WETLANDS

Diagnosing Ailments of Coastal Marshes

J. Andy Nyman, Associate Professor

Restoring degraded coastal wetlands requires knowledge about the existing and the optimal conditions for wetlands. Flooding stress, nutrient starvation and salinity stress are the most likely problems for wetlands that have high loss rates or low productivity. Those currently attempting to diagnose the causes of poor wetland health primarily rely on the plant species growing in the wetlands. The dominant species and the number of species present can be used to infer levels of salinity stress and flooding stress, but gauging nutrient limitation is not possible from species lists. Even with salinity and flooding stress, experts may disagree about which is more important at a particular site. Coastal managers could benefit from new tools to help them objectively diagnose factors limiting plant growth.

Dr. Andy Nyman and some of his graduate students have been working to modify a technique farmers use to diagnose their fields so marsh managers and restoration planners can similarly diagnose coastal wetlands. Farmers and home gardeners can clip leaves from their fields and lawns and send the leaf tissue to the LSU AgCenter's Soil Testing and Plant Analysis Laboratory. A few weeks later they receive a diagnosis from the lab concerning the factors most likely to be limiting plant production.

The plant analysis diagnoses nutrient deficiency, toxicity, and imbalance of major and micro-nutrient elements. Commonly tested elements include nitrogen, phosphorus, potassium, magnesium, zinc, copper, and boron. The lab can diagnose more than 90 crops (from alfalfa to wheat) and lawn plants (from Bermuda grass to poinsettias). They can do this because of the work of numerous scientists who have grown crops and lawn plants under known conditions of nutrient deficiency or toxicity and then identified a chemical consequence of those conditions in the leaf tissue. Until now, comparable information did not exist for coastal wetland grasses.

Nyman's research focused on *Spartina patens* – also known as wiregrass – because this grass is the most common plant in coastal Louisiana. It occurs from fresh to saline marshes but dominates intermediate and brackish marshes. Work began with experimental projects growing wiregrass under a range of flooding, nutrient and salinity conditions in the greenhouse. The health of those plants and the chemical makeup of their leaves were used to develop chemical signatures of flooding stress, nutrient starvation and salinity stress. Fifteen elements, and various combinations of those elements, were considered when trying to

(continued on page 2)

Sponsor: Coastal Restoration Enhancement Through Science and Technology

Dr. Vanessa Tobias collects data at Marsh Island Wildlife Refuge. Below her is a "marsh organ," which is used to create a range of flooding conditions for marsh vegetation. The lowest row of plants was continually flooded, while the highest rows seldom flooded.

Hydrology of Forested Floodplains

Richard Keim, Associate Professor

Water moving through floodplains controls ecosystem structure and function, as well as other ecosystem services such as nutrient and sediment retention and water quality mediation. Details of flowpaths and residence times are poorly understood, however.

We are doing a series of experiments to measure water fluxes and pathways in floodplain environments to enable better understanding and better management of water resources for ecological objectives. Forested floodplains are an important ecosystem in Louisiana, though they have not been extensively studied to understand critical hydrological characteristics.

The majority of flow through most floodplains is in channels, but many of the ecosystem services we obtain from floodplains occur when floodwaters leave the channel and interact with adjacent wetlands.

For example, lowland rivers with upstream agricultural land typically carry nitrogen and phosphorus from excess fertilizer use. In the Mississippi River, these pollutants cause serious problems in the Gulf of Mexico when they cause algae blooms that later decay and deplete oxygen in a "dead zone" nearly devoid of life.

However, when water leaves the channel and becomes stagnant in backswamps, nitrogen can be removed by bacteria that convert it to inert nitrogen gas. A key process controlling the rate at which this denitrification can occur is connectivity between water flowing in the channels and the backswamps.

The quantity of water exchanged between channels and backswamps is greatest when rivers flood over their banks, but river banks are porous because they are typically coarser sediments than in most of the floodplain (sands and silts instead of clays typical of backswamps) and because tree roots and animal burrows give pathways for water to move via bypass flow through banks.

We have done experiments in the Atchafalaya Basin to measure how water flows through banks during the majority of the time when lower water prevents exchange by overbank flow but subsurface seepage is still potentially important for overall exchange. Results showed that water may seep through some natural levees at rates of up to 5 meters per day. We are working now to understand what these results mean in the context of the entire floodplain.

(continued on page 2)

DIRECTOR'S COMMENTS

Allen Rutherford

We are still here and still working to conserve your natural resources through quality research and extension activities! Once again this year we improved our research and extension productivity with effective grantsmanship that resulted in more refereed and nonrefereed publications. Our graduate research programs are strong, and student quality continues to increase. Like the nation, however, we are confronted by a difficult economic climate that involves budget cuts, hiring freezes and the need to do more with less.

I am sad to report that we are losing two of our valued faculty members, Dr. Leroy Shilling and Dr. Michael Chamberlain. Dr. Shilling, who for more than 30 years has made great contributions to teaching and extension activities in the school, has decided to retire. As the Director of Student Services, Shilling has assisted hundreds of students over the years as he shepherded them through the academic maze and taught numerous courses including Conservation of Forest Resources, Forest Fire Protection and Use and Natural Resource Policy. Given his tireless efforts over the years and his prominent role in the program, Shilling will be extremely difficult to replace. Fortunately, we have his contact number and will be calling on him to get his expert guidance. Dr. Chamberlain is leaving to join the faculty at the University of Georgia's Warnell School of Natural Resources. His high-quality and high-profile research on game and endangered species will be sorely missed, and his commitment to teaching will be difficult to replace. We wish Drs. Shilling and Chamberlain well in the next phase of their careers.

Despite these obstacles, we remain committed to fulfilling our land-grant mission of addressing clients' needs. In this issue, we have highlighted a diversity of ongoing research efforts with a spotlight on several RNR faculty members. We hope you can see that we continue to address relevant natural resource issues while anticipating future challenges and seeking answers to questions yet to be asked.

As always, we seek your assistance in making potential students aware of the unique opportunities we offer to those interested in outdoor careers in forestry, wildlife and fisheries. If you have any questions or comments, or if you would just like to come by to visit, please feel free to contact me (drutherford@agcenter.lsu.edu or 225-578-4187).

***ON THE COVER:** Two whooping cranes take flight for the first time. Photo courtesy of Carrie Salyers, Louisiana Department of Wildlife and Fisheries.*

School of Renewable Natural Resources Research Matters - Summer 2011

Director: Allen Rutherford
Editors: Tom Dean
Melinda Hughes
William Kelso
Frank Rohwer
Designer: Barbara Groves Corns

School of Renewable Natural Resources
Louisiana State University
Baton Rouge, LA 70803-6200
Tel 225-578-4131 Fax 225-578-4227
www.rnr.lsu.edu
www.lsuagcenter.com

Louisiana State University Agricultural Center
William B. Richardson, Chancellor
John S. Russin, Vice Chancellor
and Director of Research
Paul D. Coreil, Vice Chancellor
and Director of Extension

Louisiana State University and A&M College
Michael Martin, Chancellor
College of Agriculture
Kenneth L. Koonce, Dean

Produced by LSU AgCenter Communications.

Lucius W. Gilbert Visiting Scholar

The School of Renewable Natural Resources is creating a visiting scholar program that will support outside faculty with expertise that will complement the graduate program in forest science or forestry.

The requirements of the visiting scholar include being a resident in the school, teaching a graduate level class in the area of the scholar's expertise, participating in the school's seminar series and collaborating with graduate students and their advisers.

The length of employment is limited to one year. We are particularly interested in established faculty members planning a year-long sabbatical.

The goal of the program is to broaden the course offerings and points of view beyond those routinely offered by the resident faculty and to create opportunities for collaboration with outside faculty.

Louisiana has an abundance of natural resources that are found in a diversity of terrestrial and aquatic habitats ranging from coastal marshes to upland forests. This diversity creates many possible areas for complementing our graduate program.

The starting date is flexible to coincide with the scholar's sabbatical schedule.

For more information contact: Thomas J. Dean, 225-578-4216 or email fwdean@lsu.edu.

Hydrology of Forested Floodplains

(continued from page 1)

Another important hydrological process that plays a role in ecology is evaporation. Surprisingly little is known about evaporation from flood waters under forested canopies. The forest cover decreases both radiation at the water surface and air exchange with the drier atmosphere above, so forests may be reducing the evaporation rates below those in open water.

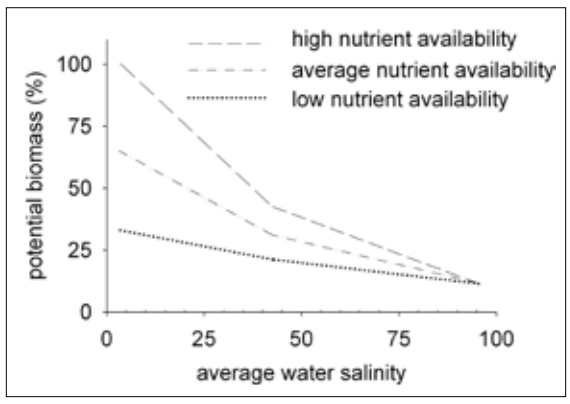
If the trees are experiencing sufficient flood stress, they reduce growth rates and consequently reduce the rate of transpiration (evaporation from leaf surfaces). We are beginning measurements of evaporation rates from the swamp surface below the trees in a cypress-tupelo swamp in the Atchafalaya Basin to quantify the effect the canopy has on free-water evaporation.

