

TENNESSEE

LAND *life &* Science

VOL. 4/NO. 1/2006 • UT INSTITUTE OF AGRICULTURE

A focus on agriculture and
natural resources programs at
the University of Tennessee
Institute of Agriculture

THE UNIVERSITY of TENNESSEE



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E11-1101-00-001-07

One of the big things I've come to realize in the short time I've been at the Institute is how connected we are to helping Tennesseans improve their lives. Our presence in every county is a part of it. But more importantly, agriculture touches our lives every day, and that holds true whether you are part of a traditional rural farm family or live in the suburbs or an urban area.

The way I like to put it, it's like from the tomato on your counter to the bush in your backyard to the turfgrass you play golf on to the food you pick up in the grocery to the environment you enjoy when you go hike or bike ride. It's all about agriculture. And, if you eat, you better be concerned about where agriculture is coming from and what it's doing.

This issue of *Tennessee Land, Life & Science* explores some of our current programs. The Sun Grant Initiative holds an ambitious goal of growing our energy independence through a biomass and bio-

fuels research program that would serve the state and nation well. Rural roundtables are working to identify and meet community development needs, and, through engagement and research, we are combating obesity.

We're really in the learning, discovery, and engagement business—and engagement is particularly important. As an alumnus or friend of the Institute, I hope that you, too, will be engaged. I encourage you to call me or send an email, to communicate both when you're happy about what we're doing and when you see things you feel we could be doing better. I want to hear from you.

In my first nine months on the job, I've made it to many meetings and events across Tennessee, and I've met alumni at those gatherings. As the new academic year begins and as alumni prepare to return for game day gatherings, I hope to meet many more of you, and I welcome your interest in what we're doing at the Institute.

One of the measures of institutes—the very best—is not only the quality of the alumni but also how they continue to be engaged in the enterprise. There's a lot of fan loyalty at UT. I'd like you to continue to be engaged in who we are and what we're about, too.


Joseph A. DiPietro
UT Vice President for Agriculture



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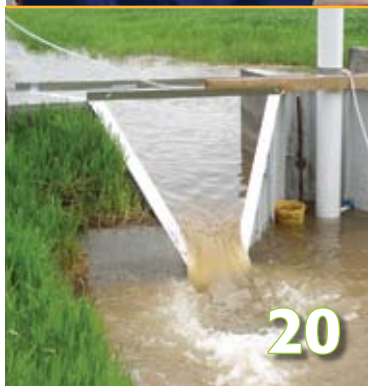
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Alexander promotes biofuels

At a roundtable discussion at UT's West Tennessee Research and Education Center, U.S. Sen. Lamar Alexander said that Tennessee "is well-placed to take a leadership role" in the production and growth of alternative fuels.

Alexander discussed the future of biofuels and the state's agriculture health with an audience of 200 politicians, farmers, and agribusiness specialists.

"Much like the combination of factors that led to the auto industry coming to the South 25 years ago, I see us being unusually well-placed to take a leadership role because of our location and our ability to grow the kinds of things needed to make these new fuels," said Alexander, who chairs the Senate Energy Subcommittee. "I'm excited by the promise, but it's still just promise. We have a long way to go."

Look elsewhere in this issue to learn about what the Institute is doing to help the nation become more energy self-sufficient.

Biotech start-up launches

The first biotechnology start-up company based on intellectual property developed in the Institute has announced that the Tennessee Center for Research and Development (TCRD) has made a substantial investment in the company. "The TCRD investment validates our business model, enables the completion of pre-commercial research, and positions us to accelerate time-to-market," said MycoGenomix chief executive officer Dr. Harry Richards.

MycoGenomix is a biotechnology start-up company that will commercialize intellectual property developed at the Institute to provide

genetics-based solutions for pest management in agricultural and other crops. These solutions hold promise to be more effective and environmentally friendly than those currently available on the market.

The investment by TCRD represents an infusion of private funds that will help leverage the university's intellectual property. MycoGenomix was cofounded by Dr. Harry Richards, chief executive officer, who has a master's degree from UT where he was also a postdoctoral fellow, and Dr. Neal Stewart, who holds the Racheff Chair of Excellence in Plant Molecular Genetics in the Department of Plant Sciences. They are joined by Dr. Don Loveday, a Knoxville native who is the chief operations officer for the company. The company is pursuing additional funding to extend its research program and enhance the UT intellectual property it employs.

Dr. Fred Tompkins, president of the UT Research Foundation, expressed enthusiasm for the company's concept. "MycoGenomix and UT academic collaborators such as Dr. Neal Stewart are delivering novel research, finding new funding opportunities, and creating direct economic benefit from the UT research enterprise."



UT studies issue of vet availability

Large-animal veterinarians face demanding, intense field work as they provide medical services for farm animals. They tend to work longer hours and under more difficult conditions than their counterparts in small-animal practices. These factors, plus economics (vets enter practice with an average of \$80,000 of student loan debt), seem to be causing many prospective large-animal practitioners to seek other career opportunities.

The Institute, at the request of the Tennessee General Assembly House Agriculture Committee, has launched a study into Tennessee's situation with regard to large-animal vets and to determine why their numbers are apparently declining in a state that boasts one of only 28 colleges of veterinary medicine in the nation.

Issues that are being studied include how animal

health care impacts the quality and cost of food as well as the overall future of the state's economy. As part of the analysis and to solicit input for public policy recommendations, the Institute conducted three public forums across the state for citizens to voice their concerns. A transcript from each forum is being compiled and will be used as part of the overall study, as well as provided to the House Agriculture Committee to serve as a benchmark for policymakers on the issue in future years.

Fall events ahead

Join us for two special events this fall that celebrate the state's heritage. The UT Research and Education Center at Ames Plantation hosts its annual Heritage Festival on Oct. 14, and the center at Milan holds a fall folklore jamboree on Oct. 21. More details on the programs can be found at the Institute's Web site, <http://agriculture.tennessee.edu/>.



A focus on rural needs

Fifty-seven of Tennessee's ninety-five counties are considered non-metropolitan. These rural counties contain over sixty percent of Tennessee's land area and twenty-seven percent of the state's population. Though rural and urban counties are, on average, quite similar in area, rural counties have much lower population densities. This provides the idyllic setting for much of what people value about rural Tennessee, yet it also presents unique economic development challenges.

To identify and address these challenges, rural roundtables were held as part of a thirteen-state regional initiative.

Results from the roundtables suggested that the top five priorities for rural Tennessee are:

- Education & Workforce Development
- Economic Development
- Leadership & Citizen Participation
- Public Services/Infrastructure/Information Technology
- Population Change/Migration Patterns

Specific strategies are now being developed to address these priority issues. The research and Extension agenda will be geared towards identifying best practices and facilitating their implementation on a local, state, and regional level with partners that range from local non-profits to federal agencies.

—Michael Wilcox

Building bridges

UT looks to rural areas as engines for growth in a global economy

In August, President Petersen unveiled UT's new strategic plan, which calls for research and outreach initiatives in areas such as economic development and globalization. From the mighty Mississippi to the mountains of East Tennessee, UT recognizes that the state's rural areas are vital to our continued growth and success as a state competing in a global economy.

To this end, UT and Tennessee State University recently hosted rural roundtables in Jackson, Cookeville, and Morristown, each chosen to represent the diverse assets and needs of its region. The information gleaned from these meetings should prove invaluable as UT strives to strengthen the well-being of all communities in Tennessee, especially those in rural areas.

"The forums discussed current issues and viable solutions that focus on strengthening rural communities," said Dr. Michael Wilcox, a rural economic development specialist with UT Extension. Funding was provided by the W.K. Kellogg Foundation and UT, with leadership from the Southern Rural Development Center and expertise from UT Extension and the Institute for Public Service.

The roundtables sought to identify positive features associated with

rural Tennessee; prioritize action steps to strengthen the future of rural areas; refine strategies and initiatives that offer unique opportunities for rural areas; and share ideas on the role of the land-grant university in terms of research and education related to rural development. The roundtables were open to all, including representatives from government, business, and civic organizations.

Dr. Wilcox's work reaches beyond the borders of Tennessee. With a \$100,000 grant from the International Institute of Tropical Agriculture, UT Extension is assisting the Sustainable Tree Crops Program and the Ministry of Agriculture in Liberia to rebuild that nation's tropical tree crop sector, which



Listening sessions in each of the state's three grand divisions focused on needs and issues.



Kadalla Grey, in the UT cap, is one of the roundtable participants in Liberia who is working to raise the income of cocoa farmers in that nation.

is primarily cocoa. This requires working with institutions in the United States, Britain, Belgium, Cameroon, Ghana, Nigeria, and Liberia. "A total of thirty-five attendees met in Monrovia, the capital of Liberia, to conduct roundtables similar to those held this summer in Tennessee," Dr. Wilcox said.

"In Liberia, a country the size of Tennessee that has been devastated by civil war, the vast majority of the population is engaged in agriculture; therefore agriculture is going to be a driving force in the rebuilding and revitalization of the Liberian economy," Dr. Wilcox explained.

"The idea was primarily to share experiences and to assist the Ministry of Agriculture to develop policy initiatives geared towards enhancing cocoa production and fostering the creation of markets that would provide fair prices for all actors in the marketplace, especially farmers," he said.

—Leslie Ogle

Rogers Group blazes trail for the UT Arboretum

The Rogers Group has a long history of paving the way. Literally. Founded by Ralph Rogers in 1908, this privately owned company is in the business of providing crushed stone, sand and gravel, asphalt, and highway construction in five states. With a strong tradition of community and environmental support, they've taken their commitment to a new level for the UT Arboretum in Oak Ridge, helping ensure its future by pledging \$500,000 toward the \$3 million endowment the Arboretum plans to raise.

The Rogers Group's Oak Ridge facility is adjacent to the 2,260-acre Forest Resources Research and Education Center, where the UT Arboretum is situated. Rogers Group has a longstanding relationship with the Arboretum, a cherished community landmark that attracts over 35,000 visitors each year. Rogers Group also has a history of being a good corporate citizen and environmental steward.

According to Rogers Group Vice President David Rechter, "Supporting the UT Arboretum is a natural fit for our commitment to the communities we work in. When the University of Tennessee approached us to make a lead gift and seed the \$3 million initiative to endow the Arboretum, we knew we wanted

to be a part of the effort. The UT Arboretum is an important part of the community and a good neighbor that serves as a resource and outdoor classroom for area schools, Boy and Girl Scouts, university students, and local residents. We're proud to lead the way."

