THE UNIVERSITY OF MISSISSIPPI

FIELD STATION

FALL 2010/WINTER 2011

Ray Highsmith and Greg Swain at the National Center for Natural Products Research

As I write this note for the Fall/Winter Newsletter, trees are doing a gentle two-step in the breeze and red and yellow leaves flutter and spin on their final journey. People are enjoying Thanksgiving and looking ahead to Christmas as the seasons change. We are keenly aware of the seasons at the Field Station. Fall and winter not only end the growing season but also bring badly needed rains to fill our system of more than 200 ponds. Diversity declines as the weeds die, migratory birds wing south, bugs disappear and frogs, turtles and snakes hibernate. Researchers and students shift from experimenting, counting and measuring to analyzing, graphing and writing results. For example, Rita Moraes and Greg Swain presented four posters on this year's research at a science day at one of our partner centers, the university's National Center for Natural Products Research.

It's always a pleasure to include the highlights of work by our partners at the Field Station, and we have two such articles in this edition that I hope you will enjoy reading : National Sedimentation laboratory studies on stream oxygen and NIUST work on the BP oil spill.

In previous newsletters, I have stated our long-term goal of becoming the leading field station in the Mid-South. One measure of the success of an academic institution and its departments/centers is the success of its students. We are extremely proud of Robbie Kroger's early successes in his new position at Mississippi State University, as described in the staff announcements section.

Ray Highsmith

Photo by Sarah Lovett

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STAFF ANNOUNCEMENTS

Welcome Sumi Weerasooriya to the Field Station staff! Sumi is a research and development botanist working in the mosquito lab with Dr. Abbas Ali. She screens bioassays against ants and mosquitoes using botanical extracts.
Educated in her home county of Sri Lanka at the University of Peradeniya, Sumi received her undergraduate degree in agricultural sciences and master's in agricultural biology. After working for the university and then the Department of Agriculture in Sri Lanka, Sumi and her husband, Aruna Weerasooriya, lived and worked in Hong Kong and St. Louis, and both are here at the University of MS.
(Aruna works for the NCNPR Research Garden as a research scientist.) They have a 7 year-old daughter, Sayumi, who attends Bramlett Elementary.

Congratulations Dr. Rita Moraes! Dr. Moraes has been appointed as secretary of the newly formed Medicinal & Essential Oil Crops Germplasm Committee.
The Crop Germplasm Committees are a national working group of specialists providing recommendations for managing, evaluating and encouraging the use of the United States germplasm collections. Membership consists of representation from federal, state and private sectors; representation from various scientific disciplines; and geographical representation for the crop(s). The first meeting was held via teleconference in October, and the group is organizing a larger physical meeting for Asheville, N.C., in the late spring of 2011.

Dr. Robert "Robbie" Kroger was awarded the early career achievement award through the College of Forest Resources at Mississippi State University. Robbie is an Ole Miss graduate (biology) and post-doctoral fellow who did much of his research at the Field Station.
Dr. Kroger, in his assistant professor position, has exhibited excellence in garnering more than 2 million in extramural funds, has published 13 peer-reviewed publications with seven in review, and supervises a post-doctoral research associate, a Ph.D. student and four master's students. His research program is quickly gaining national and international recognition with strong collaborative ties having been built between the Wildlife, Fisheries and Aquaculture Department, at MSU and several state and federal agencies.

Correction: In the previous newsletter, Spring 2010, the article "NIUST AUVs Study Shipwrecks in the Northern Gulf of Mexico" was written by Dr. Arne Dierks. Photo credit belongs to him as well.

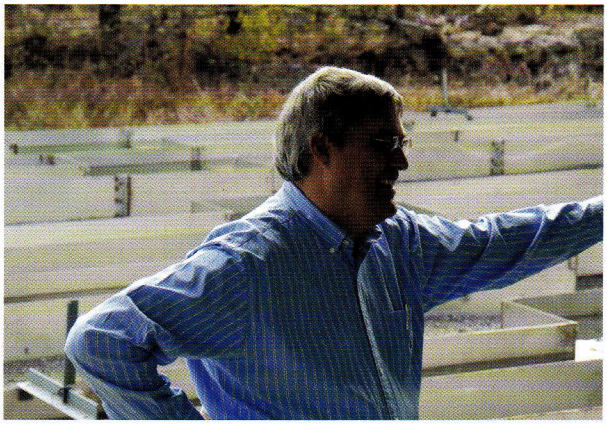
Donor Information: Friends of the Field Station Account, UM Foundation, P.O. Box 249, University MS 38677

All photos by Michelle Edwards unless otherwise noted.

