

LOUISIANA AGRICULTURE

THE MAGAZINE OF THE LOUISIANA AGRICULTURAL EXPERIMENT STATION

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Urban Agriculture Issue

Larry Rogers Retires As LSU AgCenter Vice Chancellor

Mississippi's gain is Louisiana's loss with the March 1 retirement of R. Larry Rogers as director of the Louisiana Agricultural Experiment Station and vice chancellor of the LSU AgCenter. Rogers is in the process of moving back to his family farm across the border near Prentiss.

Rogers had been with the LSU AgCenter nearly 35 years. The job he held longest was resident director of the Northeast Research Station, which includes sites at both St. Joseph and Winnsboro, from 1974 to 1994.

"Larry made a big impact on agriculture in this region – and all over the state," said Ray Young, farmer and agriculture consultant from Wisner. "He believed in research that was relevant. Agriculture would have been on the wane without him."

While at the Northeast Research Station, which serves an 11-parish area that encompasses two of the major agricultural regions in Louisiana, Rogers increased the number of senior research faculty from four to eight, increased the research staffs and added new facilities. Research projects were expanded to include most aspects of row crop production and forages.

"One of his strengths was selecting top quality people to work for him," said Carter Webb, a farmer from Tensas Parish, who raises cotton, soybeans and grain sorghum. "No one at the station was ever too busy for a farmer who came by with a problem and needed advice."

Rogers attended Hinds Junior College and Mississippi State University, where he received a B.S. degree in plant pathology and weed science in 1964.

Photo by Mark Claesgens



R. Larry Rogers, left, presents the Distinguished Service Award from the Sweet Potato Council to Larry Rolston, a former LSU AgCenter entomologist. Rolston, who could not attend the council's recent meeting, was the creator of the Beauregard sweet potato, released by the LSU AgCenter in 1987.

AgCenter's vice chancellor for administration. In 1996, he was named vice chancellor for research and director of the Louisiana Agricultural Experiment Station.

"His expertise, administrative ability and dedication to agriculture helped redirect research resources to effectively and efficiently meet the changing needs of the state's producers," said William B. "Bill" Richardson, chancellor of the LSU AgCenter.

William H. Brown, formerly associate director and associate vice chancellor, has been named as Rogers' replacement. ■ **Linda Foster Benedict**

After receiving his Ph.D. from Auburn University in plant pathology and weed science in 1967, he came to LSU as an assistant professor in the Department of Plant Pathology. He was promoted to associate professor in 1972 and professor in 1976. His research focused on soybean weed control research.

From 1988 until 1991, Rogers' duties were expanded to include the Sweet Potato Research Station at Chase.

In 1995, he moved to Baton Rouge to become the LSU

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PHOTO EDITOR: John Wozniak

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Linda Foster Benedict, Editor
Louisiana Agriculture
P.O. Box 25100
Baton Rouge, LA 70894-5100
phone (225) 578-2263
fax (225) 578-4524
lbenedict@agcenter.lsu.edu.

www.lsuagcenter.com

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Louisiana State University Agricultural Center, William B. Richardson, Chancellor
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ON THE COVER:

A growing population with added economic activity in urban areas influences rural land markets at the rural-urban fringe. LSU AgCenter economists keep track of this through research. Some of the highest priced land is north of Baton Rouge featuring up-scale homes and a golf course. See page 13. Photo by John Wozniak.

Agriculture: More 'Urban' Than You Think

R. Larry Rogers



R. Larry Rogers

Diversity is a word used frequently in discussions related to social, environmental and economic issues. The word diversity implies variety, inclusiveness and comprehensiveness, qualities that have the capacity to lend strength to an individual, an organization, a system or an entity. Therefore, diversity is considered a highly desirable quality. Among other things, it imparts to those individuals, entities and systems that have this characteristic the ability to prepare for and respond to opportunities and challenges more effectively and comprehensively than those lacking this quality.

Diversity can certainly be used most appropriately in describing agriculture in Louisiana and research programs of the Louisiana Agricultural Experiment Station (LAES). One of the greatest challenges the LAES task force charged with developing a strategic plan titled "Focus 2000: Research for the Twenty-

first Century" encountered was developing a statement that defined the word agriculture. I think it is appropriate to include that definition because it explains why diversity is an integral part of agriculture in Louisiana.

Agriculture is a diverse and dynamic activity that encompasses the science and art of managing, protecting and conserving natural resources such as soil, water, air and sunlight to produce plants and animals that provide food, clothing, shelter and other amenities for man. Agriculture also includes forestry, fisheries, wildlife, human nutrition, apparel design, ornamental horticulture, gardening, and development of human and community resources. Moreover, the term includes a myriad of agriculturally related businesses such as those involved with banking and finance, food processing and packaging, marketing and distribution, farm structures and equipment, and agricultural chemicals and fertilizers. Thus, agriculture is intimately intertwined with local, state, national and international economics.

If you reflect on this definition, you will find that the diversity of Louisiana's agriculture derives from two primary sources.

Louisiana farmers are engaged in the production of many agricultural commodities. Timber, cotton, sugarcane, rice and soybeans are the major plant commodities, but perhaps as many as 100 other agronomic and horticultural crops go into the agricultural mix, which annually generates \$2.5 billion to \$3 billion of income for farmers. Poultry, beef cattle and dairy are the primary farm animal enterprises, but horses,

sheep and swine also generate about \$1 billion a year in farm income. Aquaculture enterprises such as catfish, crawfish, alligators and other fisheries and wildlife enterprises now generate about \$500 million a year in income for farmers and landowners. Collectively, the production of this diversity of animal and plant commodities generates \$4 billion to \$5 billion per year in farm income that comprises the real economic base for most rural communities in this state as well as employment for thousands of others in urban areas engaged in the production of machinery, supplies and services needed to support production of these agricultural commodities. Production of this vast array of agricultural commodities is possible because of the rich natural resource base in Louisiana and a favorable temperate to subtropical climate.

The greatest and least-appreciated source of diversity in agriculture relates to the myriad of off-farm activities that supports agricultural production – transportation, storage, processing, marketing and use of agricultural commodities and products derived from them. The social and economic impacts of agriculture are far greater off the farm than on the farm. Agriculture and related activities constitute about 16 percent, or \$1.5 trillion, of the total U.S. economy and provide employment for approximately 17 percent of the U.S. work force or about 23 million jobs.

The LAES is charged by federal and state legislation to conduct research that supports agriculture in the broadest sense of the word. Our forefathers made the decision more than 100 years ago, in 1887, to invest public federal and state funds to support agricultural research with the expectation that the technologies derived from this research would contribute to economic development, an improved standard of living, enhanced national security, and the conservation and protection of natural resources.

This investment of public funds has served society exceedingly well. During the past century, the percentage of the U.S. population directly engaged in production agriculture has declined from about 50 percent to less than 2 percent. The needs of 280 million people are being met using less land than was required for a population of 75 million in 1900, and more than 20 percent of current production is exported. The average U.S. family can access the greatest variety of the safest food available anywhere in the world using only about 10 percent of their total disposal income. These factors have played absolutely essential roles in dramatically improving the standard of living, the health and the longevity of Americans over the past century. Clearly, our forefathers' expectation that investment of public funds in agriculture and agricultural-related research would pay big dividends for Americans has been realized much more effectively than they could have possibly imagined.

The LSU AgCenter administration believes that accountability is part of our responsibility as public servants and stewards of public funds. *Louisiana Agriculture* is one of the ways we attempt to keep the citizens of Louisiana informed about programs and accomplishments of this organization. This issue focuses on some of our programs and accomplishments that relate to the city dweller as well as to our more traditional farm audience. Included are articles about our research in mosquito control and forensic entomology. Other research efforts that evolved out of more traditional agricultural programs include fire ant control and the battle being waged with the Formosan subterranean termite. Other issues of this magazine have focused on food safety, composting and human ecology – topics that directly affect both the urban and rural Louisianian. If you are interested in receiving back issues, please contact the magazine's editor.

We hope you enjoy reading this issue. Agriculture is more "urban" than many people realize. We welcome your suggestions for improving the relevance and effectiveness of our research programs. We thank you for your past support of the LSU AgCenter and request your continued support so we can maintain, and enhance, our quest to improve the quality of your lives and communities. ■

Let's Get Neighborly

LSU AgCenter Urges City Dwellers To Unite for Fire Ant Control

When individual homeowners try to get rid of the red imported fire ant, all they really do is move the mounds around their own yard or send them to the neighbor's.

That's why Dale Pollet, LSU AgCenter entomologist, is promoting a plan in which city dwellers band together by neighborhood to control the spread of this troublesome pest.

Called "Put the Fire Out," the plan involves a two-step treatment method that costs less and is more effective than when people work alone. The plan requires somebody to take the lead. This can be an existing neighborhood association or some type of committee formed for this purpose. This person or group can buy the bait in bulk at far cheaper prices than when purchased in small quantities.

"It helps if everyone in the neighborhood agrees to cooperate," Pollet said.

The two-step plan involves areawide treatments in the spring and fall followed by treatments of individual mounds as they arise.

"To maintain control, neighborhoods may have to repeat the areawide treatment yearly," Pollet said.

Here's how the plan works:

- Inform the neighborhood residents of the date for treatment. Be sure to include an alternate date in case of rain.
- Decide how the bait should be distributed. A central location where residents can pick up the bait on the designated date is effective. Block captains also can be used to distribute bait. They can check to see if everyone on the block treats.

"Don't worry if a few residents refuse to participate. Their ants will feed on bait in neighboring yards," Pollet said.

- Distribute the bait according to size of property. Residents will need to provide measurements. If possible or necessary, borrow spreaders that residents can return when done.
- Broadcast the bait on all areas of the property, including sidewalks.

Treat individual mounds with about 3 to 5 tablespoons of bait.

"More is not better with these baits. Follow the directions," Pollet said, adding that it is important not to disturb the mound when applying the bait because this may cause the ants to move before they eat it.

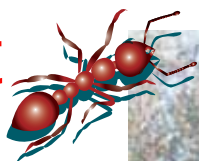
Rest assured, however, that even the best of plans will not rid Louisiana of the red imported fire ant. Rather, the goal is to keep their populations down to economically acceptable levels.

"The red imported fire ant is here to stay," Pollet said.

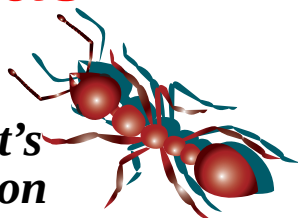
Though a pest, fire ants can be beneficial. They feed on insects including ticks, fleas and termites. Louisiana sugarcane farmers like that they eat the sugarcane borer, the No. 1 insect pest of that crop. This can reduce their need for one or two pesticide applications.

More information may be obtained on organizing a "Put the Fire Out" campaign by contacting local parish LSU AgCenter extension offices or by visiting the website: www.lsu.edu/ants. ■ **Linda Foster Benedict**

Fire Ant Control in Urban Areas



This pest's population continues to grow in Louisiana. However, research shows numbers can be held in check with a blanket approach.



Linda M. Hooper-Bùi

Red imported fire ants are ubiquitous in Louisiana. They inhabit pastures, fields, playgrounds, lawns, flowerbeds and even potted plants. These ants are called imported because they were accidentally brought here from South America in the early 1930s. In such countries as Brazil and Argentina, the ants are held in check by other organisms and environmental factors. In Louisiana, however, there are no natural controls, resulting in an ever-growing population.

In infested urban areas, red imported fire ants can cause many problems. If stung, some people suffer allergic reactions, secondary infections and unsightly skin damage. The ants can cause structural damage in houses and industrial buildings. Some infestations lead to damage of waste containers, electronic circuitry, ground-placed industrial lighting and even traffic control lights.

Linda M. Hooper-Bùi, Assistant Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.



Residents used hand-held spreaders to apply the bait in their yards. When they returned the spreaders, they indicated on a map where they had spread the bait. Researchers could then make sure the entire area was covered.

Fire Ant Biology

Red imported fire ants are omnivorous and opportunistic in their food gathering. They will gather practically anything, including dead animals and plants, and will kill other arthropods. Fire ants can remove seeds, developing and ripe fruit, and feed on sap flows.

Reproduction in fire ant colonies is accomplished by winged "sexuals." These winged individuals fly out of the colony and mate in the air. The males die, and the mated females return to the ground (often after flying several miles) to find a suitable place to start a nest.

The mating flight is one way fire ants infest previously noninfested or treated areas. Another way is by splitting the colony (budding) or moving the colony after it has been disturbed.

The fire ant queens lay eggs that hatch into balloon-like, helpless larvae. Worker ants use these larvae to process the solid food they gather into a form easily consumable by the colony. Larvae eventually transform into adults. The adult ants function as workers who build the nest, feed other workers and larvae, and most important, care for and feed the queen. The workers that provide the



colony with food will exit the colony or mound through tunnels and forage for food on the soil surface.

