DEPARTMENT OF
ENVIRONMENTAL
SCIENCE & TECHNOLOGY

Undergraduate Program	Graduate Program
Ecological Technology Design	Soil and Watershed Sciences
Ecosystem Health	Ecological Technology Design
Soil and Watershed Science	Wetland Science
Natural Resources Management	Ecosystem Health & Natural Resource Management

Cutting-Edge Computer System as Wastewater Treatment Method

Water, the world's most precious resource, will soon get a breath of fresh life thanks to graduate an ecological engineering student David Blersch's research into wastewater treatment methods. He is designing a new computer-based system that will treat wastewater via an algal turf scrubber treatment. The first system to operate autonomously without human interference, the algal turf scrubber, promises to cut operational expenses of water treatment - and strip pollutants and harmful nutrients from water.

ATS- Promising Wastewater Treatment Method

In David's four-year study entitled "Towards an Autonomous Algal Turf Scrubber", he uses a computer interface to examine ways to better design ecologically-engineered wastewater treatment systems. One such system is the Algal Turf Scrubber (ATS) system, a complex community of benthic algae and invertebrates cultivated in a turbulent aquatic environment. The ATS, which exploits algae's natural ability to metabolize excess nutrients, offers unparalleled performance in the removal of nutrients and pollutants from wastewater and polluted waterways. Currently, several ENST faculty along with researchers in the USDA Agriculture Research Laboratory are preparing to install a number of ATS in relatively remote locations around Maryland, as a way to test their ability to mitigate nitrogen and phosphorus pollution in impacted waterways. David's laboratory-scale project could prove that ATS can work without human input. "My research could lead to a system where these remote ATS units can operate autonomously, by controlling and optimizing their own operational parameters for maximum treatment potential," David explains. In addition, these constructed ecosystems could save on the cost of installation and make this treatment system competitive with other technologies. Currently, it's estimated that it cost about five dollars per pound of nitrogen removal when the treatment system is operated manually.

How Do ATS Work?

The efficiency of the ATS as a waste treatment technology is directly related to the rate of algal growth - the faster the algae grow, the greater the pollutant uptake rate. "The rate of algal growth is controlled by limiting factors, including light, nutrients, and turbulence," David explains. "The computer-based system that I'm developing monitors the ATS ecosystem metabolism and automatically takes action on one of the limiting factors, like turbulence, as mitigated by volumetric flow rate through the ATS to maximize the metabolism at the minimum input energy." This system allows David to study the behavior of the combined techno-ecosystem on multiple levels.

Interdisciplinary Approach to Solving Manmade Problems

David's study is a perfect example of how environmental science may be integrated in the search for ecological solutions to manmade problems. In this case, David combined ecological engineering, techno-ecology, and ecology. "My research encapsulates one form of ecological engineering attaining engineering goals by leveraging ecological principles," says David. "At the same time, I am looking at the behavior of the combined techno-ecological hybrid by forming the kernel of exploratory work into the brand new field of eco-robotics."

www.enst.umd.edu