

THE UNIVERSITY OF GEORGIA COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

# Environmental Report

2007



# ENVIRONMENTAL REPORT

The **ENVIRONMENTAL REPORT** is published by the Office of Environmental Sciences, College of Agricultural and Environmental Sciences, Robert N. Shulstad, director; Susan M. Varlamoff, program coordinator. Send comments or questions to the Office of Environmental Sciences, University of Georgia College of Agricultural and Environmental Sciences, 109 Conner Hall, Athens, Ga. 30602-7503. Or call (706) 542-2151, fax (706) 542-1119, or e-mail varlamof@uga.edu. Articles may be reprinted with permission. Visit our Web site at <http://unit.caes.uga.edu/oes/> to access more information about our academic, research, extension programs, and the electronic edition of the **ENVIRONMENTAL REPORT**. Susan M. Varlamoff, editor and science consultant; Stephanie Schupska, consulting editor; Ellen Bauske, Marcy Coburn, Brad Haire, Sharon Omahen, Faith Peppers, Dan Rahn, Stephanie Schupska, Susan M. Varlamoff, Gary L. Wade, contributing writers, contributing writers; Carol Williamson, graphic designer.

PRINTED ON RECYCLED PAPER

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Shoal lilies along the Flint River  
Richard T. Bryant



**4 Director's statement**

**water**

- 5** Flint River Basin showcases water conservation
- 6** Recycling water on dairy farms
- 9** College scientists participate in state water planning
- 10** UGA irrigation technology studied in other states

**land**

- 11** Protecting ecosystem services through the market
- 12** Turfgrasses rebuild land after fires, hurricanes
- 14** Look out for alien invader in Georgia woodlands
- 15** Organic way to destroy insects
- 16** Beneficial bugs eliminate pests naturally

**air**

- 17** Bio-energy conference touts alternative fuels
- 18** UGA engineers make bio-fuels from poultry litter
- 20** How will global warming affect people in Georgia?

**extension education**

- 21** Perdue honors farmers' environmental stewardship
- 22** Students get hands on in service-learning classes
- 24** System prevents pests from leaving foreign ports
- 25** Sustainable farming in Costa Rica
- 26** Workshop addresses pesticide use concerns
- 27** Orange Tide takes 4-H'ers on extraordinary journey



**Robert N. Shulstad**

Director, Office of Environmental Sciences  
College of Agricultural and Environmental Sciences

In 2006, we saw some major policy shifts on environmental issues statewide, nationally and even internationally. Such concerns as providing adequate water quality and quantity for the state's citizens, meeting future energy needs and finding ways to safeguard our natural resources through a market economy are making headline news. Our scientists, engineers, Extension agents and even our 4-H'ers are working hard in the College of Agricultural and Environmental Sciences to address these issues through research, extension and classroom instruction. The 2007 Environmental Report provides highlights of the year's activities.

Water — we can't live without it, and we never seem to have enough where we want it. In Georgia, 70 percent of the water consumed is used to irrigate crops in the southern part of the state. For many years, scientists and engineers in Tifton have researched ways to make every drop count. On Earth Day, pivot irrigation systems retrofitted with precision irrigation technology showcased the strides they have made. And Larry Newton, an animal scientist doing research in Tifton, developed a closed system for dairy farm waste to prevent it from contaminating surface or ground water, to provide fuel for the farmer and to irrigate hydroponic grass — a nutritious feed for the cows.

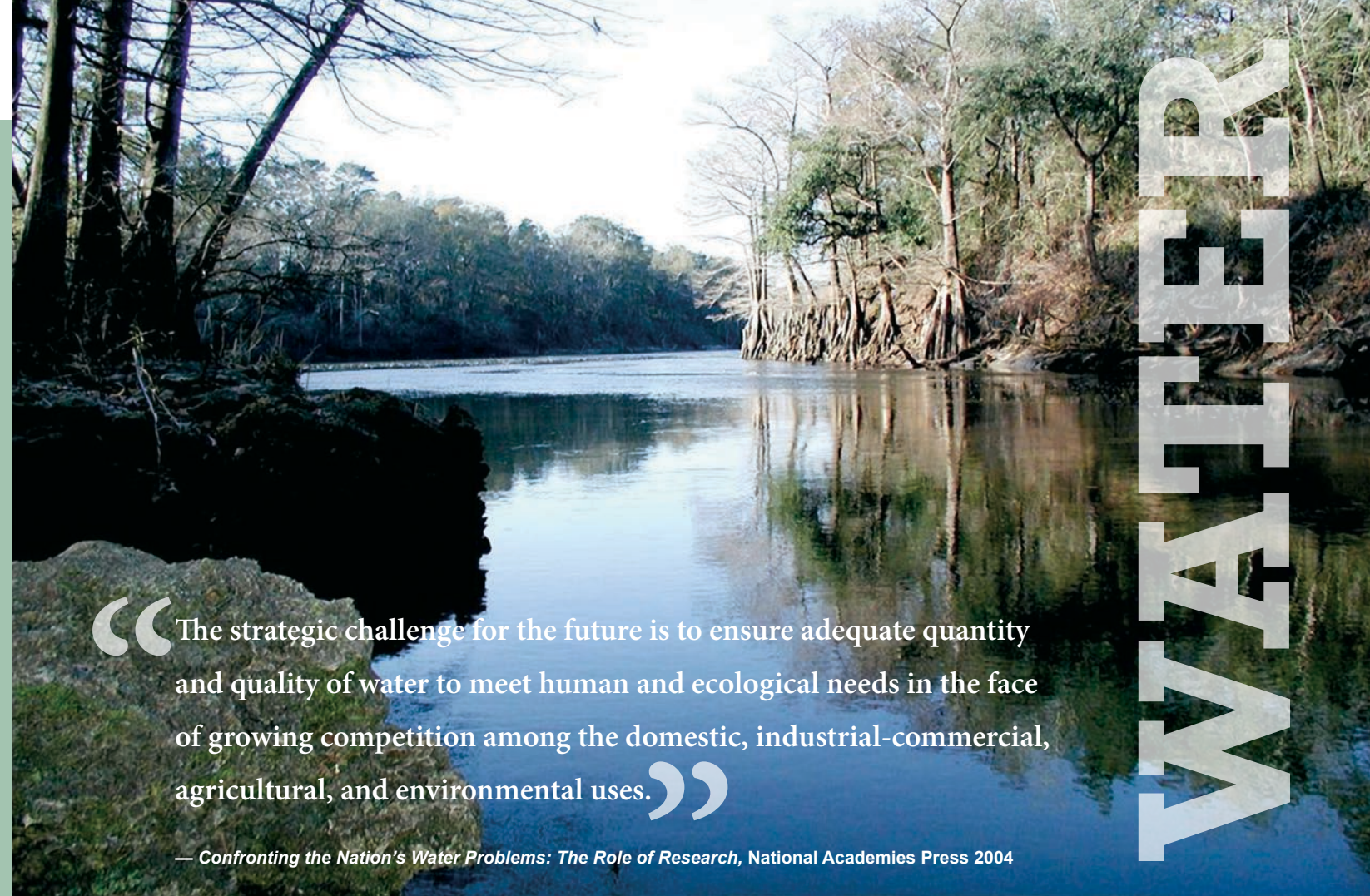
The Georgia Environmental Protection Division has embarked on a process to develop a comprehensive water plan for Georgians. Our college scientists participate extensively by sitting on the statewide, technical and basin advisory committees and supplying technical review of the discussion packets.

High gasoline prices, war in the Middle East and concerns for global warming have pushed interest in biofuels to record highs. More than 600 people attended the Bioenergy Conference held Aug. 1-3 in Tifton to learn how farm commodities and waste can be used to fuel cars, trucks and farm equipment. K.C. Das, an engineer in the biological and agricultural engineering department, found a way to turn poultry litter, a potential surface water polluter in north Georgia, into fuel pellets. Students visiting a Costa Rican farm learned that pig's waste fed into a biodigester can produce methane gas for cooking.

More and more our scientists are looking for natural means to control pests both to avoid human exposure to pesticides and to prevent residues from contaminating nearby rivers and streams. Mike Adang, an entomologist who has conducted experiments with biopesticides for years, discovered Bt booster, a supercharged *Bacillus thuringiensis* toxic to insect pests. And Kris Braman's research involves using natural predators to biologically control insect pests.

In this report you will also learn how our economists are looking for ways to protect our ecosystem services such as water purification, plant pollination and waste assimilation by inventorying them and placing a value on their benefits. Decision makers will explicitly consider their value in making policy and management decisions. And an interview with our state climatologist gives interesting insights into how land use affects Georgia's weather.

On the back cover, there is the story about how the Sea Monkeys, a group of 4-H'ers who worked with environmental scientists, used oranges to locate the source of bacterial contamination on the beaches of St. Simons Island and made us proud winning awards and national recognition.



WATER

“The strategic challenge for the future is to ensure adequate quantity and quality of water to meet human and ecological needs in the face of growing competition among the domestic, industrial-commercial, agricultural, and environmental uses.”

— *Confronting the Nation's Water Problems: The Role of Research*, National Academies Press 2004

Woody Hicks

## Flint River Basin showcases water conservation

BY SUSAN M. VARLAMOFF

A Celebration of Water was the 2006 Earth Day theme in southwest Georgia where new technology was demonstrated to help farmers conserve millions of gallons water. Merlyn Carlson, deputy under secretary to the USDA's Natural Resources and Environment, watched as one of 20 irrigation systems fitted with variable-rate nozzles sprayed water exactly where it was needed on the fields. Conventional systems spray

the same volume throughout a field and often on areas not needed such as roadways, vegetated buffers and uncultivated fields.

“What you prototyped here is certainly something that will be used by the rest of the nation for precision agriculture,” Carlson said as the 2,200-foot center-pivot irrigation system passed over the 328-acre field.

The system's nozzles turned off when they passed over a weedy low area that didn't need water. They reduced the flow when they passed over a strip covered with grasses to sustain quail.

Variable-rate irrigation (VRI) was developed by research engineers with the National Environmentally Sound Production Laboratory (NESPAL) at the University of Georgia in Tifton. Calvin Perry and his team try to make every drop of irrigation water count. Another benefit of VRI is the typically higher yields when the crop receives precisely the water it needs.