How Baits Work

Because of the way worker ants feed the rest of the colony, baits make an appropriate and effective means of control. Baits consist of a food item desirable to the target ants combined with either a slow-acting toxicant or a growth regulator. The worker ants pass the food around to the various members of the colony, who will eventually succumb to the effects of the toxicant or be rendered sterile from the growth regulator. Either way, the population of affected ants will die.



Homeowners have used bait for years, but results are usually short-lived. The baits were probably working and controlling the ants in the treated yards, creating an "ant-free zone." Because of their mobility, ant colonies from the neighboring yards may move into areas where the baits had not been used.

LSU AgCenter Research

The LSU AgCenter began focusing research efforts on fire ant control in urban areas in 1998. Researchers wanted to test the effectiveness of large-scale, community-based management techniques as compared to individual homeowner efforts. Traditionally, large-scale bait treatments of red imported fire

ants have been applied to agricultural or grazed fields. The practice of managing fire ants using a large-scale technique in urban areas has been tried in other southern states, beginning in Arkansas in 1991. Texas made popular a two-step technique in which insecticidal bait is broadcast followed by individual mound treatments with a contact insecticide.

To study fire ant control in an urban area, LSU AgCenter scientists selected for the large-scale portion of the study an 85-acre subdivision near downtown Baton Rouge called Spanish Town. Nine homes within the neighborhood were selected for more intense study of the ants, and three nontreated areas adjacent to the subdivision were monitored.



Baton Rouge residents signed up to receive their share of bait. All spread the bait in their own yards all on the same day to blanket their neighborhood.



For the small-scale portion of the study, 30 individual homes scattered in Baton Rouge close to Louisiana State University were chosen for treatment. Three homes were used as nontreated controls.

Large-scale Study in Spanish Town

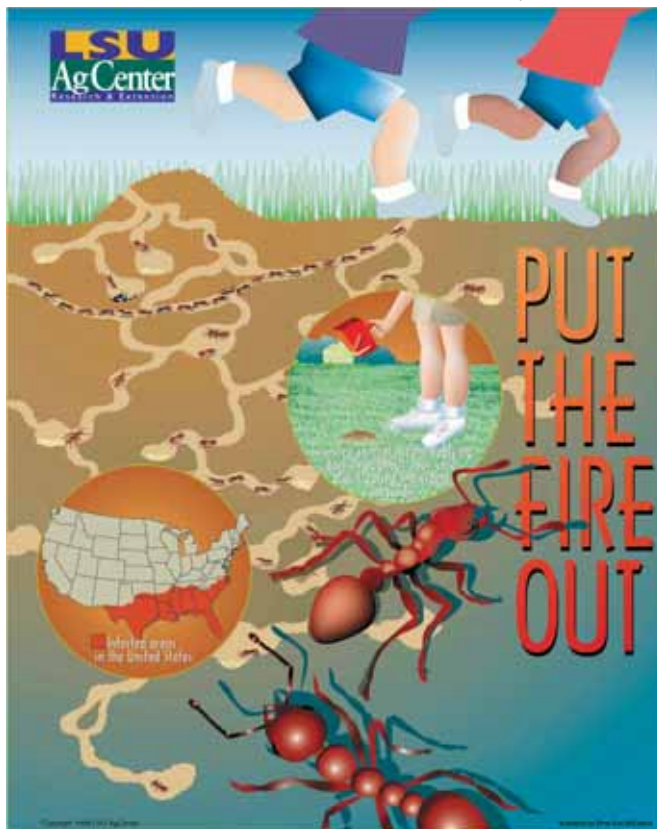
LSU AgCenter personnel worked with Spanish Town residents to develop the plan, which was nicknamed “Put the Fire Out.” The homeowners were to broadcast bait in their individual yards all on the same day at three times six months apart—April 17 and Oct. 16, 1999, and April 22, 2000. The residents were instructed to measure the area of their property and subtract the area of their house’s footprint. LSU AgCenter personnel then distributed the appropriate quantity of bait and a hand-held spreader to each of the homeowners on the three days.

Each homeowner received one of three baits—Amdro, Distance or Award—randomly assigned and recorded on a data sheet. The spreader with the correct amount of bait was checked out to the individual, who then treated his or her yard. When the resident returned the spreader, he or she was asked to mark on a map the area treated to ensure that the entire area was covered.

LSU AgCenter employees broadcast monthly each type of bait at three of the nine houses (for three replicates) in conjunction with the community effort. The type of bait each of the study houses received was randomly assigned but remained the same throughout the study.

Small-scale Treatment of Individual Homes

Thirty homes were treated with the same three baits—10 per bait. Using a hand-held spreader, a pest control technician applied all of the broadcast bait treatments to the 30 houses. This ensured that the bait was spread correctly and consistently. The individual homes



“Put the Fire Out” is the name of the LSU AgCenter program that helps communities band together to help control fire ant populations.

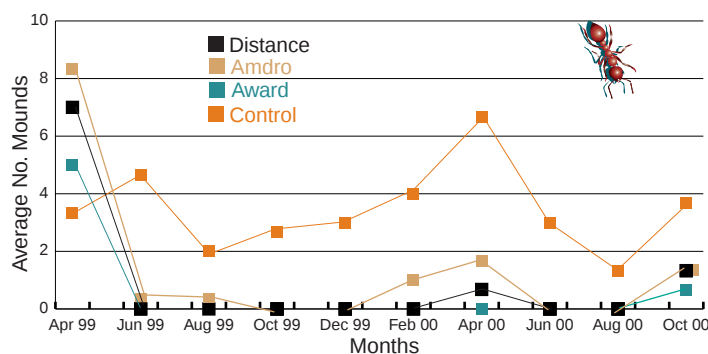
were treated in April 1999. However, this treatment method was not as effective as the areawide treatment.

Numbers Go Down

Before the initiation of the study, mounds were counted in the yards of the



This line chart follows the average number of mounds in yards in Baton Rouge’s Spanish Town neighborhood after large-scale treatments. Treatments were applied in April and October of 1999 and April of 2000. Area-wide broadcast treatments with baits maintained fire ant mound reduction for six months after application.



areas set for treatment and the nontreated controls. After the initial treatment, the mounds were counted monthly in each homeowner’s yard and the nontreated control areas.

All three baits used were successful in reducing the number of fire ant mounds in all homeowners’ yards in the study. Large-scale fire ant control using baits was more efficacious than individual homeowner efforts. Small-scale treatments initially were effective with a reduction in fire ant mounds for the first month and then gradually increased, supporting the hypothesis that the fire ants were moving from the neighbors’ yards. Results from the large-scale application demonstrate that granular baits are effective in controlling red imported fire ants. Ant movement from nontreated adjacent areas into the treated area thwarted the small-scale efforts. Because baits offer little or no residual, there is no protection from re-invasion from neighboring nontreated areas.

This LSU AgCenter study demonstrated that large-scale treatment in urban areas may slow the re-invasion of red imported fire ants and reduce the number of treatments needed, cost of treatments and the amount of chemicals released in the urban environment. Treatment for fire ants with the large-scale broadcast approach, in which bait is bought in bulk, would have cost each resident of Spanish Town about \$2 to \$10 per year all together, depending on the size of their yards. (For participating in the study, residents received the bait free.) This is compared to an estimated \$20 to \$100 each homeowner would have to pay per year to treat for red imported fire ants on his or her own. With large-scale fire ant treatments using broadcast granular baits, residents can expect to reduce ant control costs tenfold, reduce fire ant populations and experience more success. ■

Formosan Subterranean Termites in Louisiana

They are here to stay. But, the LSU AgCenter is taking a three-pronged approach to stem their spread.

W. Ramsay Smith, Dennis R. Ring, Gregg Henderson, Qinglin Wu and Michael A. Dunn

Formosan subterranean termites have proved to be one of the most formidable pests ever to invade Louisiana. Their success is a numbers game. Compared to a native Louisiana subterranean termite colony of up to one million individuals, Formosan subterranean termite colonies can have 10 million individuals. One colony in Algiers, La., had an estimated 70 million individuals.

Big numbers cause big problems. The Formosan subterranean termite causes severe economic loss, including an estimated \$300 million of property damage per year in New Orleans alone. For example, termite damage caused one house to split apart and required that several other houses and an apartment complex be demolished. People are defaulting on mortgages and cannot get loans to repair their damaged homes.

The Formosan subterranean termite is aggressive in its pursuit of water. It finds sources of water other than ground moisture, such as leaking pipes, roof leaks and blocked gutters. It builds nests above ground in walls, which can store water for future use. This frees the termites from the continuous ground contact that subterranean termites require. Formosan subterranean termites can eat the untreated centers of creosote-treated railroad ties, pilings and utility poles. They will go through thin sheets of soft metal, mortar, gypsum board,

PVC pipe, electric power lines and telecommunications lines to reach food and moisture sources. They can also go through 1/16-inch cracks in concrete, entering homes without requiring typical mud tubes. Once in the interior they can keep out of sight while doing major damage to interior walls.

LSU AgCenter researchers have been tracking numbers of the Formosan subterranean termites since 1989 and have found a continual increase, except for slight downturns in 1997 and 2000 (Figure 1).

Unlike our native subterranean termites, the Formosan subterranean termite infests the wood of live trees. This not only provides them a food source but also serves as a reservoir for infestations into nearby structures. Weakened trees are susceptible to being blown over in high winds.

The LSU AgCenter is taking a three-pronged approach to find solutions to the Formosan subterranean termite

problem. One is entomological and involves study of the insect and ways to control its numbers. Another is a material properties approach to determine the best way to protect existing and future structures from attack. The third is education.

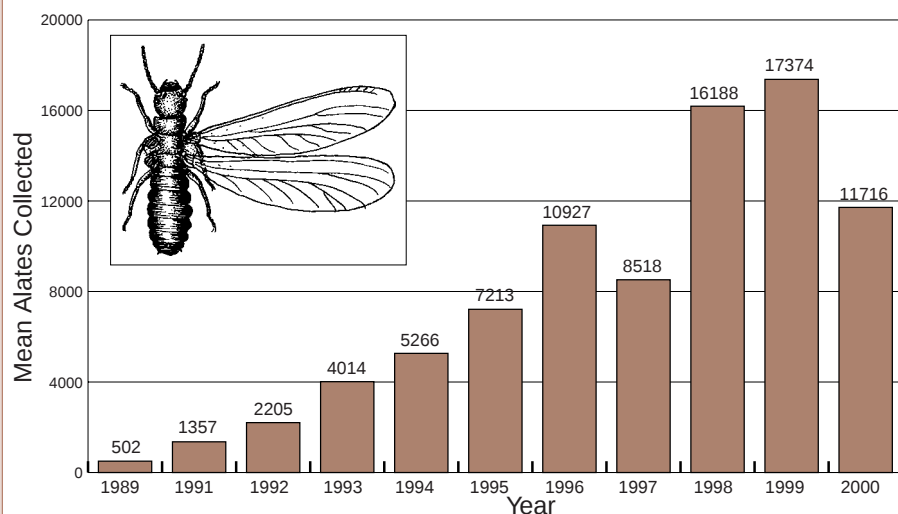
LSU AgCenter entomologists started studying the insect when it was first identified in Louisiana in 1966. Termite bait research started at the LSU AgCenter in 1991. This work resulted in development of bait systems now on the market.

Another control method being explored is a plant extract called nootkatone from vetiver grass roots. Nootkatone has been used in the perfume industry and for flavoring in citrus drinks. It has been found to act as a repellent with the Formosan subterranean termite.

In reducing termite populations, research efforts have been focused on targeting termites in living trees. One

W. Ramsay Smith, Program Leader and Professor, Louisiana Forest Products Laboratory; Dennis R. Ring, Associate Extension Specialist; Gregg Henderson, Associate Professor, Department of Entomology; Qinglin Wu, Associate Professor, and Todd F. Shupe, Assistant Professor, Louisiana Forest Products Laboratory; and Michael A. Dunn, Program Leader and Assistant Specialist – Forestry Extension Natural Resources, LSU AgCenter, Baton Rouge, La.

Figure 1. LSU AgCenter researchers have been tracking numbers of the Formosan subterranean termites since 1989 and have found a continual increase, except for slight downturns in 1997 and 2000.



implementation of this research is a five-year, \$5 million treatment project started in New Orleans in the spring of 2000. The project involves treating trees and is directed by the Louisiana Department of Agriculture and Forestry. LSU AgCenter scientists are involved in the evaluation of the project.

Another avenue for reducing the problem is to reduce the spread of this termite. Used railroad ties sold as landscape timbers are common means of transport. As a result of education efforts by LSU AgCenter researchers and collaborators from other institutions, the Railway Tie Association and Norfolk Southern Corporation instituted strict guidelines for movement of railroad ties as of December 11, 2000. In addition, they have organized an industry effort to determine the scope of the problem and work toward the necessary solutions to end the spread of Formosan subterranean termites through this route.

