



Plant Sciences Newsletter

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Service Learning with Native Plants

by Sam Rogers



A major trend in education over the past decade has been 'service learning,' which combines meaningful community service experience with academic objectives in a course or curriculum. Blending environmental service with community outreach, my 'Native Plants in the Landscape' course has especially illustrated to me that our students have a sincere interest in volunteerism and are eager to participate in hands-on learning activities. Popular with Plant Sciences majors and related disciplines, the 'Natives' class has become known for its off-campus outings and its contribution to environmental restoration within the context of local parks, greenways, schoolyards and other public lands.

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Spring 2008 Natives class students Martha Cate Shamblin (left) and Jessica Hentchel (right) planting a white pine as part of a 'pocket woodland' restoration project at Coalfield Community Park, Morgan County.



WTREC Cotton Gin Celebrates 40th Anniversary

by Owen Gwathmey

The research cotton gin at the West Tennessee Research & Education Center celebrated its 40th anniversary this year, after a major overhaul and tune-up in 2007. The gin was originally assembled in 1968 by a group led by UT agricultural engineer Dr. James 'Kayo' Mullins. Original funding came from the Tennessee Agricultural Experiment Station via Dean John Ewing to modify and assemble a cut-down version of a commercial gin of the time.

The research gin assembly includes components found in a commercial gin of the 1960s, as well as in modern commercial gins. Components include a stick and bur extractor, two incline cleaners before the gin stand, a vacuum dropper feeding the 20-saw gin stand, followed by two lint cleaners and a condenser. The gin assembly thus emulates a commercial gin in its process, providing researchers with realistic turnout data and fiber samples for quality analysis.

The gin assembly was refurbished in 2007 on the recommendation of Dr. Bill Mayfield, UT alumnus in agricultural engineering. Dr. Mayfield pointed out several design features that are nearly impossible to find in new equipment. These features allow seed-cotton samples as small as 6 pounds, whereas a modern gin would require much larger samples. This in turn allows researchers to use small-plot methods that make efficient use of field space and other resources.

In recent years, about 1,500 to 2,000 individual samples have been ginned each year from UT AgResearch and Extension plots at the Research & Education Centers, as well as on-farm trials in West and Middle Tennessee. Management of samples and data has been modernized with barcode technology developed by Philip Allen in Biosystems Engineering and by Carl Michaud at WTREC. Lint samples sent for fiber-quality analysis at external laboratories are identified and tracked by this technology.

The gin is currently maintained and operated by WTREC technical staff, including Pat Brawley, Tracy Bush, Janet Gibson, Ernest Merriweather, Carl Michaud, Matt Ross, Bob Sharp, Sandy Steckel, Kevin Willis and others led by WTREC Director Dr. Bob Hayes. Current cotton research is led by AgResearch and Extension faculty from several departments, including

Dr. Owen Gwathmey is an associate professor of crop physiology in the Department of Plant Sciences. He specializes in the adaptation, ecology and management of field crops. Owen has been based at the West Tennessee AgResearch and Education Center in Jackson since 1993, where he leads the cotton physiology research project. His research aims to improve the efficiency, profitability and sustainability of Tennessee's cotton production.

Biosystems Engineering and Soil Science, Entomology and Plant Pathology, and Plant Sciences. They include Drs. Mike Buschermohle, Owen Gwathmey, Brian Leib, Chris Main, Melvin Newman, Larry Steckel, Scott Stewart, Don Tyler, John Wilkerson and Frank Yin. The quality of data and samples from this gin allows these scientists to report realistic results to Tennessee cotton producers, industry clientele and their professional colleagues. 🌱



Photo by Ginger Trice

Tennessee Grapes and Wines



By Dave Lockwood

The history of commercial grape production in Tennessee extends back more than 160 years. One of the first documented vineyards was planted in Stewart County in 1844. This vineyard consisted of two acres of European varieties, which did not survive long in Tennessee's erratic continental climate.

In the 1860s, numerous vineyards were established throughout the state, with concentrated acreages in the areas of Memphis, Clarksville, Chattanooga, Knoxville and Johnson City. Grapes from these vineyards were used for wines, juice, jellies and for fresh consumption.

By 1889, there were an estimated 1,500 acres of bearing vineyards in the state, with another 600 acres of nonbearing vineyards. Some of the varieties in these vineyards were Concord (released in 1843) and Elvira. Niagara, introduced in 1882, was seeing a lot of interest for white grapes. The average reported yield was 2.5 tons per acre. About 2,500 tons of grapes were sold for table use and 1,250 tons were sold to wineries. From these grapes, wineries made an estimated 208,300 gallons of wine that had an average market value of \$1 per gallon. At that time, Tennessee was one of 10 U. S. states boasting a commercial wine industry.

With the onset of prohibition, ranging from 1920 through 1933 in the U.S., the commercial wineries all closed, and the science and art of winemaking was carried on by a few people in communities around the state. One such community, Greutli Lager in Grundy County, was made up of Swiss and German immigrants. The varieties of grapes used for their wines and their knowledge of winemaking still exist today.

Interest in commercial grape production and winemaking was dormant until the 1970s. In 1973, a group of seven individuals met around a kitchen table in Clarksville and organized the Tennessee Viticultural and Oenological Society (TVOS). As this group grew in membership, more pressure was brought to bear upon legislators to pass legislation enabling the development of commercial wineries. The Tennessee Farm Winery Act was passed in 1978. It permitted the development of farm wineries, on-site sales up to 15,000 gallons and free tastings at the winery.