Research Spotlight : USDA Studies Oxygen in Streams

If you mention the hurricane of 2005, the name Katrina will surely come to mind for most people. However, the hurricane that delivered the most rainfall to the Mississippi Delta in 2005 was Rita. As Rita came through Mississippi from Texas, there were fish kill events in the Delta at Deer Creek, close to Stoneville. It's thought that this storm flushed large amounts of debris into the waterways, and subsequent decay caused stream oxygen concentrations to drop to insufficient levels, called hypoxia, to keep fish alive.

This is the hypothesis of researchers Dr. Scott Knight and Dr. Rich Lizotte, ecologists at the USDA National Sedimentation Laboratory, and the subject of their latest research at the UM Field Station.



They have constructed artificial microcosm streams to simulate the conditions of the slow-moving delta bayous to test this theory. The streams are designed to mirror the Delta's "black water" as closely as possible. They are equipped with small pumps to facilitate the water's slow-to-nonexistent movement and are filled with organic matter to simulate the soft, silty mud bottoms found in the Delta's dark waterways. These waterways have very low oxygen content - but why? Is the low oxygen content a product of decomposing leaf and crop debris? How does water flow effect this dynamic, and to what degree? These are just a few of the questions that the researchers hope to answer. "Usually when you answer one question, about 10 more pop up," says Scott.

The USDA and the university are working together under a specific cooperative agreement that allows the combining of resources, resulting in more benefits for both. "We couldn't conduct these experiments at our labs in town because the city water has too much chlorine in it. The Field Station has really good water and the facilities are second to none," says Knight.

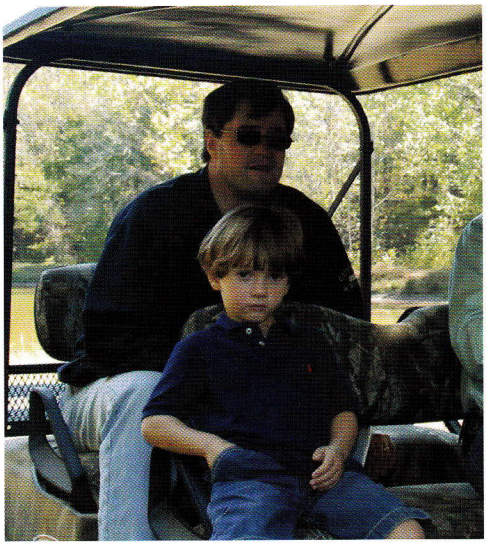
Of course, Scott Knight knows all about the Field Station - his dad, Dr. Luther Knight, now retired, was a professor in the Ole Miss biology department, and the first director of the Field Station after it's establishment in the 1980s. Scott also helped his dad work on the Field Station ponds and land as a student, so he knows the place pretty well.

"As I've stated in previous newsletters, the scientists at the National Sedimentation laboratory were instrumental in getting the UM Field Station established," says station director Ray Highsmith. "Therefore, it is especially fitting to see them conducting major research programs here. In fact, the Cooperative Agreement with USDA is very broad and has lead to other research projects in addition to the Sed Lab studies being conducted at the Field Station. This relationship is extremely valuable to us and has been very productive." The agreement is in place for a number of years to come and the research will continue to change and expand according to the data collected, and with the planned inclusion of fathead minnows and eventually native fish species to the constructed streams.

Solving fish kills in Mississippi bayous following disturbances will lead to better understanding of large river and wetland ecosystems and will have application to other watershed systems around the country. Using microcosm streams at the Field Station makes it possible to do controlled experiments in which stream components such as oxygen concentration can be manipulated and the impacts carefully measured, in contrast to field experiments in which there are numerous potential confusion factors.

pictured: Dr. Rich Lizotte (above) and Dr. Scott Knight(below)

Neighbors



While hunting in the Bay Springs area some years ago, Dr. Bradford "Ford" Dye came across what would later become his farm, 150 acres that adjoin the UM Field Station, filled with hardwood trees and abundant wildlife. Just the kind of place he wanted, peaceful and beautiful. Although the local ear, nose and throat physician grew up in Jackson, he loves everything to do with the outdoors, so it is no surprise that he spends most weekends at his cabin on the farm.

