



2023 ANNUAL REPORT



SCHOOL OF
NATURAL RESOURCES



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The School of Natural Resources
is located in the Herbert College
of Agriculture at the University of
Tennessee Institute of Agriculture.

naturalresources.tennessee.edu

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Message from **School Director**

We marked our first full year as the School of Natural Resources in 2023 after changing from the Department of Forestry, Wildlife and Fisheries in January. The new designation fully encompasses all the programs and opportunities we offer in research, teaching, and Extension.

Natural resources significantly contribute to the Tennessee economy. Forestry and forest products generate more than \$24 billion each year, account for almost 4 percent of the state's economy, and provide more than 85,000 jobs. In 2022, outdoor recreation generated \$11.9 billion with more than 3.6 million people participating in the state of Tennessee. Each year fishing generates \$1.2 billion and provides 7,480 jobs. Wildlife and fisheries-related recreation creates almost \$3 billion each year.

Natural resources also are a fundamental part of the state's culture. Tennesseans see the outdoors as an essential part of life. They rely on it for recreation, mental and physical health, socializing, and other benefits.

In 2023, the School awarded 76 degrees including 58 undergraduate degrees and 18 graduate degrees. Faculty members received more than \$33 million in research grants and contracts, and Extension reached more than 689,000 people through educational programs and events. Faculty and students also received multiple awards including numerous university and professional society awards.

Our School's teaching programs, research, and Extension play a vital role in sustainably managing natural resources to make our state and world a better place to live.

I look forward to sharing our current and future accomplishments. Thank you for your support.

Don Hodges

School of Natural Resources Director

SNR By The Numbers



PEOPLE

326

Undergraduates enrolled

50

Graduate students enrolled

76

Degrees awarded in 2023

37

Faculty

RESEARCH PROJECTS

108

Active Projects

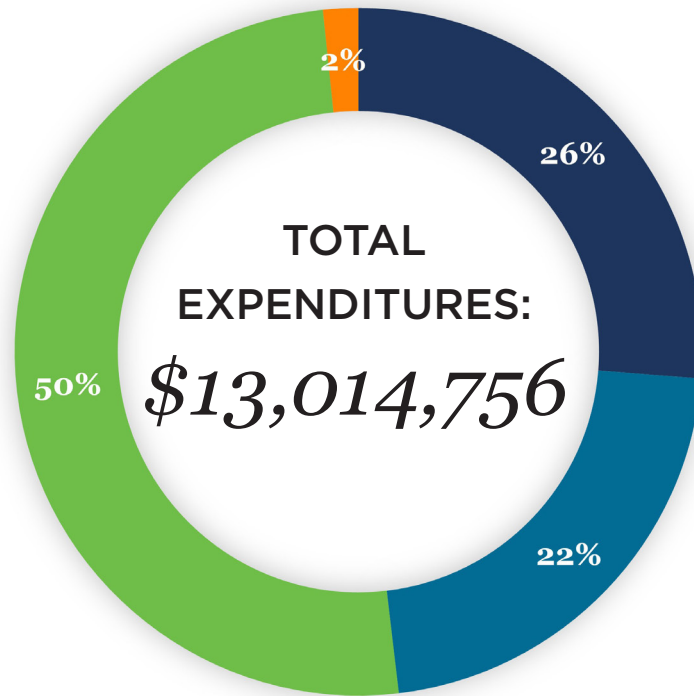
123

Refereed publications

\$33,504,194

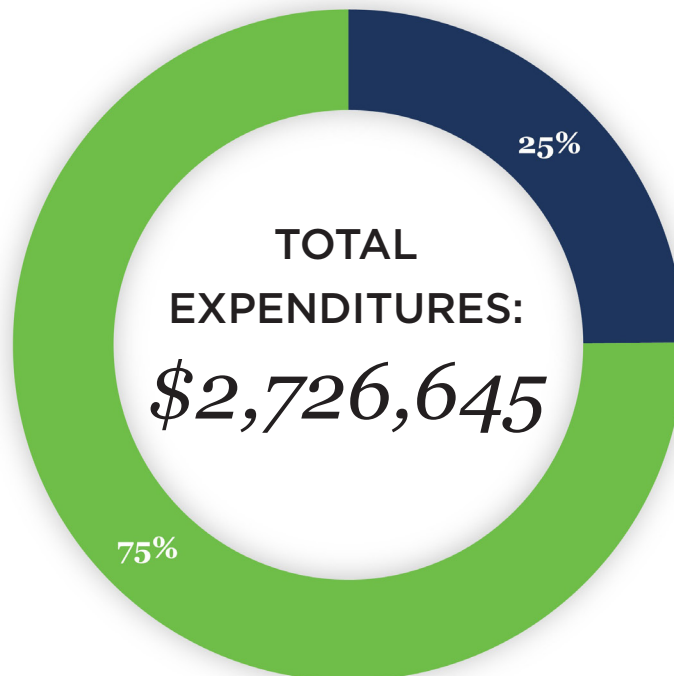
SNR Grants Awarded in 2023

SCHOOL OF NATURAL RESOURCES



- Grants, Contracts
- State Funds
- Federal Funds
- Other

CENTER FOR RENEWABLE CARBON



Extension Summary

689,324

contacts reached

799

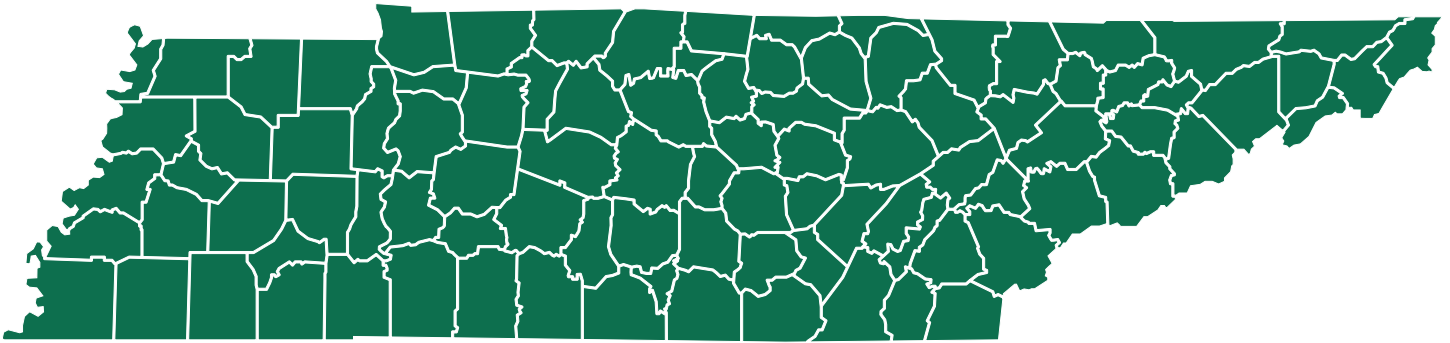
activities

6,208

hours

Includes:

- Public meetings
- Zooms & Facebook Lives
- Trainings
- Educational Videos
- On-site visits
- Phone calls and emails



SAMPLE OF 2023 EXTENSION PROGRAMS

4-H Wildlife Judging in Tennessee

Quality Deer Management

Wildlife Health trainings

Welcome to Your Woods

Tennessee Healthy Hardwoods

Tennessee Tree Day

Pond Management trainings

Pond Renovation/Electrofishing demonstrations

Forest Landowner Field Day

EXTENSION FACULTY

Chris Graves

Dan Grove

Craig Harper

Sharon Jean-Philippe

Pat Keyser

David Mercker

Stephen Peairs

Ryan Sharp

Adam Taylor

REGIONAL FISHERIES EXTENSION AGENTS

Mannie Bedwell
Hamblen County

Joshua Daugherty
Morgan County

Justin Hargrove
Benton County

Wayne Key
Putnam County

Creig Kimbro
Grundy County

Jeff Via
Fayette County



FORESTRY AND FOREST PRODUCTS

UNDERGRADUATE MAJOR CONCENTRATIONS

- Forest Resources Management
- Restoration and Conservation Science
- Urban Forestry
- Wildland Recreation

GRADUATE AREAS OF STUDY

- Ecosystem function and structure
- Natural resources economics and policy
- Human dimensions of natural resource management
- Wood Sciences
- Multidisciplinary natural resource management

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Urban Forestry professor part of \$4.3 million effort to plant trees in urban areas

Thanks to two federal grants totaling \$4.3 million, tree lovers hoping to expand Knoxville's canopy – especially in neighborhoods needing it the most – have something to celebrate.

