THE URBAN STREAM CONTINUUM: THE EFFECTS OF UPLAND RIPARIAN ZONES AND ENGINEERED "URBAN KARST" ON ORGANIC MATTER, CONTAMINANT FLUXES AND LOTIC ECOLOGY.

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Urban streams have long been known to have poor water quality due to stormwater runoff and sewer/illicit connections. However, understanding how these affect aquatic ecosystem structure and function requires a highly interdisciplinary, multi dimensional approach. Just as aquatic ecologists have come to realize the importance of hyporheic and watershed influences on stream ecology, it has become apparent that urban streams are even more complex, three dimensional, catchment-wide hydrologic ecosystems, and not simply runoff conveyance systems. Of great importance is the degree of connectivity between civil infrastructure and receiving streams, including the routing of stormflow, augmentation of baseflow by potable water networks, "upland riparian" sources and riparian interactions with sanitary sewers. Almost every hectare of the urban landscape can be underlain by this dense network of pipes which create a kind of "engineered karst" which not only affects hydrologic processes, but creates a previously under-appreciated "gutter subsidy" for organic matter and contaminants to urban streams. The exponential extension of the stream network density by stormwater drainage reaches almost every drainage feature in the landscape, essentially making every gutter and rooftop a zero order stream, with potentially important implications for stream ecosystems, watershed management and public health.

We present several years of water quality data for streams and storm drains of the BES LTER & Baltimore City stream networks. Storm and dry weather DOC, TSS, and FPOM revealed high temporal variance, with high flux levels and concentrations. Ultra urban small headwater residential catchments had very high organic matter, bacterial, nutrient, and metal concentrations, suggesting that these are hotspots in the urban hydrologic landscape deserving of more attention. Thermal inputs from urban headwaters were also significant, and may have implications for stream biota and biogeochemical processing. These results suggest that the altered drainage pathways and strong terrestrial-aquatic linkages of urban catchments may combine in a way such that both natural and urbanized headwaters are important locations for management of catchment pollutant loads, and are important for aquatic food webs and productivity. We discuss various aspects of these complexities with respect to how they create a new "urban stream continuum" and determine water quality and constrain aquatic communities.

KEYWORDS: Organic Matter, Urban Hydrology, Urban Stormwater, Leaf Litter, Drainage Networks