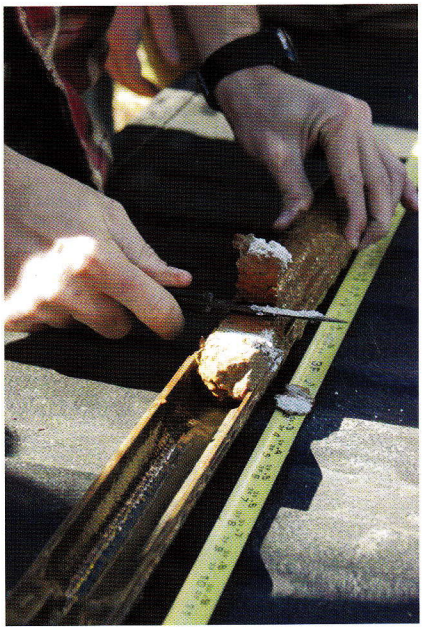
An Ole Miss graduate, Dr. Dye has been in Oxford since 2000 and has owned his Bay Springs farm for seven years. His roots to this area are deep. His maternal grandmother was raised in Oxford and both parents are from north Mississippi - his mom from Coffeeville and his dad from Charleston. He and his wife, Sonya, have a 5 year-old son, Jack, who loves to spend time at the farm with his dad and their three dogs, chickens and guineas.

Both father and son love talking about the farm. "One of my most enjoyable things to do is to plant trees with my son," says Dr. Dye. (Jack's favorite thing to do is ride the tractor with his dad.) "We love to ride around with my dogs and look at the wildlife. My plans for my farm are to continue to plant trees and work to improve the land so that my son and future generations can continue to enjoy it as much as I do."

"One of the most important aspects of owning any land is having good neighbors. I am really lucky there. We all try to work together for the collective good of our land. Having the Field Station as my eastern neighbor is a great asset. It is like having a 700-acre nature preserve and wildlife sanctuary next door."