The UT Arboretum is indeed an important community resource. Functioning as a 250-acre living museum and forested retreat, the Arboretum represents East Tennessee's natural heritage with over 2,000 plant specimens representing more than 800 species, varieties, and cultivars. The Arboretum functions as outdoor classroom and laboratory for students and faculty alike.

"We've always enjoyed a strong relationship with Rogers Group. They have a great company ethic when it comes to people, community, and the environment," said Richard Evans, director of the UT Arboretum. "Because of their leadership and commitment, we're well on our way to ensuring the future and viability of the UT Arboretum for generations to come."

The campaign to build an endowment is part of a larger vision to expand and care for plant collections, including dogwoods, hollies, junipers, magnolias, and more.



The endowment will help improve facilities and create robust educational and outreach programs. Evans also hopes to eventually be able to hire a full-time coordinator for the Arboretum to help manage those programs.

"We recognize that to continue providing valuable programs and expand collections in meaningful ways, we must have the support of individuals and corporations alike. We're thankful to the Rogers Group for helping us create great momentum," said Evans.

To learn more about supporting the UT Arboretum, contact Richard Evans at (865) 483-3571 or Rhodes Logan at (865) 974-1928. Visit the UT Arboretum Society online at www.utarboretumsociety.org. To learn more about the Rogers Group, visit them on the Web at www.rogers-groupinc.com.

—Amy Yancey Jenkins

UT Arboretum facts

- Established in 1964, the Arboretum is recognized by the Holly Society of America as an official holly test garden.
- The Arboretum is designated an official observation area as part of the Tennessee Wildlife Resources Agency's National Watchable Wildlife Program.
- Five miles of trails provide access to plant collections, displays, and native forests as part of the Tennessee Recreational Trail System.
- The University of Tennessee Arboretum Society has been a key University partner for over 41 years, contributing more than \$250,000 in donations and countless volunteer hours.

UT Trustee Waymon Hickman creates charitable trust for UT and other charities

Waymon Logan Hickman, Sr. knows his way around the University of Tennessee. In fact, he's been actively involved with UT since his days as a student in agricultural education in the 1950's. While his generosity comes as no surprise to those who know and work with him, this trustee and community leader has taken his commitment to the Institute of Agriculture and volunteer spirit to new heights.

Over the years, Hickman has served in several prominent roles within the Institute and the larger community, including serving as president of the Maury County Alumni Association, a member of UT National Alumni Association Board of Governors, and Public Affairs Committee. In 1989, Hickman agreed to serve on the inaugural UT Agricultural Development Board. He was appointed to the Board of Trustees in 2000, serving as chairman of the University Audit Committee and member of the Investment Committee. He and wife Helen live in Columbia, where he recently retired as chairman & CEO of First Farmers & Merchants Bank after a career that spanned 47 years. He has served on both the Federal Reserve Bank of Atlanta and as president of Tennessee Bankers Association. Hickman has served on the boards of Columbia State Community College and Martin

Methodist College, and as president of the Graduate School of Banking at Louisiana State University, president of Middle Tennessee Council Boy Scouts of America, chairman of Maury Regional Hospital, and as an active member of First United Methodist Church.

Now he's taken on yet a new role, that of benefactor.

On June 23 of this year, Hickman gave the largest single gift ever given by a UT Trustee to the Institute of Agriculture. The university is projected to receive \$1.2 million with \$600,000 designated for endowing two new Institute programs through a charitable remainder trust. The donation will be used to establish the Waymon Logan Hickman Agricultural Scholarships and the Waymon Logan Hickman Improvement Fund for the UT Middle Tennessee Research and Education Center. Generous gifts are also designated for Columbia area charities including Columbia State Community College, Maury Regional Hospital, Martin Methodist College, and the Middle Tennessee Council of Boy Scouts of America. Hickman also made provisions for remaining funds to be designated to the University of Tennessee at Martin's College of Agriculture and Applied Sciences and the UT 4-H Program.

"We're fortunate to have Waymon Hickman as a friend and leader," said Vice President for Agriculture Dr. Joseph DiPietro. "He recognizes the importance of agriculture across the state as he guides and leads the university in his role as trustee. Now he's invested considerable personal resources to make a substantial gift that will have real impact on students and residents across Tennessee."

The newly created Waymon Logan Hickman Scholarships will be awarded to outstanding students who wish to pursue degrees in agricultural education. "My degree has served me well in many facets of life, from my lifelong profession as a banker to serving on the University of Tennessee Board of Trustees," said Hickman. "I hope that by establishing scholarships, young Tennesseans will have the opportunity to successfully pursue their career goals in agriculture."

Hickman's contribution to the Middle Tennessee Research and Education Center will create and support educational programs and incentives, including merit awards for exceptional employees, professional development programs, and scholarships for children of employees of the center.

"The Middle Tennessee Research and Education Center endowment

will provide incentives for the continued hard work of researchers and give them the resources they need to continue the wide array of successful programs crucial for Tennessee producers. This is my way of giving back to the university and its outstanding employees," Hickman said.

"Waymon Hickman has been a great leader for the university and a long-time advocate of agriculture programs across Tennessee," said Buddy Mitchell, associate vice president for agricultural development and government relations. "Now, through his vision and generosity, he has ensured a new generation of qualified agricultural educators and provided the Middle Tennessee Research and Education Center with incentives for their outstanding work."

For more information regarding charitable remainder trusts, contact Dennis Jones at (865) 974-7396 or djones@utk.edu.



Waymon Hickman, center, with Dennis Jones, left, and Buddy Mitchell

Combating obesity

Institute takes teamwork to tackle a serious issue

First a snug waistband, then the need for clothes the next size up. Weight has a way of creeping on. Tennesseans know the steps all too well.

The good news is that things don't have to stay that way. UT nutrition specialists are working to provide citizens with the tools, life skills, and knowledge to fight weight gain. And it's a fight worth winning. Obesity is a serious matter that yields enormous cost. Being overweight is one of two key risk factors associated with increased mortality. It is also a risk factor for chronic diseases such as diabetes,

heart disease, and cancer. There are social costs, as well. By one estimate, the cost to Tennessee's economy in 2004 was \$1.8 billion.

When Dr. Shirley Hastings considers the statistics for Tennessee, she sees an epidemic. The associate dean of UT Extension Family and Consumer Sciences notes that 62 percent of Tennessee adults were considered overweight or obese in 2002. That same year, according to the Centers for Disease Control and Prevention, 16 percent of kids ages 6 to 19 were overweight and an additional four of every 10 school-age children were at risk of becoming overweight.



Tennessee Shapes Up — Eating healthy is one of the key messages taught to employees at the Leroy Somer industry in Lexington. In Henderson County, 338 participants in Tennessee Shapes Up have lost a combined 749 pounds of weight and walked 25,200 miles.

"If we do not deal with this epidemic, today's younger generation will, for the first time in the modern era, experience shorter and less healthy lives than their parents," Hastings notes.

In response to the problem, UT Extension Family and Consumer Sciences launched the statewide nutrition education and physical activity initiative "Tennessee Shapes Up" in 2004. This spring they followed up with a youth pilot program called "Power U."

Tennessee Shapes Up

The aim of Tennessee Shapes Up is to guide Tennesseans in how to achieve and maintain a healthy weight. The key messages are eat smart, move more, and tune in—the latter meaning to be more aware of when eating or overeating occurs due to emotional situations, such as stress or frustration.

Those messages are distributed statewide by Family and Consumer Science agents. Since January close to 100 agents have made 104,014 direct contacts related to the program, sharing information about nutrition and fitness in group meetings and demonstrations or in response to visits to county Extension offices and in other ways. Add to this an additional 404,878 indirect contacts, such as exposure through news articles, radio programs, and Web-based material, and the program has substantial reach.

Brenda Stephens can attest to the program's success. While help-

ing to prepare Tennessee Shapes Up resource materials, Stephens decided to put some of the recommendations into practice in her own life. She replaced sugary soft drinks with diet ones. Then she started walking two miles a day and watching portion sizes. She lost 63 pounds in the first year.

"The weight has come off. I feel better than I have in 20 years," Stephens says.

Stephens is quick to emphasize that she's not on a diet. "I'm not, because you can go off of a diet, and when you do, you gain the weight back. This is a lifestyle change that you have to make, and it's not a hard one."

"In Tennessee Shapes Up, we're focusing on small steps that anyone can take to eat smarter and to get more steps into their day anyway they can, such as park the car further away and take the stairs instead of the elevator," says program director Dr. Betty Greer. Other key messages are choosing healthy foods, food balance, and portion control.

Instilling life-long good habits

A typical fourth grader studies reading, math, and social studies just about every day. But now some Tennessee children are also learning about nutrition and physical fitness when the school bell rings. This spring "Power U" was offered as a pilot program in five middle Tennessee counties, and the hope



is to expand the program to many more areas in this and coming school years.

At Coles Ferry Elementary in Lebanon, the program had fourth graders boogying through the classroom on a *Soul Train* dance line. The exercise, disguised as silliness, got the students moving.

Wilson County Extension Agent Shelly Phillips teaches the children that to stay healthy they need to get moving. "These children are at an age where they form so many habits, and it's best to get them to form good, healthy habits now instead of correcting a problem later in life."

Environment can be a large part of the problem, says Dr. Janie Burney. "Depending on where they live and how safe their neighborhood is, they may come home from school and not do much in the way of physical activity. Instead they may be inside on a computer, watching television, doing the kind of things that lead to weight gain."

Power U seeks to turn that dynamic around by emphasizing steps that children and their parents can take for better fitness and nutrition. During the pilot stage this spring, data was collected using a food frequency questionnaire and

a parental survey about diet and physical activity behaviors in the family. That information is now being analyzed, and the results will be invested back into the program to optimize its impact.

Power U is a team effort. The program is offered in collaboration with local school systems and in partnership with Vanderbilt University Medical Center, with funding from Blue Cross/Blue Shield Health Foundation of Tennessee, the Memorial Foundation, and the Farm Bureau Tennessee Farmers Insurance Companies, and Farm Bureau Rural Health Plans.

"One of the greatest strengths of these programs is their capacity to reach large numbers of people in communities across the state," says Dean Hastings. "Extension agents, trained by Family and Consumer Sciences faculty with expertise in nutrition, health and family relations, implement the program through a vast network of public and private partnerships."