The first commercial winery in Tennessee, Highland Manor in Jamestown, opened for business in 1980. By 1982, several commercial wineries had been licensed across the state. The need for an organization representing the commercial grape growers and the wineries, the Tennessee Farm Winegrowers Association (TFWA), came into being. TVOS and TFWA work closely together to coordinate and advance the efforts of all Tennessee grape interests. In 1985, TVOS and TFWA jointly sponsored a bill in the state legislature that ultimately resulted in the creation of

Dr. David Lockwood is a professor in the Plant Sciences Department. He directs the Extension educational programs in tree fruits, small fruits, tree nuts and fruit tree nurseries in Tennessee. He also has a 15 percent appointment with the Dept. of Horticulture at the University of Georgia, where he has Extension responsibilities in apples and bunch grapes. Beginning in July, the UGA effort will increase to 25 percent with the addition of peaches.

the Viticulture Advisory Board (VAB). The nine members of this board are appointed by the governor and report on the potential and proper direction for the growth of the Tennessee grape and wine industry. UT has a permanent member on this board.

The interest in grapes and wines continues to expand in all parts of Tennessee. Currently, there are 38 licensed wineries across the state, including a new solar-powered winery, with interest levels in new wineries at a high level. Grape acreage has not kept pace with increased winery needs. The current grape acreage is estimated at 650 acres.

The value of Tennessee's grape and wine industry is considerable. In a report published by MFK Research, the value of the 2004 grape crop to the farmer was about \$1 million. The value of the wine was more than \$11 million and the value of the grape and wine industry to the state exceeded \$140 million. This figure takes into account taxes paid; jobs created; and the impact on businesses such as restaurants, hotels, service stations, etc. Tennessee wineries are a strong attraction for tourists as well as instate residents. 🌿





by Bob Augé

Augé. I'll start by asking you to define biotechnology. Literally, it sounds like it might refer to anything involving biology and technology.

Chen. In the narrow sense, it is used to refer to genetic engineering. In the broader sense, it is defined as any technological application based on biology. Biotechnology has wide uses in agriculture, food science and medicine.

Cheng. Biotechnology is used in contrast to traditional biological technology and refers to modern techniques that have been used in biological research and applications. In plants, it includes various tissue culture techniques and recombinant DNA technologies. Biotechnology can complement traditional biological technologies for applications in all aspects of biology and related fields, such as gene therapy, genetic engineering of crops and animals, plant-based vaccine and industrial enzymes, etc.

Augé. How has plant biotechnology helped agriculture?

Cheng. There are numerous ways that biotechnology can help plant-based agriculture. Some of the most successful examples are large-scale, year-round production of pathogen-free, elite horticultural plants that are herbicide-, insect- and stress-resistant. These plants greatly increase crop yields and reduce chemical input to the environment, making agriculture more sustainable.

Fall armyworm caterpillars on a rice plant. Biotechnology research can produce novel plants able to reduce insect feeding by attracting the natural enemies of the attacking insects. Photo by Rich Maxey.

Chen. The most successful application of biotechnology in agriculture is to reduce dependence of farmers on agrochemicals that include insecticides and herbicides. Transgenic crops containing a Bt gene are much more resistant to insects than non-transgenic crops. The transgenic crops harboring herbicide-resistant genes have revolutionized weed control.

Augé. Besides agriculture, are there other ways plant biotechnology helps society?

Cheng. Biotechnology can greatly benefit society in numerous ways, from new medicines and new industrial enzymes that increase efficiencies in food processing and safety, to environmental applications such as plant- or microbe-based environmental remediation.

Chen. Biotechnology has also significantly helped society in the area of medicine and food science. For example, insulin, which is widely used for the treatment of diabetes, is a pharmaceutical product now produced by biotechnology. Another promising application of biotechnology is gene therapy.

Augé. What kind of biotechnology are you studying?

Chen. My research program is interested in understanding the genetic and genomic bases underlying the production of a diverse array of specialized metabolites that are also called natural products. These metabolites have important biological/ecological functions, and therefore have many applications. The genes identified in my lab can be used for genetic improvement of crops for enhanced defenses to biotic and abiotic stresses (e.g., insects, diseases, drought), improved flavor and novel floral scents.

Cheng. In my research program, we apply genomics tools to understand gene functions in plant growth and development, more specifically in the areas of cell wall formation, stress tolerance and biomass production. The promising genes will be used for genetic engineering of crops, such as poplar trees and other agronomic and horticultural crops, that can yield more and are resistant to pests and environmental stresses.

Augé. We have a new undergraduate concentration in plant biotechnology in our department. What sorts of jobs are available for our graduates?

Cheng. Public and private biotech and agricultural companies.

Augé. Some biotechnology possibilities sound almost like sci-fi. Describe what biotechnology may have accomplished 50 years from now.

Cheng. In horticulture and agronomy, it is not surprising that many YFPs (your favorite plants) or “super plants” of your wildest imagination will be produced. In human biology, I can expect that many of today’s incurable diseases will be cured or managed, our quality of life will be drastically improved, and human life span will be extended to an average of 100 years. So expect to live 35 years after your retirement.

Chen. In the area of agriculture, further biotechnology development will continue to provide novel crop varieties with reduced dependence on pesticides. In addition, crop varieties will be developed based on biotechnology that have higher yield; increased nutritional values; improved taste, texture or appearance of food; and/or more resistance to environmental stresses. In addition, novel crops may be used to produce new substances, such as plastics and pharmaceuticals. ❀

Now-permanent Department head Bob Augé interviewed faculty members Feng Chen and Max Cheng about biotechnology.