The University of Tennessee, Knoxville, was awarded \$2.6 million to increase tree canopy coverage, reduce stormwater runoff, mitigate extreme heat and bring ecosystem services to underserved communities in East Knoxville.

The federal government awarded another \$1.7 million to Trees Knoxville, a nonprofit partner, to plant and maintain 7,500 trees along streets, in parks, at schools, in public housing communities, in historic African American cemeteries and elsewhere.

UT Support for Knoxville's Tree Project

Associate Professor of Civil and Environmental Engineering Jon Hathaway will lead the university's team, which also includes Assistant Professor of Social Work Jennifer First and Professor of Urban Forestry Sharon Jean-Philippe.

Hathaway added that while the trees are a major part of the plan, the overall aim will help fulfill UT's land-grant mission by focusing on several areas, including supporting underserved communities in East Knoxville.

He added, "Our plan to install gravel tree stormwater systems and provide accompanying public education and workforce development has significant implications for climate resilience by providing shading, evaporative cooling



and extreme precipitation mitigation; for workforce development by providing internships in the forestry profession and building a group of certified professionals in green infrastructure maintenance; and for increasing public participation in urban forestry to build the next generation of diverse leadership in this field."

City of Knoxville's Goal to Increase Green Space

According to Knoxville Mayor Indya Kincannon, the grants, awarded as part of the Inflation Reduction Act, come at a strategically opportune time.

"The investments made possible by these federal grants will be transformative," said Kincannon. "We're going to reverse the slow decline of tree canopy, and in fact prioritizing the greening up of areas that we know are the most in need of additional plantings."

The city's Urban Forestry Division oversaw a first-ever comprehensive canopy assessment in 2021. That study documented more than 24,000 acres of tree cover in Knoxville — 38% of the total land area. The canopy decreased by 732 acres over a decade, however, with most of those decreases on private property.



The canopy assessment, along with immense public input, led the city and Trees Knoxville to develop the Knoxville urban forest master plan, a long-term roadmap showing which trees to plant were. Trees Knoxville and the city share a goal of increasing tree cover to 40%.

While the city generally plants up to 500 trees a year, the grant funding to Trees Knoxville will pay for three times as many plantings.

“The master plan is community driven,” said Trees Knoxville Chair Dale Madden. “It will better human health, create more access to green space and improve our quality of life. This federal funding is a springboard for us to launch the implementation of the plan. What we do in these next five years will be critically important to the future of Knoxville for many years to come.”

The grant to Trees Knoxville will fund the purchase, plantings and care for 1,000 trees on public property each year for five years, plus a giveaway of 500 trees a year for

residential plantings. Trees Knoxville will offer free educational events on tree care and provide professional training to expand the tree-care workforce.

UT’s grant, meanwhile, will complement the work of Trees Knoxville and the city.

Growth Through Collaboration

One of the first gravel tree stormwater systems was installed in East Knoxville in a collaborative effort between the U.S. Forest Service, UT, and the City of Knoxville Urban Forestry Division.

“Observation of the system showed it was well functioning and tree growth and health in the system were excellent,” Hathaway said. “Due to the low cost and benefits provided by these systems, GTSS may be an integral part of climate resilience in communities, in particular those that are economically disadvantaged.”

This article was first published on news.utk.edu.

Trees & whiskey: Celebrating a well-aged partnership spanning 25 years



The UT Tree Improvement Program and the Jack Daniel Distillery began a partnership to grow trees for reforestation 25 years ago. Dozens of people gathered in Lynchburg to celebrate the milestone in June 2023.

The event recognized UT-TIP Director and Professor Scott Schlarbaum for his years of leadership and service to the program and its partnership with the distillery.

Jack Daniel Distillery General Manager Melvin Keebler shared the impact the partnership has made on the distillery, state and beyond. “It’s not just about our barrel-making. It’s about forestry throughout the southeast and making sure that we have the right species that can then go into nurseries that can then be planted and they are the best ones,” Keebler said.

In 1998, Schlarbaum met with distillery leaders about the sugar maple inventory used in the whiskey-making process. The program started growing sugar maple and white oak seed orchards on distillery property. Fast forward to 2023, and 10 types of seed orchards live on the land including black

walnut, butternut, water oak, willow oak, swamp white oak, chinkapin oak, chestnut oak and overcup oak.

Schlarbaum said “Sure, we’re working with some of the trees they use like sugar maple here at Jack Daniel’s, making Tennessee whiskey, and oak barrels that all the distilleries use, but look at all these other species. They’re not used by the distillery. The distillery had the land. The distillery had the willpower to say we’re going to do this, and we’re going to make a contribution to Tennessee natural resources.”

UT Extension Agent and Moore County Director Larry Moorehead was also honored at the event for his 46 years of service to agriculture and forestry efforts in middle Tennessee. He and Schlarbaum received certificates honoring their years of leadership.

The Tree Improvement Program started in 1959 as a research program in the Tennessee Agricultural Experiment Station. It aims to improve the productivity and health of Tennessee forested lands through the planting of high-quality, genetically improved seedlings by Tennessee landowners.

SNR faculty judge 4-H forestry competition

Smith County won the top spot against five other teams in the 2023 State 4-H Forestry competition at the UT Arboretum in Oak Ridge on Saturday, Oct. 7. The team will compete at the National 4-H Forestry Invitational in West Virginia next summer.

The events included tree, insect, disease, and wood identification along with tree measurements, compass and pacing, and a forest stand evaluation.

“It is seriously impressive to see these high school students display their knowledge and

skills,” School of Natural Resources Extension Specialist Chris Graves said. “Thank you to all the Extension staff, coaches, volunteers, and family members who support and encourage our 4-H’ers.”

Graves, School of Natural Resources Assistant Professor Stephen Peairs, Extension Program Leader Melissa Henry, and School of Natural Resources Extension Specialist David Mercker coordinated the event. UT Forest Resources AgResearch and Education Center Director Kevin Hoyt hosted the event at the UT Arboretum.



