



It's a Very Complex Environment

They cover only 25 percent of the world-wide area covered by coral reefs...1/100th of the area of inland tropical forests... but are valued at almost twice that of the former and five times the latter. What are they?

A hint: They are salt tolerant...have extensive, interconnected root systems... create an excellent habitat for adult and juvenile fish, shellfish and water birds... and improve surrounding water quality by filtering nutrients and trapping suspended sediments.

Another hint: They are an integral part of the Louisiana barrier island system...help stabilize the shoreline...dissipate wave energy...and reduce erosion.

They are mangrove forests. They are also the research focus of a LA EPSCoR Pfund grant (see sidebar, pg. 2) awarded to Dr. Amy Anne Erickson, an Assistant Professor of Biological Sciences at Louisiana State University-Shreveport.

The LA EPSCoR project was funded to examine how nutrient fertilization influences the nutritional and the defensive chemistry of mangrove leaves. Its importance lies in the significant impacts that nutrient additions can have on coastal communities.

The Research

"Basically we are looking at how nutrients that end up in mangrove forests affect organisms that live there and the way these organisms interact with each other. Our objective is to determine how the chemistry of plant material is influenced by nutrients and, indirectly, how animals that feed on mangroves are affected by the modified plant chemistry," explains Dr. Erickson, who received her Ph.D. from the University of South Florida.

"It's a very complex environment. Adding nutrients to natural habitats via anthropogenic means, such as in agricultural runoff or from sewage outfalls, can disrupt interactions among species.

"Changes in community structure can result, which can lead to shifts in the function of an ecosystem and the value it pro-

vides to both organisms that live within it and man. For instance, about 75 percent of fish species that are commercially important rely on mangroves at some point in their lifetime. Adding nutrients



Sinking in mud in a mangrove forest is just another day of research for Dr. Amy Anne Erickson, Assistant Professor of Biological Sciences at LSU-Shreveport.

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can lead to changes in the mangrove food web that could negatively impact these important fish species."

Noting that the mangroves' ability to filter nutrients out of runoff water as rivers empty into estuaries protects offshore communities such as coral reefs, Dr. Erickson adds that high levels of nutrients in coral reefs lead to the overgrowth

of coral by algae, which compromises the health and survival of the reefs.

In terms of their storm and erosion protection, an aerial analysis of Louisiana's coastline by the National Oceanic and Atmospheric Administration (NOAA) revealed that areas in which wetlands remained intact were not as badly damaged by hurricanes Katrina and Rita in 2005.

Louisiana's mangroves are found along the fringes of the Deltaic Plain coast marshes, most commonly flanking large bays and on the windy side of barrier islands. Unlike taller species in Florida and the tropics, Louisiana's mangrove community resembles a shrub thicket in which the plants are 10 feet or less in height. While they thrive in areas with high rainfall or an abundant freshwater supply through run-off or river discharge, mangroves can't tolerate the cold.

"Research on mangroves, which has not received as much attention as other terrestrial or marine habitats, is currently on the rise," adds Dr. Erickson. "Given their high ecological and economic value, more baseline data on mangroves are being accumulated to explain their structure and function.

"This is important; when they are threatened by loss or degradation, researchers can determine how severely the habitat has been affected and calculate ecological and economic losses that will result from man-made or natural disasters."

The LA EPSCoR Pfund grant began in 2009 when Dr. Erickson and two biology graduates began collecting mangrove leaves in Florida and Belize.

"We are now in the process of preparing our collected leaves for chemical analysis. We will measure nutrient and chemical defense concentration in mangrove leaves that have and have not been exposed to experimental nutrient fertilization.

"Experiments will be conducted to see how animals feeding on mangroves are affected by different levels of nutrients

Complex Environment, Continued page 2

Complex Environment Continued

and defensive chemical in their food.

“When nutrients are added into mangrove ecosystems, the trees may become more nutritious; however, they could also lead to increases or decreases in chemical defenses. We are thus looking at how the plant responds to nutrients that are added into the environment and how animals feeding on plants respond to changes in plant chemistry.

“If plants become more ‘tasty,’ animals may consume a lot more plant material, which could also have negative impacts on the plant.”

Economic Development

Besides the travel to Florida and Belize, the LA EPSCoR Pfund grant provided funding for much-needed laboratory equipment and training faculty and undergraduate and graduate students in the maintenance and use of technological equipment.

“With Louisiana aggressively seeking science and technology-oriented industries to locate here, there is a strong need for

increasing the pool of scientifically trained graduates,” says Dr. Erickson.

“Grants such as this will allow LSU graduates to be competitive in the job market, given their gained experience in experimental design, chemical analysis, and data analysis and interpretation.”

Dr. Erickson, who developed her interest in mangroves as an undergraduate Georgetown University volunteer for a Smithsonian Ecosystems Research Project, presented a poster this year at the Benthic Ecology Meeting in Wilmington, NC. There she presented new trends in mangrove feeding ecology establishing why mangrove tree crabs prefer older to younger mangrove leaves.

“This area of research is of special importance, not just to those of us living in Louisiana, the Florida peninsula and South Texas, but also to millions of people throughout the world who live in countries with mangrove eco-regions,” says Dr. Michael Khonsari, LA EPSCoR Project Director and Board of Regents Associate Commissioner for Research and Development.

LA EPSCoR's Pilot Funding for New Research (Pfund)

Stimulating and supporting science and engineering tenured and untenured faculty in their exploration of novel research is the objective of the LA EPSCoR Pfund.

Untenured faculty can use the seed funding made available through this program to sharpen their research focus and develop cutting-edge techniques.

Tenured faculty can use it to demonstrate an innovative or novel concept and become more competitive by investigating areas that require a shift in their current research direction.

LA EPSCoR Pfund grants are limited to the science and engineering research disciplines supported by NSF, the awards support students, travel, and the purchase of scientific equipment and supplies.

For more information, go to laregents.org and click on the Office of Sponsored Programs and LA EPSCoR.



A mangrove forest in which Dr. Amy Anne Erickson collected some samples for her research.