Semiporous river banks control exchange between rivers and backswamps at low water.

Sponsor: U. S. Army Corps of Engineers

Diagnosing Ailments of Coastal Marshes

(continued from page 1)



Salinity stress prevents Spartina patens *from using available nutrients.*

Dr. Vanessa Tobias harvesting above and belowground biomass of Spartina patens *grown in marsh organs at Rockefeller Wildlife Refuge.*

identify chemical consequences of flooding stress, nutrient deficiency and salinity stress.

Identifying a signature of flooding stress was fairly simple because flooding stress is unaffected by salinity stress and nutrient starvation; flooding appears to simply add to those stresses. Identifying signatures of salinity stress and nutrient starvation was more complex, however, because those factors interact in such a way that growth is limited by salinity even when nutrient content is high.

Work continued with field studies designed to challenge the chemical signatures developed from the experimental greenhouse work. Dr. Vanessa Tobias, who completed her Ph.D. in 2010 in RNR, had study sites ranging from Four League Bay (southeast of Morgan City) to Calcasieu Lake (south of Lake Charles). Public lands involved were the Cameron Prairie National Wildlife Refuge and Louisiana Department of Wildlife and Fisheries land at Rockefeller Refuge and Marsh Island. Private landowners, including Miami Corp. also cooperated. Most of the field study sites were within a mile or two of a sensor operated by the Louisiana Office of Coastal Protection and Restoration that recorded the water level and salinity hourly. In addition, and more importantly, salinity and nutrient levels were measured in pore water collected from the study plots where wiregrass health (biomass) was measured.

The field challenges revealed that the new technique accurately indentified salinity stress and nutrient limitations. The flooding stress indicator appeared to work but could not be tested rigorously because the water level recorder data did not accurately reflect flooding and drainage conditions at the sampling sites. Thus, while marsh managers and restoration planners can confidently use the new tool to diagnose nutrient starvation and flooding stress, the flooding stress indicator may turn out to require some fine tuning. Additional field work is planned that will incorporate adjacent study plots and water level recorders.

TOXICITY TESTING of a New Oil Dispersant Produced by Microbes

J. Andy Nyman, Associate Professor

Faculty members in the School of Renewable Natural Resources are helping evaluate the effectiveness of new dispersants to replace those used in the Gulf of Mexico following the Deepwater Horizon oil spill. The new dispersants are produced by fermentation involving microorganisms fed cellulose-rich agricultural wastes as an energy source.

This is a completely different approach from traditional production by organic chemists using petroleum or seed oil as their base ingredients. Over the next century, fermentation of agricultural wastes is expected to become more important as petroleum becomes increasingly rare and expensive. It is estimated that the worldwide production of surfactants, which are common in detergents and shampoos, uses enough petroleum to produce 3.6 million gallons of gasoline annually.

Dr. Andy Nyman secured research funding from the National Science Foundation as part of a coordinated effort that included proposals from Iowa State University and Columbia University. A biotech firm in Massachusetts, Modular Genetics Inc., also is collaborating but is not receiving NSF funds.

Nyman will focus on the new dispersants' toxicity to organisms common in coastal wetlands and that are important prey items for commercially important fishes. Dr.

Dr.Haibin Zhang is a postdoctoral researcher, orginally from the Chinese Academy of Sciences, who came to the School of Renewable Natural Resources from Cornell University. He'll be working for the Monterey Bay Aquarium Research Institute when he finishes working here with Dr. Andy Nyman on the dispersant toxicity study.

Logan Boudreaux is a student worker assisting Dr. Haibin Zhang and Dr. Andy Nyman compare the toxicity of different dispersants.

Haibin Zhang, a postdoctoral researcher in Nyman's lab, is doing most of the "heavy lifting" on this project and is supported by student workers Chris Algero and Logan Boudreaux, who are both majoring in Natural Resource Ecology and Management. Zhang came to RNR from Cornell University.

The project is based on genetically modified organisms created by Modular Genetics. Modular Genetics is a 10-year old biotechnology company specializing in the design and development of engineered microorganisms that synthesize chemicals using renewable raw materials – primarily for industrial biotechnology, protein therapeutics and natural products drug discovery. The GMOs are transferred to the Center for Crops Utilization Research at Iowa State University where a team is modifying a benchtop fermentation based on glucose into an industrial scale fermentation based on soybean waste. This natural fermentation process is analogous to the well-known process of yeast fermentation used to make beer, but rather than converting sugar into beer, the bacteria convert soybean hulls into dispersants. The Iowa State University researchers extract the dispersants from the brew and purify them before sending some to Columbia University and some to Nyman. Columbia University is measuring the ability of each preparation to disperse crude oil.

Nyman's team is comparing the toxicity of the brewed dispersants and the chemically produced dispersant COREXIT 9500, which was used extensively in the Gulf following the BP oil spill.

"We initially planned on only using a test organism called *Streblospio* because it is an important food of brown shrimp," said Nyman. *Streblospio* is small marine worm that lives in the upper few inches of coastal sediments in offshore Louisiana. The worms apparently have never been used for toxicity testing and thus the techniques to culture them and use them in toxicity testing are still being developed. "With the help of Dr. Chris Green at the Aquacultural Research Station, we've learned how to work with *Fundulus grandis*, so we are including that important baitfish in our tests," Nyman said. Green's lab supplies the eight- to 11-day-old fish for the toxicity testing.

Sponsor: National Science Foundation

Efforts to Keep Oil Offshore May Have Affected Health of Oysters

Ben Eberline, Graduate Student

With an entire country scrambling last summer to respond to the BP Deepwater Horizon oil spill, large-scale experiments were conducted to keep the oil offshore. One tool available in some areas of coastal Louisiana was the use of large Mississippi River diversions that flow fresh water from the river into normally saline areas. The idea was that the flushing of fresh water into the bays would push or hold the potentially oily sea water out.

This is just what happened in Breton Sound, La., where we were in the middle of a multiyear project documenting local oyster growth, mortality and health for use in developing production models for management of this valuable resource. Breton Sound is oyster central in Louisiana and is home to publicly managed seed grounds that supply the multitude of oystermen's privately owned and harvested leases. With information like how fast oysters reach a harvestable size, how local conditions affect the number that die and what lasting disease effects exist, these ecologically and economically valuable animals can be more efficiently managed.

With that in mind, wild oysters from Breton Sound were collected and deployed at four sites within the estuary. The sites at Cow Bayou, Bay Gardene, Snake Island and Mozambique Point originally were set up along a natural salinity gradient, but with all Mississippi freshwater diversions flowing nearly at capacity from April to July and high rainfall in 2010, these normally very salty sites were extremely fresh for an extended period. Unfortunately, this transitional time of year is critical because as water temperatures rise oysters feed and grow quickly after a cold winter – while they prepare to reproduce. Even with oysters' amazingly high tolerance to varying salinities and temperatures, prolonged exposure to these environmental stresses can have drastic effects on oysters.

Our research oysters suffered high mortalities in 2010, with 100 percent dying at one site and about half dying at the other three sites. A possible explanation for this is starvation. Oysters are filter feeders and normally match their body's salinity with the salinity in the water around them. As part of our study, the salinity within the oysters' blood was monitored. When site salinities dropped, the salinity of the blood within the oysters did not. This may suggest that a large portion of the oysters stopped pulling water in to feed and starved to death.