VRI uses pressure regulators on the sprinklers of the central pivot to manage how much water comes out at any given time. The farmer uses a personal computer to adjust the



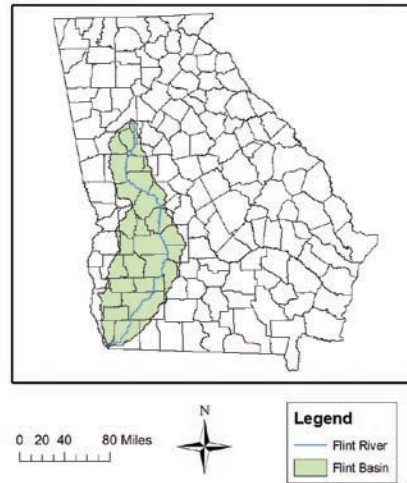
Woody Hicks

Radium springs in the lower Flint River.

settings to reflect the distribution of the field's crops and the optimal amount of water that each particular crop should get. Global positioning satellite systems based on aerial maps show areas that need the most and the least water. The mapping information is programmed into the computers.

Soils can vary from one area to another, and some places may be wetter or drier than other places in the same field. Soil monitors transmit signals wirelessly giving farmers real-time information and saving fuel they would normally consume making trips to the field. A wireless network covering 100 square miles in rural Calhoun County allows farmers to monitor soil-moisture conditions in their fields by logging onto the Internet from their home or office computers.

### State of Georgia's Flint River Basin



“On average, we determined that the process saves about 17 percent of the water normally used,” Perry said, or 128 million gallons for 20 systems.

Seventy percent of water consumed in Georgia is used to irrigate agricultural crops. In the interstate “water war,” Alabama and Florida have accused Georgia of using more than its fair share of water. By seeking pragmatic solutions, Perry said, “we in Georgia show that we are being proactive should the water war go to the Supreme Court.

The 1998–2002 drought also provided additional incentives to conserve water because the Flint River ran dangerously low. The state ordered a moratorium in 1999 on the drilling of new agricultural wells.

“The variable-rate irrigation pilot project has been a great success,” said Carlson, a farmer and rancher from Lodgepole, Neb. “We support this culture of responsibility.”

**For more information on variable rate irrigation, visit [www.nespal.org/precisionag/paguide2005.asp](http://www.nespal.org/precisionag/paguide2005.asp).** Susan M. Varlamoff is a program coordinator for the College of Agricultural and Environmental Sciences Office of Environmental Sciences.

## Recycling water on dairy farms BY SUSAN M. VARLAMOFF

An innovative system for treating dairy waste not only prevents nutrients from polluting nearby rivers and streams but generates energy and grows high quality forage for cows.

A closed wastewater treatment system developed by University of Georgia researcher Larry Newton under a Lindbergh Foundation grant reduces nitrogen by 90-95 percent, phosphorus by 70-75 percent and potassium by 60-65 percent.

“Because this system is closed, no nutrients escape into rivers and streams; and odors are controlled and not released into the atmosphere,” Newton said.

Traditional dairy operations consume large amounts of water. Increased concerns for water quality and quantity led to the development of this system that reduces total water use through recycling and prevents water from leaving the site.

Confined animal feeding lots (CAFOs) have long posed environmental problems because they generate great quantities of manure in a small area. Disposing of it can pollute the air and water.

Today, of the approximately 1.3 million livestock farms in the United States, about 5.5 percent or 71,500 are CAFOs. Each of these must meet strict environmental regulations on how they manage their manure.

Even though production of animals and animal products has significantly changed in the last 20 years, dealing with manure has remained the same. Most systems flush the cement floors on which livestock stand using large quantities of water. The flush water goes into a lagoon or holding pond and is used to irrigate crops.

“During catastrophic rain events like hurricanes, lagoon water may overflow into nearby surface water and contaminate it,” said Mark Risse, water quality coordinator for the College of Agricultural and Environmental Sciences. “We saw this happen in North Carolina during hurricane Hugo. The swine lagoons flooded into the nearby rivers causing enormous pollution problems.”

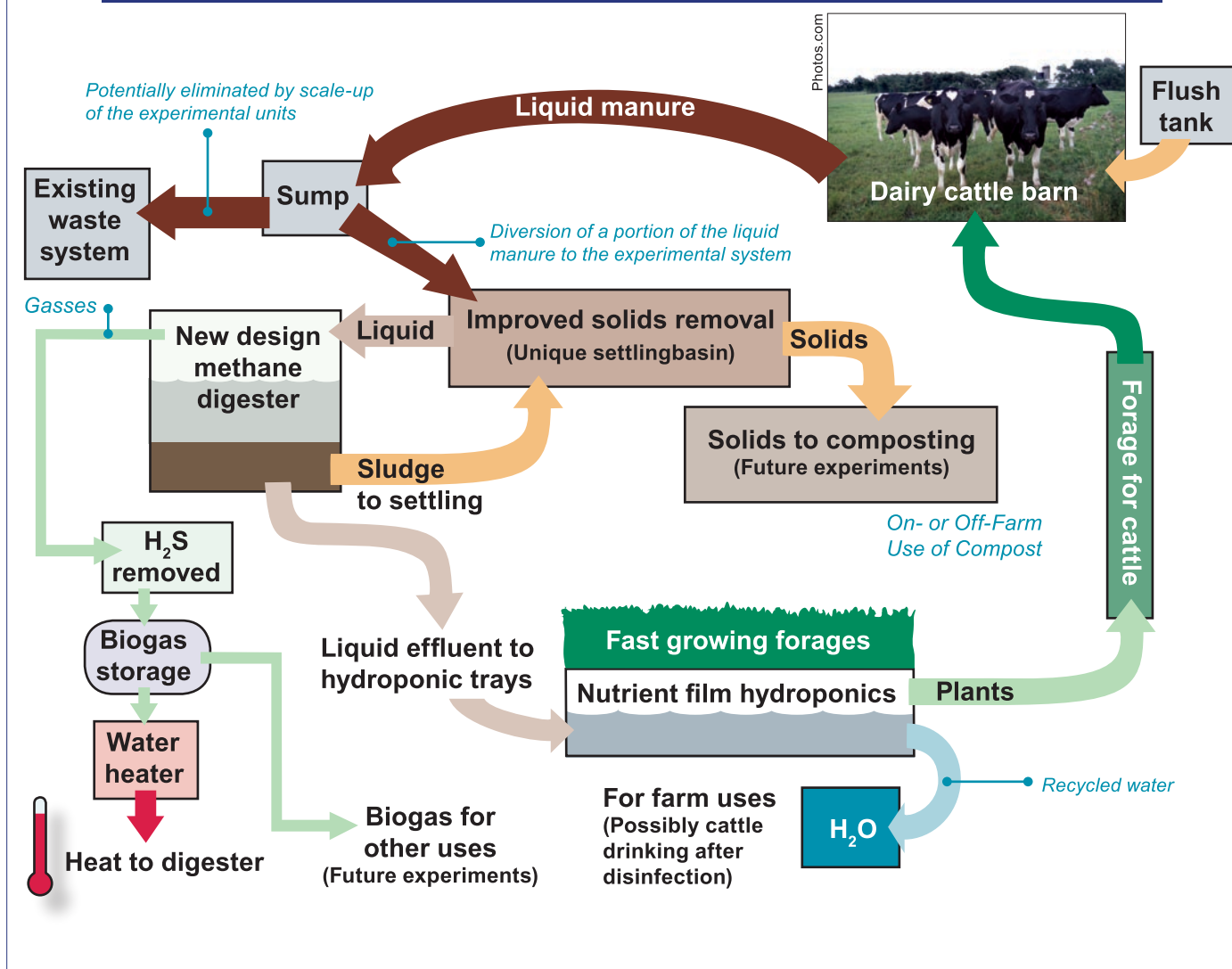
Gravity and sunlight drive this newer treatment system that requires only a fraction of the fossil fuels used by a



“Because this system is closed, no nutrients escape into rivers and streams; and odors are controlled and not released into the atmosphere.”

— LARRY NEWTON

## Nutrient, Water, and Energy Recycling System for Dairy Manure



conventional wastewater treatment facility. Flushed manure arrives from the barns by gravity and is pumped to the vertical drainage-settling basin. This step produces a biosolids sludge that can be composted for use on and off the farm and greatly reduces the required size and cost of the subsequent biogas digester.

After 24-36 hours, the liquid is slowly drained off and transferred to a retention basin from where it is transferred in measured quantities, six times a day, to a heated digester or a closed tank. Here methane gas is produced and transferred to collection and storage receptacles to fire a water heater for the digester. The digester effluent, which is essentially odor-free, contains mineralized nutrients that are readily absorbed by plant roots. Effluent overflows into a storage tank. From there, the water with nutrients is metered to hydroponic grass plants produced in a greenhouse under sunlight.

The fresh grass has health benefits also. It stimulates milk production in the cows and creation of conjugated linoleic

acid, a beneficial fatty acid that reduces the accumulation of body fat and the growth of most cancers.

“The conjugated linoleic acid is transferred to cow’s milk, potentially making the milk an even more healthful food,” Newton said.

The current pilot scale project treats only about 2 percent of the wastewater produced by the Tifton dairy. “After more testing of different rates, plant materials, forage harvesting methods and other alternatives, we hope to devise a system that can be economically scaled up to effectively recycle the waste stream of a commercial-size dairy while using a relatively small land area and little fossil fuel,” Newton said.

Susan M. Varlamoff is a program coordinator for the College of Agricultural and Environmental Sciences Office of Environmental Sciences.

## College scientists participate in state water planning

BY SUSAN M. VARLAMOFF

In an energy crisis, we can always turn down the air conditioning and run our cars on alternative fuels. Water is a different matter. We have no substitutes for water, and without it, we cannot survive. Because a water crisis could threaten our drinking water supplies and Georgia’s economic future, we must plan today to manage this precious and limited resource in times of both scarcity and plenty.

For those of us who lived in Georgia during the 1998-2002 drought, we remember a time when the Flint River — an irrigation source — ran dangerously low, resulting in a moratorium on new wells in the basin. As the City of Griffin faced a drinking water shortage, I was jokingly asked to use the restroom before I came into town for a University of Georgia Experiment Station meeting. Outdoor water restrictions and bans were the norm, and boats ran aground

on the shores of Lake Lanier.

An elaborate planning process is under way to provide future generations of Georgians with sufficient water resources while still maintaining the biological integrity of streams and rivers. More than 200 people from across the state, representing a variety of interests, sit on the Water Council, Statewide Advisory Committee, Technical Advisory Committees and Basin Advisory Committees. They provide their expertise and perspective on water quality and water quantity issues. Carol Couch, director of the Georgia Environmental Protection Division, is leading this Herculean effort.

The College of Agricultural and Environmental Sciences is playing an important role in providing scientific expertise for the planning process. Kerry Harrison, a biological and



Chattooga River Ivan Varlamoff

agricultural Extension specialist; Jim Hook, a crop and soil sciences professor; and Rose Mary Seymour, a biological and agricultural engineer, serve on the Water Conservation Technical Advisory Committee. They provide input for the documents the basin advisory committees review.