Dr. Feng Chen is an assistant professor in the Plant Sciences Department and an adjunct faculty member at the graduate school of UT-ORNL Genome Science and Technology. Dr. Chen received his Ph.D. in plant biology from the University of California, Davis. Dr. Chen’s research program focuses on functional and comparative genomics of natural plant products that have many applications, such as improvements of plant natural defenses, fruit and flower quality and biofuel feedstock. Dr. Chen teaches plant physiology at both undergraduate and graduate levels.



Dr. Max Cheng is an associate professor working in a wide variety of areas, including molecular biology, woody ornamentals and invasive plant species. His molecular research program currently focuses on genomics and molecular phylogeny, and on the interface of molecular biology and plant breeding, and plant growth and development of woody plants. Research projects include poplar genomics and genetic engineering for biomass energy production; transformation of aspen plants for increasing growth rate and enhancing rooting of hardwood cuttings; understanding adventitious rooting mechanisms; genetic transformation for poplar functional genomics research; developing sterile poplar trees to reduce the environmental risk of the transgenic poplars; genetic engineering for heavy metal phytoremediation; and characterization of poplar genome. He has been with the department since 2001.



Urban Landscape and Nursery Research Program Update



by Bill Klingeman

Our Urban Landscape and Nursery Research Program has diversified into several new areas of study. During 2008, Dr. Greg Armel and I began herbicide trials for post-emergence weed control in container-grown ornamentals. New HPPD and PSII chemistries show real promise for controlling many weed species and appear safe for over-the-top applications to many woody and perennial ornamental plants – an exception being ‘Knockout’ roses.

Master’s student Drew Jeffers studied nursery-liner buyers’ perceptions of quality related to bare-root liner price, production region and several physical attributes. We worked with Drs. Charlie Hall and Marco Palma (Texas A & M) and found that bare-root liners with seven to eight first-order lateral roots per taproot explained about 65 percent of why a buyer believed a liner was “high-quality.” Price, production region and uniform caliper diameter each gave less than 4 percent importance to buyer perceptions about quality. Because of this, a bare-root liner grower’s marketing efforts should emphasize high root number, then uniform canopy density (16 percent of perceived quality) and uniform liner height (11 percent of perceived quality). Drew also analyzed, revised and updated fixed and variable

costs for three different liner production systems and developed an interactive software tool for growers.

Last fall, Phil Flanagan and I concluded the Tennessee portion of data analysis for a two-year, five-state study monitoring dogwood borer (DWB) flight activity. With cooperators, we trapped DWB in managed landscapes, woodlands and apple orchards from northern New York to eastern Tennessee. Burr knot tissues from grafted dwarf apple cultivars yielded huge numbers of DWB: 15x more male moths than urban landscapes and 200x more moths than woodlots. In Tennessee, we captured DWB from April through October, with flight peaks occurring in mid June and late August.

Jason Hansen is ending the second year of his Ph.D. research project. I co-advise Jason, along with Dr. Kevin Moulton (UT Entomology and Plant Pathology Department), in a collaborative project between the Dogwood Research Team, USDA-ARS scientists in Poplarville, MS; Beltsville, MD; and Wooster, OH; and Dr. Jason Oliver’s research team at the TSU Otis Floyd Nursery Crop Research Station (McMinnville, TN). Jason Hansen has contacted additional cooperators across the U.S. and Canada to help trap species of both clearwing moths and metallic wood-boring beetles. These insects are pests of trees, shrubs and herbs both in managed nurseries and landscapes. Jason will use seasonal trap data and the insect specimens

Dr. Bill Klingeman is an associate professor with a research and teaching appointment in the Plant Sciences Department. His research focuses on optimizing ornamental plant production efficiency and best management practices for plant and landscape maintenance. Recent projects have also included host plant resistance and herbicide tolerance screening, consumer preference testing and perception assessments of landscape management professionals to aid in plant product marketing and development. Dr. Klingeman’s turfgrass entomology course is taught each spring in support of the turfgrass science concentration. He also teaches our nursery production and management course. Dr. Klingeman has served for several years as Plant Sciences’ graduate director and has most recently agreed to serve as our department’s instructional coordinator.

to answer questions about relatedness within species “complexes” and between species, and to help identify geographic and host plant ranges for members of these pest groups.

We also hope to contribute solutions to challenges faced by biofuel producers. In August 2007, we began work with Dr. Juan-Luis Jurat-Fuentes, his post-doctoral associate Dr. Cris Oppert and graduate student Jonathan Willis (UT Entomology and Plant Pathology Department), providing live insects for large-scale cellulosytic enzyme screening assays. Phil and I have now collected replicated sets of more than 70 insect species from six insect orders that feed on wood, leaf, stem or root tissues. Our search for unique protein cellulases will continue in 2009, with an emphasis by the Jurat-Fuentes lab to identify genetic sequences coding for cellulase activity. 🌱



Left: Drew Jeffers presents his MS survey project to a participant at the Southern Nursery Association Tradeshow in Atlanta, Georgia. Right: White flannel moth larvae were among the replicated sets of 70 plant-feeding insect species screened for cellulosytic enzyme activity in gut and head sections. We also learned firsthand that this species has stinging hairs. Photos by Bill Klingeman.



Forage Programs Improve Farmers' Profitability

by Gary Bates



One of the major components of the forage research and education program has been the need to use clovers in a mixture with grasses such as tall fescue for forage production. The addition of red and white clover to pastures and hayfields has long been a standard forage recommendation. The benefits of clovers include improved nutrient content and decreased fescue toxicosis, as well as the decreased need for nitrogen fertilizer. Research has shown that a clover/tall fescue field can produce the same yield as a pure stand of tall fescue fertilized with 60 pounds of nitrogen per acre in the spring.

