intensities, inquiring performance insight to future development and climate change projections. To answer these pressing questions, a Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model is used to simulate total runoff volume and peak discharge rate for a sub catchment in Austin, TX. Unsurprisingly, a general trend of decreasing performance under increasing intensity was seen for all GSI. Key results show performance reductions of total runoff for single-family scenarios range between 0-9%. The multifamily strategy, with a 16,000-gallon capacity cistern, reduced total runoff volume 33-18% from the median to the 25-year storm. Increasing impervious cover from 50 to 60% for the 16,000-gallon capacity multifamily scenario improved the reduction of total runoff volume to 35-24%. When storm intensity was increased to 100 and 500-year storms, the 16,000-gallon capacity scenario with 60% impervious cover reduced total runoff volume by 18% and 13% respectively. The results show integrating cisterns for multifamily apartments can lead to better outcomes under median storm intensities, increasing storm intensities, and denser urban development. This study contributes to the current body of knowledge and practice by understanding renter and owner GSI adoption impact, and suggesting new multifamily strategies absent from the literature that achieve comparatively improved results.

Signature:  Date: April 14, 2022