The Louisiana Forest Products Laboratory is addressing the problem by working to develop and test wood treatments that will protect structural materials from attack. There are chemicals and treated wood on the market that resist termite attack. Most chemicals, however, are primarily used on solid wood components such as sill plates, studs and plywood. Few are suitable for engineered wood products such as oriented strandboard or wood-based I-beams. These chemicals use water to transport them into the wood, which affects swelling properties and hence dimensional change and strength when applied after manufacturing. They can also affect the gluing characteristics of wood particles before manufacturing because of resin-additive interactions. For a treatment to work, it has to be effective against the termite without compromising the product properties during service. Research, therefore, is being carried out to determine and enhance physical properties and efficacy of various treatments for engineered wood products.

Adequate protection for residential structures requires education of the public. An integrated program includes using the proper techniques and understanding the interactions between planning, designing, site preparation, building and long-term maintenance during the life of a structure. The LSU AgCenter has educational programs for homebuilders, homeowners and pest control operators.

In an effort to help pest control



The Louisiana Forest Products Laboratory is testing wood treatments that will protect structural materials from termites. This house in New Orleans is being constructed with borate-treated lumber. Borates have been found to be toxic to termites.

operators address site preparation and pest management techniques, the LSU AgCenter coordinates a two-day termite training school twice a year for them. Approximately 150 operators are trained per year. In addition, a six-day course is offered at the LSU Summer Urban Pest Management Institute that includes educational programs on integrated pest management of most types of urban pests. This institute produces about 30 graduates per summer.

The Formosan subterranean termite is here to stay. It is well established in the southern United States and is being spread primarily by humans. Its ability to infest living trees will help assure its continued existence. The only hope of management and control is through educational and research efforts, such as those being conducted by LSU AgCenter scientists in cooperation with other agencies and institutions, including the Louisiana Department of Agriculture and Forestry. ■



This tree was so weakened from termite infestation that high winds blew it onto this house in New Orleans.

Termites Under the Weather

Gregg Henderson

Insects, such as the Formosan subterranean termite, are cold-blooded animals that depend on temperature and weather conditions for normal functioning. Temperature, humidity, rainfall, wind and even electrical charging in the air can affect termite behavior. Understanding how the weather affects Formosan subterranean termites may lead to improvements in ways to manage them.

During cold months, social insects like subterranean termites and ants go into a quiescent state, huddling together until warmer weather allows them to search again for food. Foraging by Formosan subterranean termites is strongly influenced by temperature. Louisiana's steamy, subtropical climate is a big reason such a massive population of this invasive insect pest lives here. Termites can forage for food most of the year in Louisiana.

The annual swarm season of the winged reproductives (alates) also is influenced by temperature and moisture. In Louisiana, May is warm, humid and the air is electrically charged because of frequent late-afternoon thunderstorms. These conditions allow the Formosan subterranean termites to start their mating flights around Mother's Day each year.

Termites exert some control over their own environment, especially in regulating nest temperatures. The termite nest is a well-constructed labyrinth of galleries and pathways surrounded by a hardened shell made from their own excrement, glandular secretions and transported clay particles. Nest temperatures in a Formosan subterranean termite colony stay fairly constant (91 degrees F) for all but the coldest months as a result of heat generated by the metabolism of millions of tiny termite bodies, aided by the even tinier dung-loving fungi that cohabit the nest.

Formosan subterranean termites, unlike most subterranean termite species, will build nests above and below ground. In Louisiana, aboveground nests are often found in attics and walls near doorways and window frames and in the center of living trees that the termites have consumed. Again, weather may play a role in this "small-minded" (a termite brain is the size of a grain of sand) but wise decision.

Subterranean termites often are exposed for long periods to inundation from rainfall that can accumulate into puddles on top of the soil for days. To study how subterranean termites react to and are affected by rising water levels, we took Formosan subterranean termites, along with their more commonly found cousins, the eastern subterranean termite and the southern subterranean termite, and completely submerged them in water in a laboratory setting. Besides giving us clues as to how heavy rainfall might affect a ground-nesting termite colony, the results of this study gave us insight on termite movement along waterways. We wanted to determine, for example, how likely a new infestation might occur as a result of a termite-infested tree limb breaking during a storm and traveling across a lake or down a river to fertile, cellulose-rich environs.

Our study indicated that subterranean termites escape drowning when confronted with excessive amounts of

Formosan subterranean termites, unlike most subterranean termite species, will build nests above and below ground.

water not by seeking higher ground, as commonly observed in red imported fire ants, but by entering an immobile state that conserves oxygen. In this suspended state, it took 30 hours of submergence for 90 percent of the eastern subterranean termites to drown, 23 hours for southern subterranean termites and 16 hours for Formosan subterranean termites. That is a long time for any animal to hold its breath! Of course, a natural soil profile or a log floating down a river would have air pockets. The time before drowning would likely take even longer. Such a natural event has been documented. In 1992, an areawide flood in west central Georgia that saturated the soil for more than a month resulted in a 77 percent reduction in subterranean termite populations.

Because Formosan subterranean termites are the most susceptible

subterranean species to drowning, that suggests they have a possible survival strategy for building aboveground nests that has evolved over millions of years. Termites have been on this earth for more than 200 million years. Unwittingly, this nest construction behavior also helps Formosan subterranean termites bypass traditional liquid ground barrier treatments applied commonly by pest control operators today, since this treatment does little to affect an aboveground colony.

Although too much water can kill a termite colony, water is necessary for their survival and termites will actively seek it. Formosan subterranean termites will even transport water from below ground to aboveground sites. If water is not constantly available to the colony, the soft bodies of subterranean termites will quickly dry out. For this reason, a leaking roof that causes moisture buildup in the walls of a house will make a pest control operator hesitant to provide a treatment warranty. Pest control professionals know of the termite's attraction to these moist areas.

Such aboveground nest construction has led to the misconception that Formosan subterranean termites will start a new colony in an aboveground location, like the walls of a house. This is not likely. A study we conducted evaluated the likelihood of a colony getting its start in a normally dry wall. Given the choice between a moist location and a dry location to start a new colony, the new queens and kings almost always chose the moist site. The termites choosing the dry site would have soon died. The drastic drop in termite numbers observed in our 2000 census may have had something to do with the drought of 1999, making it harder for aboveground colonies to survive. See Figure 1 on page 9.

Knowing the moisture-loving habits of Formosan subterranean termites can help in their management. To find what termites consider the most favorable conditions in which to live, we conducted a 13-month study around a

*Gregg Henderson, Associate Professor,
Department of Entomology, LSU AgCenter,
Baton Rouge, La.*

termite-infested apartment complex in New Orleans. Since moist soil conditions are believed to be one of the most important conditions, wooden stakes were placed near locations like dripping faucets, air conditioning units, areas having improper drainage and wood debris that helped retain moisture, with a similar number of wooden stakes placed in areas not appearing so attractive. Four separate inspections of 426 stakes placed around the apartment complex showed that moister sites had an almost 2 to 1 difference in attacks. With the advent of termite baits available in today's termite control marketplace, this fact can be particularly important. The more attractive to termites the baits can be made, the greater the impact they will have on reducing termite populations.

We tested this idea of "precision targeting" in the baiting of termites. About 1,200 cardboard monitors were

placed around 16 public schools in Orleans, Jefferson and St. Bernard parishes and examined each month for more than two years for attacks by termites (hits) before and after treatments. We were particularly interested in knowing how soil temperature and moisture affect hits by termites. Termite attacks on monitors fluctuated with the seasonal changes in temperature, with winter showing the lowest "success rate." We also found that Formosan subterranean termites and native subterranean termites prefer different sun exposures. Formosan subterranean termites showed a strong preference for east and north exposures, whereas native subterranean termites were not so picky but seemed to like southern exposures the most. Soils on the east and north sides of a building retained more moisture and did not dry out or stay as hot. Monthly soil temperature readings at

4-inch depths verified that sun-exposed locations were warmer. Native subterranean termites may have selected southern exposures more often because they were farther away from the large populations of the more aggressive Formosan termite.

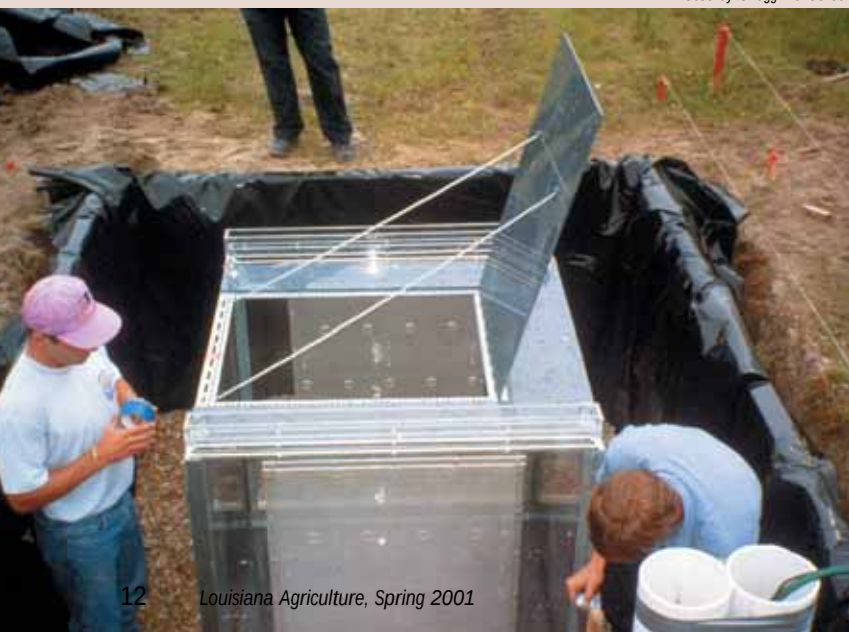
The more we know how the weather affects termite behavior and biology, the more likely we can develop improved methods to control them. Now if we could just understand the weather! To learn more about how termites get into your home and what you can do about them, you may visit our website www.agctr.lsu.edu/wwwac/termites. ■

Acknowledgment

U.S. Department of Agriculture Agricultural Research Service Southern Regional Laboratory-New Orleans and the Louisiana Department of Agriculture and Forestry



Photos by Gregg Henderson



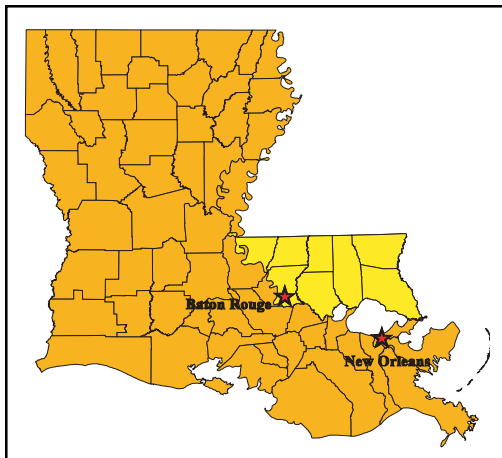
The termites could be viewed from the top. The termitarium is located at one of the facilities of the Mosquito and Termite Control Board in New Orleans.

Termitarium Reveals Termite Habits

To study the foraging behavior of soil-dwelling termites, LSU AgCenter scientists were involved in the building of a termitarium in New Orleans on the site of one of the facilities of the Mosquito and Termite Control Board. A termitarium is a large underground nesting chamber with a pair of sandwiched Plexiglas sheets for viewing two captive termite colonies while they forage both below and above ground. Being in contact with the soil, the termites placed in the large "farm" faced the natural fluctuations of soil temperature and moisture. A fine mesh stainless steel screen kept the termites contained inside in contact with the soil. Inside the aboveground portion of the termitarium was pine framing, which served as an attractive place for nest construction for Formosan termites. A roof constructed above the termitarium kept the unit from becoming too hot. Two times each day for a year, air and soil temperatures and observations of foraging were recorded. Aboveground foraging was found to be closely associated with ambient air temperatures. ■

Gregg Henderson, Associate Professor, Department of Entomology, LSU AgCenter, Baton Rouge, La.

Swimming pool experts advised on how to anchor the underground containment to keep it from pushing out of the ground during heavy rains.



Rural Land Values at the Urban Fringe

Rural land value contours were estimated to show the combined effects of location and economic development. In general, the metropolitan areas of Baton Rouge and New Orleans have a dramatic effect on rural land values.

Lonnie R. Vandever, Steven A. Henning, Huizhen Niu and Gary A. Kennedy

Lonnie R. Vandever, Warner L. Bruner Regents Professor; Steven A. Henning, Associate Professor; Huizhen Niu, Instructor/GIS Manager; and Gary A. Kennedy, Adjunct Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter, Baton Rouge, La. Kennedy is also Associate Professor, Agricultural Sciences Department, Louisiana Tech University, Ruston, La.

A growing population with added economic activity in urban areas influences rural land markets at the rural-urban fringe. With more rural land acres being converted at the urban fringe, buyers, sellers, planners, appraisers, tax assessors, lenders and others are expected to have an increasing need for information about the effect of location and economic development on rural land values.