Research on obesity

In the late 1990s, a discovery came from UT's Department of Nutrition that surprised many. In studies funded through the Tennessee Agricultural Experiment Station, a team of scientists found that when people increased their consumption of low-fat milk, yogurt, or cheese while decreasing calories overall, bodies that are accustomed to storing fat suddenly find themselves breaking fat down and burning it at higher rates.

Today Dr. Michael Zemel continues to build upon that finding through research and applications focused on obesity. His recent research indicates that not only do people lose more weight on a dairy-rich diet, but they also preserve muscle. "We think of it as a metabolic shift, where we're shifting energy metabolism away from storage in fat towards utilization of calories in muscle to support new protein synthesis, new growth, and development. A lot of our work has been focused on how that happens and how to optimize it."

Zemel has also found that there are components in milk that potentially activate a body's own antioxidant and anti-inflammatory defenses. Since inflammation is often a dangerous side-effect of being obese,

learning that dairy can stimulate the body's own defenses is good news for dairy lovers. Zemel's science on the subject is due to be reported this fall in the *International Journal of Obesity*.

Through simple steps, such as increasing physical activity, cutting calories, and adding low-fat dairy to diets, Zemel sees the ingredients Tennesseans need to become more fit and lose weight.

"Great fitness promises are difficult to keep," Zemel says. Instead it's the small changes that can be made to people's existing lifestyle that are more successful. "It's motivating. It feels good, and that's why people continue to do it."



Walk Across Tennessee —Dyer County participants in this statewide program have accumulated enough mileage to walk around the equator nearly 3.5 times. Even more impressive are their reports of weight loss and lowered blood pressure, along with the response that 98 percent of participants planned to continue fitness walking after the program's end.



Tennessee's transportation system and climate make the state ideal for the production of large volumes of biomass and for the location of bio-based industries.

Harnessing the Power of Biomass

UT's Agricultural Experiment Station is primed to support bio-based energy and industries

In the midst of the current energy crunch, researchers with the University of Tennessee Agricultural Experiment Station are developing bio-based solutions to put America on the road to energy independence and revitalize rural communities in the bargain. As plant materials are increasingly tapped to displace imported fossil fuels and petroleum-based products, market opportunities abound.

A new industry is emerging as the nation shifts toward a bio-based economy. Experiment Station sci-

entists have been working at the forefront to help farmers develop feedstocks that can be used by businesses to produce a plethora of new bio-based products. Renewable fuels such as ethanol are among the best known non-food uses for farm commodities, but the potential exists for many other bio-based products, including pharmaceuticals, building materials, bioplastics, textiles, lubricants, solvents, and adhesives.

Established as a national research priority, the federal Sun Grant Initiative encourages investment in

alternative uses for agricultural commodities. As the Initiative's Southeastern Regional Center, the Experiment Station is building partnerships within UT and between the university and national laboratories, other universities, private sector entities, and local, state, and federal governments to promote greater innovation and development related to biomass materials. The push is across two fronts: reducing the nation's dependence on foreign oil and reducing the environmental impacts of energy consumption. Biofuels recycle carbon already present in Earth's biosystems. In contrast, petroleum introduces carbon to the environment in the form of carbon dioxide, increasing the level of greenhouse gases.

"We expect the breakthroughs coming from our research programs will make biomass conversion technologies economical, so businesses can thrive by going to market with them," says Dr. Thomas Klindt, the Experiment Station's interim dean. Already, Klindt adds, UT researchers are working with companies and looking for additional business and community partners to explore opportunities for collaboration.

Southeastern potential

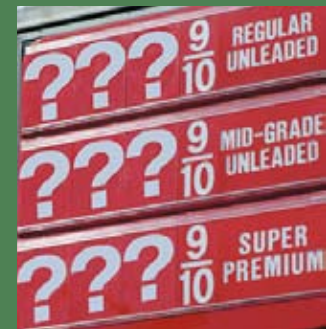
Traditionally, most ethanol is distilled from corn. However, fuels obtained from the cellulose fibers in wood chips, switchgrass, and farm residues—as opposed to corn kernels—could yield far greater energy returns, notes Dr. Tim Rials, who is spearheading the Experiment Station's Sun Grant activities. In addi-

tion, Experiment Station researchers are looking at ways to multiply that return by developing products that use a residue, called lignin, left over once the cellulose has been extracted from the woody biomass.

In this respect, the Southeast, particularly Tennessee, has a huge comparative advantage over other regions. Its temperate climate and long growing season produce a vast array of agricultural crops, trees, and other perennials perfect for use as the raw materials for fuels and other bio-based products.

"As we move into the biomass arena, it's really breaking down the walls be-

Biomass research and development offers the promise of predictable and affordable gas prices.



Current technology harvests only grain to make ethanol. The power of biomass is derived from the whole plant, grain and chaff.



tween agriculture and forestry,” Rials says. “When we start to talk about biomass and what can be produced from it, it doesn’t matter whether it’s wood or soybean stalks or switchgrass, it’s really the chemical raw material that we’re working with.”

Key to this push toward a bio-based economy are partnerships across various technical disciplines, Rials adds. The Sun Grant Initiative is pulling a number of ongoing research activities into a multidisciplinary, systematic approach for providing the technologies needed to make bioenergy and bioproducts a reality.

The efforts encompass everything from assessing different agricultural

and forestry materials for their feedstock potential to engineering and optimizing manufacturing plants for more efficient conversion of feedstocks into products, to developing new products. For example, Experiment Station scientists are working with researchers at the Oak Ridge National Laboratory to make carbon fibers from lignin. The high-strength, lightweight materials enhance the manufacture of various components, among them automotive parts and sports equipment like tennis rackets and golf clubs.

The biorefinery: A new test bed for research

Experiment Station scientists are extending their research capabilities by constructing an integrated, multi-process bioconversion plant. The small-scale plant will make the leap from the laboratory to the demonstration phase.

In a petroleum refinery, crude oil goes in at the front end, and gasoline comes out the back end. During the process, other chemicals get pulled off to form the building blocks for a vast number of high-value products and materials. It is these relatively small-volume, high-value chemicals that subsidize the fuel production.

In the case of UT’s biorefinery, renewable feedstocks will go in at the front, and fuel-grade ethanol will be the product. A number of conversion, separation, and purification processes will be integrated into the system to make other bioproducts.

“The refinery will create new research capacities, as well as development around feedstocks using existing processes,” Rials says. Businesses will also be able to contract for research and development services to demonstrate the potential of their technologies and products.

The final ingredient for success

In addition to research and Extension programs, the Sun Grant Initiative emphasizes education as a strong component in building bio-based industries. The Experiment Station, together with its university partners in North Carolina, was recently awarded funding from the USDA to develop a graduate level curriculum in biomaterials and biomass processing and use.

“We’ve got an industry that’s looking for somewhere to land, and we’ve got UT providing access to research skills and capabilities,” Rials notes. “To encourage successful economic development, UT plans to provide a well-educated workforce..”

—Kris Christen

Sun Grant Basics

- The Sun Grant Initiative is a network of U.S. land-grant universities and U.S. Department of Energy laboratories partnering to stimulate the development of renewable energy and new bio-based, non-food products and industries.
- As the Initiative’s Southeastern Regional Center, the University of Tennessee Agricultural Experiment Station coordinates competitive grant opportunities for biomass researchers in nine Southeastern states, as well as Puerto Rico and the U.S. Virgin Islands.
- UT’s biomass research emphasizes policy analysis, feedstock assessment and preprocessing, processing and conversion technologies, co-product utilization, and value-added bio-based products and technologies.
- Projected to open in March 2007, UT’s new demonstration refinery will allow businesses to test bioconversion technologies and bio-product development techniques.

Researchers are studying biomass extracts to determine which have the potential to replace petroleum by-products in manufacturing processes.



For information about using our facilities or partnering with a research effort contact:

**Dr. Tim Rials, Director
Sun Grant Initiative
Southeastern Regional Center
(865) 946-1129
E-mail: trials@utk.edu
<http://sungrant.tennessee.edu>**

**Dr. Thomas H. Klindt,
Interim Dean
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Experiment Station
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E-mail: tklindt@utk.edu
<http://taes.tennessee.edu>**

Unlocking biomass' potential

A bioprocessing project underway at the Institute is tackling problems related to size reduction and separation of biomass to improve the production of energy and bioproducts. The team is addressing an area of biomass science where not much is known.

A simple definition of biomass is material of recent biological origin. A more complete definition is any organic matter that is available on a renewable or recurring basis including but not limited to dedicated energy crops, agricultural crops and trees, food and feed crop residues, aquatic plants, industrial, municipal and agricultural solid wastes, forestry residues, and other fundamental cellular structures such as sugars, starch, and lignocellulose. Biomass is primarily produced from water and carbon dioxide by the process of photosynthesis. Biomass is from sustainable natural resources



Processed biomass can capitalize on the U.S.'s "Middle East" of carbohydrate production capability.

and therefore they renew at such as a rate that they will be available for use by next and future generations.

Unprocessed biomass has few applications. Processed biomass opens many opportunities to capitalize upon what has been described as North America's "Middle East" of carbohydrate production capability. Some may have previously referred to this capability as the "world's bread basket."

Various platforms convert biomass into usable products using chemicals, enzymes, or heat. However, before these platforms can perform, biomass must be supplied in a conversion-friendly form. The biomass is often referred to as feedstock though the application is for an industrial conversion and not as animal feed. Processing the biomass feedstock, or bioprocessing, often involves the handling, drying, grinding, and pre-separation of plant parts.

Objectives for UT's interdisciplinary bioprocessing team are to:

- Develop a proof-of-concept integrated biomass size reduction and separation system that uses energy-optimized, low-cost physical processes, and a commercialization path,
- Identify commercially-needed process control factors for the integrated size reduction and separation system to universally accommodate a variety of biomass feedstocks, and
- Demonstrate the integrated biomass size reduction and separation system to biomass

processors, converters, and users through exhibits and one-on-one contact.

You can learn more about their work at www.biomassprocessing.org/ or by contacting Dr. Alvin Womac at (865) 974-7104, awomac@utk.edu.

Bioweb to unify biomass knowledge

Information on biomass and its uses is cropping up everywhere. UT's Southeastern Sun Grant Center is pulling this knowledge abundance under a single roof to provide organized, one-stop shopping for those seeking knowledge about bio-based energy development.