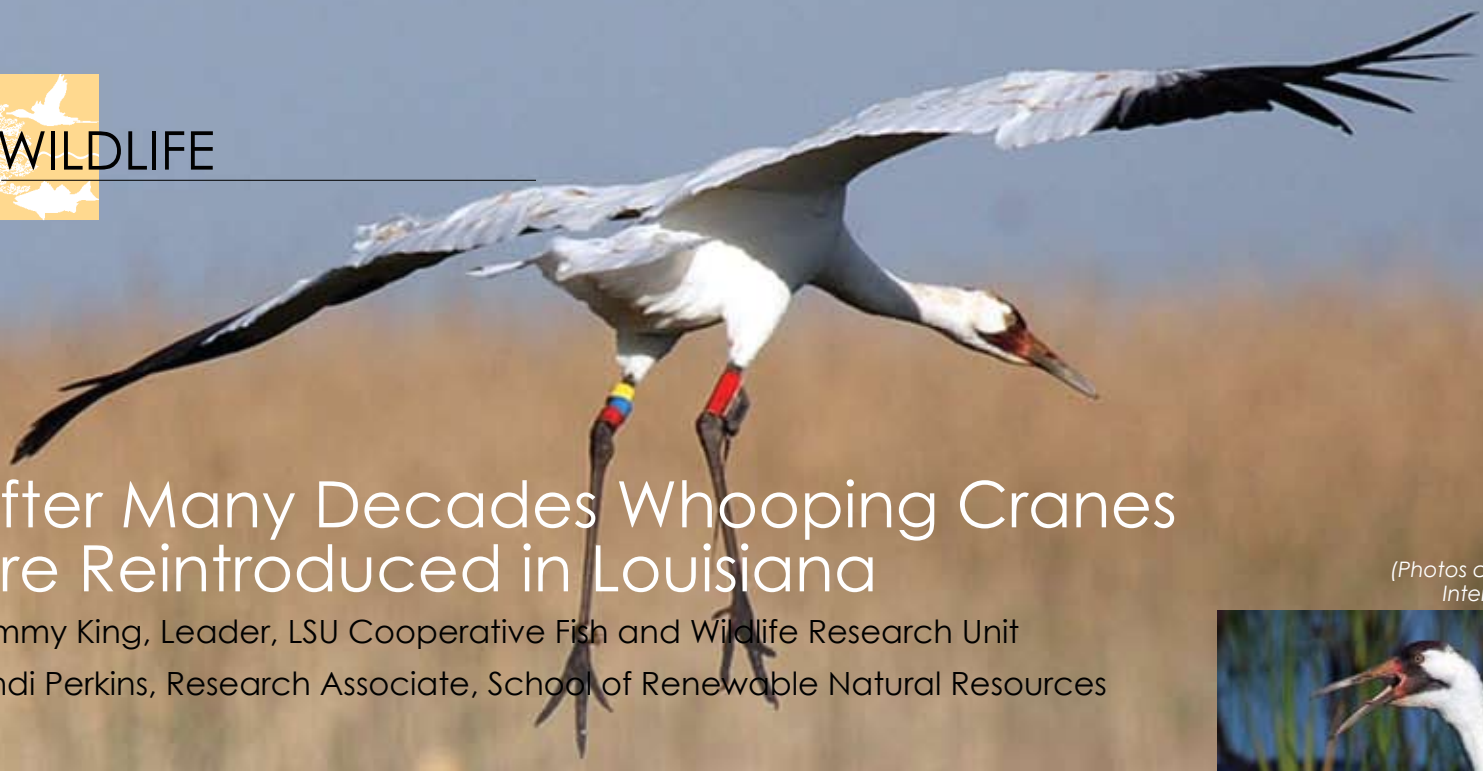
Graduate student Ben Eberline samples oysters in cages in Breton Sound, La., following the BP oil spill.

The health, or condition, of the oysters was also measured in Breton Sound. This parameter was an index based on the weight of both the shell and the meat inside of an oyster. Oyster condition decreased greatly from April 2010 to October 2010. This pattern can again be attributed to the prolonged exposure of oysters to fresh water at high water temperatures.

Disease, on the other hand, was not an issue with Breton Sound oysters during this time. Dermo (*Perkinsus marinus*) is the most prevalent disease in coastal Louisiana that affects oysters. This parasite cannot reproduce in low salinities, however. Therefore, very few of the oysters remaining were affected by disease.

Even with the temporary relief from disease, Breton Sound oysters were exposed to extremely unfavorable conditions last summer – just short of being pried open. We will continue this project through 2011 to further investigate oyster population response in Breton Sound.

This research is funded through the Louisiana Sea Grant program.



After Many Decades Whooping Cranes Are Reintroduced in Louisiana

Sammy King, Leader, LSU Cooperative Fish and Wildlife Research Unit

Tandi Perkins, Research Associate, School of Renewable Natural Resources

The Louisiana Department of Wildlife and Fisheries (LDWF) recently reintroduced whooping cranes to southwest Louisiana.

In February, 10 birds, raised in captivity at the U. S. Geological Survey's Patuxent Wildlife Research Center in Maryland, were placed in an enclosed pen at the White Lake Wetland Conservation Area near Gueydan. The birds were fitted with GPS satellite transmitters and have since been released into an open topped pen and are free to roam across the landscape.

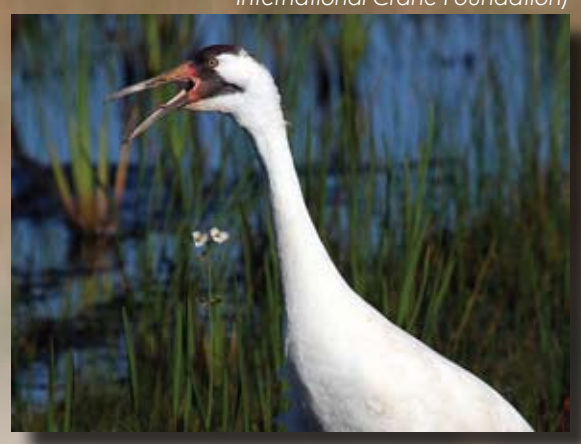
Dr. Sammy King of the Louisiana Cooperative Fish and Wildlife Research Unit and Dr. Tandi Perkins, a research associate in RNR, will be leading research efforts on the whooping crane reintroduction project. Their research will evaluate habitat use patterns of whooping cranes to assist in reintroduction of additional cranes in the future.

Southwestern Louisiana once supported more whooping cranes than anywhere in North America, including large numbers of wintering birds and a resident flock centered near White Lake south of Gueydan. The migrant flock was eliminated because of overhunting and drainage of wetlands on their breeding grounds in the Midwest. The resident flock was unable to withstand the pressure of human encroachment, primarily the conversion of nesting habitat to agricultural acreage, as well as hunting and specimen collection, which occurred across North America.

Whooping cranes reintroduced to White Lake will be a resident, non-migratory flock. Although the wild flock of whooping cranes is a federally listed endangered species, the reintroduced flock is designated as "experimental, non-essential."

This status provides much greater flexibility and does not invoke the protection and regulations of the Endangered Species Act. This designation allows for uninterrupted daily activities of area landowners and the general public. This provision additionally provides citizens protection in the event of accidental harm to the birds resulting from actions that are incidental to an otherwise lawful activity, including agricultural practices, outdoor recreation and hunting. The reintroduced birds will be protected under the Migratory Bird Treaty Act, however.

(Photos courtesy of K. S. Gopi Sundar, International Crane Foundation)



Partners/sponsors include the LDWF, the U.S. Fish and Wildlife Service, the U.S. Geological Survey and the International Crane Foundation.

Rusty Blackbirds and Forested Wetlands

Emma DeLeon, Graduate Assistant, and Philip Stouffer, Associate Professor

The rusty blackbird (*Euphagus carolinus*), a migrant that winters in Louisiana, is one of North America's most rapidly declining birds, making it a Species of Concern by the U. S. Fish and Wildlife Service.

Populations have decreased since the 1800s, with sharpest declines since the 1950s. Current estimates indicate a loss of 5-12 percent of the population each year. Changes went virtually unnoticed until recently, largely due to similarities to other more common blackbirds. However, rusty blackbirds differ from familiar blackbirds in several key aspects of behavior and habitat preference.

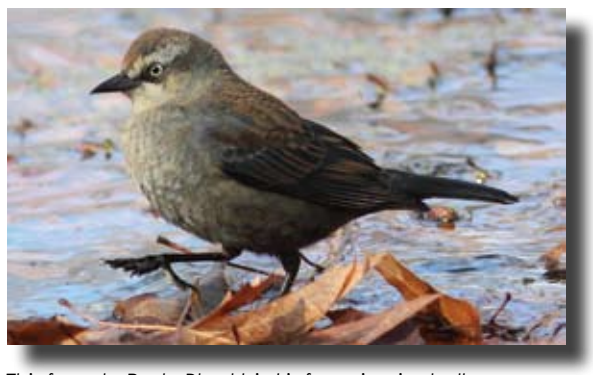
Rusties forage on invertebrates and tree mast in shallow water and damp leaf litter, often in forests. Like other blackbirds, they will also use agricultural or suburban areas, although very little is known about how they use different habitat types or to what extent habitat quality may be affecting population levels.

Flooded bottomland hardwood forest in the Mississippi Alluvial Valley is thought to be a stronghold for wintering rusty blackbirds, and conversion of this forest may be a factor in their decline. Circumstantial evidence shows that as land was cleared for agriculture, increasing in intensity and progressing to wetter land through the 1950s, rusty blackbird populations declined correspondingly.

Rusties may also be faced with increased competition with other blackbirds and lower quality habitats on their wintering grounds, along migration routes and on the breeding grounds due to fragmentation.

Our current study investigates rusty blackbird habitat association on several spatial scales across a variety of habitat types. We are examining microhabitat, including ground cover, flooding, forest structure and food availability at 115 sites in the Mississippi Alluvial Valley, the Atchafalaya basin and other riparian areas in south central Louisiana.

We are also studying rusty blackbird use of general habitat types (e. g., forested vs. agricultural) at a larger scale at 157 points throughout the state. Much of these data have come from Louisiana birders, many of whom have been enthusiastic participants in the project. We are comparing flock size, sex ratio, presence of other blackbirds and repeated occupancy at sites within and between years to determine potential habitat quality.



