Applying knowledge to improve water quality

New York - New Jersey
Puerto Rico - Virgin Islands
Regional Water Coordination Program
A Partnership of USDA CSREES
& Land Grant Colleges and Universities

Region 2 Water Quality Coordination Project – Undergraduate Student Summer Stipend Program

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Undergraduate Student Stipend Program:

Funding was made available for faculty seeking to hire undergraduate students during the summer of 2006 to assist with water related research and/or extension projects in the areas of watershed management, water conservation, water reuse, agricultural water management, and/or onsite wastewater treatment system management. A total of thirteen proposals were submitted for three grants of $4,000 each. The grants were awarded by the USDA-CSREES Region 2 Water Quality Coordination Project.

- One project involved an undergraduate student collecting fundamental, scientific information about the potential for horse manure as a biofuel feedstock, a potential best management practice for avoiding fecal contaminated runoff.
- A second project involved an undergraduate student researching bacteria and beach closings, expired marine flare disposal, and the use of optical brightener traps as volunteer monitoring devices to screen for wastewater in surface waters.
- A third project involved an undergraduate student designing, implementing, and evaluating a public education program for children and adults at community rain garden sites.

The following summarizes problem identification, project outcomes, and project impacts for the three projects awarded under the Region 2 Water Quality Coordination Project Undergraduate Student Summer Stipend Program.

Enhancing Watershed Protection with Development of Economical Manure Management Technology: Horse Manure to BioEnergy

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Problem Identification – To investigate how watersheds could be protected by increasing the value of horse manure through conversion to biofuel. Manures are an important component of an emerging biomass to biofuel route in the energy market.

Project Outcomes - One undergraduate research student and junior and senior level Bioenvironmental Engineering students involved in the Bioenvironmental Engineering Unit Processes Laboratory II investigated the two main research objectives:

1) *Establish stable methanogenic anaerobic digesters operating with horse manure feedstock.* Stable, long-term digesters were established to provide benchmarks for energy yield. Stable reactors will provide materials for future fundamental investigation that is needed to improve the yield and efficiency of the process.

2) *Improve the efficiency and yield of anaerobic digestion of horse manure by co-amendment with other biomass, pretreatment, and by optimization of retention times.* Using inoculum from reactors established in objective (1), an invesitigation was conducted to determine how mixtures can improve biofuel yield and thus increase the value of the manure.

Project Impact - This research may be directly linked to watershed health since increasing the value of manure as a biofuel source could result in an end to indefinite/uncontrolled storage, and since the final product of anaerobic digestion will be reduced in volume, pathogens, and biochemical oxygen demand, the burden on water bodies during land application is decreased.

Jersey Summer Shore Safety

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Problem Identification – The population at the Jersey Shore nearly doubles in the summer as vacationers flock to enjoy water sports, beach bathing, and other recreational activities. This is a key time to not only make them aware of how to recreate safely, but to teach them about water quality issues that affect their use of our water resources.

Project Outcomes - Two Jersey Shore Summer Safety topics were researched: 1) Bacteria and Beach Closings and 2) Expired Marine Flare Disposal.

- A research paper was prepared on the subject of pathogenic bacteria, beach closings, state bacterial monitoring standards, monitoring efforts and methods, and management practices for reducing bacterial loads in watersheds.
- The use of optical brightener traps as a volunteer monitoring device to screen for wastewater effluent in surface waters was also researched. A small study was designed to test the devices. Twelve optical brightener traps were deployed at six sites in Monmouth, Ocean, and Atlantic Counties.
- Marine regulations and disposal options for marine flares were researched, as well as information regarding perchlorate as a new pollutant of concern.

Project Impact – Bacteria and Beach closing information was presented at the Monmouth and Ocean County fairs, which saw an estimated total of 160,000 people over the course of two weeks. Seven documents were produced for use in public education efforts. The preliminary research involving volunteer monitoring devices will be used to further evaluate the effectiveness of optical brightener traps as a volunteer screening tool for potential bacterial contamination of surface waters.

Extension Project in Watershed Management in Union County, NJ

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Problem Identification - The objectives of this 2006 Extension Project in Watershed Management were to:
- Offer public education programs for children and adults at community rain garden sites that were installed in 2005.
- Provide an undergraduate student an opportunity to design, implement and evaluate an extension program in watershed management.
- Create educational materials about rain gardens.
- Educate children and adults about actions they can take to protect groundwater, particularly the installation of rain gardens.

Program Outcome - Educational programs for adults and children were held at a number of community rain garden sites. Photographs and an article about the program were featured in the town's local newspaper. Each student received a fact sheet describing all of the plants in their school or library rain garden.

A fact sheet describing native plants found in a rain garden was written for elementary school students. A fact sheet describing plants and their cultural care was created for four of the community rain garden sites. A scripted PowerPoint® presentation on "How to Build a Rain Garden" was produced. An educational poster on "How to Build a Rain Garden" was designed and printed and is being distributed to each of the rain garden sites and at local garden centers. A website was created for the public library's website that includes a map of the garden, plant list and links to information on rain garden construction and groundwater protection.

An extension education poster about the project was presented at the National Association of County Agricultural Agents Annual Meeting and Professional Improvement Conference in Cincinnati, Ohio.

Project Impact –
- On a scale of 1-3, 3 indicating they learned "a lot," 56 elementary school students rated their learning about protecting water as 2.71 and rain gardens as 2.63.
- 68% of the elementary school students will tell someone what they learned about rain gardens and 96% would like to learn more about protecting ground water.
- In the children's program pre/post brainstorming evaluation about ways to protect groundwater, students could identify 50 % more ways to protect ground water then they could at the beginning of the program.
- 30 adult participants improved their pre/post test scores by an average of 13%.