"The Bioweb is essentially an online encyclopedia of everything we know about biomass," says Dr. Kelly Tiller, an agricultural economist with the Tennessee Agricultural Experiment Station and leader of the effort. "We're hoping it will be a valuable educational tool for a lot of different people given all the emphasis in this area right now."

Major sections include biofuels, bioenergy, and bioproducts. Two categories that cut across each of these areas—feedstocks and biorefineries—add in the different materials used to create these new fuels, power, and products and highlight an integrated systems approach for producing them all together.

What sets the online tool apart from a printed resource are the various search capabilities and level of detail



Dr. Kelly Tiller leads a national effort to coordinate biomass information.

provided. What's more, the material is presented in a standardized manner so that side-by-side comparisons can be made, something that is difficult to do at present. And the resource takes into account that user needs will vary. Depending on how much detail you want at any time along the way, you can click from the bare basics summary version, to the newspaper style general public version, to the research-oriented, academic version and back again.

To provide a truly comprehensive picture of the state of knowledge on biomass, Tiller has pulled together a wide variety of experts from universities, private industries, government agencies, national laboratories, and private non-profit think tanks from all areas of the country to compile the web content.

The Bioweb site, www.bioweb.sun-grant.org, will be unveiled in March 2007.

Contact: Dr. Kelly Tiller, ktiller@utk.edu, (865) 974-7407.

—Kris Christen

Learning life

In Nashville, 4-H youth learn skills for the workplace



It's a fact of life. Children grow up and become adults. And one aspect of adult life is finding a career. Tennessee youth in a special 4-H program are getting an early start on the working world. In a game simulation in Nashville, the kids learn that landing a job takes careful planning.

Much like the real working world, a job move can be a roll of the dice. Here it literally happens in a board game called "Careers." Roll an eight and land on the square that says "Promoted to Vice President" and you get a pile of play cash. But find the space that says you've been caught gambling, and you have to give some back. It's one of the fun activities for kids in the 4-H Works program.

"Our main focus, our main goal is to prepare them for the world of work," says 4-H Agent Justin Crowe, who

4-H Agent Justin Crowe sees great potential in all youth.



Life simulations like this board game encourage youth to think ahead.

helped start the program at several inner city locations in Nashville.

Crowe says that every kid has potential and that they can succeed with the right guidance.

"These young people just need some motivation. They need some education to let them know there are opportunities. Just because I live in a certain neighborhood or just because I have a certain background makes no difference. There are jobs out there, and everyone can find what they're good at or what they enjoy."

4-H Works is for middle school children, many of whom will be looking for part-time jobs within a few years. Here they learn practical skills like how to fill out an application, what goes on a résumé, and how to spiff up for a job interview.

The youth do team building exercises to learn about getting along with others and communication skills. They also play computer games where they make choices in working world scenarios.



4-H Works emphasizes teamwork and communication skills.

It's good practice for 4-H'er Briania Smith. When asked what she might like to do one day, Smith says be an actress or maybe a teacher.

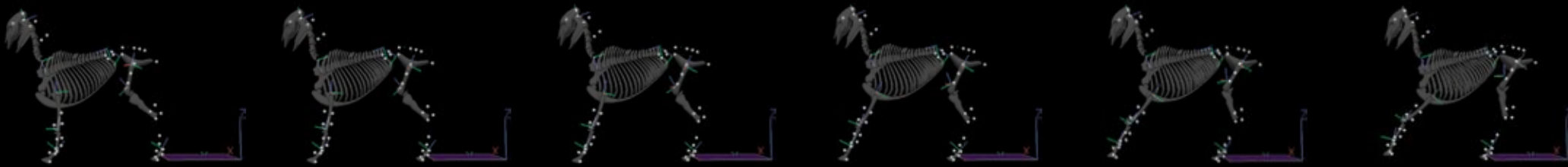
Community leaders say they like that attitude—and it's important to reach kids with messages about careers, even at this young age.

"I think it's imperative," says Tony Hall of the Martha O'Bryan Center, "especially in the community in which we serve because there's not any exposure to it until they're probably 11th, 12th grade when they're attempting to gain a job. So our goal in partnering with 4-H is to help our kids gain some knowledge and experience."

While their "career" may be a game now, before you know it, the rules change. Today's kids will be tomorrow's work force. And now's the time to prepare.

Tennessee received a grant to implement the 4-H Works program in Nashville. The money came from J.C. Penney Company and NFL Charities.

—Chuck Denney



Walking Horse owners show their Volunteer Spirit

Gait analysis studies seek to quantify the relationship between equine form and function.



In 2005, owners from across the state brought their prized Tennessee Walking Horses to the University of Tennessee to participate in a study of the horse's signature gait, the running walk. Thanks to this volunteer spirit, researchers in the Department of Animal Science at the Institute of Agriculture hope to better understand the biomechanics of the gait. Their study is validating the use of three-dimensional modeling to assess horse movement—an approach that could offer both veterinarians and breeders a new diagnostic tool for their work.

"What we've seen," Roberson says, "is a remarkable uniformity in the speed of the running walk across horses of different training backgrounds. While the horses in this trial exhibited varying degrees of action or smoothness, they all covered ground at a similar speed. Also, each horse was very consistent in terms of gait characteristics from stride to stride. These horses worked very well for validating the 3-D system."

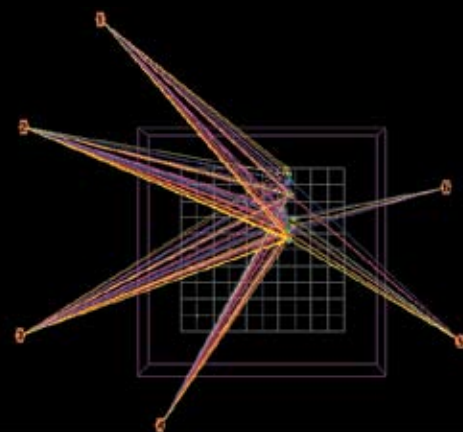
"All sorts of owners brought their registered horses, from as far away as Shelbyville" says Dr. Cheryl Kojima, an assistant professor in the department. "We were pleased and surprised at the variety of people who came," she says.

The smooth, rhythmic one-two-three-four beat of the running walk has long made the Tennessee Walking Horse prized among farmers, pleasure riders, and show-horse owners. But buyers can't always tell by looking if a horse will ultimately demonstrate the desired qualities of the gait or, even more important, if the horse is put together in such a way that it will remain sound.

Enter modern technology. Sixteen registered Tennessee Walking Horses participated in the high-tech gait analysis conducted at the Brehm Animal Science Arena in July and August, 2005. The goal was to determine the relationship between conformation—the anatomical structure of the horse—and the quality of the gait. "We propose that there is a relationship between the structure and the movement that is quantifiable," says Paul Roberson, a master's degree candidate in Animal Science. The researchers attached reflective markers to the horses under saddle

and tracked them so a 3-D analysis of the horse's movements and anatomical structures of interest could be performed. Six infrared high-speed cameras placed around the arena and connected by cables to a data station captured the details of movement and velocity as the horses performed. The researchers are now analyzing the data with computer software that essentially rebuilds the structure of the horse mathematically based on the tracked markers, in order to identify and define relationships between structure and function.

Six infrared high-speed cameras placed around the arena and connected by cables to a data station captured the details of movement and velocity as the horses performed.





The researchers attached reflective markers to the horses under saddle and tracked them so a 3-D analysis of the horses' movements and anatomical structures of interest could be performed.

"Virtually all previous studies of horse movement have been in two dimensions," Kojima says. "Yet the horse is moving in all planes. Three-dimensional analysis is more accurate, plus it gives a lot more information. For instance you can track whether a horse is tracking straight."

The equipment was borrowed from the Biomechanics/Sports Medicine Lab of the Department of Exercise, Sport, and Leisure Studies, and Dr. Songning Zhang, the lab's director was on hand to help in data collection. There were challenges to adapting the equipment, normally used

Expanding equine program

This fall, a new horse science instructor will be teaching in the Department of Animal Science. Trinette Ross, a graduate teaching associate and master's graduate of Texas A&M will guide the department's Equestrian Team, as well as teach Animal Science 285: Horse Handling and Care.

Her presence is part of a growing focus in Animal Science on equine studies, says professor and department head Dr. Alan Mathew.

"There are more families in Tennessee who own horses than all the other livestock commodities combined, so we can touch more people with an equine program, although we're not going to slight our traditional livestock activities, either. We'll remain strong in them, and they'll remain important to Tennessee agriculture."

More than 50 percent of entering animal science students indicate an interest in horses, and the department's activities attract

involvement by non-ag majors, as well. "These are students who may maintain a horse here or a few counties away and want to be involved in the Equestrian Team or Horse Club or some of the other things our department is well positioned to provide them," Mathews says.

Interest in 4-H horse project remains high, as well. Close to 21,000 Tennessee 4-H'ers take part in the program every year.



New instructor Trinette Ross will guide UT's equine programs.

in an indoor lab to analyze human locomotion, including overheating of the control unit. The horses also occasionally injected an element of unpredictability. "With people, you can tell them not to move," says Zhang. "I am delighted to work on this collaborative project with the Department of Animal Science."

The technology may become useful to prospective buyers, whether they are investing in a \$2,000 pleasure

horse or a \$1,000,000 racehorse. For now, it's an expensive venture, but with the rapid deployment of new technologies, the researchers see promise that it will become an affordable tool to assist veterinarians in lameness diagnosis and treatment evaluation. For breeders the system could aid in determining winning mating strategies.

—Elise LeQuire



Equine physical rehabilitation: treating the whole horse

Modern veterinary practitioners have a wide array of preventive and therapeutic approaches to treating their charges, from vaccinations to antibiotics to surgery. The medical “black bag” of the 21st century also includes complementary treatment options designed to enhance performance, recovery, or rehabilitation of

the equine patient, whether it’s a high-level endurance competitor, or an aging backyard pony.

Equine physical rehabilitation basically helps an animal recover from disease or injury to regain its best possible function, says Steve Adair, MS, DVM. “The umbrella of rehabilitation includes a range of treatment modalities, from the underwater treadmill to different types of hot and cold therapy, therapeutic ultrasound, electrical stimulation, pain relief, joint mobilization, and hyperbaric oxygen therapy,” says Dr. Adair, an associate professor of equine surgery in the Department of Large Animal Clinical Sciences of UT’s College of Veterinary Medicine.