I serve on the Basin Advisory Committee for the Oconee-Ocmulgee-Altamaha river basins, where I live and work. These basins stretch from metro Atlanta to the Atlantic Ocean, giving me the opportunity to interact with people representing an array of urban and rural interests that include local government officials, riverkeeper groups, farmers, industry leaders and public works and power company managers.

Those of us who serve on the Basin Advisory Committee take our task seriously. For this reason, I travel two hours south from the metro Atlanta headwaters of the Ocmulgee River while the Altamaha riverkeeper rides four hours north from the mouth of the Altamaha River on the coast to attend our meetings in Macon.

Attendance is high — there was only one absentee at our first meeting among the 31 people selected. Attendees provided their ideas on how to conserve water while facilitators furiously recorded them. For example:

- Offer a tax credit to retrofit plumbing in older homes with water-saving devices.
- Provide local governments technical help to implement regulations.
- Collect rainwater in cisterns to irrigate outdoor landscaping.
- Educate school children about water conservation so they can teach their parents.
- Consider the compost toilet as a water conservation method.

At meetings, we often debate the science or lack of it on various topics. Are septic systems and land application of wastewater consumptive uses of water?

UGA scientists reported that if properly sited and maintained, septic tanks and land application systems return 70 percent of the water back into streams. However, since soils vary throughout the state, we proposed site-specific studies to determine regional differences in water percolation. We all agreed we cannot base a water plan on incorrect assumptions. More funding is needed for scientific studies to fill knowledge gaps on this and other critical issues.

There is consensus among the diverse group that given the competing demands on water, we must find equitable ways to conserve and allocate it. As Gail Cowie, policy advisor to the EPD director, says, we are all in this together. After extensive public comment, the final plan will be presented to the General Assembly in 2008.

**For more information of the comprehensive water planning process, visit [www.gadnr.org/gswp/](http://www.gadnr.org/gswp/)** Susan M. Varlamoff is a program coordinator for the College of Agricultural and Environmental Sciences Office of Environmental Sciences.

## UGA irrigation technology studied in other states

BY BRAD HAIRE

Using a \$500,000 Natural Resource Conservation Service grant, Calvin Perry and other College of Agricultural and Environmental Sciences specialists are now sharing the technology's potential with researchers and farmers in other states. In cooperation with Clemson University, VRI systems are now studied in South Carolina and are being demonstrated to farmers there.

In spring 2006, in cooperation with the University of Arkansas, the technology was installed in Poinsett County, Ark., on a 4,000-acre plantation. It's part of the Judd Hill Foundation, established in 1985 to foster research and public outreach on progressive techniques in farming.

"Researchers there are working on their own pivot irrigation studies and thought VRI would be a good complement to it," Perry said. "Agricultural water use is a big issue in Arkansas just like in Georgia."

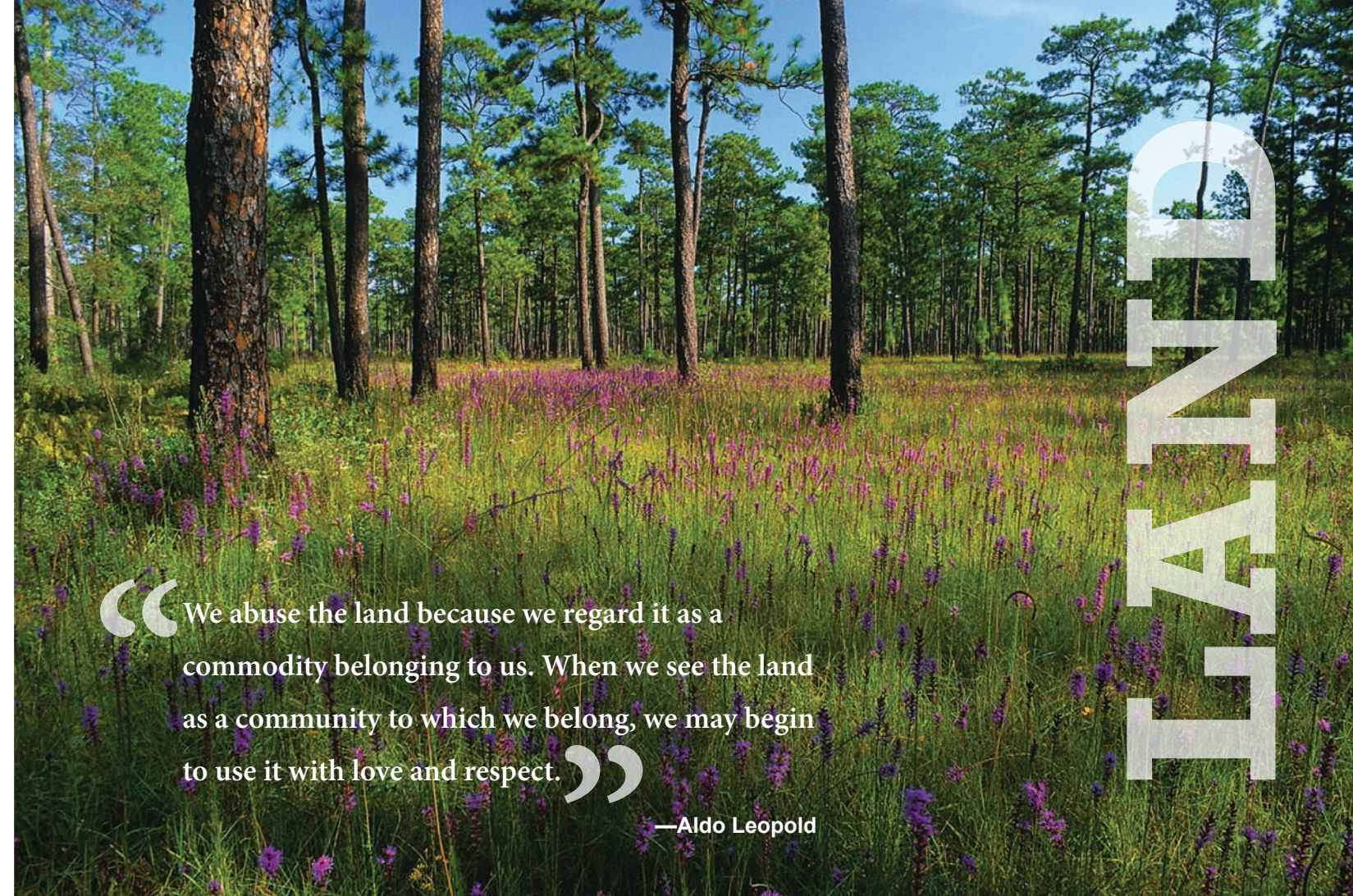
The VRI system received much attention during the plantation's annual field day Aug. 31, Perry said.

"This opportunity in Arkansas allowed us to see how the VRI product does under other climate conditions and other soil conditions, particularly how it does in the cotton-growing Arkansas Delta region," Perry said.



Variable-rate irrigation, a precision agriculture tool was developed on the Tifton, Ga., University of Georgia campus. It is being used here to water cotton at the Judd Hill Plantation in Poinsett County, Ark.

Brad Haire is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.



“We abuse the land because we regard it as a commodity belonging to us. When we see the land as a community to which we belong, we may begin to use it with love and respect.”

—Aldo Leopold

Greenwood Plantation in south Georgia  
Keith Lazelle

## Protecting ecosystem services through the market

BY SUSAN M. VARLAMOFF

Ecosystem service is the latest environmental buzzword. Human life is dependent on the many physical and biological processes or services that nature provides. The air we breathe, the water we drink, the food we eat, the outdoor recreation we engage in, and even the solace a sunset offers are brought to us care of nature. University of Georgia economists are looking for ways in which a market-based economy can protect our dwindling natural resources and the goods and services they provide.

"Today we are using more land per person for houses and shopping centers," said UGA economist John Bergstrom. "As the 'human footprint' gets bigger and bigger from increased population and per capita consumption, natural undeveloped land becomes scarcer; and the services provided by this land become scarcer."

Economists divide the products of a healthy ecosystem into services and goods, which can be renewable and nonrenewable. Renewable goods such as timber and fish can be managed indefinitely if we don't harvest the stock faster

than we replenish it. But economists are challenged to find ways to prevent fishermen from over fishing the open seas.

Nonrenewable resources include oil, natural gas, minerals and gems such as gold and diamonds. All that exists today is all we will ever have. The market already puts a dollar value on these products but it doesn't take into account the effects of burning fossil fuels on the planet's plant and animal life.

"We have to see the benefits of ecosystem services provided by land and not just commercial products," Bergstrom said. Water purification, flood control, pollination of plants and waste assimilation are among the many services supplied by an ecosystem that support economic activities and our quality of life.

At a recent UGA Academy of the Environment Symposium, Georgia Environmental Protection Division (EPD) Director Carol Couch said not only is Georgia losing the tangible benefits of healthy ecosystems but the services such as water quality and quantity.

"Atlanta is the fastest growing human settlement in earth's

history,” Couch said.

As a result, in the Atlanta metro area, more than 1,000 miles of streams violate EPD water quality standards. During the last drought, the Flint River in southwest Georgia ran dangerously low as farmers used the river to irrigate their crops.

As ecosystem’s goods and services have become depleted, we have engineered substitutes. Wastewater treatment systems perform the function of assimilating waste and purifying water, and man-made pesticides take the place of biological pest control. However, substitutes for nature’s services are often imperfect and costly. Wastewater treatment facilities use chlorine that produces a set of compounds called chloramines that can be toxic to humans. Manmade pesticides often kill beneficial insects such as honeybees that pollinate flowers and crops and may cause health problems in humans if used improperly.

Recently, New York City officials were faced with spending billion of dollars to upgrade their wastewater treatment system. Some enlightened city officials decided instead to pay for conserving land along the Catskill watershed. The land buffer successfully removed contaminants flowing into the river that supplies drinking water to 16 million New York City residents, saved the city more than a billion dollars and provided additional benefits of wildlife habitat and recreation.

“The forests and other undeveloped land in north Georgia provide water quality and water quantity benefits to the metro Atlanta residents since the head waters of the Chattahoochee River — the drinking water source — originate there,” Bergstrom said. “As in the New York City case, it may make economic sense for the City of Atlanta to help conserve land along the river to protect water quality and reduce potential higher water treatment costs in the future. For example, the City of Atlanta could partner with other conservation groups and programs including the new Georgia Land Protection Program to help purchase conservation easements in the upper Chattahoochee River watershed.”

Regarding air quality the Georgia EPD issues fines for companies that violate air quality standards.

“Providing clean air through a healthy environment provides many economic benefits to people such as reduced health care costs and the aesthetic value of better visibility. Studies have also shown that cleaner air contributes to higher property values,” Bergstrom said.