Research results from a spatial econometric study of the rural land market in southeast Louisiana provide an indication of the factors that influence rural land values in this area and

Figure 1. The study area includes the metropolitan statistical areas of New Orleans and Baton Rouge. Each symbol represents the location of each of the 237 rural land sales from 1993 to 1997. Data indicate a clustering of relatively higher per acre sales in a commuting area north of New Orleans and another clustering of such sales north of Baton Rouge.

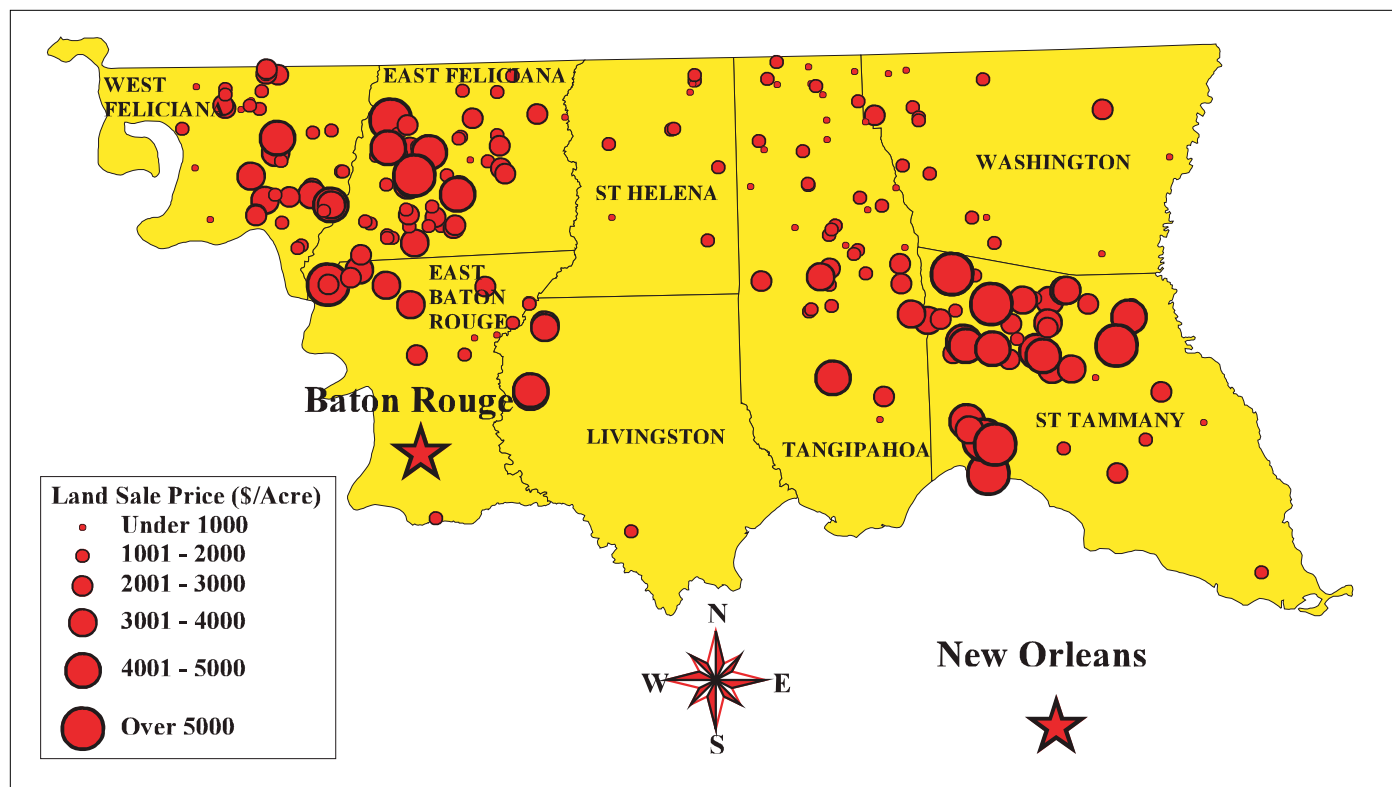


Figure 2. A \$1,000 increase in improvements increases per acre value (VALUE) by \$4.24. Similarly, the time of sale estimate (TIME) indicates that, starting in 1993, each additional month adds \$18.93 to the per acre value of a tract of land. A one-acre increase in size (SIZE), however, decreases per acre price by \$4.19. The distance to nearest town variable (DNT) indicates that a one-mile increase from the nearest town decreases per acre value by \$17.87; the travel time variable (TTNC) indicates that for each minute increase in travel time from nearest city (Baton Rouge or New Orleans) per acre land value decreases \$17.30.

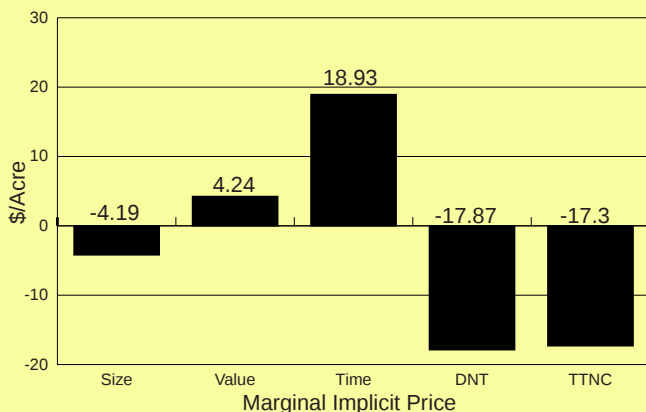
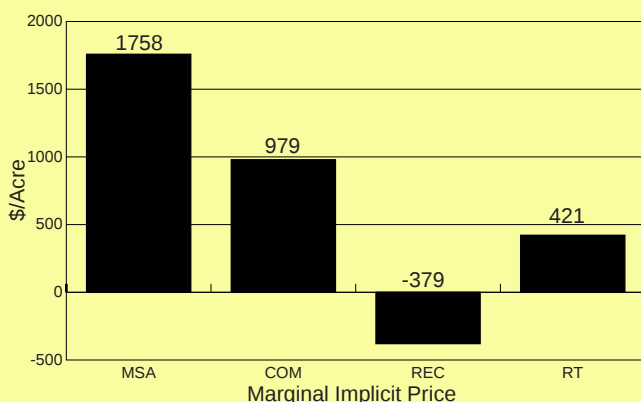


Figure 3. A tract located in the New Orleans MSA sells for \$1,758 more per acre than a tract not located in this MSA, and a tract purchased for commercial purposes (COM) sells for \$979 more per acre than other tracts. A tract with paved road access (RT) sells for \$421 more per acre than a tract that does not have paved road access. Land purchased for recreational purposes (REC), however, sells for \$379 less per acre than a tract purchased for other reasons.



the magnitude of these factors in this market. Factors studied include site characteristics, tract location and economic development activity.

Site characteristics hypothesized to influence per acre rural land values in this analysis are size of tract and the dollar value of improvements. The size of tract is expected to have a negative relationship with per acre selling price because fewer buyers compete in markets for larger tracts and many buyers compete in markets for smaller tracts. Value of improvements is expected to have a positive influence on per acre values.

Three hypothesized relationships are included as measures of location and economic development. These include travel time to nearest city, distance to nearest town and paved access road. The travel time and distance variables are expected to have a negative influence on per acre rural land values. Location theory generally suggests an inverse relationship between distance to markets and per acre selling prices. Paved road access is expected to reflect development potential and accessibility and have a positive influence on per land values.

The effects of economic development and other factors are measured by four variables. These variables include location in the New Orleans metropolitan statistical area, commercial reason for purchase, recreational reason for purchase and month of sale. Location in the New Orleans metropolitan statistical area and month of sale are expected to have a positive influence on per acre values, and a recreational reason for purchase is expected to have a negative influence on land values. The location of a tract in a metropolitan statistical area is expected to be influenced by economic development.

Data for this study are based on rural land market sales from southeast Louisiana as determined through a mail survey. The rural land market survey was mailed to state certified appraisers, officers in commercial banks, Farm Service Agency personnel, Federal Land Bank personnel, Production Credit Association personnel, members of the Louisiana Chapter of the American Society of Farm Managers and Rural Appraisers, and members of the Louisiana Realtors Land Institute. Each respondent was asked to provide rural land sales of 10 acres or more in size including attachments to the surface such as buildings and other improvements and sales outside the boundaries of towns and cities.

The study area includes the metropolitan statistical areas of New Orleans and Baton Rouge. Each symbol in Figure 1 represents the location of each of the 237 rural land sales from 1993 to 1997. Data indicate a clustering of relatively higher per acre sales in a commuting area north of New Orleans and another clustering of such sales north of Baton Rouge.

Marginal implicit prices presented in Figures 2 and 3 are used to observe the magnitude and direction of influence of various factors on per acre land values. For convenience, marginal implicit prices are evaluated at mean values of per acre price and of the characteristic. A positive marginal implicit price suggests that an increase in that characteristic results in an increase in the per acre price of rural land, other things constant. Conversely, a negative marginal implicit price resulting from a negative coefficient has a depressing effect on per acre land prices.

Marginal implicit prices for continuous model variables indicated that both the value of improvements and time of sale have a positive influence on per acre land value (Figure 2). A \$1,000 increase in improvements increases per acre value by \$4.24. Similarly, the time of sale estimate indicates that, starting in 1993, each additional month adds \$18.93 to the per acre value of a tract of land.

Three continuous variables were estimated to have a negative influence on per acre values. A one-acre increase in size decreases per acre price by \$4.19. The distance to nearest town variable indicates that a one-mile increase from the nearest town decreases per acre value by \$17.87, while the travel time variable indicates that, for each minute increase in travel time from the nearest city (Baton Rouge or New Orleans), per acre land value decreases \$17.30.

Implicit marginal prices for discrete model variables suggest that a tract located in the New Orleans metropolitan statistical area sells for \$1,758 more per acre than a tract not located in this area; a tract purchased for commercial purposes sells for \$979 more per acre than other tracts (Figure 3). Similarly, the marginal implicit price suggests that a tract with paved road access sells for \$421 more per acre than a tract that does not have this access. Land purchased for recreational purposes sells for \$379 less per acre than a tract purchased for other reasons. This generally reflects marginal land purchases that are primarily suitable for hunting and fishing.

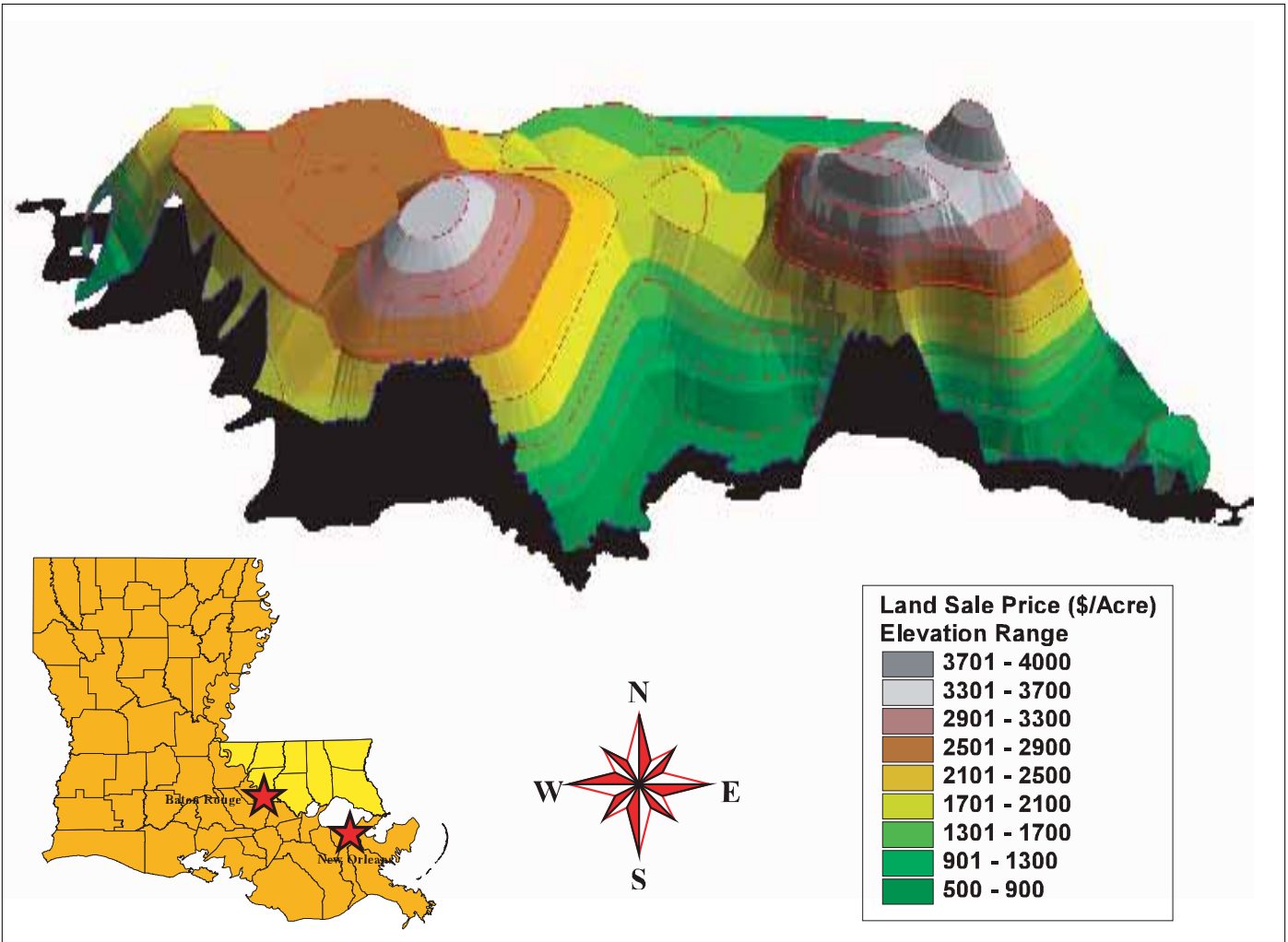
Land Value Contours

Rural land value estimates from the spatial econometric model along with Geographic Information Systems (GIS)

procedures are used to estimate rural land value contours, which reflect effects of location and economic development on per acre rural land values (Figure 4). Similar to topographic maps that show equal elevation above sea level, the Louisiana land value contour map depicts areas with approximately equal per acre land values. In this analysis, tract size, improvement value and time variables are held constant in developing predictions, while travel time to nearest city, distance to nearest city, paved road access, New Orleans metropolitan statistical area, commercial reason for purchase and recreational reason for purchase variables were allowed to vary.

