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# Integration of Education, Scholarship, and Service through Stormwater Management

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## **Integration of Education, Scholarship and Service Through Stormwater Management**

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### **Introduction**

The advent of stormwater PDES Phase II regulations has created an extraordinary shift in the field of stormwater management. Volume, quality, baseflow, temperature have joined peak flow as design parameters, radically changing the design approach of the stormwater profession, and enabled a whole suite of tools to include green technologies, and low impact development concepts. Recognizing the radical nature of these changes and the need to research new approaches, Villanova University, in collaboration with PaDEP, created the Villanova Urban Stormwater Partnership (VUSP) in 2002. This partnership has quickly become a vehicle in advancing the universities missions of education, scholarship and service.

***Mission Statement:*** *The mission of the Villanova Urban Stormwater Partnership is to advance the evolving sustainable stormwater management field and to foster the development of public and private partnerships through research on innovative SWM Best Management Practices, directed studies, technology transfer and education.*

- *Research and directed studies will emphasize sustainable watershed stormwater management planning, implementation, and evaluation.*
- *Technology transfer will provide tools, guidance and education for the professional.*
- *Partnership Goal is to promote cooperation amongst the private, public and academic sectors.*

### **Campus as a Research Test Site**

The first stage of the integration of the universities mission with stormwater research was the decision to use the university as a test site, constructing multiple stormwater Best Management Practices ranging from green roofs to pervious pavements and raingardens. The focus of the research has been on how these management measures operate and perform, and the resulting lessons on design, and maintenance. A secondary but equally important aspect is the introduction of these facilities to the public and profession so their value and functions are recognized. Fortunately, the universities Facilities Office saw their mission as complimentary to the educational mission, and they have become a key partner.



**Stormwater Wetland** - (319 Grant-1998): An existing stormwater detention basin on Villanova University property has been converted into an extended detention wetland BMP. The stormwater wetland treats runoff from a 41 acre site that includes 16 impervious acres. The contributing watershed forms the headwaters of a watershed listed as medium priority on the degraded watershed list. The project has been published as an EPA 319 Success Story. This site is currently under renewed study, with a grant to reconfigure.



**Bioinfiltration Traffic Island (NMP)**. – (Growing Greener Grant, 2001) A traffic island was retrofitted creating a Bioinfiltration BMP during summer 2001. The facility provides for infiltration of the initial first flush. Groundwater Monitoring has been added to this site for 2007. Believed to be the only continuously monitored site in the nation of this type.



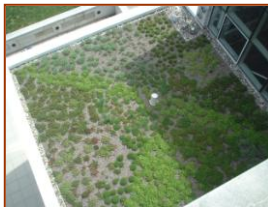
**Porous Concrete Demonstration Site** – (319 Grant, 2002) The grant was to create a porous concrete infiltration facility in an existing central paved area on the Villanova University campus. The porous concrete site was built in 2002, but the initial concrete pour failed. This surface was replaced in the summer of 2003, and repaired in 2004. Runoff from the site and surrounding buildings are captured and infiltrated, decreasing the flows and pollution to a high priority stream segment on the 303(d) list. The site has a much higher capacity than the Bioinfiltration Traffic Island as it overlies a large rock holding bed. Sampling was halted at this site in Dec 2006.



**Infiltration Trench (NMP)** (319 Grant –2004). The project is designed to capture runoff from an elevated parking deck and then infiltrate it through a rock bed into the ground. The project presents some unique possibilities. As the water is piped through storm drains to the site, filtration devices can be used and tested at this site. It is the only site available with a 100% impervious drainage area. It is believed that the bottom filter fabric has sealed, with infiltration only occurring through the sides.



**Pervious Concrete / Pervious Asphalt** (EPA, 319 Program – NRMCA – Prince Georges County). This project is designed to capture runoff from a faculty staff parking area on campus, and then pass the flow through either a pervious concrete or porous asphalt surface course, and then infiltrate it through a rock bed into the ground. The project presents some unique possibilities, to include comparing the performance from both a hydrologic and environmental view of the technologies. Hydrocarbon testing is part of the project, and it will be added to the NMP in 2008.



**Green Roof** (Villanova University 2006) This Green Roof is a demonstration and undergraduate research / laboratory experience project. A rain gage, overflow gage, and temperature sensors are mounted. Constructed on the CEER first floor roof, it is visible from the second floor stairway.



**Pavilion BioInfiltration** ( VU 2007) This student designed infiltration site is built to reduce runoff from a heavily used parking area. Instrumented for Flow only.

## **Education and Service Partnership**

As the stormwater research program has evolved at Villanova, it has become integrated far past the normal scholarship aspects of the research supporting both the educational and service missions. Classes routinely visit and use data from this on campus research laboratory work in their coursework at both the undergraduate and graduate level. The green roof is becoming part of a hydrology experiment for the fluid mechanics laboratory, and the availability of water quality analytical equipment has enabled undergraduate research projects into the fate of metals, and nutrients as well the hydrology of green roofs to name a few. The stormwater wetland in addition has enabled faculty from the engineering and science faculties to work together.

The service aspects impact the university as a community, and reach far past it's boundaries. The university has embraced stormwater as part of the campus sustainability commitment. New building projects routinely include green roofs, pervious paving and raingardens. Many area groups from engineers or scientists to garden clubs and grade school teachers use the site for tours. With such a radical change in focus, these demonstration sites enable the professionals and the public to understand and accept these practices.

## **Summary**

It is rare that Education, Scholarship and Service can be focused through a single vehicle. This presentation will review the integration of these elements focusing on the reasons for this successful approach and what lessons have been learned.

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