Conserving Harbison's hawthorn in West Tennessee

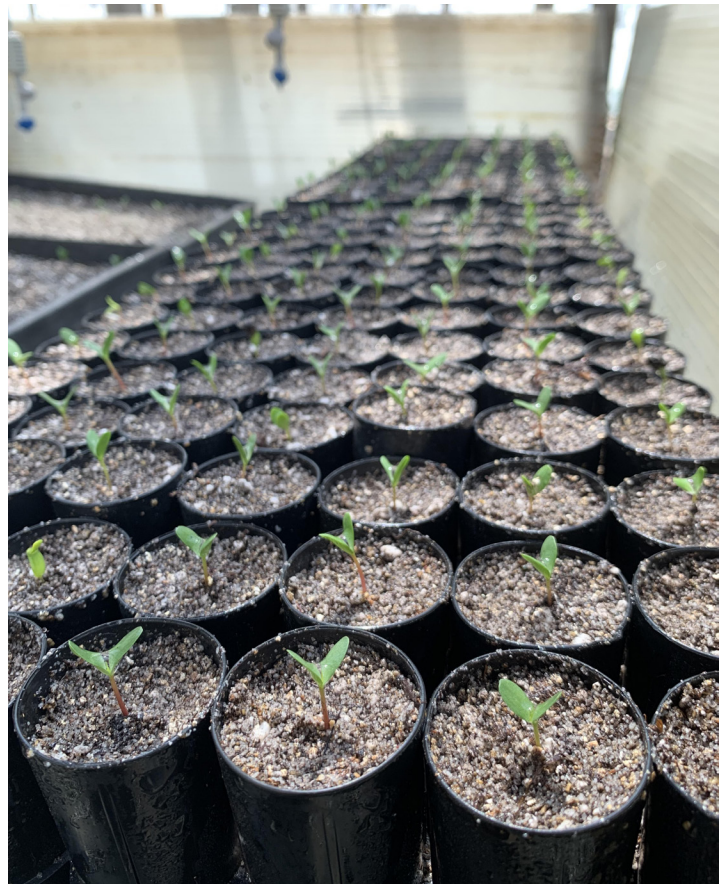


A small population of one of the rarest woody plant species in North America grows in Obion County, Tenn. The Harbison's hawthorn tree is ranked as extremely rare and critically imperiled by the Tennessee Rare Plant List.

Only two trees were known to exist in Davidson County, but in 2019, NRCS biologists found 70 trees in Obion County.

This past spring Barry Hart and Mike Hansbrough, both NRCS, resurveyed the area in April with Jesse Parker, a research specialist with the UT Tree Improvement Program. They found 91 Harbison's sprawled across 87 acres in Obion County.

The trees ranged in height from one to 19 feet with an average height of 10 feet. They found 24 trees were flowering including some heavy with blooms. Parker said this suggests the potential for a large seed crop in the fall. They



hope to collect seeds from each of the trees with the cooperation of the landowners.

The team recorded coordinates for each tree and staked aluminum tags at each tree base. These details will help the program locate, identify and maintain the origin of the trees when collecting scion wood, or twigs, for grafting. The team plans to experiment with bud grafting Harbison's hawthorn onto Washington hawthorn understock.

Once the grafted clones grown to a suitable size, the program will plant them on orchard spacing sites at the UT AgResearch Center at Milan and the UT Ames AgResearch Center.

Working to grow willow oak seed orchard in Greene County

Crews with the Tennessee Wildlife Resources Agency used chainsaws and heavy equipment to thin a willow oak progeny test at the Lick Creek Bottoms Wildlife Management Area in Greene County for the UT Tree Improvement Program at the beginning of March.

Part of the area was planted in 2003. Program Director Scott Schlarbaum says they plan to let the vegetation grow up around the trees instead of maintaining a grass cover. The overgrowth will provide a wildlife habitat to the area.

Schlarbaum says they will chop it back down and clean up the area in a couple years when the trees start producing acorns. They will then collect the acorns.

“All the acorns will go down to the East Tennessee State Nursery to be grown for reforestation here, specifically for East Tennessee because these acorns will be locally adapted,” Schlarbaum said.

Schlarbaum says the program has worked with TWRA since 2001 when the wildlife biologists for Lick Creek collected acorns for the program. They decided to put seed orchards on the property to produce acorns and benefit wildlife.

East Tennessee Forestry Work Unit Supervisor Luke Hadden with TWRA is helping thin the area. He worked with the UT Tree Improvement Program for two years as a student.

“Every chance we get, I try to help him out, and hauling a couple pieces of equipment over here for the day to make that happen, that’s the least we can do to help him out,” Hadden said.

The program plans to integrate the new willow oak seed orchard into its Tennessee seed orchard system. It stretches across the state and produces locally adapted acorns for the state nursery.



Using new technology in seed orchards



The UT Tree Improvement Program tested out its new drone at its Watauga Northern Red Oak Seed Orchard in August 2023.

“We’re doing our typical seed surveys to see how many acorns we have, and we generally do that with binoculars, but these trees have gotten so big it’s really difficult,” Ami Sharp, Tree Improvement Program research associate, said. “We’re seeing if the drones are capable of seeing the acorns for us.”

Sharp and Research Associate Allison Mains took a training class on flying the drone. Sharp said, “It’s sort of like playing a little video game, especially in the class. We were on simulators. They really did train us with like the muscle memory and all that.” It took about

a year of training and logistics before the program received its own drone.

Sharp hopes the new technology will make it easier to collect data from each seed orchard. “I have in mind getting tree heights more easily. We have a pretty nice laser, but sometimes if you’re on the interior of an existing forest, it’s difficult or impossible to get tree heights. Also, mapping would be great if it can assist us with mapping,” Sharp said. “I think the data that we could get with that we just might not even know about yet. I think the sky’s the limit.”

SNR faculty, graduate students present at 2023 Woods and Wildlife Field Day

School of Natural Resources faculty members and graduate students shared their knowledge and research at the 2023 Woods and Wildlife Field Day presented by UT AgResearch and UT Extension at the UT Arboretum in Oak Ridge.

Professor Scott Schlarbaum gave a presentation on the UT Tree Improvement Program and showed the Cornelia Cherry Project the program has at the UT Arboretum.

Graduate student Ashley Epstein shared her research on Eastern red bats and why they are indicators of environmental health. Bats play an essential role in controlling pests and pollinating plants.

Professor Jennifer Franklin gave a talk on Forest Restoration and Prescribed Fire projects. She shared how her Forestry 305 course teaches students about determining the best conditions to use prescribed fire in forest stands.



Participants also took a van field tour to different project sites including a Tree Harvesting Demo Plot. Extension Specialist David Mercker explained how the project shows the results of waiting for trees to grow more than 16 inches in diameter to harvest and the long-term benefits.

The field tour ended with a presentation from Professor David Buckley and graduate student Mel Mount about Carbon Capture in Irregular Shelterwood Harvest Areas. Buckley and Mount explained how certain plots measured in the project area before and after a clear cut.

Center Director Kevin Hoyt and the UT Forest Resources Ag Research and Education Center staff hosted the field day.



WILDLIFE AND FISHERIES

UNDERGRADUATE MAJOR CONCENTRATIONS

- Wildlife and fisheries management
- Wildlife Health

GRADUATE AREAS OF STUDY

- Wildlife and fisheries biology
- Ecosystem function and structure
- Natural resource economics and policy
- Human dimensions of natural resource management
- Multidisciplinary natural resource management

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SNR researchers use helicopter capture for deer monitoring study



Crews flew a helicopter over the Ames AgResearch and Education Center in March to capture deer for a monitoring study conducted by faculty members of the School of Natural Resources. The study is looking at whitetail deer movements and transmission rates for diseases including Chronic Wasting Disease (CWD) and SARS-CoV-2, the disease that causes COVID-19 in humans.

Dr. Lisa Muller, Dr. Dan Grove, Dr. Mark Wilber and Justin Kosiewska, a wildlife and fisheries graduate student, worked on the ground with the Tennessee Wildlife Resources Agency to collect blood, hair and other samples before putting GPS collars on the deer and releasing them. The collars allow researchers to monitor deer movements every 30 minutes, providing coordinates of their locations in almost real time. Researchers hope the data will help them understand the disease transmission rates among deer.