Extension agricultural agents have incorporated the topic of clover seeding into their educational programs. Surveys and interviews were used to determine that almost 50,000 acres of

pasture and hayfields were seeded with clovers during 2008, for a fertilizer savings of approximately \$2 million.

The forage variety testing program is currently conducting studies to help determine the best-yielding varieties of cool-season annual and perennial grasses, warm-season annual grasses, alfalfa and red clover. To help Extension agents in their variety recommendations, the testing program has identified several varieties of red clover that are well-adapted to Tennessee conditions. In particular, "Renegade" from DLF International and "FLMD" from Barenbrug Seed have performed consistently well. Both of these new varieties offer new opportunities for improved forage profitability for producers in Tennessee. The current red clover evaluations will continue for the

next year. New red clover tests will be planted in several locations in 2010. See <http://forages.tennessee.edu/> for more information. ✿

Dr. Gary Bates is a professor and the forage crops specialist for the Plant Sciences Department. He directs a state-wide forage educational and research program designed to help livestock producers be more profitable and sustainable in their production systems. His program focuses on the use of various forage species, fertilization and grazing management to improve forage production. Dr. Bates received his graduate degrees from Louisiana State University and the University of Georgia before joining the University of Tennessee in 1993.



Switchgrass Production Update

by Neil Rhodes



A cornerstone of the University of Tennessee Biofuel Initiative (UTBI) is the pilot-scale cellulosic ethanol research refinery in Vonore. All site preparation and final grade work have been completed, and we should be seeing concrete and steel in the very near future. In addition to corn cobs, wood chips and other forest biomass, switchgrass will be one of the primary feedstocks for the refinery. We are happy to report that we are making excellent progress toward the goal of approximately 5,000 acres of switchgrass planted by 2010. This is due to the hard work of our 43 farmer cooperators, UT Extension, UT AgResearch and agribusiness.

Switchgrass by the numbers

Last year and again this year, area farmers and land owners were encouraged to submit bids for contracts to produce, harvest and deliver switchgrass for the biorefinery. The contracts are for three years, and producers who are awarded contracts are paid \$450 per acre per year. In 2008, 723 acres were planted, of which 610 were successful. The 113 unsuccessful acres will be replanted this year. Seventy-two percent of the acreage was no-till. For 2009, it appears that an additional 1,880 acres will be planted. Eleven of last year's 16 producers are adding additional acreage for 2009.

This will bring us to a total of approximately 2,600 acres across nine East Tennessee counties by the end of this year; the heaviest concentration of acreage is in Monroe County.

Challenges and opportunities

Technical assistance to producers is provided by county Extension agents, the State biofuel specialist, the Eastern Region biofuel specialist and various other statewide Extension specialists in Plant Sciences, Entomology and Plant Pathology, Agricultural Economics, and Biosystems Engineering and Soil Science. However, as hard as we tried, none of us were able to make it rain in 2008! Clearly, the drought was our biggest challenge, closely followed by weed pressure. Other challenges include seed quality, soil insects and foliar pathogens. These issues are providing fuel (or should we say biofuel) for our ongoing applied research efforts. Current research areas include varietal evaluation and development; seeding rates and dates; herbicide, insecticide and fungicide evaluations; soil fertility; and production economics and logistics. This research is being conducted by UT Extension and UT AgResearch faculty at the Research and Education Centers and on the farms of our cooperators.

Dr. Neil Rhodes is a professor and weed management specialist for UT Extension where he conducts educational programming and applied weed management research in forages, biofuel crops, tobacco and aquatics. Neil began his career at the University of Tennessee in 1985, and he served as head of the Plant Sciences Department from 2001 to 2008. He is a past-president of the Tennessee Agricultural Chemical Association and of the Tennessee Agricultural Production Association. He is a former winner of the Weed Science Society of America's Outstanding Extension Weed Scientist Award. Neil and his wife Becky live in Maryville. Becky is head of Regulatory Affairs for Arysta LifeScience, North America, an agricultural chemical company based in Cary, NC.

A look toward the future

It is safe to say that much of the public is hopeful that alternative energy sources will play a key role in America's quest for a greater degree of energy independence and that biofuels will play a key role in this process. Will Tennessee have tens of thousands of acres of switchgrass fueling numerous, commercial-scale, private-sector refineries in 2020 and beyond? Nobody knows. We do know, however, that our talented scientists and other professionals in UT Extension and UT AgResearch will conduct excellent educational and research projects to address the challenges and we will answer the key switchgrass production questions. After all, this type of work is what we have done best for more than a century.

Please visit www.utbioenergy.org for more information on the UTBI. ❁

Notes from an Alumnus

by Matthew Dobson

The Department of Ornamental Horticulture & Landscape Design (OHL D) provided a well-rounded education, exposing me to many aspects of the green industries: turf and plant science, plant pathology, soil science, entomology, forestry, landscape design and other topics.

While in school, I first joined the golf maintenance staff of a local semi-private facility called Willow Creek, gaining experience in the golf shop of Eagle's Landing Golf Club. These formative years served as very good preparation for my internship with the Atlanta Athletic Club. My summer at the AAC was an eye-opening exposure to the business of golf. As a high-end private club with a very demanding membership, the facility carried out its day-to-day activities at a standard that was at a completely different level from what I had been exposed to previously. After my internship was complete, the superintendent staff offered me a position as second assistant superintendent of the Riverside Course when I graduated from UT.