Results presented in Figure 4 illustrate the effects of New Orleans and Baton Rouge metropolitan areas on per acre rural land values. St. Tammany Parish, directly north of New Orleans, is in the New Orleans metropolitan statistical area. This parish also is connected to the New Orleans area via the Pontchartrain Causeway. Results indicate that the effects of location and economic development cause land values to vary from \$500 to \$4,000 per acre in this area. In Figure 4, rural land values vary from \$3,700 per acre for areas close to Baton Rouge to \$500 per acre as distance increases from Baton Rouge. ■

Figure 4. Results indicate that the effects of location and economic development cause land values to vary from \$500 to \$4,000 per acre in this area. Rural land values vary from \$3,700 per acre for areas close to Baton Rouge to \$500 per acre as distance increases from Baton Rouge.



WATER QUALITY and the Tangipahoa River

Research shows that woodlands and dairy farm pastures both contribute to contamination. Better systems for measuring fecal coliform numbers are needed in Louisiana's warm, subtropical climate.

Caye M. Drapcho, James F. Beatty and Eric C. Achberger

A major water quality concern in Louisiana is the concentration of fecal coliform bacteria in our streams and bayous. Currently four health advisories that limit primary contact recreation such as swimming are in place because of elevated fecal coliform counts. These advisories are for the south shore beaches of Lake Pontchartrain, 18 miles of the Tchefuncte River, 12 miles of the Bogue Falaya and 79 miles of the Tangipahoa River. The Louisiana Department of Environmental Quality identified three potential sources of fecal coliform contamination in the Tangipahoa River: leakage from faulty home septic systems, effluent from municipal wastewater treatment plants not operating properly and runoff from confinement areas of dairy farms where cattle are held for feeding. Dairy farms in the watershed were required to install waste treatment lagoons and apply the water from the lagoons to nearby pastures to prevent transport of fecal coliform bacteria to nearby surface waters.

Fecal coliform bacteria are found naturally in the intestinal tract of warm-blooded animals. Average fecal coliform counts per gram of waste vary from 230,000 for cattle to 13 million for humans. *Escherichia coli* is the predominant fecal coliform in the waste of most warm-blooded animals. The percentage of the fecal coliform count in animal waste attributed to *E. coli* ranges from 84 percent for pigs, 97 percent for sheep and humans, and 99.9 percent for cows. Although fecal coliform bacteria as a group are not pathogenic, they are used as a test of recent fecal contamination from either animal or human origin;

however, the fecal coliform test as an indicator of water contamination in subtropical and tropical climates has been questioned. This is because the presence of some soil bacteria from nonfecal sources may show up as "false positives."

A research project was initiated at the LSU AgCenter Southeast Research Station in Washington Parish to evaluate the effect of dairy farming on surface water quality. The objectives were to quantify the fecal coliform content in surface water runoff from grazed pastures as compared to drainage from nongrazed pastures and forested areas and to determine if bacteria from nonfecal sources were contributing a significant portion to the fecal coliform count. The research consisted of a watershed study and a field-scale study.

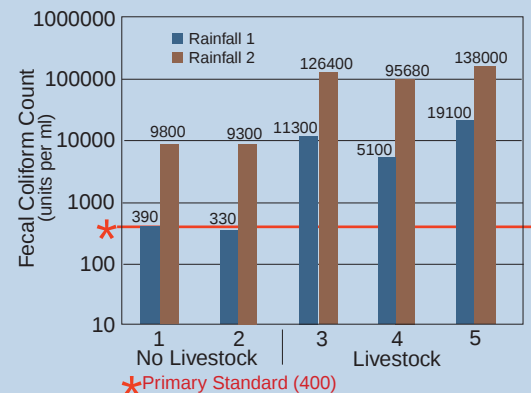
The dairy farm at the Southeast Research Station is a fairly typical size for Louisiana, with a dairy herd of 180 milking cows. As with most Louisiana dairy farms, the cows are fed forage in confinement systems about 25 percent of the time and graze on pastures the rest of the time. Waste from confinement areas is collected and treated in a lagoon system. Dairy cattle are grazed at an average density of one cow per acre.

For the watershed study, water samples were collected at 10 points along the natural drainage at the station after rainfall. These points included drainage from a 300-acre wooded area containing no livestock and drainage from grazed pastures.

For the field-scale study, plots with water collection

troughs were installed in Bermudagrass pastures. Dairy manure was applied evenly over the surface of four of the plots; no manure was applied to the other four plots. During periods of drought, a device called a rainfall simulator was used to water the plots. Runoff water was collected to determine the fecal coliform count and the percentage of the fecal coliform count caused by *E. coli*. This information can help determine if the fecal coliform bacteria in a water sample originated from dairy cattle or another animal source. No attempt was made in this study to find pathogenic strains of *E. coli*, such as O157:H7. These strains would be expected to account for less than 0.5 percent of the total *E. coli* count.

Figure 1. Watershed Study



For the watershed study, water samples were collected at 10 points along the station's natural drainage after rainfall events. These points included drainage from a 300-acre wooded area containing no livestock and drainage from grazed pastures. Typical results from five of the sites, including two with no livestock and three with livestock after two random rainfalls, are shown above. Fecal coliform counts in surface runoff from timberland with no livestock frequently exceeded the primary standard for swimming and other contact recreation. Fecal coliform counts in surface runoff from grazed pastures routinely exceeded the primary standard by a factor of 10 or more.

Caye M. Drapcho, Assistant Professor, Biological and Agricultural Engineering; James F. Beatty, Professor and Resident Director, Southeast Research Station, Franklinton, La.; and Eric C. Achberger, Associate Professor, Biological Sciences, LSU AgCenter, Baton Rouge, La.

Results from the watershed study indicate that the fecal coliform levels in surface runoff from timberland with no livestock frequently exceeded the standard set by LDEQ for swimming and other primary contact recreation. Fecal coliform counts in surface runoff from grazed pastures routinely exceeded the primary standard by a factor of 10 or more (Figure 1). The values increased as the water flowed along the drainage through the station. Fecal coliform counts at the last sampling location were similar to levels in the liquid portion of the lagoon.

For the field-scale study, the fecal coliform counts in the surface runoff from the pasture plots that received manure were 10 to 30 times higher than the primary standard when collected one day after manure application. Fecal coliform colonies in these samples included at least 90 percent *E. coli*. For rainfall applied one and two weeks after manure application, the fecal coliform count in the surface runoff declined to near the standard set for primary contact recreation. This is caused by decay of the bacteria and physical removal of the bacteria from the soil surface. *E. coli* accounted for only 10 percent to 50 percent of the fecal coliform count.

For the nontreated plots, the fecal coliform count in the surface runoff samples was not zero as might be expected. Rather, the fecal coliform count was near the primary standard for most periods of rainfall and did not decline with time. For rainfall applied one and two weeks after the beginning of the study, fecal coliform counts in the runoff from the manure-applied plots and the nontreated plots were essentially the same. Further, fewer than 5 percent of the fecal coliform colonies in the runoff from the nontreated plots were *E. coli*.

The information obtained from these studies suggests that bacteria from sources other than dairy cattle may contribute a substantial portion of the fecal coliform count. The fecal coliform counts from the forested area containing no livestock in the watershed study indicate that wildlife contribute fecal coliform bacteria to water. In addition, the data from the control plots in the field-scale study indicate that soil bacteria may be causing “false positive” readings on the fecal coliform test. Although the fecal coliform test uses an elevated incubation temperature to prevent the growth of nonfecal bacteria, researchers have shown that soil coliforms from the *Klebsiella* and



Citrobacter groups are able to grow at the high incubation temperature.

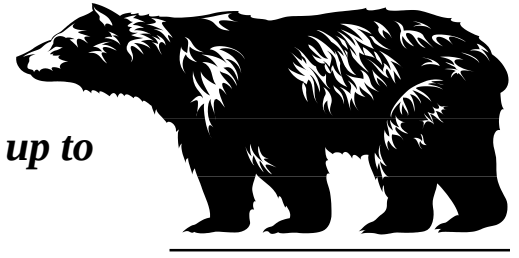
This study also suggests that grazing cattle may represent a significant source of fecal coliform contamination to surface waters. The fecal coliform counts from the grazed pastures in the watershed study and from the manure-applied pasture plots in the field-scale study were above the primary standard, and most of the fecal coliform count was caused by *E. coli*. Further research on management measures and grazing practices that could reduce fecal coliform transport from grazed pastures is needed to ensure that grazing is maintained as a viable option for Louisiana cattle farmers.

Two problems that limit the development of effective and sensible control measures are: (1) distinguishing soil coliform bacteria from true fecal

coliform bacteria so that accurate assessments of the level of fecal contamination are made and (2) identifying the source of fecal coliform contamination by differentiating coliforms from cattle and those from other sources, such as humans, wildlife and pets.

We are studying the feasibility of using DNA fingerprinting techniques to correlate specific strains of *E. coli* to each common source of fecal contamination. This approach will require developing a database of DNA patterns attributed to *E. coli* strains from human and animal sources. In practice, *E. coli* isolated from water samples would be fingerprinted and compared with the database to identify the likely source of contamination. Once the source was identified, appropriate control or treatment methods could be used. ■

Insects Incriminate Poachers of Louisiana Wildlife



Because of LSU AgCenter forensic entomology research, law enforcement officials expect to solve up to 1,000 more cases per year.

Erin J. Watson

Photo by C. Lamar Meek

Most people are familiar with the use of forensic entomology in the investigation of crimes involving humans. However, another area in which this type of science is valuable is in the investigation of suspicious deaths of animals and suspected cases of animal poaching. The illegal take of wildlife is a serious offense. About 16,000 poaching cases occur annually in Louisiana. Only half of these cases are prosecuted because of limited or no evidence available.

Traditional techniques for establishing time of death of wildlife are limiting. At most, they are effective for only 72 hours postmortem. These methods include measuring the presence of electrical currents in muscle tissue, which is generally not detectable after three hours postmortem. Another method is comparing the rate of decreasing internal temperature to ambient temperature; however, internal body temperature is of no value beyond 48 hours when carcass and ambient temperatures reach equilibrium. A third method involves measuring the degree of rigor mortis, or stiffening of muscle joints. Rigor mortis occurs soon after death in a predictable manner and is later reversed by internal chemical changes. The entire process of stiffening



Because the Louisiana black bear is a threatened species, researchers could collect data only from bears found dead, usually because of a highway accident. Erin J. Watson is shown with a Louisiana black bear on Day 2 of the study conducted in the spring of 1999.

and relaxing of a carcass takes place within the first two days. A fourth method measures the physical changes of the eye, including pupil size and degree of transparency and luminescence, but this is no longer of value by Day 3 because of decomposition or consumption by fly larvae.

The use of insects can further support the estimated postmortem interval established by these methods for the first 72 hours. Insects are, however, the primary means of determining time of death for wildlife recovered three or more days postmortem. To help develop

an entomological database applicable to future poaching cases, a cooperative research effort between the LSU AgCenter and the Louisiana Department of Wildlife and Fisheries was established in 1999. The purpose of the research is to document succession patterns and species composition of necrophilous insects (carion-frequenting insects) associated with the Louisiana black bear, whitetail deer and alligator.