Grove said the deer in Fayette County tested positive for SARS-CoV-2 during the 2021-2022

hunting season. “Anytime you’ve got a disease that spills over into wildlife, the disease could change and then spill back over into people and potentially be more infectious and more detrimental,” he said. Researchers are also using the study to look at CWD transmission rates. The disease was first detected in Tennessee in 2018 in both Hardeman and Fayette counties. Grove added, “We can study two diseases at the same time and what disease dynamics may actually be if there are co-infections.”

To capture the animals, a helicopter crew found deer to herd into an open area. They used a net gun to trap the deer and secured them with eye coverings and hobbles before putting them in a sling attached to the helicopter. They then flew them back to ground crews who collected samples from the deer.

“It all takes about 20-30 minutes,” Wilber said about the collection process. Researchers took nasal and oral swabs for SARS-CoV-2 while

also collecting biological information (e.g., sex, age, weight), blood samples, ear punches for CWD, ticks and hair.

After collecting all the samples and data, they carried the deer to an open area to release the animals safely. Muller said they decided to try this capture method after trying other capture techniques in the area and seeing recent success with helicopter capture in a separate elk study by TWRA. “It’s very efficient. They’re able to get on animals fast,” Muller said.

The monitoring is part of a nationwide study by the USDA. Wilber said whitetail deer across the U.S. have tested positive for SARS-CoV-2. He added, “We don’t really know if that’s from spillover of SARS-CoV-2 from humans to deer, which is a contributor, or if it’s driven by deer-to-deer transmission, and that’s important because another strain circulating in deer could kind of spill back and re-infect humans.”

Through using the GPS collars, they hope to learn why deer are testing positive for

the virus that causes COVID-19 and how to minimize the expansion of CWD. Muller added, “Hopefully, if we have animals that disperse, meaning they leave the area, we’ll know where they went and use that to see how pathogens are spreading. Hopefully, we can do something to stop it.”

Funding support for the SARS-CoV-2 sampling portion of this project was provided by the U.S. Department of Agriculture (USDA) and Animal and Plant Health Inspection Services (APHIS). APHIS is currently implementing a provision in the American Rescue Plan Act to conduct monitoring and surveillance of susceptible animals for SARS-CoV-2 and enhance its ability to prevent, detect, investigate and control emerging zoonotic diseases using a One Health approach. Funding for the CWD work is provided under the McIntire Stennis project, TEN00MS-113. The deer monitoring project was also made possible thanks to the financial support from TWRA, the School of Natural Resources, UT AgResearch and UT Extension.



Freshwater mussels work highlighted in academic journal

School of Natural Resources Assistant Fisheries Professor Augustin Engman joined Gerry Dinkins with the McClung Museum of Natural History and Culture and other researchers to survey 25 sites on Bayou Bartholomew in Louisiana for freshwater mussels in 2021.

The American Malacological Bulletin published their study “Status and Distribution of Freshwater Mussels in the Louisiana Section of Bayou Bartholomew” in its December 2022 issue. Dinkins also presented the study’s data at the 2023 Freshwater Mollusk Conservation Society Symposium in Portland, Ore.

“We were approached by Louisiana Department of Wildlife and Fisheries to conduct the survey of mussels in Bayou Bartholomew because the bayou is one of the only rivers left in Louisiana that has not been altered by dredging and deepening, and

historically it had been shown to harbor a rich array of species,” Dinkins said. He added the last and only drainage-wide survey took place almost 30 years ago.

Dinkins is the lead author on the research. Other authors include Engman, UT Wildlife and Fisheries graduate student Winston Clark, Brittany Bajo-Walker of the Virginia Department of Wildlife Resources, Justin Wolbert of Fisheries and Aquatic Monitoring with the Tennessee Valley Authority, Dr. Kyler Hecke with the Department of Biological Sciences at Arkansas Tech University and J. Brian Alford with the School of Environmental and Natural Resources at Ohio State University.

They observed 35 mussel species including two listed as federally endangered and 13 on Louisiana’s list of Species of Greatest Conservation Need. They sampled 100 river





kilometers on the main channel of Bayou Bartholomew and four tributaries from downstream of the Arkansas-Louisiana state line.

The team collected genetic material on the Rabbitsfoot mussel for the U.S. Fish and Wildlife Service and on the Pyramid Pigtoe mussel for the U.S. Geological Survey. The Rabbitsfoot species is a federally endangered mussel, and the Pyramid Pigtoe is a candidate for the Federal Endangered Species list.

“Our data has been used by geneticists at both federal agencies to inform them of how to proceed with conserving both species,” Dinkins said.

Their study recommends management actions to protect Bayou Bartholomew along with efforts to stabilize eroding banks and channelized tributaries. It also urges periodic monitoring to conserve the habitat.

Along with data on mussels, the study provided information on freshwater snails in Bayou Bartholomew. The Louisiana Department of Wildlife and Fisheries made the survey of freshwater snails one of its priorities for State Wildlife Grant funding this year. The team has applied for a State Wildlife Grant to study aquatic snails in the area.

Pet industry teams up with university researchers to study pathogens in amphibian trade



Amphibian diseases cost U.S. businesses an estimated \$140 million annually. Now, the pet industry is working with university researchers, such as Drs. Matt Gray and Neelam Poudyal, to learn about pathogens in the amphibian trade. They ask businesses to participate in free testing and a survey to help set up an amphibian disease prevention program. If interested, visit healthyamphibiantrade.org.

Photos courtesy: Josh's Frogs



Diverse, native grass pastures to benefit cattle, pollinators and birds



Birds and bees benefit from cattle grazing in native grass and forb pastures. That was one of several takeaways from the Beef and Bees Workshop held Tuesday, July 25.

Pat Keyser, Center for Native Grasslands Management director and School of Natural Resources professor, hosted the workshop. He and graduate research assistant Jessica Prigge gave presentations on research they conducted with post-doctoral research associate Eric Bisangwa, Jonathan Richwine of Arkansas State University and graduate research assistant Keagan Swilling.

Dr. Amy Johnson with the Smithsonian Institution and Dr. Parry Kietzman of Virginia Tech University also gave a presentation on pollinators in diversified pastures and case studies from bee-friendly beef farms in Virginia.

Roughly 60 people, including landowners and federal and state agency representatives, attended the workshop at the Plant

Biotechnology Building on the UT Institute of Agriculture's campus. In the afternoon, the group went to the East Tennessee AgResearch and Education Center-Holston Unit to see native grass pastures interseeded with native forbs.

The workshop covered how to introduce native forbs to pastures, how to control weeds and how animal performance and pasture productivity compares to pastures without the forbs.

Funding support came from the UT Foundation, USDA Natural Resources Conservation Service Conservation Innovation Grant, USDA Agriculture and Food Research Initiative, UT AgResearch, UT School of Natural Resources and Ernst Conservation Seeds.

Publications



Alphabetical order by author

Adhikari, R.K., and **N. C. Poudyal**. 2023. An analysis of sportsperson's intention to access wildlife management areas in Tennessee. *Human Dimensions of Wildlife*. (in press)

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Emery, M. L., and **P. D. Keyser**. 2023. The Grasslands Partnership. *Land, Life, & Science*.

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Theses & Dissertations



THESES

Alphabetical order by author

Calhoun, T. J. 2023. Bog Turtle Density Estimation Using Spatial Capture Recapture, Live Traps, and Camera Traps in Northeast Tennessee, USA. M.S. Thesis.

Dixit, S. 2023. Perceived Contribution of Park Revenue Sharing in Promoting Conservation and Development: Evidence from Buffer Zone Program in Nepal. M.S. Thesis.

Dugger, C.J. 2023. Advancing Natural White Oak (*Quercus alba*) Reproduction Through a Midstory Removal. M.S. Thesis.

