Abstract

The world is currently facing many issues directly related to climate change, such as rising temperatures, increased storm frequency, and ever-climbing sea levels. One method of combating these challenges is the development of green infrastructure, which is the incorporation of porous surfaces designed to be similar to the hydrology of the natural environment. It provides benefits such as stormwater retention and filtration, cooling of ambient air and building insulation. In this study, there is a design of two green infrastructures in New York City: a green roof in Manhattan, and a hydraulically connected rain garden at an intersection in Long Island City, Queens. The rain garden design improves stormwater management of the existing bioswale by 126%, while also draining fully over a shorter period of time, allowing it to operate at an optimal level faster. The designed green roof increases site stormwater retention by 9,375 gallons, also reducing the peak flow by 0.2 cfs. Physical models of a rain garden and a green roof were constructed, to experimentally study the effect of these practices on key parameters. The model rain garden retained 60% of inflow from single storm events, but only half of the inflow from double storms. Approximately 80% of nitrogen in inflow was captured from single storms, but about only 60% from double storm events. The model green roof was more effective at delaying runoff and retaining inflow for low-intensity storms, consistently reduced peak flows, and provided insulation from heated inflow. These experiments showed proof of the effectiveness of green infrastructure for stormwater management.