Leaving school, I had set several professional goals for myself and was fortunate enough to begin achieving them at a young age. Working for Ken Mangum, Certified Golf Course Superintendent (CGCS) at the Athletic Club, and David Fruchte, CGCS at Pine Needles Resort, showed me two very different management styles.

The AAC was a very business-like setting, in which Ken had the role of the white-collar club representative who must always be the consummate professional. He employed young, reliable and professional assistants to handle large staffs and maintenance budgets. All the positions were in place and skill sets were filled so that everyone had specific tasks and took care of their own roles.

Pine Needles was a different animal. Serving as superintendent under Dave, I saw a more grass-roots approach to achieving similar results. Having smaller crews and budgets forced me into several different roles, balancing the trials and challenges that two or three positions handled at the Athletic Club. Dave, our assistants and I played hands-on roles, and it allowed us to produce high-quality playing conditions on a slightly smaller budget. This type of management style requires a special type of manager and I was extremely proud to have fulfilled the requirements of this role for more than three years. It made me a much stronger, confident and well-rounded manager.

Having two very different Certified Superintendents as mentors for the preceding six years allowed me to find the perfect balance between the two and create my own management style. Experienced and mentally ready, I accepted the position with Savannah Lakes Village, the perfect fit for me at the time. SLV was a private club in which I was exposed to the political sides of Greens Committees and Board of Directors that demanded high quality on a moderate budget.

Moving to Dubai for the development of Jumeirah Golf Estates quickly removed me from the comfort zone of SLV and into a whole other world, literally and figuratively. Helping build JGE and Leisurecorp from nothing to two very powerful and influential golf



Born the son of a minister and schoolteacher in rural Tennessee, Matthew thought moving around and adjusting to new settings and situations was part of his family's calling. He has lived in nine Tennessee towns and has fond memories from them all. He says it is fitting that he attended the University of Tennessee, where he graduated in 1999 from the Turfgrass Management program in the former Department of Ornamental Horticulture and Landscape Design.

He is currently the Golf Course Manager of Jumeirah Golf Estates in the Emirate State of Dubai, where he oversees such events as the grand opening of the Fire and Earth courses in November 2009. In continually presenting personal and professional challenges, his experiences there have been priceless. Says Matthew, "Very few jobs/professions throughout the world demand an equal balance of science, art and business. To be a truly accomplished golf course superintendent in today's market, one should work diligently at all three, be a student of all three and enjoy all three."

brands in a few short years has been a priceless career achievement. Being surrounded on a regular basis by a long list of golf industry power players, such as Greg Norman, Pete Dye, Steve Monahan, Dana Garmany, Sergio Garcia and our own David Spencer, is awe-inspiring. Along with a cast of hundreds, we have built two spectacular, world-class golf courses that will receive numerous accolades for years to come.

The University of Tennessee got me off on the right foot and I feel blessed to have spent so many years on some of the best golf courses in the world and to give blood, sweat and tears to an industry that keeps giving in return. I recently completed the Certified Golf Course Superintendent program through GCSAA and am beginning the Master Greenskeeper Program with BIGGA. I recommend both continuing education programs to better yourself professionally and find strength in personal dedication to higher goals. 🌱



The Agronomy Team of Jumeirah Golf Estates after construction completion and Media Launch in February 2009.

UT Gardens Blossom Into Independent Program

by Sue Hamilton



The University of Tennessee Gardens, located in Knoxville and Jackson, are part of the UT Institute of Agriculture. Their mission is to foster appreciation, education and stewardship of plants through garden displays, collections, educational programs and research trials. Some 4,000 annuals, perennials, herbs, tropicals, trees, shrubs, vegetables and ornamental grasses are evaluated each year. Both UT Gardens sites are Tennessee Certified Arboreta. The gardens are open during all seasons and free to the public.

The UT Gardens have been invited to participate in the new 'American Garden Award' (AGW) program, where garden visitors vote on their favorite plants in the gardens by text messaging or using a mobile phone call-in number. This "mobile marketing" appeals to Generations X and Y and is a new marketing tool in the horticulture industry. When visitors call to vote, there is a cellular charge of 99 cents. At the end of the fall season, the votes will be tallied by the AGW headquarters in Chicago and the top three most popular plants from participating gardens will win the 'American Garden Award.'

The UT Gardens have been recognized as an official 'Conifer Reference Garden' by the American Conifer Society (ACS). This prestigious status acknowledges the significance of the UT Gardens conifer collection and support from the American Conifer Society. The UT Gardens joined the ACS in 2005. We were honored to help host the 2006 ACS Annual Conference in Tennessee and to have received a \$3000 ACS grant to support our collection. Since October 2005, the UT Gardens has invested \$6,114 in developing its conifer collection, growing the collection

by 276 new specimens. Our current collection has 346 conifers representing 19 genera. We have also invested \$11,550 in permanent interpretive botanical labels, aluminum accession labels and a computer to electronically store and manage the plant collection database. Since 2005, our conifer collection has become a significant part of our gardens and helps fulfill our gardens' mission. We plan to offer a conifer symposium in early fall 2009. More information will follow as symposium plans and details are finalized.

Beth Willis is now a permanent member of our UT Gardens' staff. Beth will take over responsibilities for plant trials and will serve as our trial coordinator. She will work with the commercial seed and plant companies from around the world on evaluating their plants' performance in the gardens. Her performance data will provide valuable information for Tennessee's green industry, which includes commercial greenhouse and nursery producers, commercial landscapers and consumers. Beth's trial results take the guesswork out of which plants ought to be grown, sold and used in Tennessee. Results from the 2007 variety trials are available on the UT Gardens Web site at <http://utgardens.tennessee.edu/>. In addition to these duties, Beth will also serve as the Gardens' Webmaster and volunteer coordinator. ❁



Dr. Sue Hamilton is an associate professor and the director of the University of Tennessee Gardens, enjoyed by more than 60,000 visitors each year. The UT Gardens are important "proving grounds" where hundreds of different cultivars of trees, shrubs, annuals, perennials and herbs are evaluated each year for their landscape performance in the Southeastern region of the United States. Dr. Sue is co-host of "The Garden Girls" talk radio show and has written a book "The Best Garden Plants for Tennessee." She also is an avid gardener and enjoys practicing what she teaches.

