Effects of Increased Temperatures from Storm Water Run Off on Microbial Communities in Urban Streams

As of 2010, the percentage of the human population living in urban areas is estimated to be 82.3% in the United States and will continue to increase as the human population grows. Urban areas have been shown to affect the streams within them, including substantial increases in atmospheric temperature due to less vegetation and darker surfaces. In addition to increases in temperature, the nitrate supply found in urban streams has more than doubled within the last century; seriously affecting water quality and human health. These temperature increases affect streams during storm water runoff, altering the ability of the microbial community within the streams to transform and remove excess nutrients. The goal of our study was to determine whether increases in surface water temperatures due to storm water runoff from directly connected impervious areas (DCIAs) influenced the sediment microbial community composition in urban streams. We monitored stream temperatures during storm events, collected water for nutrient chemistry, and collected sediment cores for microbial analysis on at three separate sampling locations within the city of Tuscaloosa, AL. We determined how run off from DCIAs influenced the structure and function of the microbial community throughout a storm event by extracting DNA and RNA from sediment. We used terminal restriction fragment length polymorphisms (T-RFLPs) of the 16s rRNA gene to identify variation in the microbial diversity throughout two different storm events. T-RFLPs provide a “fingerprint” of the microbial community’s composition. Temperature increases in stream surface waters were measured during storm events between all three sampling locations during both storm events we monitored. Microbial communities exhibited variation in structure between sampling locations, and throughout storm events. Water chemistry did not vary between steams or throughout storm events. This work provides insight into the effects of urbanization on streams, which play an integral role in transforming, transporting, and eliminating excess nutrients from urban runoff. Future work on this project will determine how increased temperatures influence processes such as denitrification (microbial conversion of nitrate to N2 gas) and whole-stream metabolism.

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