“We have a unique opportunity in Georgia to protect farms, forests and other undeveloped land that can serve to protect the environment and ultimately the economy and quality-of-life.”

A good example are south Georgia plantations that preserve large scale ecosystems and valuable ecosystem services while providing quail hunting to paying clients. The income earned from hunting helps make it economically feasible for plantation owners to preserve these unique ecosystems. The Red Hills plantations located between Tallahassee, Fla., and Thomasville, Ga., is a privately-owned 300,000-plus acre home to more than 60 different state and

federally-protected plants and animals.

“The U.S. Department of Agriculture and other state and local agencies and private groups are very interested in protecting farms and forests, particularly through conservation easements,” said Bergstrom. “The voluntary nature of conservation easements is an attractive feature. However, these easements are expensive especially near urban areas.”

“We need to inventory and measure the benefits of ecosystem goods and services and then incorporate these values into public and private policy and management decisions including exploring new and innovative mechanisms for paying for ecosystem goods and services,” Bergstrom said. “Are we going to recognize ecosystem services provided by public and private lands or continue to take them for granted? Often when you take something for granted, you lose it.”

Susan M. Varlamoff is a program coordinator for the College of Agricultural and Environmental Sciences Office of Environmental Sciences.

## Turfgrasses rebuild land after fires, hurricanes

BY SHARON OMAHEN

When University of Georgia researchers bred their latest turfgrass varieties, they had home lawns, athletic fields and pastures in mind. Now grasses they bred are also being used to prevent erosion and rebuild land after wildfires and hurricanes.

“When we bred our new tall fescues, we bred them to be suited for Georgia and to be drought tolerant,” said Bob Carrow, an agronomist with the UGA College of Agricultural and Environmental Sciences. “Now the seed companies’ major business with these grasses is in land reclamation.”

**Some turfgrass seed companies are now selling as much as half of their seed for land stabilization and reclamation uses.**

Carrow said seed companies are marketing tall fescue for planting in harsh environments. “It’s being used to rebuild areas after fires and for highway stabilization to prevent erosion,” Carrow said. “Landmark Seed Company is using our tall fescue releases to rebuild the western U.S. after fires, and they’re using it in China where there are severe erosion problems.”

UGA turf breeders discovered the alternative uses for the



Don Loch

The ability to rapidly spread and cover even sandy and salt-laden soils makes seashore paspalum ideally suited for many coastal reclamation projects.

turfgrass during research trials. “We found, and the seed companies obviously agree, that these tall fescues are perfect for areas that you don’t maintain often,” he said. “The Southeast tall fescue variety in particular is perfect for planting along roadsides.”

Some turfgrass seed companies are now selling as much as half of their seed for land stabilization and reclamation uses, he said.

Another UGA turfgrass is being promoted for reclamation, too. Seaspray, a seashore paspalum grass, was co-developed by UGA and Turf Seeds of Oregon. The world’s first seeded seashore paspalum, Seaspray, is available now in limited quantities.

“Seaspray’s parent grasses originated along coastlines,” said Paul Raymer, a UGA agronomist and one of the grass’ breeders. “The new seeded variety should be a natural fit for reclamation projects in coastal areas or where salt is a problem. And its original selling point was that it is very salt tolerant.”

Raymer says Turf Seed representatives see the potential for this grass in reclaiming and stabilizing soils in coastal areas.

“Seaspray’s perfect for areas where the ground cover has been lost from saltwater storm surges like hurricanes or even the recent catastrophic tsunami,” Carrow said.

**For more information on turfgrass water management, visit <http://www.turfgrasswater.com/> Sharon Omahen is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.**



Paul Raymer

Seashore paspalum is able to slow erosion and even heal eroded areas.



Don Loch

Just 16 weeks after sprigging, seashore paspalum now provides a protective vegetative cover to this once barren salt-affected site.

## Look out for alien invaders in Georgia woodlands

BY GARY L. WADE

You don't have to go far to see alien invaders all along our highways. Nonnative, invasive pest plants are everywhere in Georgia. They're in our forests, pastures and natural areas. And their population is growing daily.

Remember kudzu? This plant was first introduced to Americans at the 1876 Centennial Exposition in Philadelphia. It was promoted as a fragrant, flowering vine from Japan. By the early 1900s, the U.S. Soil Conservation Service began using the vine to stabilize soil and control erosion. That's why you often see the plant along roadsides.

Meanwhile, the U.S. Department of Agriculture encouraged farmers to plant kudzu for cattle feed, since the forage value equaled that of alfalfa. Then it began invading areas where it wasn't planted and engulfing everything in its path. Today the plant covers more than a million acres in the Southeast. By the mid-1900s, the once cherished vine became a noxious weed, and thoughts turned from how to grow it to how to get rid of it.

Kudzu can be managed and controlled. Other invaders pose a much more serious threat to our environment.

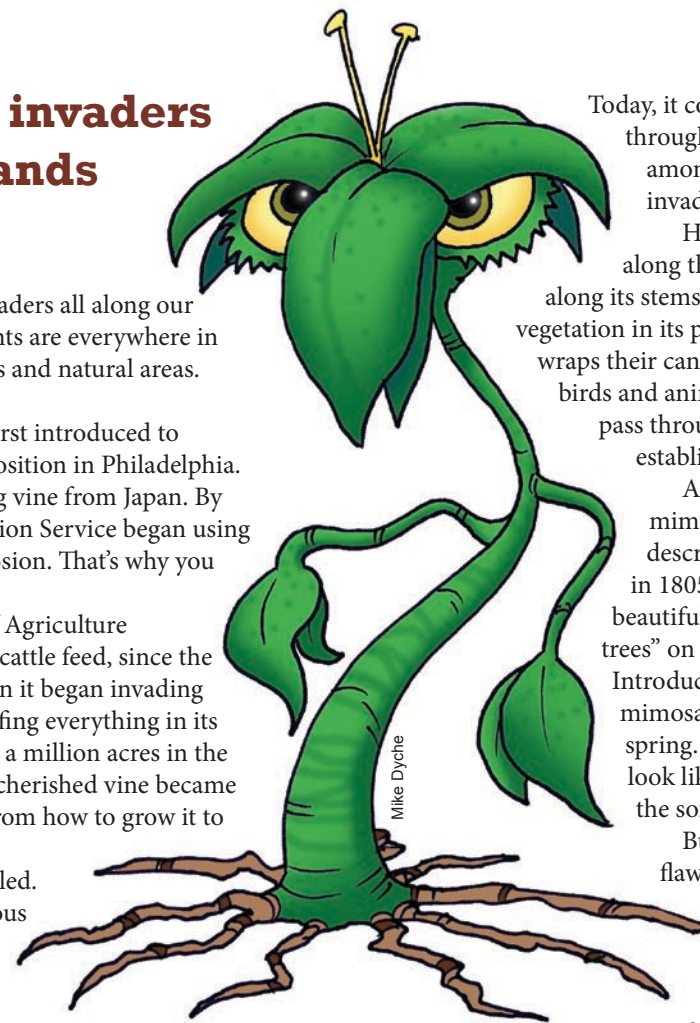
Chinese privet is one of the most widespread invaders in the South. It creates thickets along rivers, smothering native vegetation. A single plant produces thousands of seeds that are spread by birds and water. Chinese privet came from China in 1852 as a flowering shrub for the landscape. It wasn't a problem until the mid-1900s when it escaped cultivation and invaded our woodlands.

Japanese honeysuckle was listed in the 1923 catalog of the William Prince Nursery in Long Island, N.Y. It was described as "one of the most prolific climbers in cultivation." Unfortunately, it climbed far beyond where it was planted.



James R. Allison

Japanese Honeysuckle



Today, it covers millions of acres throughout the Southeast. It's among the worst of the alien invaders.

Honeysuckle's vine creeps along the ground, rooting along its stems and smothering other vegetation in its path. It climbs trees and wraps their canopies like a cocoon. Wild birds and animals eat the seeds, which pass through them unscathed to establish new colonies.

Another Asian invader is mimosa. Thomas Jefferson described it in his journal in 1805 as "one of the most beautiful of all the flowering trees" on his Monticello estate. Introduced from Asia in 1745, mimosa is a dazzling plant in spring. Its silky pink blooms look like powder puffs on top of the soft-textured foliage.

But the tree has a serious flaw: It produces an abundance of pea-like fruit pods, each containing five to 10 fertile seeds. The seeds

remain viable for years. Wildlife and

water carry them to new areas, where they sprout and form new colonies. Young mimosa seedlings are shade-tolerant and soon crowd out native vegetation to form dense thickets. Today, mimosa is among the most prolific and troublesome of the alien invaders.

While a few imported plants have caused havoc in our woodlands, not all exotic imports are invasive. In fact, only an estimated 1 percent of all the plants imported into the United States during the past two centuries have become invasive. Unfortunately, that 1 percent has caused significant destruction of natural environments. They have given the other 99 percent a bad rap.

The Georgia Green Industry Association and the Georgia Exotic Pest Plant Council are working with the Georgia Department of Agriculture to manage invasive plant populations; educate landowners, green industry professionals and gardeners about invasive plants; and develop a system for assessing new plants for invasive potential.

**To learn more about invasive exotic pest plants, see [www.gaeppc.org](http://www.gaeppc.org).**

Gary Wade is a Cooperative Extension horticulturist with the University of Georgia College of Agricultural and Environmental Sciences.

## Organic way to destroy insects BY STEPHANIE SCHUPSKA

Insects eat one-third of all food produced worldwide before it ever reaches the dinner table, according to University of Georgia expert Mike Adang. Since his undergraduate days at Indiana University, the entomology professor has been interested in ways to control insects besides using pesticides.

Through his research at UGA College of Agricultural and Environmental Sciences, Adang found a better, natural way to fight pests. Adang discovered BtBooster through a series of biopesticide experiments. By adding a bit of an insect protein to a small piece of *Bacillus thuringiensis* (Bt) protein, he learned that "it took less Bt to kill the insects." In this case, the insects were hornworms, and originally, Adang expected the experiment to leave them ready and waiting to devour more plants. Instead, it left them dead.



Dot Paul

Since Mike Adang was nine, he's been interested in insects, especially ways to kill them naturally. Through his lab's discovery of BtBooster, he's found a way to super charge biopesticides.

Bt is a biopesticide that produces proteins toxic to many insect species. "It's a natural bacterium," Adang said. "It attacks the insect's gut, making the insect sick."

However, some insects are resistant to Bt. And that's where Adang's surprise comes into play. He and colleagues Gang Hua and John Chen had been hoping to learn how Bt kills insects by feeding them part of an insect protein, the Bt receptor. Instead, they found a way to supercharge Bt and kill the insects faster and with less biopesticide.