Blowflies and Beetles

Decomposing remains of humans and wildlife provide a food source for

Erin J. Watson is a Ph.D. candidate in the Department of Entomology, LSU AgCenter, Baton Rouge, La.

necrophilous insects. The insects of forensic importance are flies, specifically blowflies, and beetles. Adult flies are referred to as the "first wave" of insects because of their ability to locate a fresh corpse within minutes of death and deposit eggs. These eggs and the fly larvae that emerge serve as a starting point for determining the minimal time elapsed since death. Shortly after the colonization of the carcass by fly larvae, the "second wave" of insects arrives. These include predatory and scavenging beetles.

All necrophilous insects recovered from decaying remains display a predictable pattern of association, depending on time elapsed since death, degree of decomposition and seasonal conditions. Entomologists can help establish time of death by combining these observed predictable "waves" with their understanding of development rates and life cycles of carrion-frequenting insects.

Blowfly life cycles have been thoroughly documented by the Medical Entomology Laboratory of the LSU AgCenter and generally take 11 to 12 days for completion (egg, larvae, pupae, adult), except during cool winter conditions. Therefore, postmortem indicators established within the first two weeks of decomposition typically provide precise estimates of time of death for the south-central United States. Insects still provide valuable clues beyond this time period, although the level of confidence declines as decomposition progresses from advanced to putrid and finally to dry remains.

Data were collected for the forensic entomology research conducted by the LSU AgCenter over the course of three seasons – spring and fall of 1999 and winter of 2000. Each seasonal experiment consisted of one Louisiana black bear, two whitetail deer, two alligators and two swine (experimental control). Fresh carcasses were randomly assigned to seven sites approximately 300 yards apart within a forested wildlife preserve in East Baton Rouge Parish.

Louisiana Black Bear

Because of its status as a threatened species, the Louisiana black bear cannot be terminated for experimental purposes. Deceased bears were donated as they became available, such as being struck by a vehicle. The size and age of bears donated ranged from an 11-year-old, 325-pound male to a 5-year-old, 150-pound male.

Whitetail deer were harvested by wildlife officers and generally weighed 70 to 90 pounds for each study. Juvenile alligators also were donated by the Department of Wildlife and Fisheries and ranged from 3 to 5½ feet in length. The swine carcasses were donated by the LSU AgCenter and weighed between 60 and 100 pounds.

All carcasses were monitored simultaneously for necrophilous insects by three sampling methods: aerial sweep net, pitfall traps for continuous surveillance and manual sampling of the carcass and surrounding soil. Sampling efforts were terminated at varying intervals, depending on the length of time required for each wildlife species to skeletonize. In the spring of 1999, this meant 24 days for the alligator, 68 days for the whitetail deer and 92 days for the black bear.

Results of the three seasonal studies can be broken down into several categories. First, the duration of insect activity associated with a carcass directly corresponded to carcass size. Similarly, the larger the carcass, the longer it took to skeletonize. For example, the 325-pound black bear in the spring series was able to support considerably more blowfly larvae. As a result, larvae were collected from Day 2 until Day 22 postmortem; no larvae were observed at the alligator, pig or deer after Days 9, 10 and 11, respectively.

Second, egg-laying blowflies showed no preferential selection or avoidance of wildlife species, but a delayed presence of eggs was noted on alligators due to limited viable sites for egg deposition. As a rule, female blowflies will first deposit eggs within natural openings and bodily wounds. Alligators were less attractive because they had no external wounds, the anal region is virtually inaccessible, and the eyes, nostrils and jaws were shut tight. Because the duration of rigor mortis varies with temperature, the presence of eggs and young larvae on alligator carrion varied from half a day to a few days later than on all other carcass types.

Third, the abundance of insects associated with carrion later into decomposition varied, depending on the wildlife species. The most obvious example was the lack of scavenging beetles on alligator carrion during advanced decay stages. These scavenging beetles and their larvae feed on dried tissue, including hair and skin. Their scarcity on alligator carrion was probably due to the absence of fur.

Fourth, overall insect diversity and species composition were noticeably less on alligator carrion than bear, deer or swine. Fifth, there was a dramatic delay of all insect development rates and patterns because of extremely low temperatures in the winter of 2000. Finally, indicator blowfly species and overall necrophilous species composition and life stage patterns differed for each season.

Solving Cases

Because of LSU AgCenter research, officials with the Department of Wildlife and Fisheries anticipate that law enforcement officers will be able to solve up to 1,000 additional cases per year. Depending on court discretion, convicted poachers of deer or alligator are fined \$750 to \$1,500 per offense and sentenced up to 30 days in jail. In addition, guilty persons must pay a civil restitution fee for the estimated replacement costs of the wildlife taken. The civil restitution fee for a whitetail deer is \$525; the fees for alligators are \$35 per foot and \$2.21 per pound.

The Department of Wildlife and Fisheries estimates only 300 Louisiana black bears remain, with four to five of them killed illegally each year. Wildlife law enforcement officers have been able to solve only one to two of these poaching cases because the remaining carcasses are either never recovered or have been found three or more days postmortem. Since Louisiana black bears are a threatened species, the combined penalties are considerably higher at \$11,000 and up to 120 days in jail. Louisiana collects approximately \$350,000 annually in penalties and restitution fees for the successfully prosecuted cases of deer and alligator. Even by a conservative estimate, the incorporation of forensic entomology may result in additional \$100,000 in recovered fines and restitution fees for deer and alligator alone.

Preliminary results obtained from this research highlight the differences in succession patterns that must be considered when prosecuting in court. Future research will explore the feasibility of applying forensic entomology to a broader spectrum of wildlife species. This research, in combination with workshops for law enforcement officials, will ensure that the use of rigorous, standardized entomological data will become a routine part of crime scene investigation of humans and wildlife. ■

Forensic Entomology Aids Crime Investigation

The ability to identify specimens from all stages of an insect's life cycle provides critical information.

The importance of entomology to legal investigations has been known for several hundred years, but it has been recognized as a separate specialty only for the last 20 years or so. Forensic entomology applies to any aspect of insect study that may aid in resolving a situation that goes through the legal system. This may range from insect parts found in food products to determining the time of death of a crime victim who goes undiscovered for several days.

With humans there are various methods of determining the time of death, such as rigor mortis and body temperature. But after 24 to 36 hours, these methods and others no longer give valid results. It is then that the services of the forensic entomologist become valuable.

Certain insects are highly attracted to dead and decomposing bodies, and their life cycles allow experts to determine the time of death. The insects most beneficial in this process are flies, specifically blowflies and flesh flies.

Familiarity with the biology and geographic distribution of these flies and the ability to identify specimens from all stages of the life cycle are what the forensic entomologist can bring to the investigation process. The time of death is established based on

the known length of time for the flies to develop to that stage under a given set of conditions. Environmental factors (temperature, rainfall, kind of habitat and length of daylight hours) affect egg deposition and length of development.

Murderers frequently go to extreme lengths to cover up their crime and lead investigators in the wrong direction. Victims have been discovered submerged in water, burned in automobiles and wrapped in various kinds of materials to conceal them. They often are found in wooded areas, ditches and overgrown vacant lots. Research at LSU has been conducted to provide as much information as possible to help law enforcement personnel with their investigations.

Because of the similarities of swine tissue to that of humans, pigs have been used most frequently for field tests. Data have been collected from tests carried out in pastures, ditches, riverbanks, pine forests, hardwood forests, car trunks and burned vehicles. Field tests have been carried out in all four seasons of the year and at the time of both the new moon and full moon.

Since it is not always possible for an entomologist to go to the crime scene, it is necessary to educate and train others to collect and preserve entomological evidence and to record information on habitat and ambient conditions. The training of law enforcement personnel and crime scene investigators is an important part of the LSU AgCenter's outreach educational program. ■

Jeanine W. Tessmer, Adjunct Instructor, Department of Entomology, and former graduate student of C. Lamar Meek

C. Lamar Meek

A leader in mosquito research and forensic entomology



C. Lamar Meek

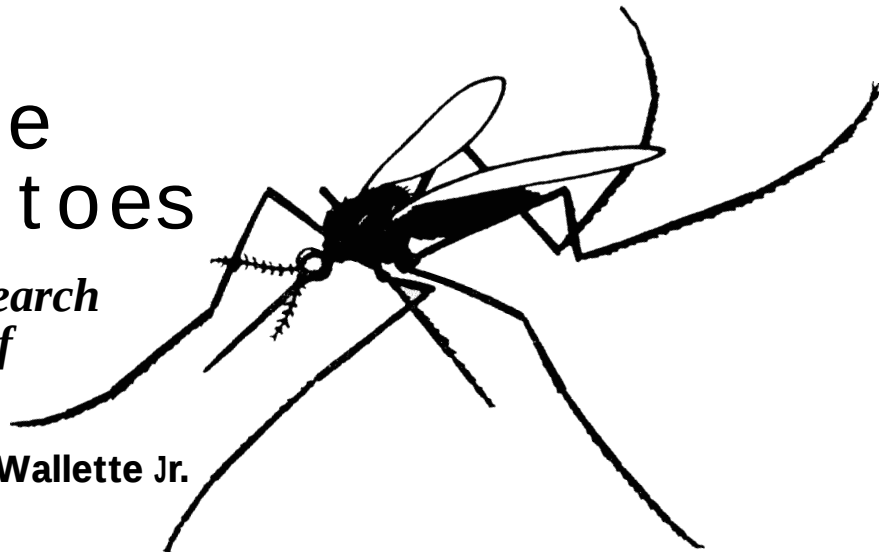
Two claims to fame for C. Lamar Meek, professor in the Department of Entomology who died June 27, 2000, were his mosquito research and forensic entomology research. In 1979, Meek became LSU's chief mosquito scientist, replacing C. Dayton Steelman, who moved to an administrative position. Meek became a driving force in the Louisiana Mosquito Control Association, twice serving as its president. He edited the Louisiana Mosquito Control Association Training Manual for mosquito control personnel. He was also instrumental in organizing an annual spring workshop for hands-on training for mosquito control district personnel. Meek was a strong advocate of having mosquito control workers tested and certified by the Louisiana Department of Agriculture and Forestry and took the lead role in writing the tests used for this purpose. Meek died of heart failure while conducting a mosquito control experiment in Cleveland, Miss. During his last 12 years, he focused on contributing to knowledge of forensic entomology in addition to his mosquito research. He published more than 20 papers and a book chapter about necrophilous arthropods in relation to investigations of homicides and deaths of high-profile wildlife. He testified in more than 10 criminal trials, including the case upon which the film "Dead Man Walking" was based. ■ **Linda Foster Benedict**

This photo was provided courtesy of the Baton Rouge Advocate. The photographer was Lori Waselchuk.

Taking the Bite Out of Mosquitoes

Since 1965, LSU AgCenter research has contributed to abatement of this potentially dangerous pest.

C. Dayton Steelman and Dennis L. Wallette Jr.



Mosquitoes have been cursed, discussed and described in written detail since the first explorers traveled through the area now known as Louisiana. Because of their need for blood from human or animal hosts, mosquitoes have historically caused misery and suffering to Louisiana citizens and visitors alike.

Throughout Louisiana's history, massive numbers of mosquitoes have thrived along the Gulf Coast from Plaquemines west through Cameron Parish. These parishes include rice production, swamps and bayou areas. Massive outbreaks occurring on seven- to 10-year cycles, and especially after hurricanes, often have resulted in cattle and other domestic animal deaths because of blood loss and suffocation caused by blockage of air passages. The impact of mosquitoes on tourism and their potential as carriers of organisms that cause disease resulted in the establishment of mosquito abatement districts in Jefferson, Orleans, St. Bernard and St. Tammany parishes in the early 1960s.

Because of public concern over the continued impact of mosquitoes on humans, domestic and wild animals, the Louisiana Agricultural Experiment Station created a position for a scientist to do research on mosquito population management in 1965. Research was conducted in cooperation with the Louisiana Mosquito Control Association, which had researchers at New Orleans, Lafayette and Lake Charles, the existing mosquito abatement districts and the U.S. Department of Agriculture (USDA) Mosquito Research Laboratory at Lake Charles.

A significant effort was immediately initiated wherein the mosquito abatement districts provided funding for a laboratory technician at LSU to determine the susceptibility of mosquitoes to the insecticides in use in mosquito control

programs. Abatement district personnel collected mosquitoes from their respective parishes and delivered them to LSU where the tests were conducted. The baseline data established in these tests later identified the development of insecticide resistance in mosquitoes to several insecticides that had been in constant use in the various parish programs. This information provided advance warning that resulted in preventing resistance development in the districts by their changing to alternative insecticides.

