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IN THIS ISSUE



In Memoriam:
Dr. John F. Hosner

▪ 3 ▪



Campus tree inventory

▪ 6 ▪



Spotlight on FREC
students

▪ 14 ▪

New environmental sensing and monitoring system tested and evaluated

On the edge of Virginia Tech’s campus, on a stretch of farmland that few students ever visit, a sequence of small boxes are collecting and transmitting data that will make it easier for scientists to monitor and collect data across landscapes.



This field test of an environmental sensing system is one step in a project between the College of Natural Resources and Environment; Innovative Wireless Technologies, a leading wireless mesh network company headquartered in Lynchburg; and the U.S. Department of Energy’s (DOE) Pacific Northwest National Laboratory. The project was funded by a DOE Small Business Innovation Research grant intended to refine, develop, and advance new technologies.

“The call for this grant was focused on below-ground environmental monitoring and the development of new sensor networks and communication platforms,” explained **Daniel McLaughlin**, Forest Resources and Environmental Conservation (FREC) assistant professor and Virginia Tech’s lead investigator on the project. “The primary goal is to advance the ways in which we can monitor the fate and transport of certain environmental constituents and contaminants.”

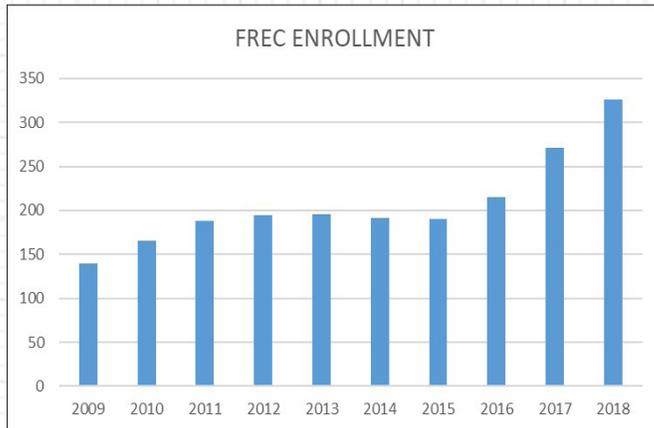
The integrated environmental quality sensing system, called Envök, is a user-deployed network composed of wireless microprocessing nodes that are capable of connecting to a wide range of environmental sensors. A grid of these nodes communicates through a wireless gateway to a server that allows operators to control the sensors remotely.

The testing of this system is taking part along Stroubles Creek on land dedicated to the Department of Biological Systems Engineering’s StREAM Lab. In addition to McLaughlin, FREC associate professors **Kevin McGuire** and **Brian Strahm**, and Ryan Stewart, assistant professor in the College of Agriculture and Life Sciences (CALIS’) School of Plant and Environmental Sciences, are participating in the project.

(continued on page 4)

From the Department Head

As usual, we are having a busy year in FREC, with many things happening and many changing faces. Perhaps of greatest note, though, is the continued growth of our current undergraduate enrollment. Fall 2018 FREC enrollment was nearly two and a half times larger than our enrollment 10 years ago!

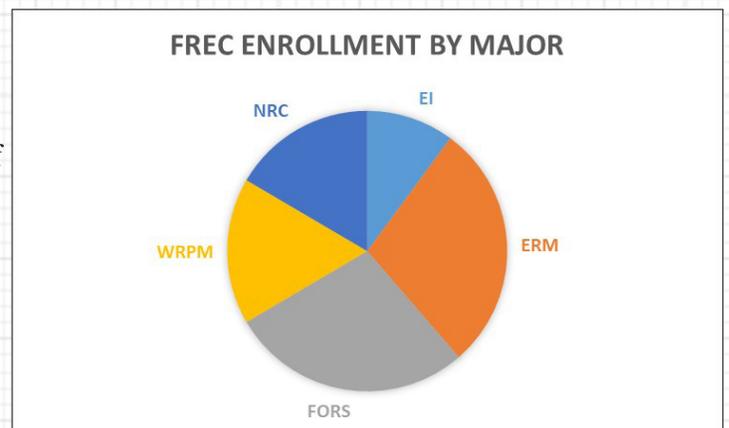


Through this growth we have maintained a nice distribution of enrollment across our five majors: environmental informatics (EI), environmental resource management (ERM), forestry (FORS), natural resources conservation (NRC), and water: resources, policy, and management (WRPM). We believe our success comes from having been active in developing and refining programs that address the very latest forest and environmental resource challenges, while never slowing down on building our already highly regarded traditional programs in forestry.