### And Bt Booster was born.

"We were very pleased to see something come from our basic research," Adang said. "It's a long way from the lab to making something useful."

Bt proteins have changed the way crop plants are protected against insects. The technology can be built into a plant like cotton or corn and has been available to farmers since 1996.

Vegetables and trees can be protected from insect damage by being sprayed with a biopesticide made from Bt.

Bt provides an alternative to chemical ways of dealing with pests, especially where chemicals could harm humans. Bt doesn't hurt people. For that reason, foresters can spray whole stands of trees with Bt to fight gypsy moths, which are among North America's most devastating forest pests.

Organic farmers can use Bt and still be considered organic because biopesticides come from living organisms. They can control the insects on their crops without having to worry about chemical residues.

Though Bt crops are becoming more common, chemicals are still a common way of controlling insects.

"Chemical pesticides are still safe," Adang said. "But over the years, people have started to worry more about problems such as groundwater contamination and other issues like that."

Through Bt, and now with Bt Booster, the potential impact is great as more producers use crops that have been retrofitted with the Bt protein.

"Using Bt Booster will allow Bt crops and Bt biopesticides to work better," Adang said, "having a positive environmental impact and reducing chemical insecticide use."

Adang is now studying how Bt kills mosquitoes through funding from a National Institutes of Health grant, UGA and his gene design and discovery company InsectiGen. Using a U.S. Department of Agriculture National Research Initiative grant, he's specifically looking at how insects become resistant to Bt in cotton. He's also digging deeper into the workings of Bt Booster trying to figure

out how it works and making improvements to optimize it.

Through UGA's Georgia BioBusiness Center, Adang formed InsectiGen in 2003 with Clifton Baile, a CAES professor of animal science. Its focus is on discovering and engineering proteins for insect control.

Because of his discovery of Bt Booster, Adang was presented the UGA Inventor's Award on March 29, 2006. He has also filed for a patent license to continue his quest of developing a farm-production product for pest control.

**For more information about Bt Booster, visit <http://adang.myweb.uga.edu/>.**

Stephanie Schupska is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

## Beneficial bugs eliminate pests naturally BY SHARON OMAHEN

About 50 men and women crowded around University of Georgia entomologist Kris Braman as she demonstrated how quickly a pair of tiger beetles attack and devour an armyworm. The group's attraction wasn't just morbid curiosity.

Georgia golf course and landscape industry professionals spend millions of dollars each year controlling armyworms and other caterpillars, so they were rooting for the beetle.

A UGA College of Agricultural and Environmental Sciences professor, Braman was one of 19 UGA scientists who shared their latest findings with more than 900 visitors at the 2006 Turfgrass Field Day held Tuesday, Aug. 14 on the college's campus in Griffin, Ga. Braman's research focuses on controlling insects that feed on Georgia turfgrasses and ornamental plants. Her subjects include fall armyworms, Japanese beetles, chinch bugs and two-lined spittle bugs. Using a predator like the tiger beetle to control a pest is called biological control. This method allows farmers and homeowners to control insect pests without spraying insecticides.

"Tiger beetles are very common in landscape beds," Braman said. "They are very ferocious predators. I wouldn't want to run into one my size."

Over the next four years, Braman will monitor how well the tiger beetles keep armyworm and Japanese beetle grub populations down in her research plots.

"These beetles aren't being used much in this way, but they are very abundant in nature," she said. "We have been finding them more and more in our insect pitfall traps."

Using beneficial insects isn't a new concept to the greenhouse and field crop industries, but it is new to the turfgrass industry. The beneficial insects that are

commercially available are not widely-used in turf," Braman said. "We're finding that the ones used in greenhouses do occur in turf."

Many greenhouse growers buy beneficial insects to control pests on their plants. One of the most popular, the minute pirate bug, feeds on insect eggs, caterpillar eggs, thrips, mites and small larvae, Braman said. One of Braman's favorite beneficial insects is the big-eyed bug. It feeds on soft-bodied small insects like armyworms, cut worms and chinch bugs.

"We ought to be looking in this direction as a possibility, if it's cost effective," Braman said. "It's a matter of conserving the predators that are already there and using management practices that don't eliminate the natural enemies."

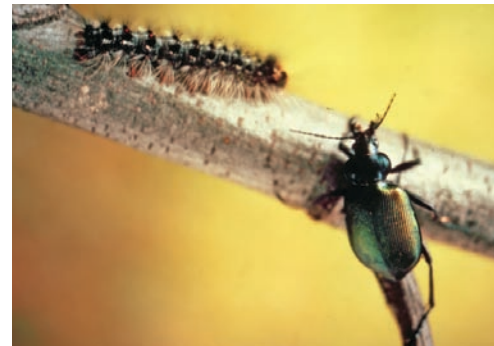
**For more information on insect pest management, visit <http://www.ent.uga.edu/insect-id.htm>**

Sharon Omahen is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.



Big-eyed bug

Bradley Higbee



Tiger beetle

Steven Munson



Pirate bug

Bradley Higbee



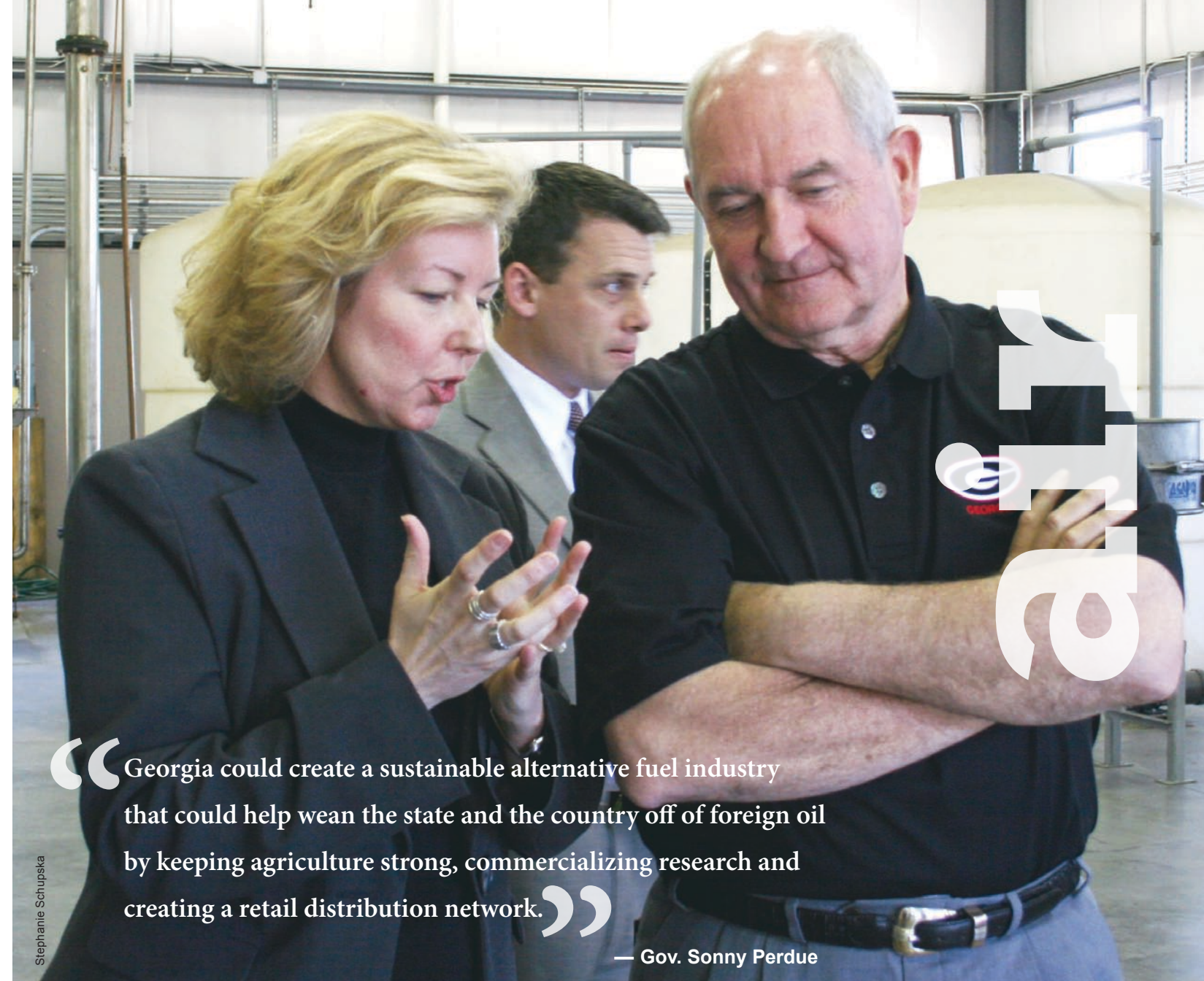
Tiger beetle

Pa. Dept. of Conservation and Natural Resources



Tiger beetle

Kris Brown



“Georgia could create a sustainable alternative fuel industry that could help wean the state and the country off of foreign oil by keeping agriculture strong, commercializing research and creating a retail distribution network.”

— Gov. Sonny Perdue

Stephanie Schupska

Sonny Perdue took a few hours to discuss biofuels at UGA's Center for Biorefining and Carbon Cycling with microbiologist Joy Peterson and engineer Ryan Adolphson.

## Bio-energy conference touts alternative fuels BY SUSAN M. VARLAMOFF

A caravan of vehicles fueled by ethanol and biodiesel made from peanuts, soybeans, chicken fat, peaches, wheat and pine trees wound their way down I-75 from Atlanta to Tifton, Ga., to demonstrate how various commodities can be used for transportation bio-fuels.

Joining them were 600 farmers, scientists, engineers, politicians, railroad officials and venture capitalists who attended a UGA-sponsored bioenergy conference Aug. 1-3, 2006.

Speakers from across the United States and Brazil came to discuss the global state of oil and our dependence on it, the economics of biofuels, energy legislation, Georgia-

grown energy commodities and Brazil's roadmap to energy independence.

Georgians "can grow it here, convert it here and use it and export it when we have plenty for ourselves," said Gov. Sonny Perdue during the opening session of the Georgia Bio-energy Conference at the College of Agricultural and Environmental Sciences' Tifton campus conference center.

"Georgia could create a sustainable alternative fuel industry that could help wean the state and the country off of foreign oil by keeping agriculture strong, commercializing research and creating a retail distribution network," he said. "By promoting alternative fuels, the United States can ensure fuel stability and

reduce its dependency on foreign sources of oil.”

Georgia is moving forward, he said. The state’s research universities must continue alternative fuel research. But they need “to scale it up” from the lab and move it to practical commercialization.

