

# Green infrastructure, groundwater and the sustainable city

**Larry Band**

*Voit Gilmore Distinguished Professor of Geography*

*Director, Institute for the Environment*

*University of North Carolina*

*Visiting Professor, Chinese Academy of Science*

The management of water is among the most important attributes of urbanization. Provision of sufficient quantities and quality of freshwater, treatment and disposal of wastewater and flood protection are critical for urban sustainability. Over the last century, two major shifts in water management paradigms have occurred, the first to improve public health with the provision of infrastructure for centralized sanitary effluent collection and treatment, and the rapid drainage and routing of stormwater. A current shift in paradigm is now occurring in response to the unintended consequences of sanitary and stormwater management, which have degraded downstream water bodies and shifted flood hazard downstream. Current infrastructure is being designed and implemented to retain, rather than rapidly drain, stormwater, with a focus on infiltration based methods. In urban areas, this amounts to a shift in hydrologic behavior to depression focused recharge.

While stormwater is defined as surface flow resulting from developed areas, an integrated hydrologic systems approach to urban water management requires treatment of the full critical zone. In urban areas this extends from the top of the vegetation and building canopy, to a subsurface depth including natural soils, fill, saprolite and bedrock. In addition to matrix and network flow in fracture systems, an urban “karst” includes multiple generations of current and past infrastructure, which has developed extensive subsurface pipe networks for supply and drainage, enhancing surface/groundwater flows and exchange. In this presentation, Band will discuss the need to focus on the urban critical zone, and the development and adaptation of new modeling and analytical approaches to understand and plan green infrastructure based on surface/groundwater/ecosystem interactions, and implications for the restoration and new design of cities.