We see our student makeup becoming more and more diverse, now with nearly 40 percent of our students being female. Also, opportunities for our students abound across our programs, with nearly 80 percent of our May 2018 graduates reporting that they had jobs lined up at the time of graduation.

Needless to say, we remain excited about the direction and strength of our program. Our biggest challenge at this time is managing our success and meeting the demand that has been created, but our faculty and staff are committed to doing everything we can to maintain and even improve our students' hands-on experiences and professional and academic opportunities. We continue to be thankful that you are with us on this ride!



Welcome new faculty and staff!



Kiandra Rajala joined FREC in January 2019 as a research associate working with Associate Professor Michael Sorice.

Her research investigates the human dimensions of invasive species management in the Northern Great Plains. She earned her M.S. here in FREC in 2018, focusing on the social dynamics of ecosystem transformation of rangelands in the Southern Great Plains. She received dual B.S. degrees in forestry and recreation management from the University of Montana in 2013.

In Memoriam: John F. Hosner, Honorary Founding Dean

Professor Emeritus **John F. Hosner**, who was recognized by the Virginia Tech Board of Visitors with the tribute of “honorary founding dean” of the College of Natural Resources and Environment (CNRE), died Sept. 13 in Blacksburg. Hosner played a significant role in the establishment of the college and received the honorary designation shortly before the college’s 25th anniversary celebration in 2017.

Hosner was a veteran of the U.S. Army Air Corps during World War II. He then received his bachelor’s degree from Michigan State University, his master’s from Duke University, and his doctorate from the State University of New York. He joined the Virginia Tech community in 1961 as head of the newly established Department of Forestry and Wildlife, which was then part of the College of Agriculture. He worked to build the department, starting with four faculty members, and was known to call department heads at other institutions to find out who their best doctoral graduates were so he could recruit them to Virginia Tech. In his three decades of leadership from 1961 to 1992, Hosner’s continual focus on excellence propelled the college into the national spotlight among peer programs.

One of the first faculty members Hosner hired was Harold Burkhart, University Distinguished Professor and current holder of the Thomas M. Brooks Professorship of Forestry, which was secured by Hosner and was the first endowed professorship at Virginia Tech. Burkhart described Hosner as “a visionary leader who pursued excellence with unrelenting perseverance and tenacity. He had an incisive sense of what programmatic directions to pursue, and he had keen instincts when recruiting faculty and students.”

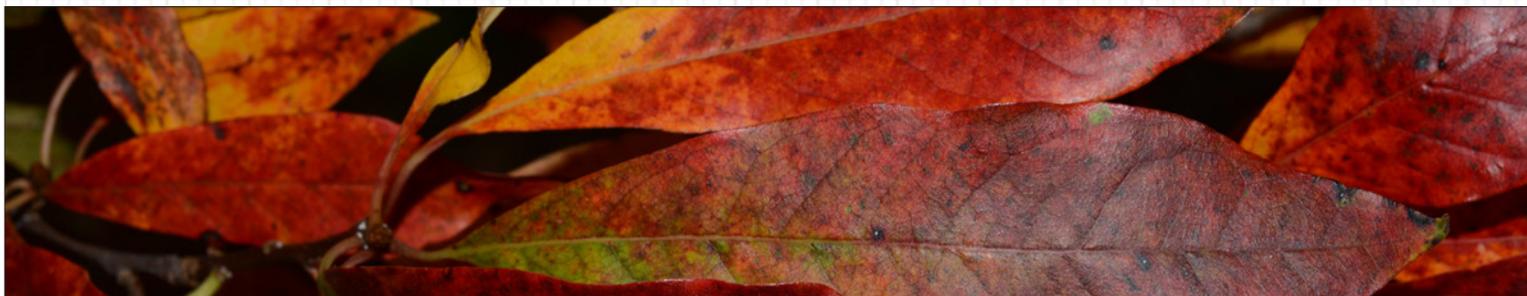
In addition to his recruiting of top faculty, Hosner worked to gain the support of industry leaders in his efforts to grow the program into a college. In 1976, the department



became the School of Forestry and Wildlife Resources, and in 1992, the school became the new College of Forestry and Wildlife Resources, with Greg Brown serving as the inaugural dean.