Guerra, G. 2023. Demand for Guided Tours on the Tennessee River. MS. Thesis.

Johnson, M. 2023. A Watershed Prioritization Model for Community-Centered Riparian Forest Restoration in Tennessee. M.S. Thesis.

Mount, M. J. 2023. Variability in microclimate and carbon dynamics in hardwood forests managed with the irregular shelterwood reproduction method. M.S. Thesis.

Patel, N. 2023. Characterization of Deodorized Kraft Lignin and Lignin-Polymer Composite Blends. M.S. Thesis.

Payne, J. 2023. A Champion Program for Champion Trees: Expanding the reach and purpose of the Tennessee Champion Program. M.S. Thesis.

Quehl, J. O. 2023. Assessing the effects of the spring hunting season start date on wild turkey productivity and hunter behavior. M.S. Thesis.

Senevirathne, D. M. 2023. Predicting Harvest Activities in Mixed-species Forests using a Random Survival Forest Algorithm. M.S. Thesis.

Skiba, T. 2023. Exploring alternative methodologies to estimate by-species sawlog volume in the southeastern United States. M.S. Thesis.

Ward, J. 2023. Investigating visitor behavior in relation to conservation practices in the outdoors. M.S. Thesis.

DISSERTATIONS

Braunstein, J. 2023. Population Abundance and Growth of Elk (*Cervus canadensis*) in Western North Carolina., Ph.D. Dissertation.

Gorrell, J. 2023. Multidimensional Investigation of Tennessee's Urban Forest. Ph.D. Dissertation.

Shively, R. 2023. The interface of wildlife and nature tourism. Ph.D. Dissertation.

Towe, A. 2023. Evaluation of Treatment Options and Investigation of Pathogenesis of Chytridiomycosis in North American Salamanders. Ph.D. Dissertation.

Research Grants



L
LARGE
GRANDS

No de reaprovizión no.:
Placement:
19-130-1597D

fisherScientific

Selecting the correct rivet:
Sélectionner le rivet qui convient:

Select diameter based on hole size. Use larger sizes for higher strength.
Sélectionner le diamètre selon la taille de l'orifice. Utiliser de plus
grandes tailles pour plus de résistance.

Select grip range based on material thickness.
Sélectionner le diamètre selon le matériau. Utilisez des tailles
plus grandes pour plus de résistance.

Select the range of grip according to the thickness of the material.
Sélectionner le diamètre selon la taille de l'orifice. Utilisez de plus
grandes tailles pour plus de résistance.

Select the diameter of the rivet according to the thickness of the material.
Sélectionner le diamètre selon la taille de l'orifice. Utilisez de plus
grandes tailles pour plus de résistance.

GRANTS

Alphabetical order by author

Assogba, N.P. 2021 — 2026.

Analyzing and Enhancing Harvest Utilization Studies. USDA Forest Service. \$125,030.

Assogba, N.P. 2021 — 2026.

Exploring Enhanced Methodology for FIA's Resource Use Monitoring. USDA Forest Service. \$119,965.

Assogba, N.P. 2022 — 2025.

Developing methodology for rapid assessment of hurricane damage on primary forest industry. USDA Forest Service. \$20,000.

Buckley, D. 2023. Novel Techniques for Restoring Shortleaf Pine and Shortleaf Pine-hardwood Ecosystems on Reclaimed Mining Sites (AL). Mississippi State University (MSU). \$12,499.

Buehler, D.A. 2021 — 2023.

Monitoring and evaluating Golden-winged Warbler (*Vermivora chrysoptera*). Tennessee Wildlife Resources Agency. \$69,256.00.

Buehler, D.A. 2023. TWRA

Cooperative Northern Bobwhite Project Field Assistant. Tennessee Wildlife Resources Agency. \$24,000.

Buehler, D.A. 2023 — 2025.

Tennessee Cooperative Wild Turkey Project-Value-Added Extension. Tennessee Wildlife Resources Agency. \$129,618.

Eda, S. 2021 — 2026. NDA - US Biologic - UTRF - MUTUAL NON-DISLOSURE AGREEMENT. U.S. Biologic, Inc.

Eda, S. 2021 — 2023. APHIS - MTA - Eda - #25027. USDA Animal and Plant Health Inspection Service.

Eda, S. 2021 — 2025. TDA - Lab License Agreement - Eda - #25151. Tennessee Department of Agriculture.

Eda, S. 2022 — 2024. Invention Disclosure - Electrochemical detection of isothermal nucleic acid amplification product. University of Tennessee Research Foundation (UTRF).

Eda, S. 2023 — 2024. Development

of a new platform for rapid and sensitive detection of chronic wasting disease prion in live animal samples. USDA Animal and Plant Health Inspection Service. \$169,782.

Engman, A. 2021 — 2023. Invasive Armored Catfish (*Pterygoplichthys* spp.) and Midas Cichlids (*Amphilophus* spp.) in Puerto Rico rivers: Evaluations of invasion extent and efficacy of a physical control method. Gulf States Marine Fisheries Commission. \$50,000.

Engman, A. 2022 — 2024.

Trophodynamics of Mercury Contamination of Smallmouth Bass *Micropterus dolomieu* in Great Smoky Mountains National Park. National Park Service. \$36,073.

Engman, A. 2023 — 2025. A Roadmap to Restoration of the Abrams Creek Mussel Fauna. Tennessee Wildlife Resources Agency. \$60,000.

Gray, M. 2021 — 2026. Pet Industry Joint Advisory Council - MOU and MOA - #24294 - Gray. Pet Industry Joint Advisory Council (PIJAC).

Gray, M. 2022 — 2027.

Socioeconomic and Epidemiological Drivers of Pathogen Dynamics in Wildlife Trade Networks. National Science Foundation. \$2,755,617.

Harper, C.A. 2021 — 2024. Effects of Fire Seasonality in Southern Yellow Pine Communities. Alabama Department of Conservation and Natural Resources. \$70,800.

Harper, C.A. 2022 — 2025. Plant communities research. Tennessee Valley Authority. \$25,000.

Harper, C.A. 2023 — 2024. Effects of Timing of Fire on Upland Plant Communities. Tennessee Valley Authority. \$25,000.

Harper, C.A. 2023 — 2027. Effects of timing of prescribed fire on ticks and associated pathogens. Mississippi Department of Fish, Wildlife and Parks. \$85,579.

Harper, D. 2021 — 2023. Invention Disclosure - Gram-scale lignin-derived carbon dots by one-step chemical reaction method. University of Tennessee Research Foundation

(UTRF).

Harper, D. 2021 — 2023. Invention Disclosure - One-step activation of highly porous carbons. University of Tennessee Research Foundation (UTRF).

Harper, D. 2022 — 2024. Groundstar LLC & UTRF - NDA - Harper - #26324. Groundstar, LLC.

Harper, D. 2022 — 2024. Invention Disclosure - Novel manufacturing process for short natural fiber reinforced composites. University of Tennessee Research Foundation (UTRF).

Harper, D. 2022 — 2023. Prisma, VW, and UTRF - 4-parties CDA - Harper - #25944. Prisma Renewable Composites, LLC.

Harper, D. 2022 — 2023. Groco Specialty Coatings & VW - NDA - Harper - #25281. GROCO Specialty Coatings Inc.

Harper, D. 2022 — 2024. Invention Disclosure - Use of Carbon Quantum Dots for Gas Separation. University of Tennessee Research Foundation (UTRF).

Harper, D. 2023 — 2024. Mutual Non-Disclosure Agreement. BioLogiQ, Inc.

