SAFL Seminar Series

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St. Anthony Falls Laboratory ~ Auditorium

Ecosystem Services and Stormwater Treatment Systems: The Case of Stormwater Ponds and Wetlands

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Abstract: Urban runoff has been cited as one of the leading causes of surface water degradation in both freshwaters and coastal estuaries. Recognition of the issues associated with runoff-borne nutrient pollution has spurred the proliferation of stormwater control measures (SCMs) designed to reduce pollutant loads from urban runoff. Among the most common SCMs are stormwater ponds, the design of which is intended to regulate peak runoff rates and remove solids from runoff. Although not as common as ponds, constructed stormwater wetlands are gaining in popularity, particularly in developing urban areas draining to nutrient-sensitive coastal areas where stormwater nitrogen loads are regulated. Since the primary functions for which SCMs such as ponds and wetlands are designed are peak flow control and pollutant removal, performance metrics generally focus on hydrologic and water quality aspects of these systems. However, as constructed ecosystems, both ponds and wetlands may provide a range of other societal benefits, or ecosystem services, such as habitat provision and biodiversity maintenance, green house gas regulation, and opportunities for recreational, educational, and aesthetic experiences. While often acknowledged, rarely are such ancillary benefits quantified, much less integrated into assessments to compare SCMs on the basis of the suite of ecosystem services they provide. The costs of creating SCMs to provide such benefits present an additional assessment metrics, and one of prime importance to developers, municipalities, and others involved in the construction and maintenance of these systems. While direct monetary costs are relatively well constrained, environmental costs incurred through stormwater management, such as greenhouse gas emissions, are only now being explored.

In this seminar, I will present an assessment framework for quantifying ecosystem service provision by constructed stormwater ponds and wetlands. Of particular focus here are carbon sequestration and biodiversity maintenance. Differences in ecosystem service provision by ponds and wetlands, as well as design features found to improve service provision, will be highlighted. A model developed to predict carbon emissions through the construction and maintenance of these systems will also be presented.