This female Rusty Blackbird is foraging in shallow water and damp leaf litter, as is typical of the species. (photo by R. Rickett)

We hope to identify which habitat factors are most important for maintaining populations, ultimately determining whether loss of flooded forest habitat in the southeastern United States could be a driving force behind rusty blackbird decline.

Results from the winter of 2009-2010 indicated low abundance of rusties across Louisiana. Small flocks of less than 10 birds were most common, while truly large flocks only occurred at a few sites. Occupancy models showed the strongest linkage with damp leaf litter as ground cover, but birds were also associated with shallow water and even open lawns.

Use of lawns was ephemeral, however, suggesting that birds spent most of their time in other habitats. Our second year of data, in winter 2010-2011, supports the observation that rusty blackbird wintering patterns vary widely from year to year, possibly correlated with weather and flooding patterns. Birds were much more abundant in the winter of 2010-2011, with flocks reported throughout Louisiana.

Hopefully our analysis will begin to show whether there are consistent patterns in their habitat selection that can help us to manage for this enigmatic and declining species.

Flooded forest habitat at this site east of Baton Rouge supported large flocks of rusty blackbirds throughout the winter.

This project was sponsored by the Lucius W. Gilbert Fellowship.

DUCKS and OIL –
The Disaster That Wasn't

Frank Rohwer, Associate Professor

Those who don't live in Louisiana watched news coverage of the oil spill and came away believing that most of Louisiana's coastal marshes were completely covered with oil. Even Louisiana residents who live away from the coast likely shared that view based on the news coverage.

The truth, however, is that Louisiana was spared the catastrophic oiling most expected, given that this was the largest spill in U.S. history. To completely understand the effects of the oil spill we have to integrate the research findings that delved into the details. This is an overview of one piece of the overall story – what about the ducks?

From midsummer 2010 through the winter of 2011 the most frequent question people asked Frank Rohwer – also known as Dr. Duck – was how will the oil affect the millions of waterfowl that winter in coastal marshes?

One of the first groups to contact Rohwer about the oil's effects on ducks was the U.S. Fish and Wildlife Service. In May of 2010 they asked Rohwer to serve on the Waterfowl Working Group, which was an advisory board organized to aid federal and state governmental efforts to evaluate oil spill effects.

Evaluation of oil spills is the core mission of the Natural Resource Damage Assessment. The Natural Resource Damage Assessment provides measurement protocol of immediate and secondary effects of any human-induced threat to renewable natural resources, which, while publicly owned and managed, are under the official jurisdiction of state and federal wildlife agencies. Rohwer agreed and signed on to be an advisor for the U.S. Fish and Wildlife Service and the four states that were significantly effected – Louisiana, Mississippi, Alabama and Florida.

According to Rohwer, "Our job in the initial damage assessment for waterfowl was pretty straightforward. We were to get reliable estimates of impacts, which translated into accurate counts of dead or oiled ducks."

Getting an accurate count turned out to be more difficult for the Deepwater Horizon oil spill than with previous spills, however. During the Exxon Valdez spill the U.S. Fish and Wildlife Service developed what is called the beached bird model, where a fraction of affected sandy or rocky shorelines were surveyed for oiled birds and then the numbers were extrapolated to estimate the overall effects. During early conference calls for the Horizon spill, Rohwer recalled having to repeatedly remind the team that Louisiana coastal wetlands did not lend themselves to the beached bird walking survey. There are few sand beaches and rocky beaches are nonexistent in Louisiana. Rohwer also had to convince the U.S. Fish and Wildlife Service' leadership that Louisiana wetlands are vast and largely composed of soft, organic bottom sediments, which are essentially unwalkable.

Rohwer lamented, "One of the uphill battles for this Natural Resource Damage Assessment waterfowl working group was that the leader was invariably someone from the permitting section of the U.S. Fish and Wildlife Service, definitely not from the Gulf South. It was difficult for a northern biologist temporarily assigned to the Alabama field office to get a sense of the enormous extent of potentially impacted Louisiana Spartina marshlands. Compounding this problem was the lack of any waterfowl expertise from these temporary leaders, which were on site for only 10 days to two weeks. By the time a temporary leader became somewhat familiar with the location and prior impact assessment discussions, that person was rotated out. That meant the group floundered in indecision for several months."

Relatively little marsh edge was actually affected by oil that drifted to shore. This roseau cane at the mouth of the Mississippi River retains some of the sticky oil residue on the stems but is showing green shoots well after the oiling.

Finally, in mid-October, the Natural Resource Damage Assessment waterfowl team developed an initial workplan to test whether observers in airboats or surface-drive boats could traverse marsh edges and detect duck carcasses. Rohwer and a field crew took on this pilot research. They obtained mallard and gull carcasses that were not oiled and then placed the carcasses along marsh edges in a way that mimicked how a dead duck would float into shore and lodge in the Spartina. Carcasses were positioned by one crew. They were followed by a second crew – not involved with carcass placement – that traveled as close to the marsh edges as possible and recorded the numbers of birds detected.

This pilot research revealed two important findings. First, detection rates were far higher than many experts, including Rohwer, had expected, with observers locating about three quarters of the positioned carcasses. Second, observers using surface-drive boats, which were designed to operate in extremely shallow waters, were as effective at finding carcasses as crews that used airboats to stay close to the marsh edges. That was great news because surface-drive boats are simpler, safer, quieter and cheaper to use than airboats.

That initial work allowed the development of a large-scale plan to search randomly selected transects of marsh edges in oiled and non-oiled areas. Again, the U.S. Fish and Wildlife Service awarded the contract for this work to Rohwer because of his familiarity with the area and because he could get a crew in place far faster than any other research team. Rohwer and a swarm of LSU students and tempo-

(continued on page 9)

This project was sponsored by The U.S. Fish and Wildlife Service, the Louisiana Department of Wildlife and Fisheries and the Delta Waterfowl Foundation.

Faculty Profile - Frank Rohwer

After 20 years in Louisiana, it may be safe to consider Frank Rohwer as a permanent Louisiana resident, even if he grew up in Maryland and wandered the continent for 20 years.

LSU students know Rohwer as the "duck man" - a label that fits. Rohwer moved from the fabled Chesapeake Bay to Kansas State University, for his B.S. in Wildlife - attracted more by the Midwestern wintering ducks than by KSU's academics.

Moving on westward, Rohwer earned his M.S. in Wildlife at Washington State University, researching ducks nesting in the Canadian prairies. Electing to do a Ph.D. at the University of Pennsylvania was definitely a move for academics; Philadelphia is anything but a haven for ducks or wildlife.

To delay a real job, Rohwer went north to Queen's University in Ontario for a postdoctoral fellowship before he gave up being a professional student and accepted a job at the University of Maryland. However, LSU lured Rohwer south in just a few years.

He has been teaching at LSU since 1991 and researching - you guessed it, on ducks. Of nearly 50 graduate students Rohwer has directed, only four have worked on something other than waterfowl.

Rohwer also serves as the scientific director of the Delta Waterfowl Foundation and oversees its research program on management of breeding waterfowl. Rohwer has the best of both worlds – researching ducks that winter in Louisiana and then following those species up to the Dakotas to do breeding ground research.

Southern Pine Pole Test Plot Established

Todd Shupe, Professor

The Wood Durability Laboratory has recently established a utility pole test plot at the Bob R. Jones Idlewild Research Station near Clinton, La.

The site contains southern pine pole stubs treated with either creosote, chromated copper arsenate, pentachlorophenol and untreated controls. The poles are 8 feet long and 3 feet of each is below ground. They were installed in a completely randomized design. All poles were donated by Roy O. Martin Lumber Co. of Alexandria. The retentions of the preservatives at the time of installation were determined according to American Wood Protection Association standards. Each preservative type has 10 replications.

The site is intended to be used for long-term research and demonstration of southern pine poles, which are the most widely used pole species. The test site is located in the wood protection association's hazard zone five, the most severe, so new treatments that prove successful in this zone will surely be effective in less intensive parts of the country.

The site also hosts aged poles that have been in service for 30 years; these poles are at the age where they become susceptible to decay organisms. Researchers are experimenting in conjunction with industrial partners to determine the effectiveness of remedial treatments at the groundline, which is the area most prone to decay problems.

If successful, these treatments will increase the reliability of the utility grid by increasing the service life of the poles. Other variables under consideration include pole caps and boron-based diffusible rods inserted at the groundline inside the poles.

Test pole plot at the Bob R. Jones Idlewild Research Station near Clinton, Louisiana.

Project collaborators include Roy O. Martin Lumber Co., Genics Inc. and Quality Pole Inspection and Maintenance, Inc.

Using Poultry Litter as a Feedstock for Energy Production

Paul Darby, Research Associate; Richard P. Vlosky, Professor;
Rangika Perera, Graduate Assistant; Priyan Perera, Graduate Assistant

The United States is the world's largest poultry producer and the second-largest egg producer and exporter of poultry meat.