Harper, D. 2023 — 2024. NDA - Biomass Conversion to Sugars, Intermediates, Functional Carbon Products, & Liquid Fuels. SIEV Technologies, LLC.

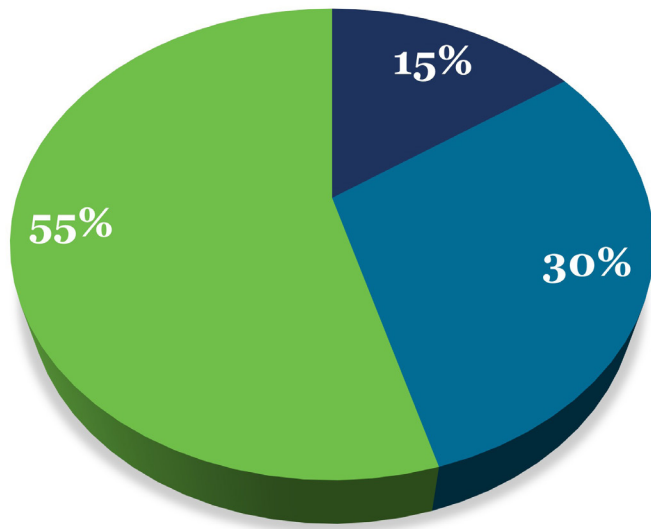
Hodges, D. 2021 — 2026. CESU SOAP - Leadership, Coordination and Administrative Oversight for the Southern Appalachian Mountains Cooperative Ecosystem Studies Unit. National Park Service. \$36,800.

Hodges, D. 2021 — 2026. Evaluating the sustainability of mixed-hardwood forest resources in the Eastern U.S. USDA Forest Service. \$371,970.

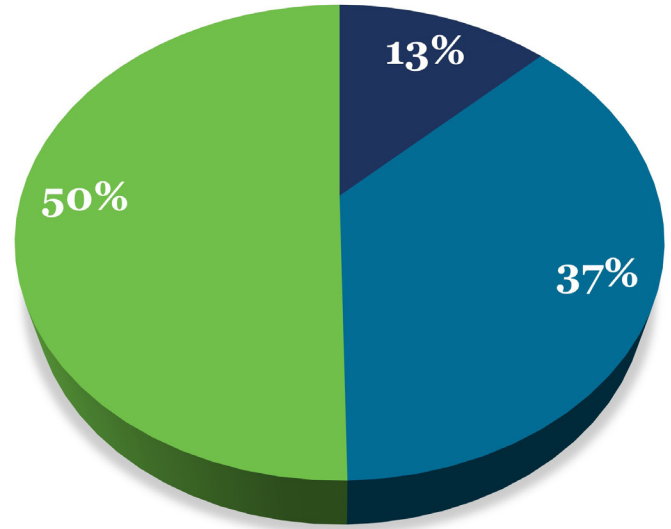
Hodges, D. 2021 — 2024. Movements and Fates of Relocated Black Bears in Great Smoky Mountains and Shenandoah National Parks. National Park Service. \$296,497.

Hodges, D. 2021 — 2024. Monitoring

2023 Research expenditures



2023 Extension expenditures



the Louisiana Black Bear. Louisiana Department of Wildlife and Fisheries. \$170,200.

Hodges, D. 2022 – 2025. Socioecological Vulnerability Assessment - Southern Appalachian Biosphere Region. National Park Service. \$120,000.

Hodges, D. 2022 – 2027. Master Challenge Cost Share Agreement. USDA Forest Service.

Hodges, D. 2022 – 2023. Modeling of Forestry Practices for the Family Forest Carbon Program. The Nature Conservancy. \$116,673.

Hodges, D. 2023 – 2024. Evaluate movements of relocated and resident black bears (*Ursus americanus*) along Interstate 40 in the Pigeon River Gorge in North Carolina and Tennessee. Tennessee Wildlife Resources Agency. \$26,304.

Hodges, D. 2023 – 2024. Tennessee Youth Hunter Education and Youth in the Outdoors programs. Tennessee Wildlife Resources Agency. \$634,000.

Hodges, D. 2023 – 2025. Movements of black bears (*Ursus americanus*) along Interstate 40 in the Pigeon River Gorge in North Carolina. North Carolina Wildlife Resources Commission. \$24,997.

Hodges, D. 2023 – 2026. Cooperation agreement for cooperation in the COMET programme of the Kompetenzzentrum Holz. Wood K Plus.

Jean-Philippe, S. 2021 – 2026. Cooperative Work Study Partnership. USDA Forest Service. \$115,800.

Jean-Philippe, S. 2022 – 2023. UT Champion Tree Internship and administration to provide students field experience and implement program. Tennessee Department of Agriculture. \$25,000.

Jean-Philippe, S. 2022 – 2024. Knox Urban Renewal DOW Landscape Design. DOW Chemical Company. \$10,000.

Jean-Philippe, S. 2023 – 2025.

Community Riparian Restoration Program. Tennessee Department of Agriculture. \$99,600.

Jean-Philippe, S. 2023 – 2025. National Champion Tree Program. American Forests. \$200,000.

Keyser, P. 2021 – 2024. Back to the Future: Improving Productivity, Sustainability, and Resilience of Eastern Grasslands. USDA National Institute of Food and Agriculture. \$499,724.

Keyser, P. 2022 – 2023. BGAD Quail Telemetry Study. Kentucky Department of Fish and Wildlife Resources. \$15,000.

Keyser, P. 2022 – 2025. Improving Native Vegetation Establishment Outcomes. Stone Barns Center for Food and Agriculture. \$299,924.

Keyser, P. 2023 – 2027. Assess the nutritional and parasite management. USDA Natural Resources Conservation Service. \$245,388.