pictured above: Dr. Ford Dye and his son Jack enjoy a tour of the Field Station

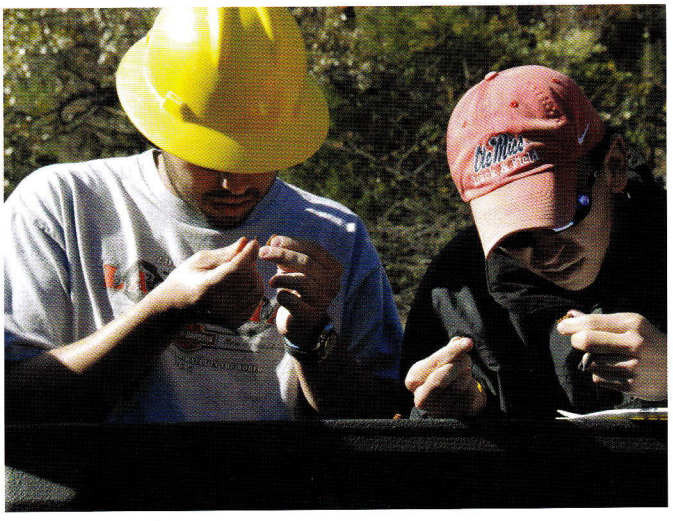
Outdoor Classrooms



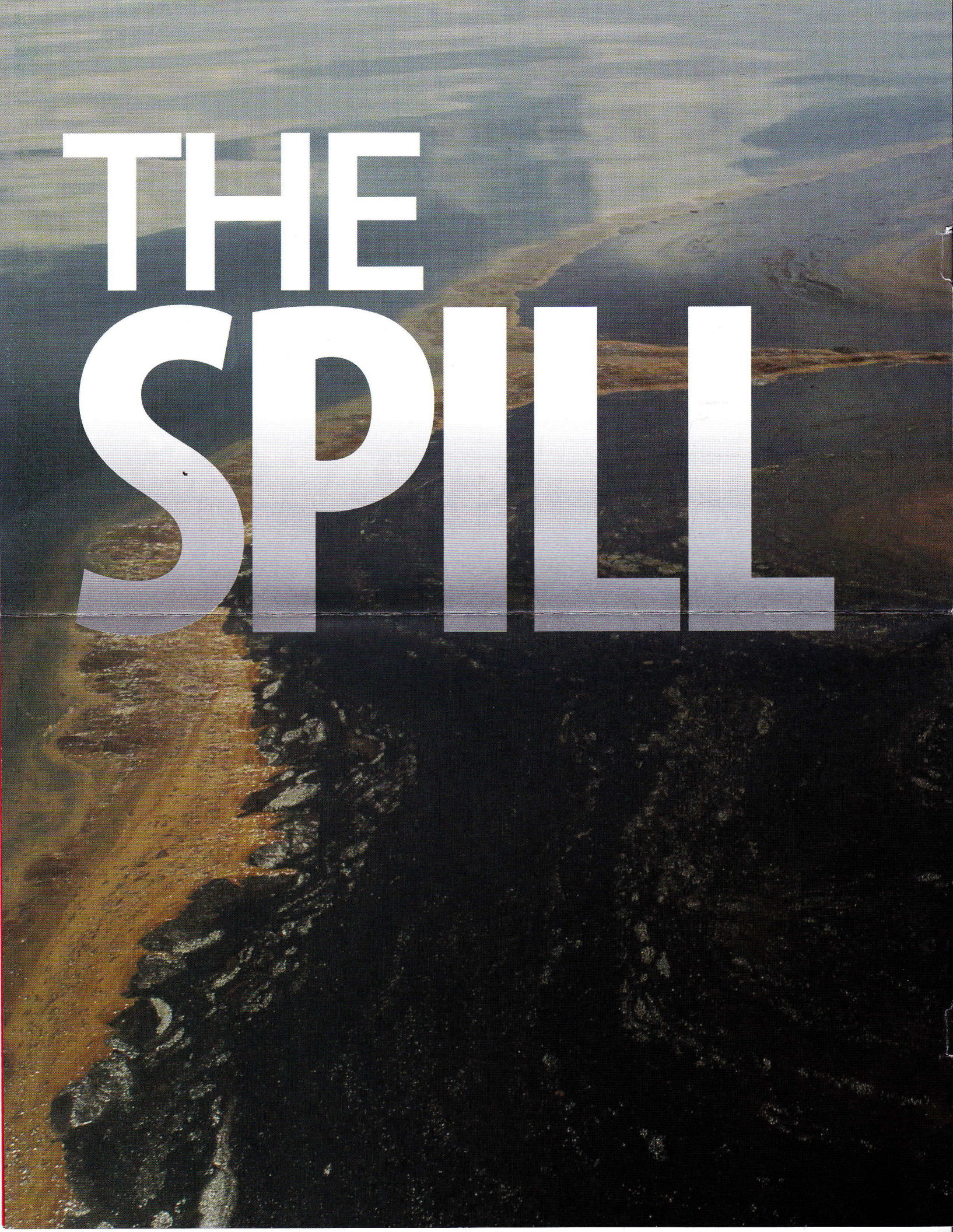
Dr. Bob Holt is giving next year's geology graduates a leg up for their entry into the job market–real world experience – via the capstone course he designed, G420 Substrate Site Characterization. His class of 14 seniors spent two days at the Field Station completing a project using a real site and real data. For the first part of a two-part senior project, students are collecting preliminary information to use in next semester's design class project.

Part one is to map the ground-water and surface water flow at the Field Station to tie into next semester's design class where they will design a dam. "Following real-world protocol, the students will write reports, distribute them among their peers for comment and review, then devise a final draft of their findings, just like they would do as working geologists," Holt says.

"This class has gotten a lot of popular feedback from students and employers alike. I was in the consulting business for 10 years, and one of the reasons I got into teaching at the college level was to help design courses like this for the students."



pictured above : Geology students examine a core sample


THE
SPILL

The massive oil spill this summer in the Gulf of Mexico has drawn numerous comparisons to the 1989 Exxon Valdez spill in Alaska, but the two cases are actually dramatically different, says a University of Mississippi researcher who has studied both disasters.