The annual poultry meat production in the U.S. totals more than 43 billion pounds. In this $20 billion dollar industry, about 80 percent of the production consists of broiler meat while turkey meat accounts for most of the remainder. According to the U.S. Department of Agriculture 2007 Census of Agriculture, there are more than 320,000 documented poultry farms nationwide and each year millions of tons of poultry litter or manure are generated through these facilities.

Over the years, nutrient-rich poultry litter was largely utilized as a soil fertilizer in crop production, source of cattle feed and as a potting medium in ornamental horticulture and lawn and garden markets. However, the ban on poultry litter as a cattle feed by the Food and Drug Administration in early 2004 due to concerns over BSE (mad cow disease), coupled with increased restrictions on land applications, has intensified the problem of disposing poultry litter in an environmentally safe manner.

Land applications of poultry litter are a potential cause of water pollution because of its high phosphorous content. Narrowing disposal options has created new opportunities in using poultry litter as a feedstock for bioenergy production. Using animal biomass as a fuel can eliminate its use in products that might be hazardous to human health and can also reduce the need for conventional fuels.

We have received funding from the U.S. Department of Agriculture to assess opportunities for poultry growers in the U.S. South to diversify their income streams by using poultry litter for energy generation, with special emphasis on co-firing with woody biomass.

Power generation from animal biomass is considered one of the best alternatives to the growing issue of poultry litter management. Recent fluctuations in energy costs and growing attention to greenhouse gas emissions have made poultry litter a potentially stable green fuel source that can help displace the demand for fossil fuels and purchased electricity.

Conversion of litter into energy is carbon dioxide neutral. Poultry litter has good burning qualities due to its composition, making it a potentially excellent source of fuel. Therefore, using it as a fuel may create a new continuous outlet for poultry litter, while improving the efficient utilization of poultry houses.

Reported heating values for broiler litter on an "as produced" basis range from 4,637 to 6,950 BTU/lb. When dry and ash free, it can be as high as 7,787 to 9,000 BTU/lb. Energy generation from the poultry litter can be achieved by anaerobic digestion, direct combustion, co-firing and gasification.

At present, these techniques are practiced on the experimental scale and, to some extent, on the commercial scale.

Converting the poultry litter into thermal energy is one of the realistic answers to lessen increasing pressures on poultry producers to embrace alternative management practices for surplus litter. On the other hand, energy from the poultry litter can be used for space heating, thereby displacing some of the fossil fuel typically used for this purpose.

Eventually, current economic conditions associated with the poultry industry are likely to become more favorable and the industry will have to embrace strategies for recovering operating costs that are now being recognized as required for managing surplus poultry litter.

This project is supported by the Agricultural Food Research Initiative of the National Institute of Food and Agriculture, USDA Grant #2009-04639.

Faculty Profile - Richard Vlosky

Rich Vlosky was born and raised in Pearl River, N.Y., a hamlet 20 miles north of New York City.

Before joining the faculty at the LSU AgCenter, he completed a B.S. degree in Natural Resources Management with a forestry minor from Colorado State University in 1979. Vlosky then served in the Peace Corps in Costa Rica before returning to the U.S. to work for the Bureau of Land Management in Alaska and California.

In 1983 he completed an M.S. degree in International Forest Products Trade and Economics from the University of Washington, followed by a two-year doctoral study, also at the University of Washington. He was hired at Plum Creek Timber Co. corporate headquarters in Seattle as a marketing analyst and then as a product line planning and marketing manager.

Vlosky returned to academia and completed his Ph.D. at Penn State University in 1994 with a degree in Wood Products Marketing.

After graduation, Vlosky began working at the LSU AgCenter in the Louisiana Forest Products Laboratory. He became director of the unit, which changed its name to the Louisiana Forest Products Development Center, in 2003. In 2009, Vlosky was named as the Crosby Land and Resources Endowed Professor in Forest Sector Business Development.

His areas of research include biofuels/bioprocessing and bioenergy, domestic and international forest products marketing and business development, certification and green marketing, e-business and e-commerce.

He has authored or co-authored 130 refereed publications, 13 book chapters and two books. Vlosky has made more than 350 presentations on a variety of topics in the U.S. and 24 countries.

He is president of the LSU chapter of the honor society of Phi Kappa Phi, faculty adviser for the International Student Association at LSU, member of the board of directors, International Cultural Center at LSU, Sector Leader-Wood Products for the Louisiana Institute for Biofuels and Bioprocessing in the LSU AgCenter and member of the board of directors for the Louisiana Forestry Association.

Internationally he is team leader for the team of specialists for Forest Products Marketing-United Nations Economic Commission for Europe/FAO in Geneva and United States representative for the International Union of Forest Research Organizations working group on forest products marketing and business development based in Vienna, Austria. His greatest joy these days is spending time with his grandson Kellan and granddaughter Kyra.

Studying Crayfish Ecology in the Atchafalaya Basin

Chris Bonvillain, Graduate Assistant

Chris Bonvillain, a Ph.D. student in Renewable Natural Resources, is examining the ecology and physiology of red swamp crayfish in the Atchafalaya River Basin. Crayfish harvested from the Atchafalaya River Basin represent the majority of Louisiana's wild crayfish landings, which typically contribute more than $20 million to Louisiana's economy each year. Bonvillain is investigating how various environmental factors such as low dissolved oxygen concentrations, river stage and aquatic macrophyte density and composition affect the structure and dynamics of the basin crayfish population.

Sedimentation, levee development and spoil banks associated with construction of oil and gas access canals have reduced water circulation and flow patterns in the Atchafalaya River Basin, which has increased the magnitude and duration of hypoxic (dissolved oxygen concentrations less than 2.0 mg/l) conditions throughout the lower Atchafalaya River Basin. Hypoxia, in particular, could have significant detrimental effects on crayfish populations, including direct mortality, reduced growth and elevated stress levels.

To better understand how crayfish respond to hypoxic conditions, Bonvillain is also studying physiological indicators of hypoxic stress in crayfish. He has combined a field sampling program and laboratory experiments to determine physiological stress levels of crayfish exposed to short-term and long-term hypoxic conditions by analyzing lactate, protein and glucose concentrations in crayfish hemolymph.

As part of this study, Bonvillain is validating the use of handheld devices for measuring protein and lactate levels that can be used on site, providing a rapid and economical method for determining crayfish stress levels.

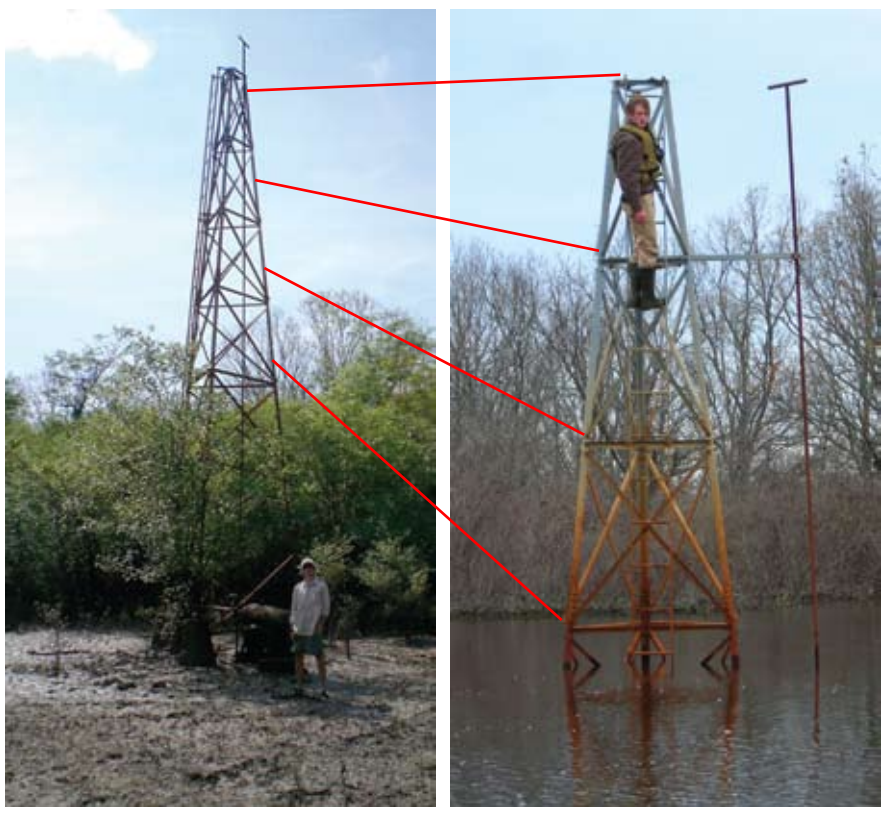
This project was funded by the Louisiana Department of Natural Resources and the U.S. Army Corps of Engineers.

A red swamp crayfish sitting in a bed of common salvinia in the Atchafalaya Basin.

A crawfish trap in the lower Atchafalaya Basin. Note the dark water and high vegetation densities in this area - these conditions often result in hypoxia in the water column, which can cause stress and mortality of red swamp crayfish.