Dr. Hamilton has a bachelor of science degree in ornamental horticulture from the University of Tennessee, 1980; a master's degree in horticulture from Ohio State University, 1983; and a doctorate degree in adult education from the University of Tennessee, 1995.

First-Ever Holiday Express at the UT Gardens Draws Thousands

The Holiday Express, a 4,000-square-foot garden railway display nestled in the beauty of the fall and winter UT Gardens, drew more than 9,000 visitors, raising public awareness for the UT Gardens and the Institute of Agriculture. Because of the success, creator Mark Fuhrman has agreed to partner with the Institute again this year to bring back the event.

In addition to the hard work of Mark Fuhrman, his business partner Jeanne Lane and the UT Gardens staff, student interns and volunteers, Holiday Express would not have been possible without the generosity of many area sponsors. Many thanks to them.

Holiday Express at the UT Gardens 2009 will open with a sneak preview for employees Tuesday, November 24th. It will open to the public November 25-29 and then Friday-Sunday December 4 through January 3. Additional days of operation will include Monday and Tuesday, December 28 and 29.



[Continued from cover]

The class is offered both spring and fall semesters. Students learn about 150 of the best Mid-South natives, focusing on gardening and environmental restoration. The class takes weekly off-campus outings to observe plant communities, to visit local native plant nurseries and to tour native plant restoration projects or native landscape gardens. Class members are also involved each semester in several 'service outings' where students contribute their energy and time to planting natives or sometimes removing ecologically detrimental invasive exotic species.

Various partners, mostly sponsors of local parks and greenways, have contributed funding for plant materials, while the students assist with the volunteer labor. The partners and agencies have included TVA, City of Alcoa, City of Maryville, City of Knoxville, Knox County, the National Fish and Wildlife Foundation, the Wildlife Habitat Council, Knox Greenways Coalition, the River Run Homeowners Association, the Halls Business and Professional Association, the Beaver Creek Watershed Association, the Town of Farragut, the Coalfield Community, the Little River Watershed Association, the ALCOA Foundation and the Tanasi Lagoon Townhome Association.

Past classes have spent extensive effort in planting hundreds of native trees, shrubs and wildflowers along or near Beaver Creek, and in establishing improved edge habitat around the perimeter of several wetlands in the Halls Community Greenway in partnership with the Knox County Parks and Recreation Department. Stream buffer demonstration projects have been implemented in Springbrook Park in Alcoa and in Campbell Station Park in Farragut. A couple of wetlands that filter runoff from surrounding urban areas have been created along the Alcoa Greenway as a strategy for improving water quality and wildlife habitat



Sam Rogers is a Registered Landscape Architect and associate professor in the Department of Plant Sciences. His interests include ecologically based landscape design, community greenways and habitat restoration. He established and directs the UT Environmental Landscape Design Lab as an outreach and service learning resource. As a proponent of the increased understanding of native plants in landscape design, he initiated and teaches 'Native Plants in the Landscape' to serve the undergraduates in landscape design and the graduate students in the newly established master of landscape architecture program at UT.

along Pistol Creek. Currently, a riparian area is being restored and 'pocket woodlands' created within the Coalfield Community Park, and a meadow and 'rain garden' are being developed and managed on TVA property at Tanasi Lagoon bordering Tellico Lake.

Funding for the plant materials, supplemental design and project assistance, and other materials such as interpretive signage has been raised for each project through grants and contracts sponsored by the various partners. In 1998, I initiated two mechanisms, the 'Sustainable Landscapes Partnership' and the 'UT Environmental Landscape Design Lab' to facilitate project funding, planning and logistics. These mechanisms laid the groundwork and served as the basis for the Natives class being established in fall semester 2000. I have taught the class each semester since then. Securing and maintaining

Spring 2008 Natives class students David Quarterman (left), Keith Finelli (center) and Thomas Peters (right) planting river oaks as part of a 'stream buffer' demonstration project at Campbell Station Park, Farragut.

funding have been the most significant challenges; however, the sense of environmental stewardship that the students gain through the various class studies and outings is invaluable.

Student response has been consistently positive to the Natives class and especially the service learning component. Perhaps one student summarizes it best by a comment recorded in an anonymous course evaluation, "I feel I have benefitted most from the application of what I have learned in the classroom coupled with the field work. I believe in giving back to the community, and it was fulfilling to me to give back to the community through one of my classes. I feel like I have been part of something larger than myself or the classroom." ❁



Plant Sciences Turf Team



Dr. James T. Brosnan, Assistant Professor

Dr. Brosnan received a Ph.D. in agronomy (turfgrass) from Penn State University, a M.S. in plant, soil and insect sciences (turfgrass) from the University of Massachusetts-Amherst and a B.S. in turfgrass science from Penn State University. Before coming to Tennessee in August, 2008, Dr. Brosnan was on the faculty of the University of Hawaii at Manoa, Honolulu, HI, serving as assistant specialist of turfgrass management, a 12-month appointment with 55 percent Extension, 35 percent research and 10 percent teaching responsibilities. Presently, Dr. Brosnan leads the turfgrass weed science research and Extension program. His research focuses on effective and economical strategies for broadleaf and grassy weed control in turfgrass systems, including golf courses, athletic fields and residential landscapes. He is also studying the effects of plant growth regulators on both warm- and cool-season turfgrasses. Dr. Brosnan has developed the Web site <http://www.tennesseeturfgrassweeds.org>.