In 2005, the Large Animal Clinic added a certification program in equine physical rehabilitation open to physical therapists, physical therapy assistants, third-year physical therapy students, veterinarians, veterinary technicians, and third-year veterinary students. “UT is on the forefront of equine sports medicine and rehabilitation. We have become a leader in determining which approaches are efficacious,” says Dr. Adair.

—Elise LeQuire



Dr. Steve Adair performs a lameness exam.

Oxygen therapy

Thanks to the generosity of the Tennessee Walking Horse Breeders and Exhibitors Association and contributions by private donors, the Large Animal Clinic will soon have a new, re-designed hyperbaric oxygen therapy treatment (HBOT) unit. The new equipment will allow a mare and foal to be treated together and permit the treatment of recumbent animals. HBOT exposes patients to up to three times the normal atmospheric pressure and a high concentration of oxygen and is used in a variety of therapeutic regimens to increase the amount of oxygen in the circulatory system and promote faster healing.

For more information, contact Large Animal Clinical Sciences at (865) 974-5701 or Dr. Steve Adair at sadair@utk.edu



The College of Veterinary Medicine is exploring training and therapeutic uses of its new underwater treadmill

Underwater treadmill

The Large Animal Clinic added an underwater treadmill to its facilities in early 2005, an above ground FERNO AquaPacer three feet wide and 12 feet long. The treadmill is currently used for conditioning performance horses. “We have a three-day event horse using it for conditioning,” says Dr. Adair. “The treadmill works a different set of muscles than are used when the horse is running free or being ridden on dry land.” It also contributes to cardiovascular fitness. “Plus, you are not pounding the limbs as much.” As researchers gain more information on the treadmill, they plan to use it in injury rehabilitation, for example after joint surgery when it’s essential to maintain motion but avoid weight-bearing exercise.

Chiropractic: the backbone connected to the nervous system...

Many of the modalities of physical rehabilitation have been adopted from human interventions, including chiropractic medicine. "Basically, an equine chiropractor works with the axial skeleton or spine to restore motion to specific vertebral segments," says Dr. Adair, who is certified by the American Veterinary Chiropractic Association (AVCA) through Options for Animals International. State laws determine whether an animal chiropractor may practice under the direct supervision of a veterinarian, through a referral, or under no supervision. To become certified as an animal chiropractor in Tennessee, a practitioner must be a human chiropractor or licensed veterinarian with specialized training.

According to the AVCA, even minor misalignment of the spine and joints can lead to irritation of the surrounding nerves, which connect to the rest of the nervous system and ultimately all the organs of the body as well as the circulatory system, affecting the overall health of the horse. Chiropractic manipulation may be indicated for recent injuries or for chronic conditions after the lameness has been identified. "Chiropractic is not a panacea, but it has a place in the veterinarian's repertoire of interventions," Dr. Adair says.



Dr. Robin Duggins, right, explains acupuncture to fourth-year students.

Acupuncture: a stimulating therapy

Most days will find Dr. Robin Duggins cruising from farm to farm with two or three senior veterinary students as part of their rotation in the equine field services section of Large Animal Clinical Sciences. Perhaps two or three times a week, the farm calls may include an acupuncture procedure.

"Horse clients tend to be well educated and aware of the utility of acupuncture in treating musculoskeletal problems," says Dr. Duggins, DVM, a clinical assistant professor certified in acupuncture by the International Veterinary Acupuncture Society. "Stimulating some of the nerves near the spinal cord can have an effect on the autonomic nerves traveling down the spinal cord. In addition to stimulating nerves, acupuncture can also increase the blood flow to an area. We're not just alleviating pain, but also reducing some of the

inflammation and treating the root of the problem," she says. Dr. Duggins, whose equine patients run the gamut of show horses, pleasure horses, and performance horses, considers acupuncture and chiropractic useful adjunctive therapies to complement traditional medical interventions. "Dr. Steve Adair and I often work together on patients, using chiropractic in conjunction with acupuncture," she says.

For more information call Large Animal Clinical Sciences at (865) 974-5701.

Critical care

The Department of Large Animal Clinical Sciences at the UT College of Veterinary Medicine has expanded its after-hours staff to meet increasing client demands. The number of emergency cases, primarily acute abdomens, sick foals, and trauma, has steadily risen over the last few years. The department hired two emergency surgeons as well as support staff in August.

No hoof, no horse

Many lamenesses—whether they stem from foot abnormalities such as founder or navicular disease, from injury to a tendon, or from degenerative diseases such as arthritis—respond well to therapeutic shoeing. Therapeutic shoeing for founder, for example, needs to be done under radiographic guidance to assure proper hoof alignment. In arthritic conditions such as bone spavin in the hock, special shoeing can change the biomechanics of the gait and help relieve pain.



The Large Animal Clinic also offers a hoof evaluation program, specialized shoeing by Dudley Hurst, and sophisticated diagnostic equipment. "The software Metron® allows you to import both digital photographs and digital radiographs, or x-rays, for analysis and archiving," says Dr. Adair. "The horse's hoof can be digitally photographed from different angles, front, side, and bottom, to establish a base line from which to monitor improvements over time."

A great year

This has been an exciting year for the UT Gardens and the Friends. Along with the announcement of the commitment to fund the professorship, the Friends are involved in other great projects.

- The Pope Interns, funded through the Friends by Pope Garden Centers, supports two outstanding students as they intern in the gardens and learn retail horticulture.
- A \$10,000 gift from Henry McIlwaine has initiated Entrance Plaza renovations that have made the garden entrance a more accessible and useable space and paved the way for future enhancements.
- The Friends recently applied for grants to enhance the Marble Touchstone Children's Table area and build a better storage facility for UT Gardens staff, students, and volunteers.

For information on the UT Gardens, please contact Dr. Susan Hamilton at (865) 974-7324 or sueham@utk.edu. To become a member of the Friends of the UT Gardens, visit them on the Web at <http://www.friendsoftheutgardens.org>. For information on contributing to the professorship, contact Amy Yancey Jenkins at (865) 974-8622 or jenkins@tennessee.edu.

Look for the new rack card developed by the Friends of the UT Gardens in one of 92 locations throughout metro Knoxville.

A few good friends

In 2003, the Institute initiated an effort to create the Donald B. Williams Professorship in Horticulture. Many generous donors and volunteers gave their time to endowing the professorship, but many of the gifts were deferred or were part of an estate gift and fell short of the minimum amount needed.

Without a renewed effort, it was going to take many years to make the professorship a reality. Then, in January of this year, the Friends of the UT Gardens Board of Directors stepped forward in a new effort to fund the professorship with the expanded role of directing the UT Gardens. Their pledge will fully endow the professorship at the \$500,000 level and will provide \$25,000 per year until it is funded so that a director may be hired by July 2007.

The Friends' goal is to attract an outstanding individual to help fulfill the research, outreach, and educational missions of the UT Gardens, while also to provide the necessary vision and leadership needed to help them fulfill their own mission of supporting the gardens. According to Theresa Pepin, president of the organization, "Many of us remember Don Williams from our years with him as friends and students. We realized the

power the professorship would have to attract someone of Don's level of com-

mitment to the role needed to provide visionary leadership in developing the UT Gardens to their fullest potential as an outdoor classroom, public gardens, and research resource for Tennessee residents and the horticulture and nursery industry alike."

The individual appointed to the Donald B. Williams Endowed Professorship will teach horticulture and direct the UT Gardens, which includes the overall leadership and supervision of garden personnel. Responsibilities will include the development, care, and interpretation of plant collections and research; educational and community outreach; raising funds with a commitment to advancing and promoting the UT Gardens; enhancing relationships, especially with community organizations such as the Friends of the UT Gardens; and building partnerships within the horticulture industry.

Dr. Donald B. Williams

A UT alumnus, Dr. Williams was chosen as the first leader of the Department of Agriculture and Horticulture Extension and for ten years headed the newly created Department of Ornamental Hor-



ticulture and Landscape Design at UT (now known as the Department of Plant Sciences). He eventually stepped down to return to his first love, teaching. Over the course of his 38-year career at UT, Dr. Williams was recognized with numerous awards throughout Tennessee, nationally, and internationally for his outstanding teaching in the field of horticulture. His legacy will continue to live on through the students whose lives he shaped and the professorship that shares his name.

Friends of the UT Gardens

The Friends of the UT Gardens is a non-profit 501(c)(3) organization of over 500 gardeners, garden lovers, and volunteers. Founded in 1992, the Friends hold a mission to raise awareness of and funding for the University of Tennessee Gardens in Knoxville, Tennessee. The UT Gardens are one of the Knoxville community's finest treasures, with over 50,000 visits each year. Situated on the Tennessee River on the UT agricultural campus, the gardens boast a collection more than 800 woody plants under long-term observation and evaluate 2000 varieties of herbaceous plants annually as part of the East Tennessee Education and Research Center.

—Amy Yancey Jenkins



On Shields–Watkins Field

AGR students handle Smokey on game days

Running through the Power T would be too much excitement for most dogs to bear, but Smokey IX is always up for game day. The responsibility for handling UT's famed bluetick coonhound is handled ably by Alpha Gamma Rho, the national agriculture fraternity.

Senior handler, Dipal Chaudhari describes Smokey as being "pretty calm"—that is until game time rolls around. "When the fans start cheering Smokey gets riled up and goes crazy," according to Chaudhari. On the odd occasion he begins to tire, Chaudhari and junior trainer Wesley Keele are ready



with pockets full of treats to fuel his characteristic howl.

Keeping such a busy schedule would be exhausting for most three-year-old

hounds, but Smokey rarely tires of the attention. On game day weekends, Smokey, Chaudhari and Keele participate in pep rallies and evening appearances. On game day, the three bound out on Shields–Watkins Field with the football players, running through the Power T and then head to the 10 yard line, Smokey's favorite spot for howling. Remaining on the sidelines is tough when surrounded with such excitement, but spending the game with the cheerleaders in front of the student section keeps him at bay.

For an East Tennessee hound, preparing for such an event involves lots of rest between appearances. There are pre- and post-event naps, traveling naps, halftime naps and, of course, the general all-purpose nap. Being a star, after all, is exhausting.

As one would expect with any celebrity, Smokey has his own idiosyncrasies. According to Chaudhari, the spoiled pooch is a picky eater and will only eat wet food. Chaudhari even recounted an away game



Pure adrenaline – Dipal Chaudhari, left, Smokey, and Clint Head run through the Power T on game day.