Zooplankton Dynamics in the Ouachita River Floodplain

Will Sheftall, Graduate Assistant



An example of the substantial changes in water levels that occured between December 2009 (left) and April 2010 (right) on the Ouachita River floodplain, Felsenthal Lake in Arkansas.

This project was made possible by The Nature Conservancy, the U.S. Environmental Protection Agency and the Louisiana Department of Environmental Quality.

The Ouachita River and associated floodplain in northern Louisiana is unique in that water levels fluctuate widely, depending on the local weather and releases from Felsenthal Lake in Arkansas.

Unfortunately, very little information exists on aquatic invertebrates and vertebrates that inhabit this area and how floodplain-dwelling organisms are affected by the river. Funding provided by The Nature Conservancy, the U.S. Environmental Protection Agency and the Louisiana Department of Environmental Quality have given Will Sheftall the opportunity to study the zooplankton community on the Ouachita River floodplain and to examine how the zooplankters respond to the substantial environmental changes that occur in this system each year.

Zooplankters are microorganisms that help transfer energy and nutrients from primary producers, such as algae and diatoms, to higher level consumers. Zooplankton is particularly important to larval and juvenile fishes, as high densities of plankton promote rapid growth and improved survival.

Over the past two years, Sheftall has been investigating zooplankton density and community composition in the Ouachita River floodplain. Monthly zooplankton sampling for one year has yielded 164,000 organisms in his collections, and Will has chosen to focus his M. S. thesis on the cladoceran (water flea) community, which is dominated numerically by *Bosmnia longirostris*.

His results indicate that zooplankton densities are higher in more isolated, slow-water environments that are less influenced by the river, and that abundances are associated with several environmental factors, including temperature, oxygen, chlorophyll levels and water clarity.

His study will help elucidate the effects of river flooding on zooplankton dynamics in this connected river-floodplain system. Moreover, results of his study can be used to assess the progression of floodplain re-establishment across the Ouachita River on the Mollicy Farms tract (see page 8).

This joint U. S. Fish and Wildlife Service - Nature Conservancy project involves removal of levees and re-connection of this historic floodplain to the river, and Sheftall's study can be used to investigate the re-development of the zooplankton community as the floodplain matures.

Floodplain Restoration on the Ouachita River

Mike Kaller, Assistant Professor

A breached levee that historically separated the Ouachita River from the Mollicy Farms Tract.

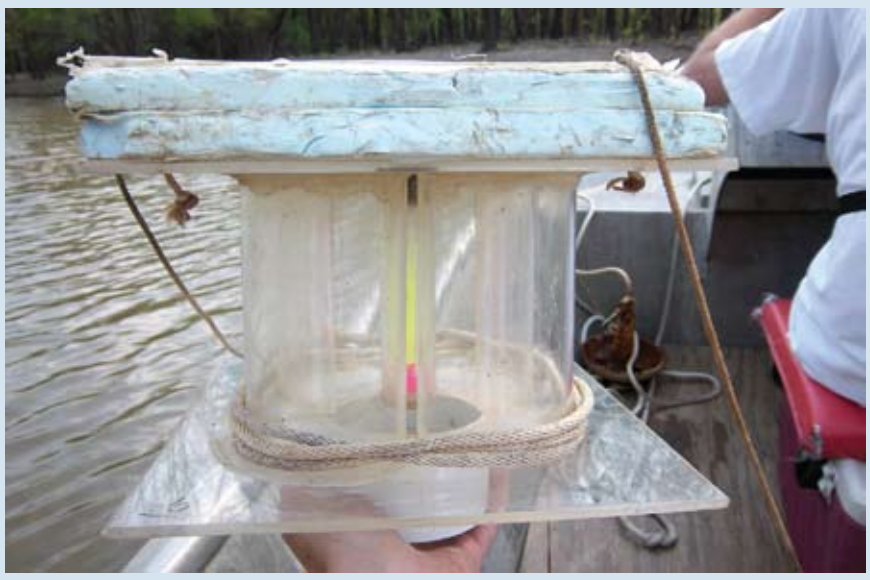
In their natural state, floodplains and rivers are vitally linked, with floodplains allowing the river to disperse its volume and energy during high water periods and reduce destructive velocities that can impact the channel and downstream riparian areas. In turn, rivers supply vital nutrients and sediment to floodplains, many of which have evolved highly productive and diverse forests with abundant wildlife and rich aquatic communities. Unfortunately, levees, dams and other water control structures have altered the relationship between rivers and floodplains resulting in a reduction of forest, fish and wildlife diversity, productivity, wetland loss and species extirpation. Consequently, scientists and resource managers have sought opportunities to reconnect rivers with their historic floodplains and Louisiana is currently the site of North America's largest floodplain restoration project.

Since 2008, the U.S. Fish and Wildlife Service, in cooperation with The Nature Conservancy, the U.S. Environmental Protection Agency and the Louisiana Department of Environmental Quality, has been working to remove old levees that have prohibited the Ouachita River from flooding a 16,000-acre tract of land known as Mollicy Farms. This tract was historically farmed and produced oil and natural gas, but was purchased by the U.S. Fish and Wildlife Service and The Nature Conservancy in the 1990s and incorporated into the Upper Ouachita National Wildlife Refuge. The restoration involves breaching the levee along the east bank of the Ouachita River to restore historical water exchange, which has progressed to the point that the 2011 spring flood provided a fairly natural ingress and egress of water into and out of the Mollicy Farms floodplain.

To monitor the success of the restoration following levee breaching, The Nature Conservancy and U.S. Fish and Wildlife Service has enlisted the assistance of Mike Kaller and Bill Kelso in the School of Renewable Natural Resources, as well as other technical specialists, to document progress of the restoration and describe biotic and abiotic changes on Mollicy Farms through time. Field teams from the School have been sampling fish, invertebrates (e.g., aquatic insects) and phytoplankton on the Mollicy Farms site quarterly since 2009, and similar data are being collected in the floodplain along the non-leveed west bank of the Ouachita River. These data should provide target conditions for successful restoration on the Mollicy Tract, as evidenced by increasingly similar biotic communities on both sides of the river through time. Data from 2009 and 2010 suggest that, as expected, fish and insect communities on the two floodplains are quite different in terms of species composition and relative abundance.

The School will continue to sample the floodplains through July 2012 for the current project and hopefully for several more years after that to document the restoration of this ecologically unique floodplain ecosystem.

This project is funded by
The Nature Conservancy, the Louisiana Department of Environmental Quality and the U.S. Environmental Protection Agency.



An underwater light trap, used to collect larval fish and invertebrates for the Mollicy Farms project. A light stick in the middle of the trap attracts larval fish and invertebrates during the night. The trap and collected organisms are retrieved the next day.

Faculty Profile - Mike Kaller

Dr. Mike Kaller, assistant research professor and coordinator of undergraduate programs, joined the LSU AgCenter in 2005 after completing a Ph.D. at Louisiana State University and joined the faculty in the School in 2007.

He earned a B.S. in Fisheries and Wildlife Management at Lake Superior State University and M.S. in Wildlife and Fisheries Resources from West Virginia University in 1997 and 2001, respectively.

Kaller's research in the school has focused on modeling genetic and spatial distribution patterns of largemouth bass, factors influencing the aquatic organisms of streams and rivers, restoration of river-floodplain connections, impacts of feral pigs on aquatic ecosystems and fisheries resources of the Atchafalaya River basin.

He has received a number of awards and recognitions from professional organizations including the American Fisheries Society, Southern Division of the American Fisheries Society and Louisiana chapter of the American Fisheries Society, which has nominated him for chapter presidency in 2012.

He has a commitment to service through research, as well, mentoring a Scotlandville High School student through local competition to compete nationally in Washington, D.C., as part of the Environmentors program.

WILDLIFE

DUCKS and OIL – The Disaster That Wasn't

(continued from page 5)

rary workers spent two months searching for carcasses and looking at live birds for oiling in three areas that had substantial oil – Terrebone Bay, Barataria Bay and the Mississippi River Delta. For comparative purposes, Rohwer's crews went west and counted birds at the Atchafalaya River Delta and Vermillion Bay, which had recorded little or no oil. The Atchafalaya is a fresh marsh system similar to the Mississippi Delta, while Vermillion Bay is a high salt Spartina-dominated marsh much like Barataria and Terrebonne bays. While marsh edge surveys dominated the work, survey crews also walked beach transects on barrier islands in Louisiana and Gulf beaches in Mississippi, Alabama and Florida. Rohwer's crews also searched open water transects in Louisiana bays. "All total, we had almost 500 transects where we surveyed for waterfowl and other water birds," he said.