Once this happens, he said, the state can create a retail distribution system to meet consumer demands.

More than \$1 million in state and private funds have fueled the Biorefining and Carbon Cycling Program in the UGA College of Agricultural and Environmental Sciences, he said.

The era of oil-driven energy is coming to an end, said Jim Fischer, a senior technical advisor with the U.S. Department of Energy.

“The world consumes two barrels of oil for every barrel discovered,” Fischer said, and has been using more oil than it has been producing for the past 20 years. By the year 2020, the world’s population will have increased its need for energy by 60 percent.

“So as we reflect on the energy situation, let’s keep in mind that we’re not at our last drop of oil,” Fischer said. “But we’re getting close.”

The U.S. uses about 25 percent of the world’s oil supply but only has about 2 percent of its reserves. The Organization of Petroleum Exporting Countries (OPEC) nations use 7 percent and have 77 percent of the reserves.

Biofuels could provide a way to oil independence, said John Sheehan, an analyst with the U.S. Department of Energy. But biofuels was never proposed as a way of avoiding all fossil fuels, such as oil, coal and natural gas. “It was proposed as a way of reducing oil consumption.”

However, there are trade-offs. For example, a typical corn ethanol plant uses 6 to 7 gallons of water to create 1 gallon of ethanol, Sheehan said.

If the U.S. wanted to replace its transportation fuel needs with biofuels, Sheehan said it would take a billion acres of switch grass, a plant with many good bioenergy and environmental benefits, given the current state of technology. America has only 400 million acres in total farmland now.

The only way to reduce that large of a land demand, he said, would be through improving vehicle efficiency and the bioenergy technology process by capturing more usable energy at the end of the process.

Georgia Agriculture Commissioner Tommy Irvin, who drove a Ford pick-up truck with a biodiesel-powered engine to the conference, said, “bio-fuels are the wave of the future. I believe the price of (conventional) fuel has made them more competitive.”

Susan M. Varlamoff is a program coordinator for the College of Agricultural and Environmental Sciences Office of Environmental Sciences.

## UGA engineers make bio-fuels from poultry litter

BY STEPHANIE SCHUPSKA

Two and a half pounds of litter is about how much one chicken produces in its lifetime. A team of University of Georgia scientists is working to turn the poultry state’s waste litter into a valuable alternative fuel product.

That’s good news in Georgia, where chickens, specifically broilers, rank No. 1 in the state’s agriculture, with a leaving-the-farm value of almost \$4 billion. Poultry litter is mostly manure mixed with a bedding material such as wood shavings.

Two and a half pounds of litter per broiler is 2.5 pounds of by-product waiting to be converted into something usable, said Jimmy Palmer of the U.S. Environmental Protection Agency. With funding from an EPA grant, UGA researchers are searching for ways to add value to poultry waste.

“This will help us collectively deal with environmental issues of growing agriculture,” said Palmer, an EPA regional administrator.

“A waste is a terrible thing to mind,” he said, twisting a common phrase. “We’re looking for better ways to deal with waste.”

Through a process called fractionation, UGA researchers plan to produce two types of materials from the poultry litter, separating the fine and coarse parts, said Mark Risse, a UGA Cooperative Extension engineer and



Jimmy Palmer of the EPA, right, presents a grant to, left to right, Sid Thompson, K.C. Das, Kaushlendra Singh, Mark Risse and John Worley of UGA’s Department of Engineering.



Brian Bibens and K.C. Das check the process of the continuous pyrolysis machine. They will use pyrolysis to turn coarse particles of chicken litter into char and bio-oil.

member of the research team.

The scientists form the fine, nutrient-rich material into pellets for fertilizer. Because the processed fertilizer pellets would allow a slower release of nutrients into the soil, pollution from pathogens and nutrients in the poultry litter would be reduced.

“Most poultry litter is currently being directly land-applied as fertilizer,” said K.C. Das, coordinator of the UGA Biorefinery. “It makes sense to a point. But in north Georgia, there’s not enough land to spread the litter. Through this process, we’re producing a better energy product as well as a better fertilizer.”

The research team puts the coarse, energy-rich poultry litter material through an intense heating process called pyrolysis to create char and bio-oil. The char can be used anywhere charcoal is used. Bio-oil can be refined further and used as diesel-like fuel.

UGA engineers say developing a cheap source of energy from poultry litter would provide a cleaner source of energy, helping the state grow in an economically and environmentally sustainable way. They estimate that in the United States, using poultry litter as fuel could save 283 million gallons of fossil fuel.

“Two or three companies are looking at Georgia right now,” Risse said. “They’re looking at pelleting litter for fertilizer. There’s a very real opportunity for research that

can be used not 10 years from now, but now.”

“A lot more is said than usually done, and we’re about to do it,” Palmer said of the project.

Besides Risse and Das, the UGA research team includes Cooperative Extension engineer John Worley, professor Sid Thompson and graduate student Kaushlendra Singh.

The project builds on work Thompson did 15 years ago and had to shelve due to a lack of application at the time. Now, with the demand for alternative fuels increasing, his halted research can continue.

The project team is in the process of showing they can break up poultry litter into two parts and use both. The researchers will also have to determine whether the processes should be done at centralized locations across the state or at individual farms.

“Poultry litter represents two times the energy consumption on a farm,” Das said. “You have everything you need to produce energy on the farm already.”

Stephanie Schupska is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

## How will global warming affect people in Georgia?

BY SUSAN M. VARLAMOFF



David Stooksbury

State climatologist and University of Georgia atmospheric sciences professor David Stooksbury answers questions on climate change in Georgia.

### How will global warming affect Georgia?

**DS:** We don't know. The models don't do a good job of predicting climates on the local scale or predicting extreme climate events. What we do know is that

Georgia has cooled down slightly (0.1 degrees Fahrenheit) in the past 100 years. I think this is the result of Georgia going from primarily row-crop agriculture in 1900 to forest. Today, 60 percent to 70 percent of Georgia is forested, and we think transpiration of water vapor from the trees has caused a drop in temperature.

### Can we link high carbon dioxide levels to Earth's warming?

**DS:** We have the highest carbon dioxide levels in recorded history. Atmospheric scientists have been sending up two weather balloons daily nationwide since 1948, and we see no trends for warming or cooling in the bottom half of the atmosphere. The measurements showing Earth is warming are taken on the surface. We're just not sure of the feedback loops and what part is human-induced.

### If sea levels rise globally, will the Georgia coast be flooded?

**DS:** Along the Georgia coast, any change in sea level will have catastrophic impacts because of the shallow nature of our coastal waters. Around the world, we don't see uniform changes in sea levels. The local sea level is modulated by local geological processes. Two important such processes are local uplift of the earth's surface and the deposition of soil from the continent.

On the global scale, ice melting in the sea doesn't cause a sea level rise — only ice on land, such as Greenland. We know the North Pole is melting, but the South Pole ice sheet is increasing. These problems are complex.

### Can we expect hurricanes like Katrina to hit Georgia?

**DS:** Yes! Major hurricanes have struck Georgia in the past and will in the future, regardless of climate change. We hear about hurricanes only when they hit land, so this year we've

had little news.

In the 1800s, Georgia had six category 3 or higher hurricanes. Thousands of people were killed. We're overdue for a major hurricane. But, as I said, our models can't predict when.

### How does burning fossil fuels fit into global warming?

**DS:** It's very complex. Atmospheric carbon dioxide caused by burning fossil fuels has increased since the 1750s and especially since 1945. Global temperatures have increased during the same period.

However, there isn't a simple, one-to-one relationship between carbon dioxide in the atmosphere and temperature. We expect most of the warming to be at night, during the winter, in the higher latitudes. We might see very little warming during the summer in Georgia.

### If we don't know the impact of fossil fuels, why do anything?

**DS:** We're polluting our environment from coal-fired power plants and driving cars that produce health-harming pollutants. Our national security and economy depend on imported oil. So to control our own destiny, we need to develop alternative fuels.

For Georgia, that means relying much more on passive and active solar power. Biofuels from agricultural and forestry waste show outstanding potential here. Along the coast, wind energy can be developed for peak power demands. No single energy source will solve the problem.

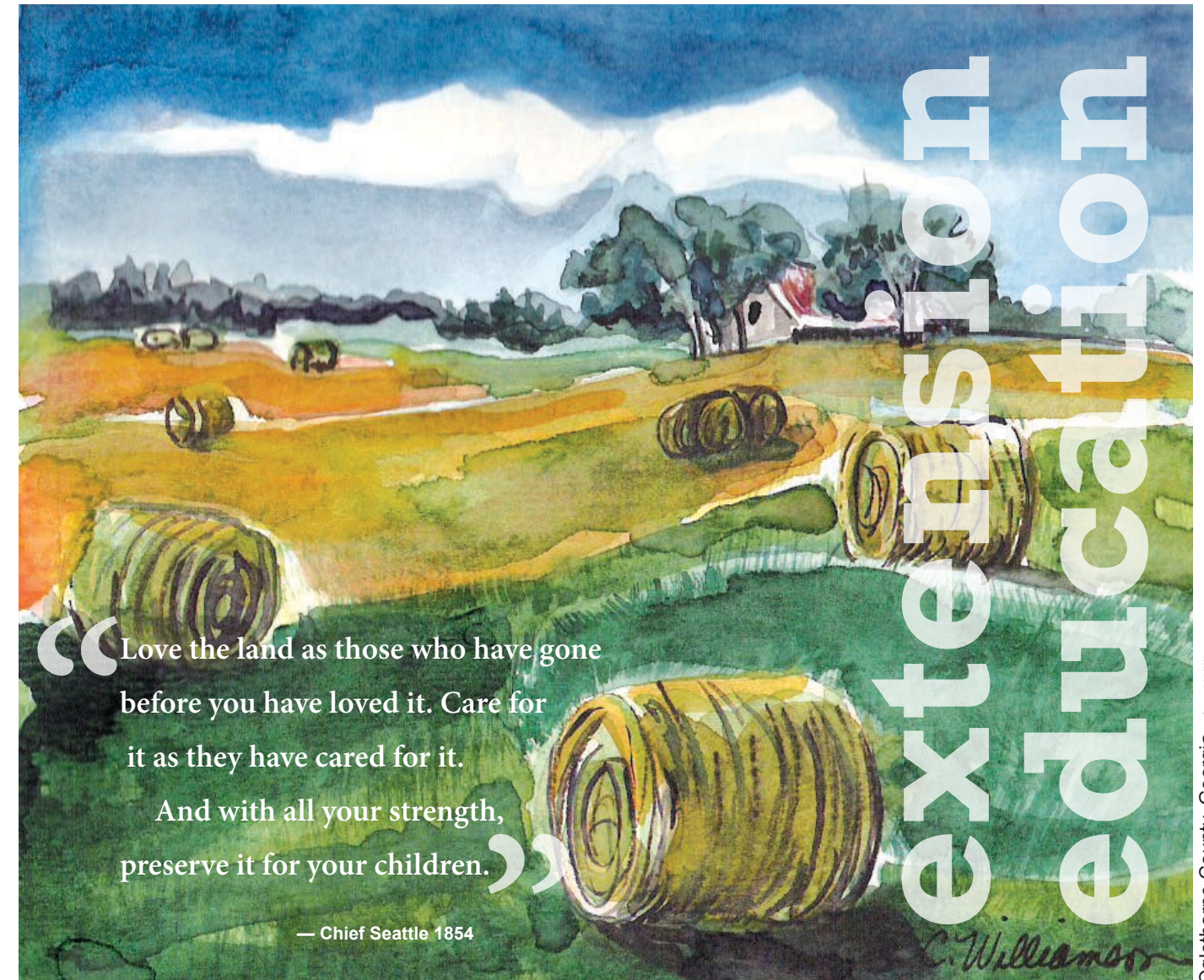
### Do you see any other weather variations caused by people?