Smokey is one of the most beloved mascots in the SEC.



in Florida where he had to borrow a can opener from a pizza kitchen just to feed the finicky pup.

For a true athletics fan, the chance to handle the superstar mascot is a dream come true. Chaudhari admits that the perks for him have helped him to expand within the university and feel like he has a part in the athletics program. "Not to mention we get to see a lot of SEC stadiums," Chaudhari mentions casually.

This is Chaudhari's second and final year handling the famous hound. Last year's senior handler, Clint Head, touts the experience as, "a huge responsibility, but it has been good." Explaining the work involved

on a typical game day weekend, Head agrees that it is more than an extracurricular activity, it is a serious responsibility. "If something happened to that dog, they'd run us off campus," Head explained of the thousands of fans of the hound dog. The requirements for the position include junior standing and a 2.5 GPA.

As the sun sets on each game day, the season of rest for Smokey and his handlers are only a few naps away.

–Amy Davis

The Dairy Move

Research capitalizes on the UT Dairy's upcoming move



The East Tennessee Research and Education Center (ETREC) dairy is scheduled to relocate in a few years. And researchers with the Tennessee Agricultural Experiment Station are seizing the opportunity for pioneering studies of the impact of animal agriculture on the environment. Under investigation are dairy's interrelationships with water and air quality, and soil nutrient levels.

The relocation involves transferring the dairy from its present site in Knoxville to a 529-acre farm in Blount County. The Tennessee Legislature has appropriated funds, and engineers and architects are

working to convert a faculty-developed program statement into a state-of-the-art research and teaching dairy complex. Construction is expected to begin within a year.

By the time the dairy cattle are transferred to the location, about four years of environmental research data will have been collected, analyzed, and archived. Preparation includes installation of a series of automated devices and sensors to collect information on water quality, soil nutrient content, and air quality.

The land where the dairy will be relocated has not been used for animal agriculture in more than 20

years, making it a pristine location to study the impacts of animal agriculture on the environment.

"Many times, dairy operators—some long-term, some short-term—will encounter problems, and then environmental engineers are called in to work out strategies to correct the problems," says Professor Jim Wills, coordinator and project leader with ETREC. "Here we're going to understand what the environmental conditions are before the cattle even arrive."

The aim is to have baseline data in place so that five or more years into the future, scientific comparisons can be made and management practices recommended that are sustainable for the environment. Scientific information collected in this study has potential to be used by all dairy farmers in Tennessee and across the nation.

"Dairies are often located in environmentally sensitive areas," Wills says. "So our goal is to take what we learn and transfer it to any dairy farmer who's in a precarious situation with regard to environmental regulations and say, 'Here are some management practices that you can incorporate that will eliminate or reduce those problems.'"

In preparation for the relocation of the dairy, teams of students and scientists are engaged in collection of baseline environmental research data.

- Engineers have installed nine automatic water samplers equipped with data loggers and water flow measurement devices to collect surface water samples several times daily and determine flow rates from the property. Additional samplers and recorders will be installed as conditions dictate.
- Soil scientists have collected baseline soil samples at the location, collecting 150 samples to date of a planned 1,000. Concentrations of soil nutrients and minerals such as phosphorous, potassium, iron, copper, zinc, and magnesium will be analyzed and recorded for future comparisons.
- Wildlife and fisheries scientists have surveyed wildlife and fish species to establish baseline populations on and adjoining the site.
- Weed scientists have established weed control plots to evaluate herbicide performance on woody brush, blackberry briars, ironweed, and other difficult-to-control plants in pastures.



H-flumes allow calculations of total water flow from a given area, permitting contaminants to be calculated on an acre basis.



Rich bottomland at the farm will be planted in feed crops.

- Animal and soil scientists have sampled soil microbes using microbe capture beads buried in the soil to identify microbes present at the location. Potential links be-

tween certain soil microbes and disease in cattle such as mastitis are under investigation.

- Ground penetrating radar has been used to locate old, failed subsurface drainage lines. New subsurface drainage patterns designed by the Natural Resources Conservation Service will be installed on site.

Future research projects that contribute to the overall environmental knowledge of this location will be incorporated into the program as needed.

“By the time animals are relocated to the site,” Wills notes, “a complete environmental blueprint of the site will be established and research data will continue to be collected daily well into the future.”

Professor Jim Wills, left, and senior plot caretaker Derick Hopkins install a water sampler.



Dairy Center hosts Jersey groups

Curiosity was the common bond earlier this year as busloads of Jersey cattle producers rolled onto the grounds of the Experiment Station's Dairy Research and Education Center in Lewisburg.

Nearly 400 Jersey cattle producers peered out of tour bus windows as the facility's 308 resident milking cows and heifers gazed back inquisitively. The producers were members of the American Jersey Cattle Association and National All-Jersey groups, which held joint national meetings in nearby Nashville.

The farmers and their families spent a pleasant morning touring the facilities and learning about research improvements that can enhance dairy operations. A separate program and tour entertained the younger set.

The center is famous for supporting one of the largest and highest milk-producing

research Jersey herds in the world. Center Director Henry Dowlen and his staff maintain meticulous records of each animal's pedigree, diet, weight, and milk output. The center measures the effectiveness of strategies for herd management and health maintenance, herd genetics, and best management practices for land sustainability and improved water quality.

Jerseys are known for the high fat content of their milk, which makes excellent ice cream and cheese, among other products. The center's herd was recognized by the American Jersey Cattle Association for top fat production in its herd size category for 2005.

On the Web at <http://dairy.tennessee.edu> —Patricia McDaniels



Dairy research associate Hugh Moorehead updates the farmers about the positive results of the center's heifer pre-calving treatment research.



Alumnus Jim Lambert with students.

The travels of a T-shirt

Last year, agricultural economics students teamed up with documentary filmmaker Jim Lambert (Ag Econ, '90) to probe China's growing role in world agricultural markets. This fall, students will follow the journey of a T-shirt.

Students in Ag Econ 410 will study Pietra Rivoli's *The Travels of a T-shirt in the Global Economy* (Wiley & Sons, 2005). The book traces the path cotton takes on an around-the-world tour that starts in the production fields in the Mid-South, moves through export and import processes and ends, ultimately, as second hand clothing sold to developing nations. Along the way, the book offers lessons on the power and politics of world markets—the very markets the students will enter as graduates.

"One of the points the book conveys so well is that some markets that are thought of as free really are not," says course instructor Dr. Bill Park. "And some of the perceived victims of globalization are actually benefiting from it."

From study tours abroad to seminars on global topics, there's a growing international focus in the College of Agricultural Sciences and Natural Resources. The aim is to equip undergraduates with the knowledge, perspectives, and skills necessary to succeed in today's complex, pluralistic world. That goal is central to UT's Quality Enhancement Plan, which is working to increase international and intercultural perspectives among the university's students.

The senior seminar course will feature lectures by experts in cotton, agricultural policy, and globalization trends, including the shift of textile production—once a stronghold in Tennessee and other Southern states—to offshore markets. One of the featured speakers will be Lambert, who is now a China marketing and strategy analyst with Globecot, a Nashville-based supplier of news, information, and market research and consulting for the global fiber and textile industries.

The position with Globecot continues a trajectory for Lambert that began with work for Archer Daniel Midlands, first in the U.S. and then in China. There he learned Mandarin Chinese and founded Menkou.com, an information portal based in Shanghai. He also worked as a freelance television writer and producer and founded a film company.

It was in that role that he returned to campus last fall. Lambert screened his film "New Roads" and shared perspectives with students about the rapid pace of agribusiness development in China.

"The students were fascinated by Jim's career story stemming from his degree in ag econ, and I think it really made them think a little

wider than they had thought before about what they might do or where they might do it," Park says.

The success of that effort, he adds, "really reinforced and strengthened my conviction to continue to use the senior seminar as a significant component of our attempts to give students more exposure to global issues and perspectives."

Beyond borders

Dr. Forbes Walker was raised in Scotland, England, and Africa. Dr. Neal Eash grew up in Ohio. While



Drs. Forbes Walker, left, and Neal Eash have studied and taught on three different continents in the past three years

speaking with different accents, the professors are united in the belief that students in the College of Agricultural Sciences and Natural Resources have much to gain through experience beyond the boundaries of state and nation. Their determination to expose undergraduates to different cultures has helped seed the development of a new minor in international agriculture planned for Fall 2007.

"By offering this minor, we want to take the students out of their comfort zones and allow them to learn how to do things other ways," Walker says. "We want them to develop an appreciation and understanding of our global competition, as well as opportunities for Tennessee and Tennessee agriculture."

— Erin Hutchison

Teaching (very far) abroad

Teaching about yabbies and sprouts was just one of the unusual experiences that three Agricultural and Extension Education seniors had this spring in Australia.

The project started about three-and-a-half years ago when Dr. Carrie Fritz made contact with Charles Sturt

University in New South Wales, Australia. Her interest was to set up a student teaching exchange program. The idea took root, first with a UT graduate student Michelle Stumbo who taught down under last year, and now with three student teachers who spent eight weeks last spring teaching in high schools in Broken Hill, New South Wales.

"It was absolutely the most rewarding and exciting experience of my life," says spring graduate Tera Bunch. "It gave me the chance to get away from culture and influence and sit back and really take a look at who I am, and I was also able to live as a person in a different culture because I was there so long."

David Little taught about sprouts and yabbies, which are Australian crawfish. He and Daniel Wilson developed lesson plans and taught biology, animal science, and some environmental science at Willyama High School.

Language differences aside, the students found the teaching experience essential preparation for their careers. "As a graduate, I had all the

book knowledge, but it was in the classroom where everything clicked and all the strategies to use really came together," Little says.

Working with international students was particularly valuable, Bunch emphasizes, because "it forced me to look outside of what I was used to, to come up with different methods of classroom management and teaching techniques."

Students who major in Agricultural and Extension education perform a practicum their final semester, during which they teach for 12 to 14 weeks at a high school. The exchange program split that period, with five weeks of teaching at Knoxville area schools and eight weeks abroad.

Fritz is now seeking to expand the exchange program to include other universities with international education components.

"The hardest part of any program like this is making the first contact, setting it up, and building that relationship, and we feel that now that we've done that, we'd like to expand more globally to other universities and countries."



David Little, Tera Bunch, and Daniel Wilson saw sights, as well as gained teaching experience.