In 1971, mosquitoes carrying Venezuelan encephalitis crossed the border between Mexico and Texas, killing horses and dogs and threatening the human population. Massive numbers of mosquitoes were in coastal Texas and Louisiana at this time, and this stimulated the U.S. Department of Agriculture to conduct an emergency adult mosquito control program in Texas that included Cameron and Calcasieu parishes in Louisiana. The emergency program involved the aerial application of ultra-low-volume insecticide and effectively controlled adult mosquitoes and protected the horse population for a three-week period until a horse vaccine could be administered. LSU AgCenter scientists worked with USDA's Animal and Plant Health Inspection Service (APHIS) personnel during this program. No horse or human cases of Venezuelan encephalitis occurred in Louisiana. This mosquito control program provided a large-scale demonstration that proved to the citizens of the coastal parishes that mosquitoes could be controlled effectively.

LSU AgCenter scientists went on to help form mosquito control programs in Cameron, Calcasieu, Jefferson Davis and Vermilion parishes. Later, the LSU AgCenter led the way to initiating mosquito control programs in East Baton

Rouge and Ouachita parishes. Since the mid-1970s, many other mosquito control programs have been initiated in other parishes.

Research on mosquitoes at LSU has included the identification of the mosquitoes responsible for transmitting dog heartworm, anaplasmosis and equine infectious anemia (swamp fever), identification of host animals that provide most of the mosquito blood meals and the impact of wildlife habitat management on mosquito production. The mosquito research program at LSU received national and international recognition for its leadership in a consortium of scientists from rice production states that conducted research from 1979 to 1993 on the biology and control of mosquitoes produced in rice fields.

In addition, landmark research that determined the effect of mosquito attacks on cattle production, identifying Brahman-breed resistance to mosquitoes, was conducted at the Rice Research Station in Crowley. The mosquito abatement districts have received helpful information on the integrated management of mosquitoes in many aquatic habitats, impact of insecticides applied for mosquito control on non-target aquatic organisms and mark-release-recapture studies that determined mosquito dispersal. Countless experiments have been conducted to determine the efficacy of many different insecticides, biological agents and habitat manipulation for managing mosquito populations. ■

C. Dayton Steelman, University of Arkansas, formerly a professor in the Department of Entomology, and Assistant Director, Louisiana Agricultural Experiment Station; and Dennis L. Wallette Jr., East Baton Rouge Mosquito Abatement, formerly a graduate student of C. Lamar Meek

Nonpoint-Source Pollution—Urban Style

Margaret Frey

Water quality monitoring of urban environments indicates high pollutant loading in the first runoff of rain known as “first flush.” As precipitation falls, it picks up contaminants from littered streets, drainage ditches, petroleum residues from cars, heavy metals and tar residues from roads, and chemicals applied for fertilization and insect control.

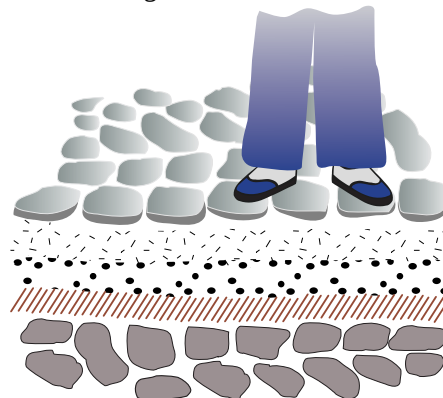
Lawn and garden care practices have the potential to significantly and adversely affect the water quality of urban waterways. The major pollutants found in runoff from urban areas include sediment eroded from bare-soil areas, nutrients from over-fertilization and oxygen-demanding substances such as leaf and grass clippings. In addition, excessive pesticide use, along with over-watering, can contribute to water quality degradation.

Other household activities that may generate pollutants include use of paints, solvents, detergents, cleaners and automotive products such as oil and antifreeze.

Proper management techniques can reduce and possibly eliminate the need for fertilization and pesticide use in the urban setting. These include: (1) mowing the lawn when grass blades are at an appropriate height, (2) leaving grass clippings on lawn (if mowed at proper height) to provide nutrients, (3) testing soils to determine necessary amount of fertilizer, (4) using slow-releasing fertilizers, (5) determining pest problems for appropriate selection and application of pesticides and (6) composting yard wastes for future source of nutrients. Most of these practices will also reduce the cost of lawn maintenance.

Impervious surfaces surrounding homes and businesses in the form of driveways, sidewalks and patios force rainwater to run off. Cities experience nine times more runoff than wooded areas. Runoff from city streets is generally channeled into storm drains

and drainage ditches. A recent study indicated that *E. coli* bacteria regrow through cloning within storm drains and sediments of urban streams. The study also concluded that nonhuman species are the dominant sources of *E. coli* to the stream and its tributaries. The major nonhuman mammal contributors are raccoons, dogs, deer and rats.



Reducing the amount of excessive runoff is possible by using more porous paving surfaces that allow rainwater to soak into the ground. Significant strides have been made in developing porous asphalt pavement in the last three decades. The material is similar to conventional asphalt in durability, but it contains a much smaller percentage of fine particles. As a result, the asphalt allows water to soak through to the base material and into the soil below.

Roof downspouts spill onto driveways that are graded down to the street gutters, which, in turn, lead to storm drains that dump accumulated rainwater into drainage canals. The destructive deluges of this collected rain erode streambanks. In places

with good soil drainage, it is recommended to capture and then spread and infiltrate the rainwater runoff from paved areas and roofs.

Oil stains and outdoor spills of antifreeze, brake fluid and other automotive fluids on driveways and in parking lots are easily carried away by a rain-storm. One quart of oil can contaminate up to two million gallons of drinking water. It has been estimated that every three weeks more oil is deposited on driveways and streets in the United States than was deposited in the Valdez oil spill in Alaska. Routine maintenance can prevent cars from leaking. Pans, carpet scraps and matting can catch drips when the car is parked at home.

The LSU AgCenter has educational programs that address nonpoint-source pollution in urban areas:

- A series of one-page fact sheets on “You Can Help Protect Our Waters” is available free from any parish extension office and online at the LSU AgCenter’s website.

- Extension agents give demonstrations and teach water-saving techniques with a traveling exhibit called the “Splashmobile.”

- Extension agents provide workshops for teachers as requested. ■



Fertilizer Spreaders for Home Lawns

Richard L. Parish

Photos by Richard L. Parish

Although some Louisiana homeowners use professional lawn care services, many homeowners maintain their own lawns. While many professional applicators use liquid fertilizers and pesticides, granular products are easier for homeowners to apply. A bewildering array of lawn spreaders is available for this purpose, and many homeowners do not know how to select or effectively use a spreader. A series of studies was conducted at the Hammond Research Station to provide information on this topic.

Two basic types of spreaders are available for home lawn use: drop and rotary. Drop spreaders have a full-width agitator over a row of metering ports and granules are dropped straight down. The width of the swath of a drop spreader is equal to the width of the hopper. Drop spreaders generally give a more uniform distribution pattern, if used correctly, but are sensitive to correct swath width. On each pass, the wheels must be overlapped inside the previous wheel tracks to avoid turf stripes. Rotary (sometimes called broadcast) spreaders typically have one to three metering ports that drop the granules onto a spinning impeller. The swath width varies with product but is wider than the spreader hopper. Rotary spreaders have wider patterns so the product can be spread over a lawn faster than with a drop spreader. Rotary spreaders are more forgiving of swath width errors, but their spreader pattern may not be as uniform. More care is needed with rotary spreaders to avoid throwing granules into nonturf areas.

Most drop and rotary homeowner spreaders are made with plastic hoppers. A study comparing three plastic homeowner drop spreaders with an older steel homeowner drop spreader and a professional steel drop spreader demonstrated that some of the newer plastic spreaders can give acceptable metering uniformity (Figure 1). The Scotts AccuGreen 1000 was both the lowest cost spreader in the test and the most uniform of the homeowner models. Consistency from one spreader to another of the same model has not been tested.



Figure 1. Spreaders used for the drop spreader metering uniformity study: Gandy professional (steel), Scotts AccuGreen 1000 (plastic), Republic/Sears/K-Mart EZ Drop (plastic), Scotts AccuGreen 3000 (plastic), obsolete Scotts PF-1 (steel).

Another study evaluated the distribution patterns from six homeowner rotary spreaders (Figure 2). The spreaders were tested with three representative granular materials. With all spreaders, except the Scotts Speedy Green 1000, the swath width that gave an acceptable pattern was narrower than was apparent from the overall throw

handle was raised only 3 inches and decreased 63 percent when the handle was lowered 3 inches. The Scott AccuGreen 3000 exhibited a similar problem, but the results were less extreme since the hopper was not as thick on the Scotts spreader. Therefore, short or tall applicators would obtain different delivery rates than people of



Figure 2. Spreaders used for the rotary spreader pattern study: Scotts Speedy Green 1000, Scotts Speedy Green 3000, Republic/Sears/K-Mart EZ Broadcast, Cyclone, Spyker and Vigoro.

width. In cases where the manufacturer claimed a swath width, the effective width found in this study was considerably narrower than what was claimed.

The popularity of plastic spreader hoppers has led to another problem. Plastic drop spreader hoppers are thicker than steel. This causes the effective opening of the ports and thus the delivery rate to change when the hopper is rotated forward or back, as will occur with changes in handle height. A study of two plastic drop spreaders demonstrated clearly that the thicker the hopper material, the more the rate changes with handle height. The delivery rate of the Republic/Sears/K-Mart EZ Drop spreader decreased 26 percent when the

average height, even when using the same spreader setting. The important point is to operate the spreader with the hopper level. This may put the handle at an uncomfortable height or angle for some people with some spreaders, but will provide the most reliable delivery rate.

Homeowner spreader models, whether drop or rotary, are designed to be pushed forward. It is sometimes tempting to pull spreaders backward. When operating on soft ground, as when fertilizing a garden or seeding a new lawn, for instance, pulling a spreader

Richard L. Parish, Professor, Hammond Research Station, Hammond, La.

backward requires much less effort than pushing it forward. Unfortunately, pulling these spreaders backward can drastically change delivery rate and can also change the pattern from rotary spreaders. Two plastic homeowner drop spreaders (Republic/Sears/K-Mart EZ Drop and Scotts AccuGreen 3000) were compared with a Gandy professional drop spreader. The plastic spreaders delivered more material when pulled backward. The Republic/Sears/K-Mart spreader, which had the thickest hopper, had a delivery rate 271 percent higher when pulled backward at a low setting and 127 percent higher when pulled backward at a high setting than when pushed forward. The corresponding changes with the Scott spreader were 145 percent and 180 percent.

Another study evaluated a new lawn spreader that claims to combine the benefits of drop and rotary spreaders. The Ames Deluxe 2-in-1 spreader has a shroud around the impeller to restrict and control the throw pattern (Figure 3). The patterns obtained with five different granular materials at the width recom-



Figure 3. Ames Deluxe 2-in-1 spreader with elliptical shroud.

mended by Ames were not uniform. It was necessary to reduce the effective swath width to only 1 foot when using the shroud to obtain patterns with acceptable uniformity.

This series of spreader tests has

demonstrated that some plastic drop spreaders can deliver acceptable metering uniformity, if a quality spreader is selected and if the spreader is used correctly. Drop spreaders with plastic hoppers are sensitive to handle height and should be operated with the hopper level. The shrouded rotary spreader does not live up to its potential and does not operate effectively. Current homeowner rotary spreaders tend to have skewed patterns and require narrow patterns to achieve acceptable pattern uniformity. Unfortunately, homeowners cannot always rely on the settings provided with the spreader and on the product label. The settings are often incorrect. Some companies (Scotts, Bayer, Andersons) do provide accurate settings based either on their own setting development or on setting development by programs such as the one at the Hammond Research Station. In considering whether to use homeowner rotary spreader width and setting recommendations by manufacturers, keep in mind that if the recommended width is more than 2 to 4 feet, the settings are probably wrong. ■

Creamery Provides Rich Source of Research Information

Photo by Mark Claesgens



Jennifer Acosta, senior, left, and Trent Roddy, senior, buy ice cream at the LSU AgCenter's Dairy Store from Charles Surbeck, junior. All three are from New Orleans. The store is open year-round and offers such original flavors as Oak Fudge Alley and Bourbon Street Vanilla Bean.

Long a campus fixture, the LSU AgCenter's Dairy Store and its accompanying creamery have offered teaching and research opportunities for the Department of Dairy Science as well as ice cream treats.

The creamery, a small-scale production facility, is used to teach students to make ice cream and cheese and produces about 6,000 gallons of ice cream and 5,000 pounds of cheese each year.

Operated almost exclusively by student labor, the store in its current location has been open since 1972, said Chuck Boeneke, an instructor and manager of the creamery. Although a creamery has been operated at various locations since 1906, the first dairy store on campus opened in 1929 and closed in 1956 when the creamery moved to its current location.

