Application Form
2011–12 TWRI Mills Scholarship Program

Applicant:
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Proposed Research

The availability and quality of fresh water is becoming an increasingly hot topic as population size and urbanization increase. Urban areas create a high demand for efficient water management. This includes not only potable water but also precipitation, wastewater, and storm water runoff.

The amount of impervious surfaces in the urban environments leads to an increase in runoff after precipitation events. This runoff can then overwhelm storm water systems and result in flooding. Excess storm water in local streams leads to increased peak flow rates causing stream channel incision and enlargement. As storm water flows across impervious areas it picks up many pollutants such as dust, oil and heavy metals, thus causing significant pollution downstream. Storm water that has been flowing over warm pavement also increases in temperature, and higher water temperatures can negatively affect stream wildlife. In some cities the storm water system is connected to a combined sewage overflow system. If the combined sewage overflow system gets overwhelmed with runoff the consequences can be even greater because runoff water contaminated with many pollutants and harmful bacteria can now run into local streams. This has a significant negative effect on the ecology of the area in and around the local streams, rivers and other water bodies.

Green roofs have been shown to aid in a number of issues regarding the management of water in the urban area, such as reduced overall runoff rates and reduced and delayed peak runoff. These living roofs act as a pervious surface, replacing the otherwise impervious roof top, and allowing for water to be absorbed and retained for some time. For large rain events as much as 20-50% of the runoff can be retained, and for smaller rain events it has been demonstrated that as much as 60-90% can be retained. The plants and soil evapotranspire some of the water, thus cooling the roof surface and the building. In a warm climate, such as Texas, this can give significant energy benefits during the summer by reducing air-conditioning energy use.

If only 10-15% of the rooftop space in an urban area was converted to green roofs, the impact it would have on the urban environment and potentially further surrounding areas could be immense. It would reduce the storm water infrastructure needed, reduce energy usage and reduce the heat island effect. Reducing the amount of

storm water received by the storm water system should also reduce the total amount of pollutants entering local water bodies.

However, green roofs have caused some concern for water quality. Compared to impervious roof runoff, runoff from green roofs has higher phosphorus, organic nitrogen, organic carbon and sometimes heavy metal concentrations, depending on the type of soil substrate used. It is important to document the effect that green roofs have on water quality for a range of scenarios. We propose to measure the effect of green roofs on water quality for two different scenarios and compare the water quality of these roofs with that of samples collected from two conventional roofs (a white and a traditional blacktop roof) and storm water runoff from natural vegetated areas. The two green roof scenarios include one roof where roof runoff is collected and continuously recycled on the roof and one scenario where the only water input in the roof is rainwater.

We aim to use the findings from this research to gauge the attributes of green roofs and their relation to improving urban areas and affected ecosystems. Quantifying the properties discussed in the proposed research will allow for proper assessment of green roofs as a storm water mitigation practice.

Academic Qualifications:

- Undergraduate – Texas A&M University, B.S. Horticulture, GPR:
- Relevant Courses- Organic Chemistry; Soil Science; Plant Physiology; Horticulture Science & Practices; Computer Analysis of Horticulture Systems; Landscape Plant Material; Landscape Maintenance & Construction; Turf Management Systems;

- Graduate - Texas A&M University, M.S. Horticulture, GPR:
- Relevant Courses - Ecology of Urban Landscapes; Statistics in Research

GRE Scores- Verbal: Quantitative: Analytical Writing:

Proposed Use of Funds

If awarded the scholarship, the funds will go towards conducting research. Most, if not all, of the awarded funds will be used to collect and analyze water samples taken from the roofs as well as to pay for travel costs to and from Houston.

Career Path

My future plans include graduating with a Masters of Science degree from Texas A&M University while researching the impact of green roofs on Texas' urban environments. Upon achieving my Masters degree, I would like to continue working on green roofs to improve their functions and their popularity. I consider pursuing a Ph.D. a viable option in my future.