



Rachel Scarlett

Rachel Scarlett is from Los Angeles, California, and she completed her B.S. in Environmental Studies at the University of California, Santa Barbara. After she was accepted to Purdue University Graduate School in 2015, she was awarded the George Washington Carver Fellowship. She is interested in interdisciplinary approaches to restoring urban waterways and remediating urban water quality. During her Master's thesis, she had the opportunity to travel to Seoul, South Korea, and Magdeburg, Germany to network with and learn from international students and faculty who are interested in solving complex, water-related problems that plague cities worldwide. She plans to stay at Purdue and pursue a doctoral degree under the mentorship of Dr. Sara McMillan and Dr. Suresh Rao. During her free time, she enjoys traveling and playing basketball.



Influence of Stormwater Control Measures (SCMs) on Hydrology and Water Quality of a Suburban Watershed

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Healthy streams create vital habitat for aquatic communities and function as essential components of hydrologic and nutrient cycles. Urban streams are ecologically deteriorated due to increases in impervious area, discharge and loads from piped drainage infrastructure, and stream straightening and burial. The resulting increases in discharge volume and intensity, and degraded water quality in urban areas have immense impacts on aquatic life and eutrophication downstream. These qualities allude to *urban stream syndrome*, a pertinent and consistent observation across cities. Although urban stream syndrome suggests that urbanized watersheds function as dominant *transporters* of material and energy to the watershed outlet, there is evidence that urban streams can also be *assimilative* ecosystems that process and cycle nutrients in a similar yet distinct manner compared to natural streams. Water retention structures, specifically stormwater control measures (SCMs), facilitate evapotranspiration, delay runoff to the stream, and increase processing time for nutrients— like phosphorus and nitrogen. Natural analogs of SCMs— including riparian and upland wetlands with ephemeral or permanent hydrologic connectivity to streams, and hyporheic-zone processes— provide assimilative and storage functions in non-urban, less-impacted stream networks. Loss of these natural analogs with increasing urbanization contributes to the transition from assimilation to transporter functionalities in urbanized watersheds.

While the effects of individual SCMs during baseflow conditions are well known, there is a knowledge gap on the cumulative influence of SCMs on hydrology and water quality during stormflow. My hypothesis was that increases in volumetric SCM storage would drive urban watersheds from primarily water and nutrient transport systems during storms towards assimilative systems, where N and P concentrations are reduced and flashy hydrology is dampened. To test this hypothesis, storm discharge and water chemistry were monitored at high temporal resolution along a gradient of SCM mitigation in a small suburban watershed in Charlotte, NC. Results indicate that SCM mitigation was not a significant predictor of storm runoff volumes, nor was it a significant predictor of solute concentrations. However, qualitative indicators of SCM mitigation are observed during small storms under dry antecedent conditions.