**DS:** Yes — population increases and land changes. As soon as we have 2,500 people in a population center, we see warming signals.

Atlanta is much warmer than the surrounding suburbs, often by 10 degrees. Downwind from major cities, we see more major storms. In Southeastern summers, afternoon temperatures in farm fields are higher than in the surrounding forest.

We must plan and design for things we do know, especially in land-use changes.

Susan M. Varlamoff is a program coordinator for the University of Georgia College of Agricultural and Environmental Sciences Office of Environmental Sciences.



Oglethorpe County, Georgia Carol Williamson

## Perdue honors farmers' environmental stewardship

BY FAITH PEPPERS

Jimmy Petty stands tall, his clear, bright eyes surveying the farm. Years of knowing the land and his family's stake in it are drawn deep into the character of his face. Almost a century of Petty history is tilled into this soil.

"We work hard to be better stewards of this land for our grandchildren," he said of his family's toil on the 6,000-acre farm straddling the Georgia-Tennessee line near Chatsworth, Ga. "We hope to leave it in even better shape for them."

Gov. Sonny Perdue acknowledged the success of the family's labors on March 21, 2006, and presented them the first Governor's Agricultural Environmental Stewardship Award at the kickoff ceremony for National Agriculture Week in Atlanta. He recognized the Pettys for not only using sound conservation methods in their farming but also for creating a

stream buffer to protect the Conasauga River.

"Get this," Perdue said during the award ceremony. "They not only created a buffer to protect the river on their land, but the river water is actually cleaner when it leaves their farm than when it entered."

Creating a stream buffer takes part of a farmer's land out of production. But the Pettys have found it to be worth the loss. Since they began their conservation reserve along the river, they've seen more wildlife on their farm.

"We began to see more quail," Petty said. "But we also brought some help to repopulate the quail." They've seen more bobcats and bears, too.

"We consider it huge when a farmer creates a... stream buffer" 1,000 feet long, said Cindy Askew, a district



Petty's Dairy, Chatsworth, Ga., was recognized by Gov. Perdue with the first annual Governor's Agricultural Environmental Stewardship Award.

conservationist with the U.S. Department of Agriculture's Natural Resources Conservation Service. The Pettys have created a stream buffer that stretches 25 miles. The family has created a 35-foot forested buffer and a 30-foot green buffer. And they're planning to add more.

"All this was done out of a love for the land before there were even any incentives in place," Askew said. "Any new lands they add will come under the incentives program. But they've done it without incentives because they saw the benefits."

"I always say that farmers were the original conservation stewards of the land," Perdue said.

The Petty farm has been in the family since 1915. Three brothers — Jimmy, Don and Jerry — and their four sons now farm it. They run a dairy and grow corn, soybeans and cover crops of wheat.

With concerns for water quality and quantity throughout the state, the Pettys use conservation tillage, which establishes crops in the previous crop's residues. This is done to conserve water and reduce soil erosion. In addition, the Petty farm has soil moisture meters and end gun shut-offs on the pivot irrigation systems to further reduce water use and diesel fuel.

"With high energy prices, farmers need to do everything to control their costs," said Louis Dykes, the UGA Cooperative Extension coordinator in Murray County.

Even the water used for the dairy operation is recaptured and recycled. The sludge generated from the dairy operation is land applied to fertilize the crops using best management practices. According to Dykes, the Pettys were the first to use BMPs for nutrient management in this part of state.

"We're proud to see the Petty family recognized for the outstanding work they've done over the years in Murray County," said Dykes who nominated the Pettys "because of the strong reputation they have in this region for their conservation practices."

Faith Peppers is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

## Students get hands-on in service-learning classes

BY STEPHANIE SCHUPSKA

Not all learning happens in a classroom. University of Georgia students are finding this out through something called service-learning, which takes students and professors beyond the typical lecture and lab and into the community.

David Berle, a UGA College of Agricultural and Environmental Sciences assistant professor, applies the concept in his classes. "The students learn out there what they would have [usually] learned in a classroom," he said. "There's a disconnect when you design. When you get out there, you realize things are hard to do, and there are ramifications on what you do."

Berle teaches a residential landscape design class for

the UGA School of Environmental Design and the CAES horticulture department. Recently, his students took part in "Hands On Athens." This multi-agency program helps economically disadvantaged homeowners whose houses have fallen into disrepair.

Students in Berle's class designed and installed new landscapes for four families. On Paris Street in Athens, Ga., homeowner William Barrow sat on his front porch, a smile cracking through his wrinkles as he watched Hands On Athens house captain Drane Wilkinson re-hang his screen door. With plywood taking up space in his back yard and concrete filling his front yard, he had some projects at his home that, at 75, he couldn't handle on his own. Through Hands On Athens and

David Berle, left, gives guidance as his Paris Street team of residential landscape design students dig out the front yard. The redesign of William Barrow's yard was thanks to Hands On Athens, a program which helps homeowners whose houses have fallen into disrepair.



Berle's service-learning class, he got the help he needed.

"This has given me a good idea of the construction side of installing materials," said Larry Brannen, one of Berle's students. "It's a good thing to do to help others like this."

Several students struggled to nail in a new screen, level and build a new porch entrance and move dirt and rocks. The day before they had taken sledgehammers to a deteriorating concrete sidewalk in Barrow's front yard.

Barrow has lived in his home for "about 20 years, I imagine," he said. His sister bought the house from his mother, and both are deceased. He owns half of his home and "the other half is going to my niece."

At a different home, the floor was rotting in. In another, only one electrical outlet was left working. Other groups helped fix these problems while Berle's class worked on the yards.

"It's one of the more successful service-learning landscape projects we do," Berle said. That's saying something, because each of his classes has a service-learning part.

- In his introduction-to-horticulture course, which averages 300 students, he gives credit for a quiz score if students help at other service-learning projects.
- During Maymester's three-week term, he's taking a class to Sapelo Island to survey trees and plants, which will help the dwindling historic community with a land management plan.
- He also teaches a one-hour special-problems class on landscape Spanish. The students in this class cleaned out a ravine, built a park and planted 175 trees at a predominately Latino mobile home park.
- A previous class cataloged trees in the historic African-American Gospel Pilgrim Cemetery in Athens. Another inventoried community landmark trees in Athens-Clarke County.

Berle has been named one of UGA's first five service-learning fellows. The university began the fellow program to cultivate a core group of campus leaders in service-learning, said Shannon Wilder, coordinator of the UGA Office of Service-Learning, in a UGA publication. Service-learning applies academic skills to address real-life needs through a collaborative process between UGA and the community.

To Berle, service-learning integrates a course's content with activities that reinforce the course goals and objectives. "It's good for students to see a slightly different version of the world," he said. "It's another way of doing something instead of something else to do."

**For more information on service learning at the University of Georgia, visit <http://www.servicelearning.uga.edu>.**

Stephanie Schupska is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

## System prevents pests from leaving foreign ports

BY SHARON OMAHEN

For eight years, University of Georgia Cooperative Extension county agents have used digital images, computers and e-mails to quickly diagnose insect and disease problems. Now a UGA team has installed their system in Honduras to protect U.S. farmers and consumers.

### Two DDDI systems have been set up at the Port of Cortez to prevent plant diseases and insects from leaving Honduras.

Called Distance Diagnostics through Digital Imaging, the system is in most UGA Extension county offices statewide. UGA shared the technology with 12 other U.S. land-grant universities and then added Honduras as its first international partner.

Two DDDI systems have been set up at the Port of Cortez to prevent plant diseases and insects from leaving Honduras.

"This is one of only a handful of U.S. Customs offices set up in ports outside the U.S.," said Marco Fonseca, a UGA Extension horticulturist and native Honduran. "A U.S. inspector checks the shipments, so now agricultural products can go straight into our market."

Fonseca says the U.S. benefits are twofold: The nation is further protected from plant diseases and insects entering its borders, and Americans get fresher imported fruits and vegetables.

"The DDDI system at the port is very valuable in terms of biosecurity," he said. "And it expedites the process on valuable, perishable products. We need to I.D. pathogens and pests at that point, not on our shores."

Inspectors are trained to look for pathogens and pests common to the region. Fonseca says with insect pests, this includes training inspectors to recognize all stages of an insect's life, not just the adult stage.

"Barriers like this slow down the movement of pathogens and pests," he said. "It's a defense system to slow down movement. We aren't going to stop the movement of people, so we have to stop the movement of pathogens."

The DDDI systems at the Port of Cortez were two of five installed through a UGA partnership with the Zamorano Pan



UGA horticulturist Marco Fonseca, center, teaches Honduran farmers how to collect plant pest samples. Thanks to a new digital diagnostic system installed by UGA researchers, the farmers can now get quick answers to pest questions.

Courtesy of Marco Fonseca

American School of Agriculture in Honduras. The other three were set up at the university, on a rural ranch and in a farm village.

"The extension system doesn't exist there, so farmers don't have county agents to go to for help," Fonseca said. "Now there's a way for them to get help from the local agriculture university."

Jean Walter, a UGA Extension agent in Jasper County, Ga., knows how well DDDI works, pointing to a weed problem she checked in a farm pond. "I took pictures of the pond, close-up photos of the weeds and then used the dissecting scope to take magnified photos," she said. She e-mailed the photos to a UGA researcher, who quickly identified the problem and recommended how to control it.

Farmers and homeowners like the quick turnaround. "With the high price of gas now, we're seeing a huge increase in the system's usage," she said.

At an aquaculture conference in Panama and later during a church mission trip in Honduras, Walter got the idea of sharing the technology with other countries.