Keyser, P. 2023 – 2028. Climate

Smart Grasslands - the Root of Agricultural Carbon Markets. USDA Natural Resources Conservation Service. \$30,000,000.	Poudyal, N. 2021 – 2025. Economic implications of Chronic Wasting Disease (CWD) on Deer Hunting. USDA National Institute of Food and Agriculture. \$499,527.	\$40,000.
Keyser, P. 2023 – 2028. Matching Funds for Climate Smart Award. Tennessee Department of Agriculture. \$354,741.	Poudyal, N. 2021 – 2025. A holistic evaluation of US forest sector carbon mitigation impacts of varying climate and socioeconomic futures using the consequential life cycle assessment framework. USDA Forest Service. \$153,250.	Schlarbaum, S. 2021 – 2026. Cooperative Research on Oak Reforestation and American Chestnut Reintroduction in the Southeastern United States. USDA Forest Service.
Labbe, N. 2022 – 2023. Pennsaco Technologies - NDA - Labbe - #25764. Pennsaco Technologies, LLC.	Poudyal, N. 2021 – 2025. Exploring potential for market development of hardwood mass timber products. USDA Forest Service. \$80,804.	Schlarbaum, S. 2022 – 2023. UTK Tree Improvement Seed Orchard FY23. Tennessee Valley Authority. \$15,000.
Labbe, N. 2023. Reducing fertilizer requirement for growing two bioenergy crops in Southeast. DOE. \$4,500,00.	Poudyal, N. 2021 – 2024. An Investigation of Economics, Market, and Policy Research Opportunities in Mass Timber Industry. USDA Forest Service. \$33,500.	Schlarbaum, S. 2023 – 2024. Developing a Wild Seed Collection Network in Tennessee. American Forests. \$60,000.
Li, M. 2022 – 2024. Queen's University Belfast - CDA - Li - #26287. Queen's University Belfast.	Poudyal, N. 2022 – 2027. Conduct surveys of Hunting, Fishing, Boating and other wildlife-associated recreation. Tennessee Wildlife Resources Agency. \$350,000.	Schlarbaum, S. 2023 – 2028. UT Hardwood Improvement. USDA Forest Service. \$109,000.
Mercker, D. 2021 – 2023. USDA RREA Renewable Resources Extension Act FY 2022. USDA National Institute of Food and Agriculture. \$73,969.	Poudyal, N. 2022 – 2023. Social feasibility of reforestation for climate change mitigation: A regional assessment of landowner's interest, perceived barriers and opportunities. Environmental Defense Fund. \$74,988.	Schlarbaum, S. 2023 – 2024. UT Tree Improvement Partnership for Tree Propagation and Planting. Tennessee Valley Authority. \$15,000.
Mercker, D. 2022 – 2024. USDA RREA Renewable Resources Extension Act FY 2023. USDA National Institute of Food and Agriculture. \$73,969.	Poudyal, N. 2023. Estimating Hunting Effort and Success at Turkey Management Unit Level. Tennessee Wildlife Resources Agency. \$15,000.	Sharp, R. 2023 – 2024. Harpers Ferry National Historic Site Visitor Use Study. Old Dominion Research Foundation. \$23,679.58.
Mercker, D. 2023 – 2025. FY2024 USDA Renewable Resources Extension Act Program (Capacity Grant Program). USDA National Institute of Food and Agriculture. \$72,360.	Poudyal, N. 2023 – 2026. Human Interaction with Deer in the Context of SARS-CoV2/Covid Transmission. USDA Animal and Plant Health Inspection Service. \$467,232.52.	Sharp, R. 2023 – 2024. Lewis and Clark National Historic Trail (LECL) Economic Impact and Use Pattern Study Proposal. National Park Service. \$97,448.
Molina Moctezuma, A. 2023 – 2024. Estimating Spatial Mortality Components from Acoustic Telemetry Detection Data. Michigan State University (MSU). \$45,470.	Schexnayder, S. 2021 – 2023. Development and facilitation of comprehensive training and resources for rural communities. Tennessee Department of Tourism Development. \$150,000.	Sharp, R. 2023 – 2025. Visitor Estimation on the Lewis and Clark National Historic Trail. Lewis and Clark Foundation. \$55,000.
Muller, L. 2021 – 2023. Population Estimation and Ecology of Elk in Tennessee. Tennessee Wildlife Resources Agency. \$220,176.	Schexnayder, S. 2022 – 2026. National Visitor Use Monitoring FY 2023 - FY 2027. USDA Forest Service. \$197,600.	Taylor, M. 2022 – 2023. VinTech coating test. VinTech Nano Materials. \$1,000.
Muller, L. 2023 – 2024. Reproduction and Recruitment in a High Prevalence CWD Area in West Tennessee. USDA Animal and Plant Health Inspection Service. \$249,975.	Schexnayder, S. 2022 – 2023. Iowa Off Highway Vehicle Study. Iowa Department of Natural Resources.	Wilber, M. 2021 – 2024. BII-Implementation: Uncovering mechanisms of amphibian resilience to global change: from molecules to landscapes. University of Pittsburgh (PITT). \$189,448.
Muller, L. 2023 – 2028. Appalachian Wildlife Foundation MOU 27429 Muller. Appalachian Wildlife Foundation.		Wilber, M. 2022 – 2025. Using fine-scaled movement data to estimate the transmission potential of SARS-COV-2 in white-tailed deer. USDA Animal and Plant Health Inspection Service. \$1,047,642.
		Wilber, M. 2022 – 2026. Collaborative Research: LTREB Renewal: Long-term dynamics of

amphibian populations following disease-driven declines. National Science Foundation. \$34,837.

Wilber, M. 2023 — 2026. MCA: Understanding the animal movement and disease transmission interface. University of Minnesota (U of M). \$15,862.

Willcox, E. 2021 — 2023. Habitat Associations and Den Site Selection of The Eastern Spotted Skunk (*Spilogale Putorius*) in Tennessee. Tennessee Wildlife Resources Agency. \$49,997.

Willcox, E. 2021 — 2024. Environmental Contaminant Exposure and White-Nose Syndrome Vulnerability. DOI — U.S. Fish and Wildlife Service. \$89,229.

Willcox, E. 2021 — 2025. TWRA Internship Program — Fisheries. Tennessee Wildlife Resources Agency. \$59,280.

Willcox, E. 2022 — 2023. Understanding the foraging ecology of red bats (*Lasiurus borealis*) and seminole bats (*Lasiurus seminolus*) to inform prescribed fire management. Bureau of Land Management. \$24,710.

Willcox, E. 2022 — 2023. Enhanced Research and Monitoring for the Tri-Colored Bat in Great Smoky Mountains National Park. National Park Service. \$51,650.

Willcox, E. 2022 — 2023. Understanding the winter hibernation and foraging ecology of red bats (*Lasiurus borealis*) and seminole bats (*Lasiurus seminolus*) to inform prescribed fire management. The Nature Conservancy. \$15,000.

Willcox, A. 2022 — 2024. Enhancing Climbing Recreation and Conservation in Vertical Environments Shared by Humans and Bats Through Input from Climbers Visiting National Parks. National Park Service. \$99,131.

Willcox, E. 2022 — 2025. TWRA Internship Program — Biodiversity. Tennessee Wildlife

Resources Agency. \$201,225.

Willcox, E. 2022 — 2026. Wildlife Management assistants to aid with data collection and management of game species. Tennessee Wildlife Resources Agency. \$378,900.

Willcox, E. 2023. Bat Research to Inform TVA Management 1. Tennessee Valley Authority. \$17,500.

Willcox, E. 2023 — 2024. Indiana Bat Maternity Colony Monitoring. Tennessee Wildlife Resources Agency. \$22,045.