Two good things emerged from this work. First, Rohwer was able to get about a dozen RNR wildlife students some interesting field research experience during the winter break between semesters. "The LSU students did a terrific job and learned a lot about the coast, wildlife research and the intricacies of working for the government," said Rohwer. More importantly, "We counted only a handful of dead waterfowl or water birds (gulls) on all of our transects. The scarcity of dead birds suggests that waterfowl and most inshore water birds had little contact with the BP oil. That was a great relief, because many waterfowl, especially scaup, canvasbacks and redheads, winter in the open bays where repeated oil incursions were reported during and after the spill." So, overall, the oil spill appeared to have little direct effect on the vast numbers of midcontinent waterfowl that come down the flyway and use coastal wetlands as their wintering site.

Oil accumulation on these soils, just 5 meters in shore from soils on page 5 photo, probably poses a more serious threat to marsh vegetation.

RNR wildlife student Brittany Perry drives a surface-drive boat while searching for duck carcasses.

Vicki Olmstead searches for waterfowl carcasses along a marsh edge.

FORESTRY

Carbon Sequestration and Uneven-aged Management of Loblolly-Shortleaf Pines in the Southern USA: A Joint Optimization Approach

Sun Joseph Chang, Professor and Rajan Parajuli, Graduate Student

Forest carbon sequestration is regarded as a viable and cost effective option for reducing global greenhouse gas emissions.

Several studies have analyzed the effects of joint management of carbon and timber under different even-aged forest management scenarios. However, research specifically focused on the inclusion of carbon sequestration benefits into uneven-aged management has received little attention among researchers.

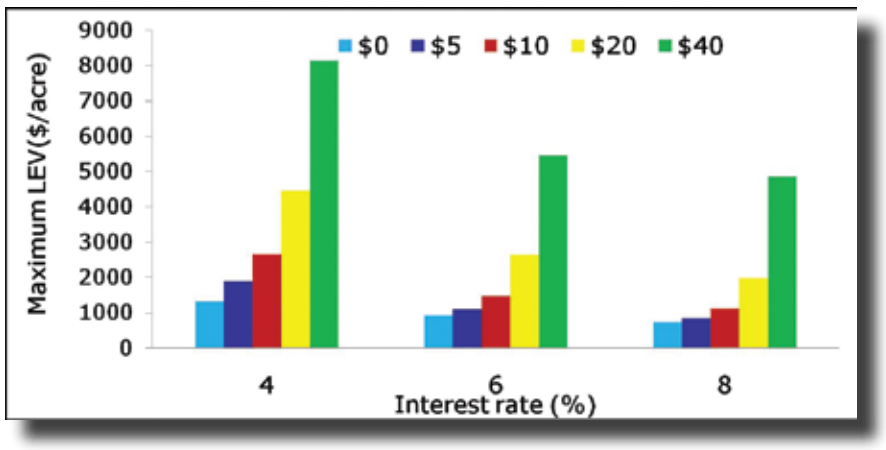
Dr. Sun Joseph Chang and graduate student Rajan Parajuli are conducting a study to assess the management as well as financial effects resulting from the integration of carbon sequestration benefits into uneven-aged stands of loblolly-shortleaf pines in the South.

Given current stumpage prices in Louisiana of $257 per MBF (Doyle) of pine sawtimber, $28 per cord of pine pulpwood, carbon price of $0, $5, $10, $20 and $40 per metric ton for carbon sequestration, and interest rate of 4, 6, and 8 percent (above), the results suggest that the lower the interest rate, the higher the land expectation value and the higher the price of carbon sequestration, the higher the land expectation value.

In addition, the higher the price of carbon sequestration, the longer the cutting cycle will be. Similar to previous findings on even-aged management, the interest rate and stumpage prices have opposite effects on the optimum management regimes of uneven-aged loblolly-shortleaf stands.

Inclusion of carbon benefits into uneven-aged loblolly-shortleaf pines stands not only increases the land expectation value but also lengthens the cutting cycle significantly.

Rajan Parjuli presented a poster on his carbon sequestration research to a recent Southern Forest Economics Workshop held March 20-22 in Little Rock, Ark.



The joint maximum land expectation values associated with different carbon prices and interest rates. The lower the interest rate, the higher the land expectation values at every level of carbon prices.

The project is supported by McIntire-Stennis Research Funds.

South Louisiana's Premier Wetland Forest: Climate or Hydrology Driven?

Som Bohora, Graduate Assistant, Richard Keim, Associate Professor and Jim Chambers, Professor

Cypress-tupelo forested areas of south Louisiana represent the premier wetland forest of the state.

The effects of climate change and changes in hydrology in the deltaic plain of the Mississippi River have significantly altered community composition and ecosystem processes of these forests in both the short- and long-term.

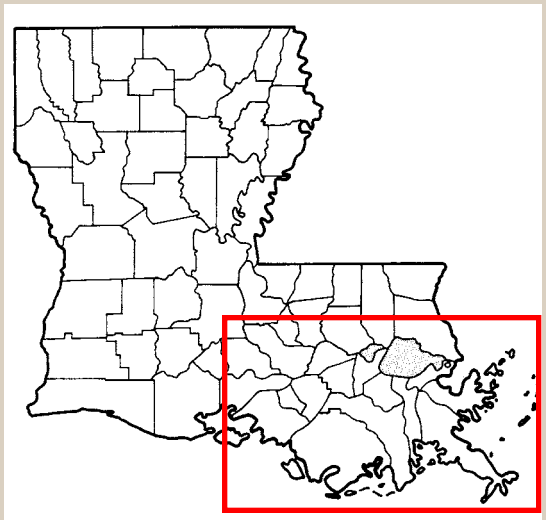
Forested ecosystems respond differently to historic and recent climatic and hydrologic variability, ultimately affecting productivity. Broad scale studies of these wetland forests are limited by the lack of instrumented sites for climate and hydrological records as well as approaches useful for evaluating the complex set of variables that affect these wetlands. Tree rings have sometimes been used to infer changes in past climate and hydrology, but not to assess overall trends within a region.

It was the need for such a study that coaxed Som Bohora, a graduate student from Nepal under the co-direction of Drs. Richard Keim and Jim Chambers, to undertake the current study to evaluate the spatial and temporal variation of growth in baldcypress wetlands.

Tree ring data from 22 tree ring chronologies were gathered for this research. The data for this large scale study was from a number of previous studies from other students in the School of RNR Tree-Ring and Environmental Evaluation Lab (TREE LAB).

Results of correlations between monthly climate and hydrology variables are being plotted within a GIS to spatially assess the data. Multivariate statistical analyses are being used to explore the complex relationships among tree radial growth and environmental variables at different spatial and temporal scales.

This research will provide insight on the relative importance of climate and hydrology to the growth of Louisiana's premier wetland forest.



The map indicates distribution of sites used for analysis of South Louisiana's climate and hydrological effects on wetland forest productivity.

The project is supported by McIntire-Stennis Research Funds.

Tree-rings allow historical analysis of radial growth in relation to climate and hydrological changes.

Som Bohora, M.S. student from Nepal, examines baldcypress tree cores for tree-ring measurements on a Velmex measuring stage. Radial growth is assessed in relation to historical changes in climate and hydrology.

Faculty Profile
Jim L. Chambers

Jim Chambers, a native of Ponca City, Okla., began his academic career as a pre-forestry student at the University of Nebraska. After two years in the pre-forestry program, he transferred to the forestry program at Southern Illinois University in Carbondale, Ill., where he received his B.S. in Agriculture with a major in forestry. Chambers continued his education by pursuing an M.S. degree in Forestry Ecology also at Southern Illinois University. He received his Ph.D. in Forestry from the University of Missouri in Columbia, specializing in physiological ecology.

Chambers has been at LSU nearly 35 years. In 2001, he was named the Weaver Brothers' Distinguished Professor of Forestry. His early research interest was in physiological ecology or eco-physiology of forest species. He initially investigated the response of Southern wetland forest species to various types of environmental stress, including flooding, salinity and drought and the effects of these stresses on regeneration.

His research emphasis subsequently included responses of hardwoods and pines to forest management regimes, including fertilization and thinning. Chambers' regeneration work with bottomland and wetland forest species' response to flooding and salinity eventually led to his chairing the Governor's Coastal Wetland Forest Conservation and Use Science Working Group (2004 -2005).

Chambers has continued his research emphasis in bottomland and wetland forests, developing new insight into how these species and forests respond to changing hydrology and environment. He recently served on the site evaluation committee of the Coastal Forest Conservation Initiative program in the State Office of Coastal Protection and Restoration.

Effectiveness of BMPs In Dissolved Oxygen Protection of Low-gradient Streams of Louisiana

Abram DaSilva, Graduate Assistant and Y. Jun Xu, Associate Professor

In addition to providing abundant wildlife habitat, Louisiana's forests provide numerous recreational opportunities, 20,000 jobs and a variety of forest products worth an estimated $3.1 billion to the state's economy each year.

Along with the benefits, however, comes a risk of water quality degradation due to the large number of streams, rivers and lakes in close proximity to forest management activities.

Numerous studies in forested areas of the southeastern U.S. have shown that unregulated timber harvesting can impact adjacent streams and rivers through increases in sediment and organic matters, resulting in low levels of dissolved oxygen (DO), which is one of the most critical indicators of water quality in surface water bodies.