Dr. John C. Sorochoan, Associate Professor

Born and raised in Calgary, Alberta, Canada, Dr. Sorochoan developed a sincere interest in turfgrass science and management research and education while enrolled in the Crop and Soil Sciences Department at Michigan State University in Lansing, where he received AgTech, B.S., M.S. and Ph.D degrees. While a student, Dr. Sorochoan worked as a researcher on the 1994 World Cup Soccer Indoor Turf Project in Pontiac, MI. He also conducted sports turf research for the Argentine Government at the LaPlata Indoor Soccer Stadium, and

supervised the renovation of five premier soccer pitches in Spain, including Real, Valencia and Atletico Madrid. Dr. Sorochoan's research efforts now focus on minimizing inputs while sustaining viable turf at an appropriate level of quality. Presently, Dr. Sorochoan teaches four classes and advises more than 40 undergraduate students and six graduate students. Dr. Sorochoan maintains the Web site <http://www.turf.tennessee.edu>.

Dr. Thomas J. Samples, Professor

Dr. Samples, turfgrass science and management Extension specialist, received a B.S. degree in agronomy/crops from the Ohio State University, and M.S. and Ph.D. degrees in turfgrass management and crop science/turfgrass management, respectively, from Oklahoma State University. He has written several book chapters, Extension publications and trade articles regarding the selection, establishment, maintenance, production and renovation of turfgrasses in the northern "transition" zone and has developed the Web site <http://www.tennesseeturf.utk.edu>. Dr. Samples serves as an educational program advisor to the Tennessee Turfgrass and the Tennessee Valley Sports Turf Manager's Associations. He also teaches PS341-Integrated Turfgrass Management and Environmental Benefits.



Dr. Brandon Horvath, Assistant Professor

Dr. Horvath received a B.S. from the Ohio State University, and M.S. and Ph.D. degrees from Michigan State University. Brandon is our newest team member, joining our faculty May 1, 2009. His chief responsibilities are in teaching, and Brandon will also conduct research. With his training in turf pathology, we look forward to a course in turf diseases, a dimension we have hoped for in the turf teaching program for a long time. Brandon comes to us from Virginia Tech University, where his research focused on developing disease management strategies for major turfgrass pathogens, such as brown patch (*Rhizoctonia solani*), Pythium blight and dollar spot (*Sclerotinia homoeocarpa*). 🌿





Tennessee's turfgrass industry continues to grow due, in part, to the demand for both residential and commercial property development, and the environmental and aesthetic benefits of turfgrasses in urban landscapes. Home and business owners in Tennessee support the industry by purchasing lawn care products and services. In 2002, an estimated 5,500 acres of sod were harvested and transported from 56 sod farms, and 598 lawn care establishments employed more than 3,900 people. The estimated gross margin of retail sales of lawn care equipment and products in 2002 was \$94.4 million. In addition to offering golfers the opportunity to experience the game of golf while enjoying a variety of plants, animals and vistas, golf courses across the state also provide employment and contribute to the state economy. In 2002, 216 golf courses provided more than 5,000 jobs and contributed an estimated total output impact of \$314 million. Sports and recreational turfs are managed at most of the state's 600+ high schools, 200+ middle schools and 900+ elementary schools.

Left: Painted T on the field in Neyland Stadium, where our students often gain experience. Below: Dr. Sorochan giving a presentation during our first Turfgrass Field Day. He is explaining a study of UT's heat-tolerant Kentucky bluegrass trial. The study evaluated improved varieties and management strategies for the transition zone. Photo by Johnny Parham. Bottom: Irrigation of Honors Golf Course (hole 15, par 4) in Ooltewah, TN. Photo by John Sorochan.



The Latest...

The new UT masters of landscape architecture program welcomes its second class of students, who start work toward their degrees in August 2009.

Graduate student Dustin Lewis took first place in the masters student oral/paper competition at the 62nd Southern Weed Science Society of America (SWSSA) conference in Orlando, Florida, in February 2009. Other authors included J.S. McElroy, J.C. Sorochan, J.T. Brosnan and G.K. Breeden. Dr. Greg Armel's student Javier Vargas won first place overall in the photo contest with wild sunflower photographs.

Graduate student Dustin Lewis (advisors: S. McElroy and J. Sorochan) was awarded first place for the outstanding graduate student oral presentation entitled "Efficacy of Aryloxyphenoxypropionate Herbicides for Bermuda-grass Control in Zoysiagrass Fairways" at the 63rd annual Northeastern Weed Science Society (NEWSS) conference, held in Baltimore, Maryland. Dustin also placed second for his photo submission, "White Clover on Frosty Morning." Graduate student Javier Vargas (advisor: G. Armel) was awarded third place for his photo "Turkey Creek Musk Thistle," while research associate Greg Breeden received an honorable mention for his photo, "Little Star of Bethlehem."

Congratulations to Kristin Abney for being awarded one of the two UTIA Tom Dunlap Graduate Fellowships for Agriculture. Kristin will receive a sizeable one-time monetary award in support of her current degree efforts. Kristin is currently pursuing an M.S. degree under the direction of Dean Kopsell. Her thesis project centers on the influence of UVA/UVB light on concentrations

of nutritionally important secondary metabolites in allium (scallion onions and chives) crop species.