"In Panama, I heard farmers talking about the huge loss their country's shrimping industry suffered due to white spot virus," she said. "This system could have saved Panama and

other surrounding countries millions of dollars."

In Honduras, she saw many ways the DDDI system could be used. "I know 'rural poor' because I've seen it," said Walter, who also lived in the Philippines for five years. "I know what it's like to not have access to health care for people and animals."

Walter gained the support of Fonseca and Don Hamilton, director of the DDDI program at UGA. What she still needed was funding. That came from Robert Fowler of Covington, Ga. Fowler is a trustee with the Arnold Fund, a charitable trust fund created by the late Robert O. and Florence T. Arnold. The trust funds scientific and educational programs that strive to make life better for the citizens of Newton County, Ga., and beyond.

"Each system costs about \$5,000 to set up," Fonseca said. "This includes two microscopes, a camera that mounts on the microscope, a dissecting scope, a digital camera, a computer and a printer."

**For more information on Distance Diagnostics through Digital Imaging, visit <http://www.dddi.org/>.** Sharon Omahen is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

## Sustainable farming in Costa Rica

BY MARCY COBURN

It looks like an overgrown garbage bag heaped in the middle of a field with a pipe connected to its top. Small holes are patched with duct tape, keeping the biodigester from leaking its liquid contents.

Students from the University of Georgia and North Carolina State University were in Costa Rica on an agro-ecology tour when Ana Quirós, the woman whose farm they were visiting, showed how she takes care of her pig's waste.

"The waste from the pigs is filtered, and the solids are used as organic compost for the banana and medicinal plants," Quirós said. "The liquids go into a biodigester."

Quirós' farm is a few miles from Escuela de Agricultura de la Región Tropical Húmeda, or EARTH, an international agricultural college focused on education and sustainable development of the humid tropics. María José is part of a group of eight farms that offer tours of their sustainable farming systems with help from EARTH students and faculty.

### Ana Quirós farms organically. She uses no synthetic pesticides, herbicides, fungicides or fertilizers.



Wayne Parrott

Ana Quirós' biodigester converts her pigs' liquid waste to methane gas and, after many more steps, water. The gas is used for cooking, and after the excess liquid travels through a set of lagoons and water hyacinths, it's clean enough to give back to the pigs.

EARTH has also helped the eight farms devise biodigestors to reduce pollution and achieve energy independence with a water recycling system.

"I like the way biodigestors allow farmers to get fuel, feed, fertilizer and income from waste, as opposed to letting the waste run into nearby streams and pollute them," said Wayne Parrott, a UGA College of Agricultural and Environmental Sciences crop and soil science professor. He heads the annual UGA "Agro-ecology in Tropical America" study-abroad course.

A biodigester looks like an oblong plastic tube about the size and shape of a Volkswagen bus. The liquid waste is pumped into the plastic tube and semi-sealed, where it ferments. Methane gas forms, and the tube inflates. The methane gas is pumped through a set of plastic pipes up to the house to be used

as cooking gas. The liquid waste travels through the tube and flows into a series of small lagoons.

Water hyacinths filter the water as it makes its way through the gravity-fed lagoons. The final lagoon, at the bottom of the gently sloping hill, has water clean enough to raise tilapia fish. As the water leaves the tilapia pond, it's pumped back to the top of the hill to be used in the pigpen, completing the cycle.

Quirós farms organically. She uses no synthetic pesticides, herbicides, fungicides or fertilizers. Using organic compost produced by her pigs, she raises medicinal herbs, vegetables,



Charlie Monroe

Ana Quirós shows University of Georgia students compost produced on her farm.

bananas and fish. Her farm is similar to many farms in the Costa Rican countryside. The difference is her commitment to sustainability. "The conventional banana plantations spray fungicide on their plants twice a week," Quirós said.

Everything on the farm is done by hand. She uses a machete to chop weeds. A small herd of cattle provides manure to fertilize the home garden.

"Seeing María José farm gave me hope," said Jennifer Johnson, a UGA landscape architecture major. "The way Doña Ana ran her farm was very inspiring."

**For more information on UGA's tropical America agro-ecology study-abroad program, visit [www.uga.edu/tropag](http://www.uga.edu/tropag).**

Marcy Coburn works with the Office of Global Programs in the University of Georgia College of Agricultural and Environmental Sciences and is a UGA senior majoring in agricultural communications.

## Workshop addresses pesticide use concerns

BY ELLEN BAUSKE

When a group of parents expressed concerns their children may have had adverse reactions to the chemicals used on a public sports field, Randy Gaddo moved into action.

Gaddo, the director of the Recreation and Library Services for Peachtree City, felt it was time to publicly discuss the safety of the common practice of applying herbicides, insecticides or fungicides to control pests on youth sports fields. Not only did this issue need to be examined, he said, but it needed to be examined in public.

Gaddo contacted Gil Landry, coordinator of the Georgia Center for Urban Agriculture. Together they gathered resources and assembled a panel of experts to discuss the



Photos.com

pros and cons. The experts included turfgrass, weed and soil scientists, an entomologist, a scientist who studies risk assessment to pesticides, and a pediatrician and medical toxicologist. They all donated their time for a free public workshop and panel discussion on how pesticides on playing fields may affect children's health.

The approximately 50 people attending included parents, product dealers, pesticide applicators, parks employees and the local media.

Each panelist stated their specialty in the field and then the floor was opened to questions. Almost two hours of discussion later, these were the highlights:

- Risk assessments are made by comparing field safety and field playability to pesticide use risks. In other words if the pests are not controlled, will the field have enough turf cover to provide a safe playing surface that will not impact game results?
- Weed infestations reduce the quality of the playing field, increasing the risk of injuries.
- The chemicals used on turf may have an effect on children with asthma, allergies, or other health-related issues, but establishing that connection is very difficult.
- Organic treatments were not necessarily safer. Synthetic products undergo strict EPA and other regulator scrutiny before being approved for use, whereas many organic products are not regulated.

The consensus of the panel was that there did not seem to be a problem with pesticides applied to the playing fields since only a tiny percentage of the children may have been affected. The panel also felt parents needed to act responsibly if they felt their children were affected.

The panel supported an Integrated Pest Management program that minimizes pesticide use and maximizes use of best cultural management practices such as selecting grass seed suited to the site, scouting for pests and monitoring weather.

"We feel that minimization of pesticide use is the right thing to do," Gaddo said.

When federally approved pesticides are applied, extra attention will be given to make sure there is no activity on the fields for a minimum of 24 hours.

"The most important outcome of this workshop may not be conclusions drawn or actions that are taken as a result of it," Landry said. "However, we answered the questions and addressed parent's concerns to the best of our ability. It is now up to the parents to assess the risks and take the actions they feel are appropriate for their children."

## Orange Tide takes 4-H'ers on extraordinary journey

BY DAN RAHN

The Sea Monkeys could never have imagined how far those oranges would take them.

"I had no idea we would do more than just gather facts for local scientists," said Nathan Potts, one of the Glynn County, Ga., high school 4-H'ers who call themselves the Sea Monkeys. "We became the scientists."

At first, the group simply had been concerned about the water washing the St. Simons Island beaches. Health advisories had warned of enterococcal bacteria, and nobody knew where it was coming from. So in December 2004, the 4-H'ers launched the first 280 oranges of their "Orange Tide Marshwater Tracking Study." Working with local environmental scientists, they used the floating fruit to track the flow of tidal streams.



Glynn County 4-H

Georgia Conservancy President Jim Stokes (right) looks on as (from left) Harvest Hale, Levi Pembroke, Brandon Smith, Candice Vinson, Nathan Potts and Glynn County Extension Agent Robi Gray celebrate the 4-H Sea Monkeys first-place award in the 2006 Youth Environmental Symposium.

They trailed those oranges and later launches over the following months. They combed beaches and searched from kayaks. They noted the oranges' exact locations with global positioning system gear secured with a grant after the project began.

Based on the group's findings, environmental scientists focused their searches and found enterococcal bacteria sources. The Sea Monkeys found an unexpected source, too: dog feces on the beaches. They mounted an intensive public education campaign to turn that "brown tide" around.

continued on back cover

Glynn County 4-H'ers Jesse Ansotigue (left) and Harvest Hale launching oranges into a tidal creek at high tide. Nathan Potts (right) provides a light, and Miles Wright (background) looks on as the group sets out to track the tidal flow around St. Simons Island beaches. The Sea Monkeys, as they call themselves, could never have imagined how far these oranges would lead them.

In October, four of the Sea Monkeys went to Sea World Adventure Park in San Antonio, Texas. There they were honored as one of eight national winners in the 2006 Environmental Excellence Awards given by Sea World, Busch Gardens and Fuji film. The award included, besides the Sea World trip, \$10,000 to expand and enhance the project; a digital camera, trophies and certificates for every student and group leader, T-shirts for school and community partners and an environmental partnership with the National Geographic Society.

The biggest impact, though, may be where the Orange Tide project is taking the Sea Monkeys next. Will Prince, for instance, moved to Glynn County only a month before the 4-H project began.

"He had never thought of marine biology," Gray said. "But now he wants to be a marine biologist."

Before the project, Hale planned to become a music teacher. "After the study, I realized how much fun environmental science really is," she said. "I want to study marsh ecology."

Potts, too, intends to study environmental science and engineering. "I'd like to work in an area," he said, "where I can bridge science with other fields to solve problems."

The Sea Monkeys went to the National 4-H Technology Leadership Conference in Lincoln, Neb., July 24-27. There, they used expertise they developed in the Orange Tide project to teach other 4-H'ers how to help develop community emergency evacuation maps.

"People from local and state organizations really like high schoolers getting involved and looking for solutions to community problems," Potts said. "I'm very grateful for the opportunity to help my island be a better place."

Dan Rahn is a news editor with the University of Georgia College of Agricultural and Environmental Sciences.

continued from page 27

## As the project progressed, awards started coming. Big awards.

In November 2005, the group won a trip for four to the Earthwatch Conference in Cambridge, Mass. There, they were named a grand prize-winner in the international Earthbound3 Challenge. The honor included a \$12,000 award that sent Potts, Harvest Hale and Will Prince and their 4-H advisor, Robi Gray, on a research expedition in southern Spain. Three students accepted \$1,750 each in lieu of the trip.

The 4-H'ers lived aboard a refitted Norwegian fishing vessel for two weeks in late June and early July. They studied dolphins, whales and sea turtles in the Alboran Sea during the days and spent each night in a different port. In April, the Sea Monkeys took top honors in the Georgia Conservancy Youth Environmental Symposium. The award included \$2,000, a plaque and a number of T-shirts, guide books, water bottles and other prizes.

"YES is a wonderful venue for inspiring young Georgians to take action in their communities," Gray said.