In Louisiana, high average temperatures, flat landscapes and high organic loads in streams and rivers often combine to cause low DO concentrations, and nearly 50 percent of Louisiana's 475 watersheds are currently listed as impaired due to low DO levels.

In 2000, voluntary best management practices (BMPs) were developed for the Louisiana forest industry to protect freshwater resources from non-point source pollution associated with typical forest management activities and efforts have continued to assess whether these BMPs effectively protect stream structure and function.

In the summer of 2006, we initiated a study on Turkey Creek, a headwater stream of the Flat Creek Watershed located in Winn Parish in central Louisiana. Flat Creek has been cited for impaired water quality due mainly to low DO concentrations, and 61 percent of its watershed is used for forestry.

To test effectiveness of Louisiana's current forestry BMPs in preventing DO depletion, two YSI 6900 water-quality monitoring sondes were deployed—one upstream and one downstream of a forested tract that was harvested in the late summer of 2007 on both sides of the stream. BMPs were followed during this harvest.

From 2006 through 2010, the sondes recorded in-stream DO concentration, temperature, pH, conductivity and water level changes at 15-minute intervals. In addition, monthly site visits were made to collect water samples from the sites for analysis of nutrient, carbon and biochemical oxygen demand (BOD).

Preliminary results show that despite post-harvest increases in stream water temperatures (about 1 degree Celsius), total carbon concentrations, and BOD levels, stream DO levels did not decline. In fact, DO was found to have actually increased from the upstream to the downstream site, likely due to decreased evapotranspiration after the harvest and an increase in surface and shallow groundwater flow into Turkey Creek.

We are able to attribute these changes to the timber harvest alone, since neither air temperature nor precipitation differed between pre- and post-harvest periods. Our results indicate that Louisiana's current BMPs are effective in minimizing the negative impacts of timber harvesting on adjacent aquatic systems and that adequate safeguards are in place for a healthy forestry-based economy to coexist with healthy freshwater systems.

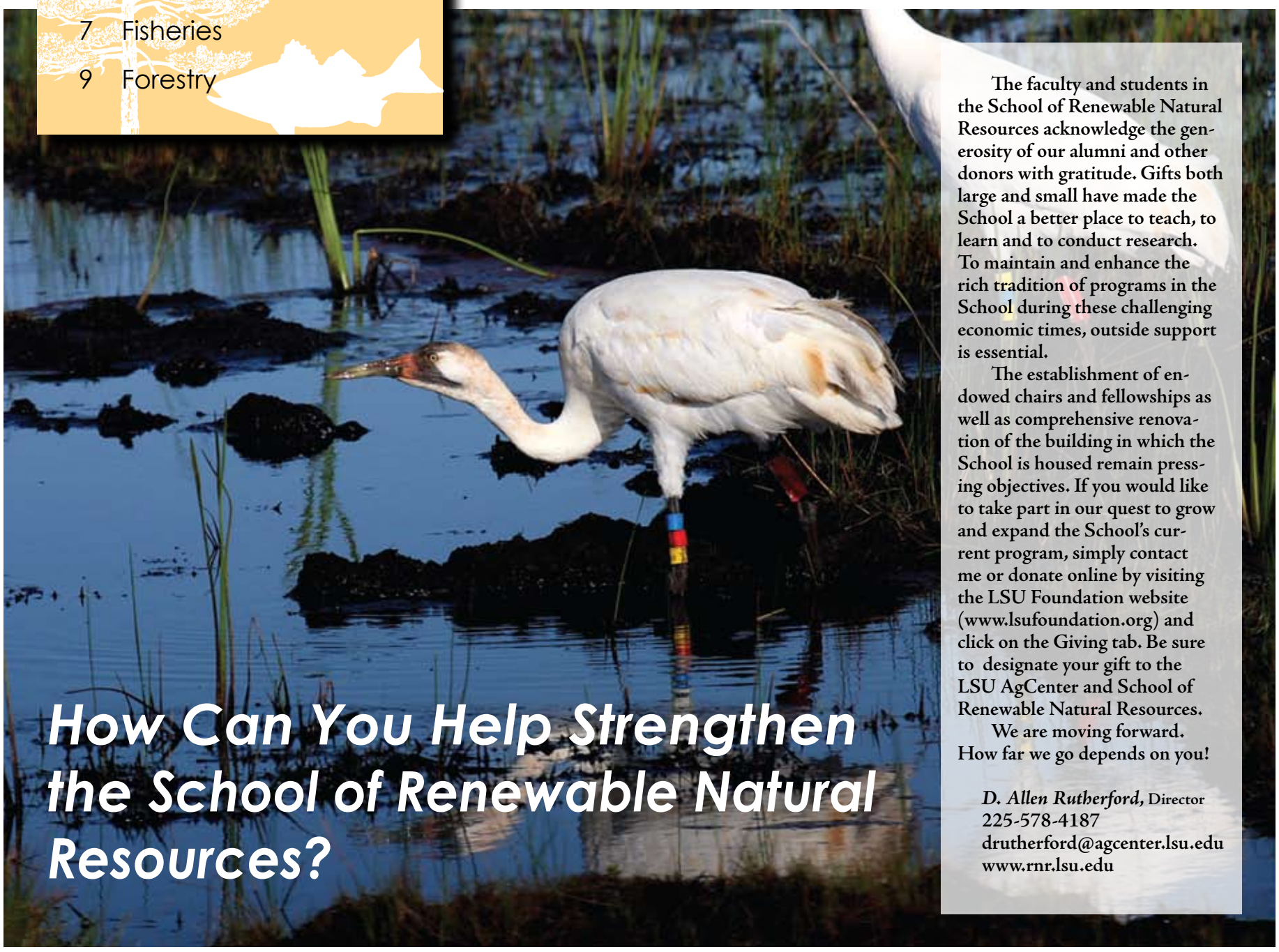
Sponsors for this project include the National Council for Air and Stream Improvement Inc., the Louisiana Department of Environmental Quality and Plum Creek Timber Co., Inc.

Abram DaSilva measures stream water fluorescence to determine the relationship of changes in stream dissolved oxygen and chlorophyll a.

Students from the RNR 7029 Wetlands Ecology class just returned from a two-week trip that explored and studied parts of Colorado and New Mexico. Drs. Sammy King and Richard Keim team up to teach the class each spring semester. Look for a full article on the class and its unique field trips in the 2011 fall newsletter.

Contents

School of Renewable Natural Resources
Louisiana State University Agricultural Center
Baton Rouge, LA 70803-6200



How Can You Help Strengthen the School of Renewable Natural Resources?

The faculty and students in the School of Renewable Natural Resources acknowledge the generosity of our alumni and other donors with gratitude. Gifts both large and small have made the School a better place to teach, to learn and to conduct research. To maintain and enhance the rich tradition of programs in the School during these challenging economic times, outside support is essential.

The establishment of endowed chairs and fellowships as well as comprehensive renovation of the building in which the School is housed remain pressing objectives. If you would like to take part in our quest to grow and expand the School's current program, simply contact me or donate online by visiting the LSU Foundation website (www.lsufoundation.org) and click on the Giving tab. Be sure to designate your gift to the LSU AgCenter and School of Renewable Natural Resources.

We are moving forward. How far we go depends on you!

D. Allen Rutherford, Director
225-578-4187
drutherford@agcenter.lsu.edu
www.rnr.lsu.edu

(Photo courtesy of K. S. Gopi Sundar, International Crane Foundation)

School of
Renewable Natural Resources

The School of Renewable Natural Resources
offers two undergraduate degrees each with specialized study options.

Bachelor of Science (B.S.)
Forestry

Forestry

Forestry is the management and conservation of forests and their natural resources. Trees, plants, wildlife, fishes, water, air, endangered species, people and communities and all things "earthy" are all part of our forest ecosystems.

From wilderness areas to the wood products we depend on daily, someone has to work to keep our forests sustainable. Who keeps it all together?

Who keeps it green? Who keeps it sustainable?
Foresters do!

Bachelor of Science (B.S.)
Natural Resources Ecology and Management

Natural Resources Ecology and Management

Natural Resources Ecology and Management includes the management and conservation of wildlife, fish, plants, forests, streams, rivers, lakes, wetlands and landscapes. Students gain hands-on, practical experience, as well as the theoretical background necessary for their unique career.

From wilderness conservation to urban wildlife management, professionals in natural resources ecology and management work to keep our ecosystems sustainable.

Who will manage our natural resources?
It could be YOU!

Professionals in Forestry:

Forest Managers
Recreational Managers
Soil Scientists
Wetland Specialists
Environmental Consultants
Wood Chemists
Park Rangers
Wilderness Specialists
Forest Pathologists
Wildlife Biologists
Environmental Lawyers

Professionals in Natural Resources Ecology and Management:

Wildlife Biologists
Fish Biologists
Veterinarians
Environmental Consultants
Wetland Specialists
Wildlife Refuge Managers
Aquarium Curators
Park Rangers
Game Wardens
Research Scientists

At RNR, we get you into the field right away.
Get in your field today!