Ray Highsmith, executive director of the National Institute for Undersea Science and Technology at Ole Miss, shared his insights with fellow scientists this Fall at a meeting of the South Central Chapter of the Society of Wetlands Scientists at the UM Field Station. A NIUST research team surveyed the Gulf spill area in early May and provided valuable data to researchers, government officials and others working to contain the spill and its environmental damage.

"In the first two weeks, we were the first and only research vehicle out there," Highsmith said.

Before coming to Ole Miss in 2005, Highsmith spent over 20 years as director of a research facility at Kasitsna Bay on Alaska's Kenai Peninsula and as director of a federal undersea research program. He spent time in Prince William Sound in 1989 and following years to monitor the effects of the Exxon Valdez oil spill, studying the oil from the intertidal zone to depths of 60 feet.

The Valdez spill was mainly onshore and on the water's surface, had stable water temperatures and was formed by nonpressurized oil, he said. In contrast, the Deepwater Horizon spill was offshore in deep water, had a gradient of cold-to-warm water temperatures and was fed by oil of continually changing pressure.

Another major difference is that in the Gulf of Mexico, the potential for gas hydrate formation and disassociation is high, while there was no hydrate potential in Alaska, he said. Hydrates are mixtures of natural gas, mostly methane, and seawater that form into ice-like crystals at the low temperatures and high pressures found on the seabed.

"Gas hydrates form under seafloor conditions, perhaps aided by microbial activity," Highsmith said. "Although the escaping oil and gas was much hotter than the bottom water, the gas quickly cooled and molecules were encased by the hydrate crystalline lattice structure."

This explains why the first attempt at capping the Deepwater Horizon well failed, he said.

"The hydrates formed inside the cap and plugged it up, so it had to be removed," Highsmith said. For 87 days, the oil and gas kept coming and made it hard to get a handle on it because the oil-seawater characteristics, locations and volumes changed every day.

"Also, the chemical dispersant agents used to break up the oil create challenges because the treated oil behaves differently than nontreated oil", Highsmith said. During the leak and after the well was plugged, floating oil covered extensive areas of the water. Then, it disappeared within a few days, though, raising questions as to its fate.

"The most recent evidence from academic cruises indicates the oil may have become caught up in mucous strands produced by microbes degrading the oil and sank rather quickly to the seafloor along with other materials caught in this 'marine snow,'" he said.

Core samples of the seafloor, which NIUST scientists collected aboard research vessels after the oil disappeared from the surface, reveal the presence of a reddish-colored sediment layer up to a few inches thick that includes oil and dead plankton organisms, he said.

Highsmith's team was able to get to the Deepwater Horizon quickly because the research vessel Pelican was already in Louisiana preparing for a NIUST mapping and photo mission. After the oil rig explosion, the Pelican was equipped with deep-sea sampling gear and was used by NIUST researchers to gather data, taking water samples from various depths and sediment samples from the seafloor.

Marjorie Holland, UM professor of biology, said she was delighted with the turnout and pleased the field station hosted the SWS meeting.

"I thought Ray did a great job comparing the Exxon Valdez and Deepwater Horizon oil spills and raised interesting points I've been wondering about. He did a nice job of pulling all that together," Holland said.

The Society of Wetlands Scientists meeting also included lectures from Melvin Warren with the USDA Forest Service and Martin Locke, UM adjunct professor and research leader at the USDA National Sedimentation Laboratory in Oxford.

The main purpose of the meeting was to give students an opportunity to present their research. Presentations were given by students from Mississippi State University, Louisiana State University, Arkansas State University and the universities of Houston, Memphis and North Texas.

Matt Stahman, SWS board president, said having the Field Station as the venue for the conference was perfect, and that he was excited to hear Highsmith's presentation.

"It was good to be able to get that information straight from the horse's mouth, which you don't get from the mainstream media," Stahman said. "It's good that the marshes seem to have recovered, but there is still oil on the bottom, and the scientific community on the Gulf Coast is concerned about that."

NIUST, which was started in 2002 and is housed at the UM Field Station, is a National Oceanic and Atmospheric Administration-funded partnership between UM and the University of Southern Mississippi that works to develop and apply new technologies to enhance undersea research and exploration. For more information, go to http://niust.org/

by Rebecca Lauck Cleary, photo by Christopher Berkey

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