Winning team members, from left, are Joshua Jones, Matt Taylor, Faith Critzer, Michael Adams, Melissa Warren, Glenn Black, and Emily Alvanas.

FST Bowl Team wins big

In a rousing comeback that had spectators cheering, UT's College Bowl Team in the Department of Food Science and Technology won the Southeastern Regional Institute of Food Technologists' College Bowl Competition this spring.

Teams from North Carolina State University (NCSU), the University of Florida, University of Georgia, and Virginia Tech University competed with UT in the double elimination tournament.

UT defeated the home team and two-time regional champ NCSU in a dramatic set of comeback matches from the loser's bracket, handing NCSU its first loss in two years.

"To win the regional the way we did, coming out of the loser's bracket was incredible," says Dr. Michael Davidson. He and Dr. Qixin Zhong coached the team. The team finished fifth at the IFT national competition in Orlando, Florida

Team members include graduate students Matt Taylor (captain, East Bend, NC), Glenn Black (Saluda, SC) and Faith Critzer (Franklin), and undergraduate students Michael Adams (senior, Nashville), Josh Jones (freshman, Knoxville), Melissa Warren (senior, Chattanooga) and Emily Alvanas (senior, Knoxville).

Academic Quad team places first

For the second year running, UT's Academic Quadrathlon Team captured first-place honors on the written exam portion of the Southern section competition. The annual event tests students' mettle on exams, quiz bowls, lab practicums and oral presentations. UT's four-member team placed seventh overall. The team was comprised of Justin Rose (Grainger County), Gatlin Brandon (Claiborne County), Walter Malone (Sullivan County), and Blake Ramsey (Hancock County).



UT's quadrathlon team diagnoses pregnancy in a dairy cow.



New test for Johne's disease for ruminants

Scientists at UT have developed an accurate and fast diagnostic test for Johne's disease, a contagious, chronic, and fatal intestinal disease of ruminants.

Johne's disease (pronounced "yo-knees") occurs worldwide, especially in dairy and beef cattle, sheep, goats, deer, elk, antelope, and bison. The USDA estimates that approximately 22 percent of all dairy herds and eight percent of all beef herds in the United States are infected with Johne's, leading to an estimated annual economic loss of more than \$200 million to the dairy industry alone.

The new diagnostic test takes just a couple of hours to perform and is highly sensitive and specific, detecting more than 95 percent of animals infected with the Johne's disease-causing bacterium. Further, the UT test can detect Johne's in

young animals before they become contagious and spread the disease.

Dr. C. A. Speer, professor of cellular and molecular immunology and director of the UT Center for Wildlife Health, directs the team's research efforts. The team's research is funded through the USDA and the Tennessee Agricultural Experiment Station.

Environmental stewardship awards

Look along the Pigeon River today, and you can find species of fish, mollusks, and snails in the riffling and generally clear water. The dramatic turnabout for this East Tennessee river is regarded as a national success story, and it has brought a federal award to the team of agencies whose hard work is represented in the vibrant and recovering waterway. Among the partner agencies is UT's Department of Forestry, Wildlife and Fish-

eries, which, through the Tennessee Agricultural Experiment Station, has coordinated the efforts of the Pigeon River Recovery Project.

In May, at the Environmental Protection Agency-sponsored National Environmental Partnership Summit, the project received the 2006 Award for the Most Environmentally Beneficial Best Practice.

Another conservation project at the Institute, this one involving the Agricultural Experiment Station's Forest Resources Research and Education Center, was selected as the winner of the 2006 Governor's Environmental Stewardship Award in the Agriculture/Forestry Category.

The project has improved water quality and habitat of the Hornyhead Branch, as well as provided better access to forestry research along 3,100 feet of the branch contained on the UT Cumberland Forest Unit in Morgan County. As it solved these problems, it evolved into a useful demonstration project featuring six different types of bank stabilization

methods as options for stream restorations. The project will serve as a source of continuing education and aid in cooperation with other agencies in riparian zone management.

These benefits, noted Interim Dean Thomas Klindt, "exemplify what the UT Agricultural Experiment Station's research and education centers are all about: developing, using, and demonstrating research advances and techniques that make a difference to Tennesseans and their quality of life."

Solving mysteries

21st century tool probes Andrew Jackson mystery

In May, Biosystems Engineering Professor Robert Freeland traveled to Nashville at the request of State Archaeologist Nick Fielder and the Tennessee Historical Commission. Their purpose was to search for the grave of Charles Dickinson, the only man ever killed in a duel with Andrew Jackson.

The location of Dickinson's grave has been the subject of an ongoing debate among historians. One camp argues that Dickinson, who was shot 22 years before Jackson was elected president, was buried on a relative's property in Nashville. The other contends his grave lies in his home state of Maryland. The hunt led Dr. Freeland and Fielder to a quiet suburb in West End built on the grounds of a former mansion.

Collecting madtoms on the French Broad River for release into the Pigeon River.





Dr. Rob Freeland's use of ground penetrating radar ranges from precision agriculture to graveyard mysteries.

Freeland's role was to use ground penetrating radar (GPR), a valuable 21st-century tool to probe for ground disturbances that might indicate the presence of the 200-year-old grave.

After two and a half hours of searching with radar and metal probes, evidence was found of a disturbed soil structural pattern indicating a grave.

Also, historical records point to a grave at the site. Now the courts and descendants of Dickinson, along with homeowners of the land where the grave appears to lie, must reach an agreement on whether and how to proceed.

Freeland and his department have used GPR in external consulting roles in Tennessee to understand seismic impacts on Tennessee Wildlife Resource Agency compounds for migratory ducks, the impact of soil depth on crop yield, and to investigate water quality in Fayette and Hardeman counties.

Last fall, the GPR system assisted the Department of Plant Sciences in evaluating turf compaction patterns in Neyland Stadium.

Freeland has also documented burial sites of archaic Native Americans and early Tennessee settlers, and aided in locating unmarked graves of pre-Civil War slaves, and the unmarked mass graves of Confederate soldiers. He has provided geophysical consulting services for the Federal Bureau of Investigation, the Tennessee Bureau of Investigation, the Bureau of Alcohol, Tobacco and Firearms, and local law enforcement agencies.

Worldwide GPR systems are put to use for non-destructive testing (NDT) and problem solving in areas of location and mapping infrastructure, civil and environmental engineering, mineral location, mapping of quarries, location and mapping of underground water levels, archaeology, neotectonics (new geological plate movement),

environmental studies, and more. Vendors of the GPR systems are now targeting the instruments for precision agriculture applications.

More information on GPR and how Freeland uses it is available at <http://groundscan.com/>.

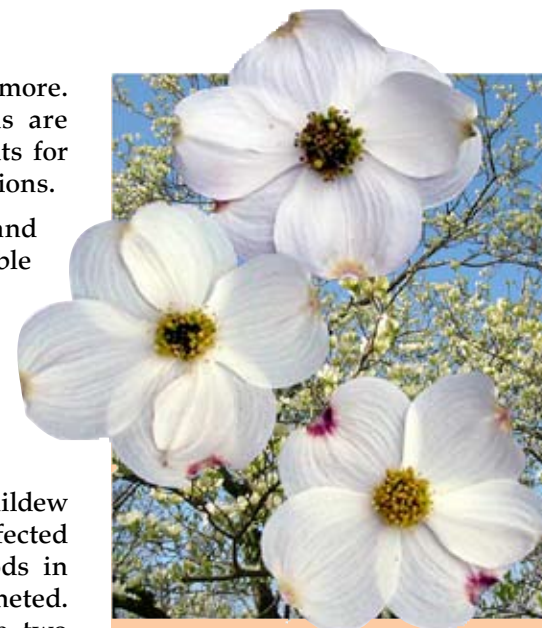
More beautiful dogwoods

When epidemics of powdery mildew and dogwood anthracnose affected almost all flowering dogwoods in 1994 and 1995, sales plummeted. The diseases packed a one-two whammy, burdening Tennessee nurseries with elevated production costs and driving a drop in consumer interest. Researchers with the Experiment Station addressed the problems by developing several patented cultivars of dogwoods that are naturally disease resistant.

Named for the researchers' wives and mothers, 'Kay's Appalachian Mist,' 'Jean's Appalachian Snow,' and 'Karen's Appalachian Blush' are the only white-bracted cultivars known to be highly resistant to powdery mildew.

Another UT cultivar, 'Appalachian Spring,' has proven resistant to dogwood anthracnose, but not to powdery mildew. Appalachian Spring is now available through retail suppliers, and the other cultivars may be available as early as next spring.

The team's newest cultivar, 'Appalachian Joy' (patent pending), is also highly resistant to powdery mildew. Yet disease resistance may



Appalachian Joy features extra bracts on its blossoms

not be its most marketable trait. The new cultivar's blossoms have extra bracts. "Anywhere from four to seven bracts appear on different branches on the same tree," says Dr. Bob Trigiano, a professor of plant pathology and member of the research team.

Since normal dogwood blossoms feature only four bracts, the increase in bracts makes for a more spectacular display. Developing these new cultivars should be a boon to the state's nursery industry. A study by UT Extension and Experiment Station researchers maintains that promoting disease-resistant trees in Tennessee creates an estimated \$7.8 million in additional revenues for nursery producers.

Of course, the beauty of the blossoms helps sell trees, too.

—Carolyn Corley



UT establishes Mid-South Grasslands Center

Prairies once covered parts of the Tennessee landscape, likely a result of the use of fire by Native Americans and early settlers to keep grassy habitats open for hunting or grazing. Historically, native grasslands supported an interesting array of wildlife including bison, elk, and prairie chickens that have long since disappeared. These once thriving and diverse wildlife habits are now some of the most threatened in the U.S., due largely to conversion of these areas to row crops and cool-season hay and pasture. In fact, more than 99 percent of tall-grass prairies east of the Mississippi River are now gone. The loss of our native prairies is even more poignant when you consider that the warm-season grasses that compose them have many benefits for livestock as well as wildlife.

Now a new initiative launched by the Institute of Agriculture hopes to facilitate the restoration of our native grasses by establishing the Mid-South Center for Native Grassland Management. The center, which is housed in the Department of Forestry, Wildlife and Fisheries, is headed by a coordinator with expertise in wildlife management and native grassland ecology and management. Dr. Pat Keyser will work with producers and experts statewide through a research and

Extension position to help farmers and landowners integrate warm-season grasses into their haying and grazing operations, providing them with high-quality forage as well as the option to grow these high yielding grasses for biofuel production.