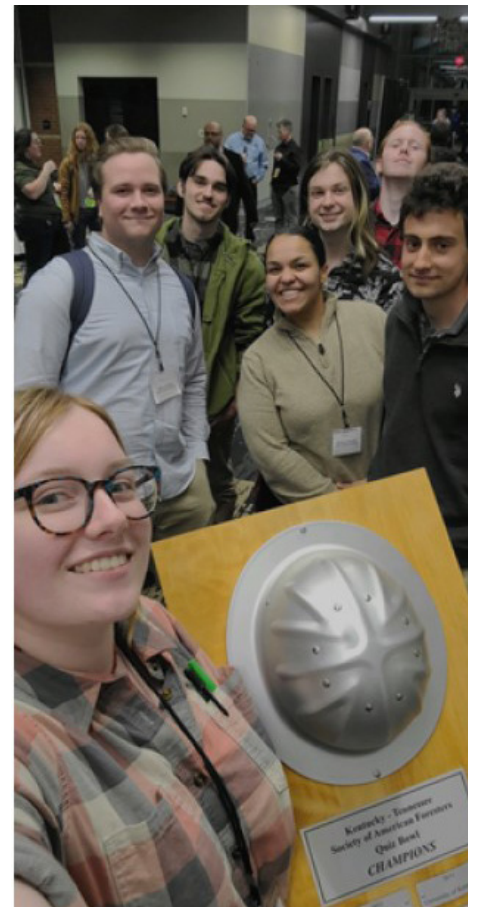
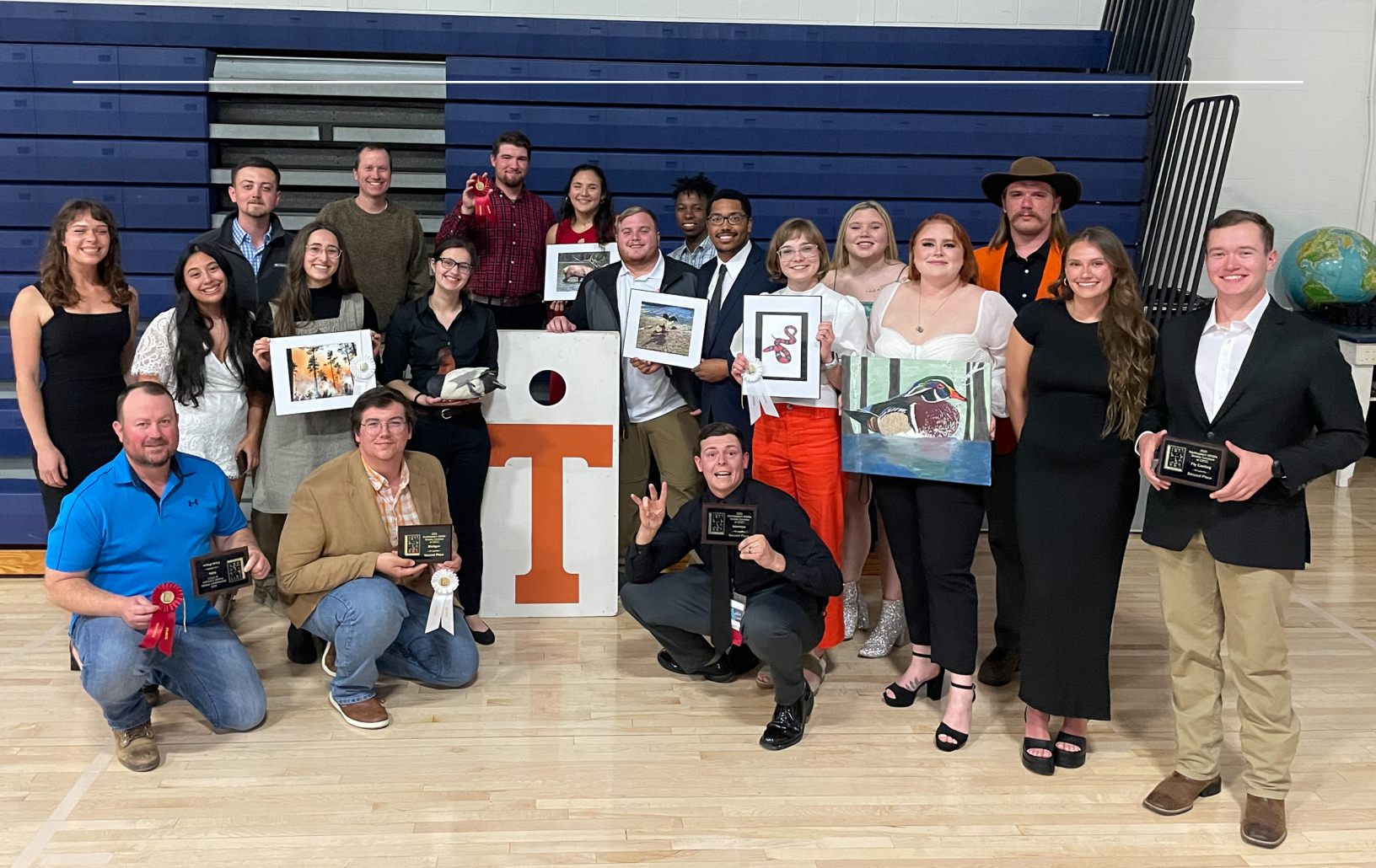
Willcox, E. 2023 — 2026. Roost Selection Of Tricolored Bats In The West Gulf Coastal Plain Of Arkansas. Arkansas Game and Fish Commission. \$139,114.

Willcox, E. 2023 — 2027. NEX - ORNL Deer Check Stations. UT-Battelle - Oak Ridge National Laboratory. \$8,000.

Xin, H. 2023 — 2028. CESU SOAP 2023 - 2028 - Leadership, Coordination and Administrative Oversight for the Southern Appalachian Mountains Cooperative Ecosystem Studies Unit. National Park Service.

Yang, S. 2022 — 2023. USDA - Forest Service - Data MTA - Yang - #26156. USDA Forest Service.

Yang, S. 2022 — 2023. USDA FS Southern Station - Incoming Data MTA - Yang - #25970. USDA Forest Service.



Awards & Honors

STUDENTS

UT Forestry Club

Kentucky-Tennessee SAF Quiz Bowl Award

UT Wildlife and Fisheries Society

Best Student Subunit Award, Southern Division of American Fisheries Society

UT Wildlife and Fisheries Society

Third Place Overall in 2023 Southeastern Student Conclave

UT Wildlife and Fisheries Society

Southeastern Section Student Chapter of the Year, The Wildlife Society

Jared E. Beeler

2023 Volunteer of Distinction

Jared E. Beeler

Spring 2023 Top Graduate, Herbert College of Agriculture

Megan Berry

First Place in Student Research Presentation, 22nd Biennial Southern Silvicultural Research Conference and American Society of Agronomy Southern Branch Meeting

Cohen W. Eastridge

Armistead Award, Herbert College of Agriculture

Jimmy Collins

Second Place in Fly Casting Competition, 2023 Southeastern Student Conclave

Devin Hevener

Second Place in Law Interview Competition, 2023 Southeastern Student Conclave

Alec Nance

Second Place in Shotgun Competition, 2023 Southeastern Student Conclave

Alec Nance

Third Place in Cervid Calling Competition, 2023 Southeastern Student Conclave

Lindsey Phillips

Best Student Presentation, 2023 Southeastern Association of Fish and Wildlife Agencies annual meeting

Brianna Saylor

Third Place in Drawing Competition, 2023 Southeastern Student Conclave

Brianna Saylor

Third Place in Landscape Photography Competition, 2023 Southeastern Student Conclave

Gabriel Siples

2023 Volunteer of Distinction

Kayla Stuart

2023 Society of American Foresters Diversity Scholar

Anna Towe

Best Student Presentation, 71st Annual International Wildlife Disease Association Conference

Donald Tucker

First Place in Rifle Competition, 2023 Southeastern Student Conclave

Donald Tucker

Second Place in Turkey Calling Competition, 2023 Southeastern Student Conclave

Phil Underwood

Second Place in Waterfowl Calling Competition, 2023 Southeastern Student Conclave

Holly Ann Whited

2023 Volunteer of Distinction

Kailong Zhang

2023 – 2024 Oscar Roy Ashley Graduate Fellowship

Kailong Zhang

2023 – 2024 UT Student-Faculty Research Award (SFRA)

FACULTY AND STAFF

Augustin Engman

2023 College of Agriculture and Life Sciences Outstanding Young Alumnus Award, Department of Applied Ecology, NC State

Allan Houston

2023 Forest Conservationist of the Year, Tennessee Wildlife Federation

Sharon Jean-Philippe

USDA Secretary of Agriculture Appointment to the Forestry Research Advisory Council, 2023 – 2026

Sharon Jean-Philippe

Academic Leadership Development Program Fellow, Southeastern Conference

Mi Li

2023 – 2024 Southeastern Conference Faculty Travel Program Award

Mi Li

2023 – 2024 UT Student-Faculty Research Award (SFRA)

David Mercker

2023 Conservation Communicator of the Year, Tennessee Wildlife Federation

Neelam Poudyal

UT AgResearch Dean's Grantsmanship Award

Scott Schlarbaum

2023 Tennessee Forestry Association Forest Resources Award

Adam Taylor

Fulbright-Saastamoinen Foundation Grant in Health and Environmental Sciences

Emma Willcox

J.E. Moss Achievement Award



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