Tom Samples of Plant Sciences has received the Gamma Sigma Delta Excellence in Extension Award.

Joe D. Burns, age 82, retired UTIA professor and Extension forage crops specialist, passed away in October 2008. Joe will be remembered for his smile and constant good cheer along with his professional excellence. He will be deeply missed by his colleagues and friends at UTIA and in the department.

Neil Rhodes and his wife Becky both won Outstanding Alumni Awards at North Carolina State University. Becky was recognized for her work in ICI Americas/Zeneca Ag products as a plant physiologist, market development supervisor, senior regulatory specialist and for her current position as head of regulatory affairs for Arysta LifeScience, North America. Neil was honored for his work as a field development representative with Rohm and Haas; his research, teaching and Extension career at UTIA; and his service as Plant Sciences department head.

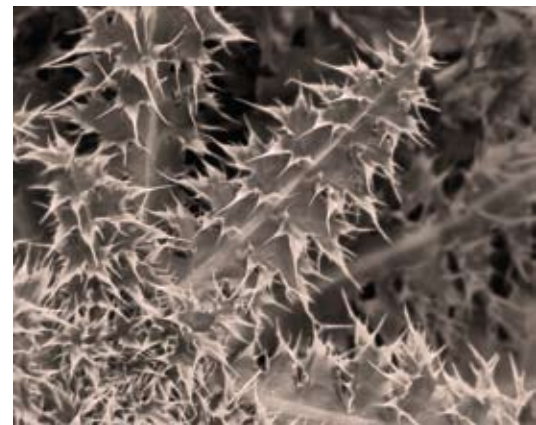
The new University of Tennessee Turfgrass Weed Science Web site is now online at <http://tennesseeturfgrassweeds.org>, compliments of Jim Brosnan, Greg Breeden and Dustin Lewis. Visit this Web site to stay in touch with all turfgrass weed science research and Extension activities at the University of Tennessee. Among several highlights of the site: a new turfgrass weed identification tool that includes both color photos and control options for numerous weeds found statewide.



White Clover on Frosty Morning



Little Star of Bethlehem



Turkey Creek Musk Thistle

We would love to assure we have your current address. Please email us at plantsciences@utk.edu with your current contact information. Thanks!

Other new departmental web resources:

Organic & Sustainable Crop Production, <http://organics.tennessee.edu/>. Visit the site to learn about the statewide organic agriculture initiative launched by the university of Tennessee, in cooperation with the Tennessee Department of Agriculture. Authored by Annette Wszelaki and Dana Saywell.

Hortweeds, <http://hortweeds.tennessee.edu/>. A database of horticultural and invasive weeds, that allows you to search for information in three search categories: single active ingredient herbicides, common commercial pre-packaged herbicide mixtures, and mode of action definitions. Authored by Greg Armel, Becky Koepke, Bill Klingeman, Larry Steckel, Greg Breeden, Neil Rhodes and Jim Brosnan.

Ag Day 2009 – UT vs. Ohio. Join UT's Institute of Agriculture for a fun and festive Ag Day Street Fair. Events start four hours before the Vols' football game, Saturday, Sept. 26. Ag Day will feature departmental exhibits, an insect petting zoo, live music and more. For details, call 865-974-4739 or visit the UT Institute of Agriculture Web site, <http://agriculture.tennessee.edu>.



Students from the Byington-Solway Career and Technical Education Center assist in the installation of UT's first greenroof, adjacent to the Environmental Landscape Bldg. on the Ag Campus. This greenroof will aid in low impact development design and research as well as provide valuable information for the public. Photo by Curtis Stewart.

For more departmental news visit
plantsciences.utk.edu/news.htm

For more undergraduate program news visit
plantsciences.utk.edu/ug_news.htm

Plant Sciences in the Campaign for Tennessee: Growing in Support

By Mark Clark

Associate Development Director, UTIA Development Office

There's an old saying that asks, "If not me, then who, and if not now, then when?" The phrase can be interpreted many different ways and applied to many different situations. Fundamentally, the core of the question asks each of us to consider what we are doing to improve our world.

Perhaps taking those words to heart, the University of Tennessee publicly launched its most ambitious fundraising campaign ever, with a goal of raising \$1 billion. That goal encompasses the desires of each department on each campus, including the Department of Plant Sciences in Knoxville and Jackson. We are constantly striving to make our department the best it can be. We are proud of the education, research and outreach we provide to our students, and to the industries and citizens of our state. Yet, for every one thing we accomplish, there are always several more things to do.

We want to provide our students with opportunities to attend professional conferences. We want to attract outstanding graduate students. We want to provide incentives for our students to study abroad so they will be better prepared for careers influenced by our ever-growing global economy. Each of these departmental ambitions requires significant resources. We pride ourselves on being practical with the resources we have, but your contributions make a difference in the quality of the experience we are able to provide to our students. For those who currently support the department, we humbly offer our gratitude.

We invite you to participate in the Campaign for Tennessee by returning the enclosed envelope and making a contribution to our department. With your help, we will continue to expand on the outstanding educational experience already being provided.

If you would like more information about the department's specific needs and/or naming opportunities, please contact Mark Clark at mclark4@utk.edu or 865-974-5315.

The University of Tennessee
Department of Plant Sciences
2431 Joe Johnson Drive
Knoxville, TN 37996-4561

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Topics planned for next issue:

Public Horticulture

Tobacco

Faculty Focus – Weed Science

The “Green T”: Department’s New Hort Club

Greenhouse Agriculture

Field Crops Update

Turf Update

Partnerships