The center will also assist landowners in managing forested grasslands (savannahs) with fire and other silvicultural techniques for improved wildlife habitat. Integrating warm-season grasses into farm and forest operations holds great potential for returning many thousands of acres in the region to excellent wildlife habitat, especially for quail and songbirds, but also for wild turkey and many other game and non-game species, while complementing existing haying and grazing operations.

A grant from the Tennessee Wildlife Resources Agency is helping to fund the project for a five-year period. The Natural Resource Conservation Service (NRCS) has also provided grant money for the first year. The university hopes to raise an additional \$2 million to endow the center permanently. To learn more about warm-season grasses, contact Keyser at (865) 974-0644. If you are interested in contributing to the program, contact Buddy Mitchell at (865) 974-5779.

New gifts, pledges advance Hemlock work

Over the past year, work in the Lindsay Young Beneficial Insects Laboratory has continued to expand attempts to stem ecological devastation from hemlock woolly adelgid. Beetle production increased by about 10 percent and several new research projects have been initiated, including studies on a new beetle predator. Faculty in the Department of Entomology and Plant Pathology are hopeful that with the recent influx of private gifts and expansion of the program, the coming year's production will skyrocket.

The largest gift received this year was a donation from the Friends of the Great Smoky Mountains, who recently completed their pledge with a \$50,000 gift from the late Lindsay Young's Aslan Foundation. The Friends' total giving to the laboratory has reached \$236,000. They also provided the initial \$96,000 bridge-the-gap money for the first year of beetle rearing operations through a contract.

According to Dr. Carl Jones, professor and head of the department, "The tireless work from the Friends of the Smokies has really been the catalyst for our laboratory. Without their start-up funds and continued support, we would not have started production nearly as quickly as we did, and our rearing capacity would be halved. New support from Alcoa Foundation and the Partners of the Cherokee National Forest will also allow us to move forward and work to develop additional control options as this pest continues to spread."

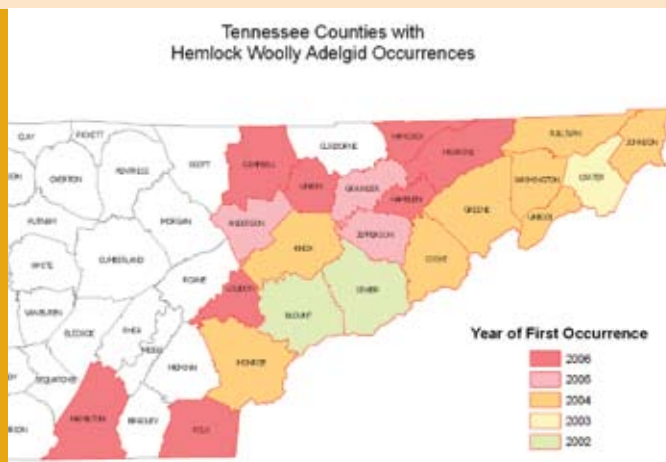
The Friends' gift helped renovate two large spaces and construct a new building which houses two large environmental chambers, necessary to extend the rearing season and accommodate a second beneficial beetle, *Laricobius nigrinus*. Much of the specialized equipment in the two laboratories was made possible by generous support from Alcoa Foundation, which recently provided another \$10,000 grant, bringing its total giving to \$25,000. The Partners of the Cherokee recently pledged \$20,000 to help cover costs associated with rearing and releasing beetles in the Cherokee National Forest.

Where do the beetles go?

About 80,000 new UT beetles were released in the Smoky Mountains this year. Another 10,000 were released on other state and federal lands in Tennessee.

In the coming months, the scope of the effort will continue to expand. The department is in the process of hiring for a postdoctoral position to oversee the project. Work on a quarantine facility will begin this year. Several state agencies have pooled resources so the department could hire a research associate who will work in the laboratory and survey state lands. The National Park Service and USDA Forest Service–Forest Health Protection continue to fund ongoing operations in the laboratory. The Forest Service is also funding several related research projects. Common Ground Foundation in North Carolina also hopes to provide support for regional work involving rearing *L. nigrinus*.

The invasive pest continues to spread through the native range of hemlocks in Tennessee, now affecting 22 counties in East Tennessee.



The department is working toward expanding the scope of the project to address future threats from additional invasive insects by forming a consortium of regional universities already involved in hemlock conservation.

“To some degree, hemlock woolly adelgid took us by surprise,” Jones says. “Predicting the speed with which invasive organisms move is far from an exact science. We can’t wait for problems to actually arrive and then scramble to catch up. With luck, we’ll eventually be able to anticipate problems and look at environmentally sound options for controlling them. We already know about some emerging invasive threats, but there are certain to be others we haven’t yet discovered.”

To learn more about the effort to save native hemlocks, contact Carl Jones at (865) 974-7135 or cjones17@utk.edu. For information about donating to the effort, contact Amy Yancey Jenkins at (865) 974-8622 or jenkins@tennessee.edu.

Current partners include the following:

- USDA Forest Service—Forest Health Protection
- National Park Service and the Great Smoky Mountains National Park
- Friends of the Smokies
- Aslan Foundation
- State of Tennessee
- Department of Agriculture—Division of Forestry
- Tennessee Wildlife Resources Agency
- Department of Environment and Conservation
- Alcoa Foundation
- Mr. and Mrs. Fred Stanback of North Carolina
- Partners of the Cherokee National Forest
- Common Ground Foundation and Blue Ridge Outdoors Magazine

Conservation Partnership Aims to Restore Native Hardwood Wetlands

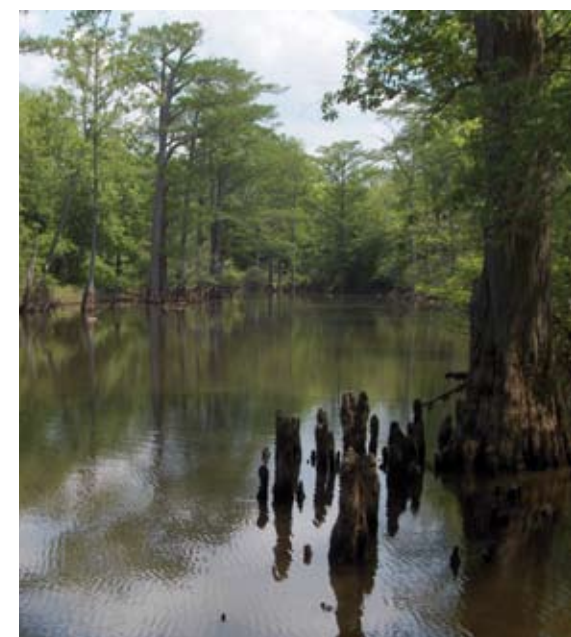
The U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) has awarded more than \$163,000 to UT to develop tools to help scientists preserve the state’s native hardwood wetlands.

Since 1992, nearly 10,000 acres of previously farmed agricultural lands have been voluntarily restored to their original wetland status by private landowners in Tennessee. The NRCS grant will provide resources to the Institute to develop tools to measure how successful those land restorations have been.

James Ford, Tennessee’s state conservationist, says the grant will improve the way NRCS completes its work. “Until now we haven’t had a good method to help us measure how successful our hardwood wetland restoration efforts have been.

This grant will result in a tool to tell us how effectively we’re restoring land back to its natural state. It will make our present work better and greatly improve all our future work”

Dr. Matthew Gray, a wetland ecologist with the UT Department of Forestry, Wildlife, and Fisheries, will oversee the project. His team will study several recently restored sites and compare them to the Hatchie River bottomland in West Tennessee, which is relatively untouched, with about 140,000 acres of mature hardwood forests associated with it.



“Our goal is to use this work in Tennessee to develop a mathematical tool that NRCS biologists can use to quantify the extent of ecological restoration on sites that were previously disturbed wetlands by agriculture and have been replanted with native tree seedlings. The tools that we develop may also be useful for NRCS biologists in other states in the Southeast region.” His team will look at several factors, including soil, vegetation, water movement, and the presence of birds, amphibians, and other wildlife.

The project will take place in 15 West Tennessee counties beginning in January.

Just doing my job

As a medical technologist, Karl Snyder performs a variety of laboratory tests for animal patients served by UT's College of Veterinary Medicine. Like many with the Institute, his commitment to service leads him to help in other, unexpected ways. Karl picks up the tale:

It was a day like any other when the phone rang. A lady began pleading, "I hope you can help me, sir. I've been transferred all over the university trying to find someone who can look at an object under a microscope and tell me if it is rodent droppings." She had my attention.



Karl Snyder
with the suspect muffin

I began to turn the problem over in my mind as she told her story. "I was eating a muffin that I'd gotten from a restaurant. I was about half finished when I put on my glasses. I was horrified to find a couple of little black things

stuck to the box and sitting on top of my muffin. I called the health department, and they are going to inspect the restaurant but told me to find some place to examine the material to see what it is."

I had considered several things by this point and offered the following: "The only thing we might be able to do is smear it on a slide and stain it. If we see a lot of bacteria, that would be about the only explanation. However, all we could say is 'it is probably' or 'it is possibly.' We couldn't pin down anything that would hold up in court." She assured me that she had no legal action in mind and just wanted to know if she should go see a doctor. I told her that her local veterinarian could do that procedure for her, since she was on the other side of town but I gave her my number if all else failed. I returned to my work routine with the feeling I'd be getting another call.

Later that afternoon, the call came. "They said they didn't know how to check it at the vet's, Karl. Can you help me?" Within an hour she was standing in the lab holding

the muffin in its original container. She pointed to the mysterious contaminants, one of which had been smashed on the container. Being a scientist by nature, I was determined to get to the bottom of this. I looked closely and blurted out my gut feeling, callous to the sensibilities of this troubled woman and my co-workers, "Looks like chocolate sprinkles to me!"

Katie, our trusty lab assistant, smeared a sample on a glass slide while I followed up on my hunch. I placed a small piece of the material on a pad that detects glucose and it showed a strong positive reaction. Katie called out, "Smells like chocolate."

I needed more proof before signing off on this case. I examined a stained slide of the cholesterol crystals. "Chocolate, ma'am. Nothing but chocolate." She looked relieved, perhaps a little embarrassed, and was grateful for our help. "Pleased to be of assistance," I said. "This is a full service lab." Outside of the box, you say? I tell you—there is no box!

—Karl Snyder



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