Jack Losso, a researcher in the Department of Food Science, uses the creamery to remove fats from milk to prepare proteins on a large scale for study. In one project, he is investigating how milk proteins can replace gums as stabilizers in foods such as salad dressings and sauces.

Ron Gough in the Department of Dairy Science uses the creamery to find better ways to treat dairy plant wastewater before the water is released into municipal water treatment systems.

"We want to be able to manage and predict how the polluting components of this waste stream can be removed and release a cleaner liquid into the municipal wastewater stream," he said.

In another project, Gough and Boeneke are evaluating manufacturing processes for creole cream cheese.

"It's a limited commercial product that requires hand labor but results in a high-quality product," said Gough, who is working with a Louisiana dairy producer who wants to get into the manufacturing business to supply creole cream cheese to restaurants and specialty stores. ■ Rick Bogren

Horticulture in the City

Research at the Louisiana Agricultural Experiment Station affects many areas of urban life including the plants that add to the aesthetic as well as the tangible benefits of community life.

Gordon E. Holcomb, Allen D. Owings, Dale K. Pollet, Roger A. Hinson, Edward W. Bush, Jeff S. Kuehny, James McCrimmon, Seth J. Johnson, Peggy Cox, Drew Bates and Timothy J. Raiford

Environmental horticulture affects all Louisiana residents, especially in urban areas, and although not widely recognized, is a critical sector of the state's economy. Environmental horticulture is concerned with the art and science of breeding, propagating, installing and maintaining ornamental plants to enhance and improve the human environment. For economic research purposes, the U.S. Department of Agriculture classifies ornamental plants into floriculture and environmental horticulture. Floriculture crops are grown predominantly under protective cover and include cut flowers and greens, potted flowering and foliage plants, and bedding plants. Environmental horticulture crops are grown outdoors and include trees, shrubs, ground covers, vines, bulbs, turfgrass, and fruit and nut plants.

These two crop areas are the fastest growing segment of U.S. agriculture, ranked as the seventh most important commodity group, and generated \$12 billion in grower cash receipts in 1998. Based on total economic output (producers of plants, service businesses that include retail sales and landscape services, and equipment and accessory businesses), the floriculture and environmental horticulture sector ranks as the second most important segment in U.S. agriculture. Retail expenditures for all floriculture and environmental horticulture products and services were \$55 billion or \$203 per capita in 1998.

Industry's Value to Louisiana

Cash receipts to Louisiana's ornamental plant producers in 1999 were \$122 million, which ranked this sector fifth in value among agricultural plant commodities. The total value of all products and services of Louisiana's

environmental horticulture industry is about \$1.5 billion annually. This equals the combined value of all animal commodities and places environmental horticulture second after forestry in total economic impact among plant commodities.

LSU AgCenter Research

The Louisiana Agricultural Experiment Station actively supports research on ornamental plants grown by nursery and garden centers and used by landscape firms and home gardeners to beautify the urban environment. Following is a sampling of some of that research.

Landscape adds value to homes. Recent research by agricultural economists addressed the impact of specific landscape attributes (combinations of design style and costs, plant material and plant sizes) on home values in three Louisiana cities. Customer preferences that related to design cost and complexity, plant size and plant material were analyzed. Customers placed the highest values on homes with the most sophisticated landscape designs that contained large plants. Design complexity was found to be the most important factor that increased home values, with plant size and material following in importance. (Figure 1)



Figure 1. Agricultural economists addressed the impact of specific landscape attributes (combinations of design style and costs, plant material and plant sizes) on home values. As part of the study, they showed groups of consumers and realtors computer-generated images of homes, such as those above, with different levels of landscaping. The strong preference was for the high cost designs.

Gordon E. Holcomb, Professor, Department of Plant Pathology and Crop Physiology; Allen D. Owings, Associate Specialist, and Dale K. Pollet, Specialist, Cooperative Extension Service; Roger A. Hinson, Associate Professor, Agricultural Economics and Agribusiness; Edward W. Bush, Assistant Professor, Jeff S. Kuehny, Associate Professor, and James McCrimmon, Associate Professor, Department of Horticulture; Seth J. Johnson, Professor, Department of Entomology; Peggy Cox, Research Associate, Drew Bates, Associate Professor, and Timothy J. Raiford, Assistant Professor, Burden Research Station; LSU AgCenter, Baton Rouge, La.



A hibiscus, above, and a rose at the LSU AgCenter's Burden Research Station, where much of the research on ornamentals is conducted.



Scientists screen ornamentals. LSU AgCenter scientists evaluate cultivars of bedding plants, trees, shrubs and turf grasses for their horticultural performance and disease susceptibility. Evaluation results are passed on to consumer groups through publications, e-mail, Internet sites, meetings and through the news media.

Burden serves as research center. Trials are conducted at Burden Research Station in Baton Rouge on annual and perennial plants such as salvia, pansy, petunia, chrysanthemum (garden mums), crape myrtle, impatiens, Indian hawthorn, lantana, liriopse, marigold, ornamental sweet potato, snapdragon, verbena, vinca and zinnia. These trials provide information on planting dates for best performance, new plant species and cultivars and overall performance ratings. These trials also identify cultivars and species with resistance to important diseases. In recent trials Indian hawthorne cultivar Olivia was rated highly for its resistance to fungal leaf spot, but all plants were killed later because of their high susceptibility to fire blight disease. Crape myrtle cultivars

have been identified that are highly resistant to Cercospora leaf spot, a serious disease that causes early defoliation of susceptible cultivars.

Scientists devise 'best management' horticulture practices. A research focus is evaluating irrigation, fertilization and pest management practices used in ornamental horticulture. They are referred to as "best management practices" and encompass an overall plan to enhance production and maintenance of plants using environmentally friendly methods. These practices are designed to achieve water use efficiency, maximum growth with minimum fertilizer use, reduced nutrient runoff and optimum pest control with minimum pesticide use.

Select LSU AgCenter recommendations. The LSU AgCenter annually recommends and promotes outstanding ornamental plants for Louisiana landscapes called "Louisiana

Select." Selections are also promoted and featured in special displays in retail garden centers. Since 1996, when the program was initiated, Goldstrum rudbeckia, Lady in Red salvia, Foxy foxglove, several lantana cultivars, bald cypress, New Wonder scaevola, Telstar dianthus, Watchet azalea, Henry's Garnet Virginia willow, Homestead Purple verbena, mayhaw and New Orleans Red coleus have been named "Louisiana Select" plants.

Landscape with vegetables. Some traditional garden vegetables add beauty and diversity to landscapes. Leaf lettuce cultivars have been evaluated for their potential as bedding plants because of their pleasing variation in color and texture. Red and maroon cultivars (Vulcan, Galactic, Redino, Carisma, Red Sales, Lollo Rosa, Cerize) performed well. An additional benefit to growing these colorful vegetable plants in the landscape is that they also make fine salads. Basil cultivars have also been evaluated for landscape performance and disease resistance. Cultivars Green Ruffles and Purple Ruffles are attractive landscape plants because of their foliage color and texture but were found to be highly susceptible to a new bacterial leaf spot disease.

Research leads to better wax and crape myrtles. LSU AgCenter scientists are studying chemical control of undesirable basal sprouting in wax myrtles, small native trees often used in land-



Baton Rouge residents and visitors benefit from the efforts of many local plant societies and organizations. Independence Park in Baton Rouge includes an attractive rose garden maintained by the local chapter of the American Rose Society.



Crape myrtles add to the beauty of the landscape on the LSU campus in Baton Rouge.

scapes. Plant growth regulators, known to be effective for controlling watersprouts and rootsuckers on other landscape trees, are being evaluated on wax myrtle. The crape myrtle cultivar Natchez is being used to evaluate the influence of three levels of pruning on overall appearance, bloom quality and disease and insect susceptibility of landscape plants.

Grow better grass. Scientists at Burden evaluate turfgrass cultivars, some in conjunction with the U.S. Department of Agriculture National Turfgrass Evaluation Program, for their horticultural performance qualities. They also do research on turfgrass weed control, shade tolerance, fertility and mowing heights. Other turfgrass research has evaluated waterlogging tolerance of lawn grasses and use of carpetgrass in lawns. Zoysiagrass and St. Augustinegrass cultivars have been identified that show disease resistance.

A rose is a rose is a rose. Burden Research Station maintains an All-

America Rose Selections display garden that is also used for cultivar performance and disease susceptibility evaluations. More than 100 cultivars are on display that belong to various rose classes such as hybrid tea, ground cover, miniature, shrub, floribunda, grandiflora, climber and various species and classes of antique roses. Roses are susceptible to several serious disease problems, and the display garden is used to evaluate cultivars for susceptibility to black spot, downy and powdery mildew and Dothiorella flower spot. Evaluations in 2000 showed that Knock Out showed outstanding resistance to black spot.

Gingers and poinsettias, too. Floricultural plants being evaluated include gingers and poinsettias. A ginger garden has been established at Burden. Poinsettias, popular holiday potted plants, are placed on display to allow consumers, garden center personnel and growers to evaluate them.

Getting rid of pests. Insect pests can damage urban landscapes. An example is

lace bug damage to azaleas. Control methods had relied on repeated insecticide treatments throughout the growing season. Through research, entomologists determined that fewer insecticide applications are needed for lace bug control if plant inspections are made in early March and followed by early insecticide applications.

Crape myrtle aphids are another insect pest that had been commonly controlled by frequent insecticide applications. A simpler and more effective control method was developed that consists of painting a slurry of four parts acephate insecticide plus one part water in a band around the lower trunk of crape myrtle trees. The insecticide is absorbed and translocated to the leaves where it kills aphids when they feed. Acephate applications should be made in April when aphids first appear and again in late summer. This eliminates the need for making frequent spray applications throughout the spring and summer. ■



'Master Gardeners' teach others to get growing

Wes Gladhart of Metairie, retired pharmacist and devout gardener, spends many a Tuesday afternoon in the LSU AgCenter's Orleans Parish Extension Office answering gardening questions – free.

He is one of about 400 volunteer Master Gardeners throughout Louisiana trained by LSU AgCenter specialists to extend their educational services.

"Most questions are seasonal so I have many of the answers ready," said Gladhart, 70, whose particular specialty is ferns.

Of course, there are those unusual calls, such as the woman who wanted advice on how to get the squirrels out of her attic.

"I learn a lot from answering the questions," he said.

These Master Gardeners, most of whom are women, do this volunteer work because they love gardening. They love learning. And they like telling others what they've learned, said Tom Koske, LSU AgCenter horticulturist and the coordinator of Master Gardener training.

The program, which is nationwide, began in Louisiana in New Orleans about 10 years ago. It has since spread to 19 of the state's 64 parishes with the goal to expand as needed, Koske said.

LSU AgCenter horticulture agents provide 40 to 50 hours of training for prospective Master Gardeners every spring and fall at various locales in the state. All but a handful finish and attain the title, said Koske, who developed the training manual.

Although they pay for the materials, the Master Gardeners do not have to pay for the training. Instead, they must commit to 40 hours of volunteer service for the next year in their parishes.

"Most give far more than that," Koske said. "Some average

about 90 hours. Some never stop. They're available to help whenever they're asked."

Another way the New Orleans-area Master Gardeners serve is helping with the renowned fall and spring garden shows at City Park, which attract 6,000 to 7,000 visitors. The volunteers do everything from laminating signs to checking audio-visual equipment and taking tickets.

"We couldn't do the shows without them," said Monica Lear, LSU AgCenter specialist in Orleans Parish. She supervises about 65 Master Gardener volunteers.

Robert Turley, LSU AgCenter specialist in Calcasieu Parish, just finished his first Master Gardener class and certified eight volunteers. They will help him with the Lake Charles garden show and with his demonstration garden.

"Classes are usually bigger than that," Koske said. "We generally have about 25. Some parishes go together to get that many."

Master Gardeners do a variety of projects. For example, the Shreveport Master Gardeners put on a popular annual garden tour that raises around \$5,000 for supplies and reference materials for their program. They also publish a gardening newsletter.

The New Orleans group hosts a website with gardening advice.

Baton Rouge Master Gardeners have formed an alliance with Habitat for Humanity to help new homeowners get established.

The Tangipahoa Parish Master Gardeners, under the supervision of LSU AgCenter agent Annie Coco, restored a camellia collection at the LSU AgCenter's Hammond Research Station.

Master Gardener training is open to any adult available to take the classes and do volunteer work. More information may be obtained from any LSU AgCenter parish extension office or by contacting Koske at 225-578-2222, or tkoske@agcenter.lsu.edu.

■ **Linda Foster Benedict**

Inside:

■ *Red imported fire ants are ubiquitous in Louisiana, but researchers are trying to stem their spread.*

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■ *The LSU AgCenter is taking a three-pronged approach to finding solutions to the state's termite problem.*

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■ *Forensic entomology research helps track down poachers.*

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LOUISIANA AGRICULTURE

Louisiana Agricultural Experiment Station
Louisiana State University Agricultural Center
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