David Wm. Smith, the Honorable and Mrs. Shelton H. Short Jr. Professor Emeritus of Forestry and former associate dean of the college, said, “John was a national leader in promoting excellence in higher education programs in the professional fields related to natural resources. He had a vision for the future, was a tenacious leader, had boundless energy, and was a fierce competitor. He fostered excellence in teaching, research, and outreach, and was an ardent supporter of faculty, staff, and students.”

Ken Morgan, founder and owner of Morgan Lumber Company, was one of the industry leaders who developed a partnership with Hosner and became affiliated with the college, a relationship that still continues today. Morgan, who considered Hosner a mentor and friend, stated, “Dr. Hosner was a giant of impeccable integrity and unselfishness. I have been friends with John Hosner for almost 30 years and witnessed, during that time, him being solid as a rock with regard to moral character and placing the welfare of others and an entity above that of himself. Our world indeed progressed from the contribution of Dr. John Hosner.”



New environmental sensing and monitoring system tested and evaluated (continued from page 1)

Matthew Fisher, the principal investigator for Innovative Wireless Technologies, described the site as an ideal location to test the system's capacities. "We have a first version of our finished product, and we wanted to evaluate that product in a field simulation," he said. "Virginia Tech is providing that evaluation. They are taking the system and, with support from us, they are going to evaluate it and see if it meets the criteria that we set for the project."

For Virginia Tech researchers, the testing and evaluation of the Envōk system has run the gamut from small software preferences to broad considerations of sensing capacities and monitoring structures. "We're assessing and tailoring the system to meet user needs, ranging from software design and installation options to what kind of outputs and sensors are most useful in field applications," McLaughlin said. "There are a lot of sensors available now, and what's lagging behind is an easily deployable sensor network that would allow a team to use sensors from any vendor and for a wide range of parameters."

A further goal of the project is to design a system that allows users to "speak" to the monitoring network using mobile devices or personal computers and alter the data collected by sensors as conditions vary. "We're focusing on user-to-network communication, but also communication among nodes, where measurements at one node location can trigger specified measurement protocols at distant nodes," McLaughlin said.

On the Stroubles Creek site, sensors will measure water levels, soil dynamics, carbon fluxes, and stream conditions. Virginia Tech researchers will be testing the hardware and durability of the system, the communication capabilities between nodes and to the server, and real-time adjustments to sensor measurements that would allow for adaptive modeling and data analysis.

The next phase of the project, set to launch in spring 2019, will be a larger field test along the Columbia River in Washington state, where the Pacific Northwest National Laboratory will take the lead in verifying the Envōk product as it moves toward commercialization. The project has the potential to make the collection and processing of field data more dynamic and easier for scientists.

Urban Tree of the Year!



Each year the Society of Municipal Arborists (SMA) recognizes an "Urban Tree of the Year." This is a tree species that is nominated by members of the SMA for its merits of being a good tree to grow in cities.

This year's tree is the American hophornbeam (*Ostrya virginiana*). The SMA 2019 Urban Tree of the Year designation recognizes the underutilized, attractive, and useful American hophornbeam (*Ostrya virginiana*) for its service to urban forests and encourages its use when matched appropriately to site and as part of a diverse urban tree inventory. It is a medium-sized tree in the birch family that has an extensive native range east of the Rockies, from Manitoba to Florida.

Eric Wiseman wrote a commentary about the species and it will be featured in the magazine *City Trees* in the winter 2019 issue.



United Nations Framework Convention on Climate Change

For the second consecutive year, Virginia Tech participated in the United Nations Framework Convention on Climate Change (UNFCCC), which held its 24th session (COP 24) in Katowice, Poland, December 2-15, 2018. Senior Research Associate, **Carol Franco**, who has been a negotiator for the Dominican Republic's government since 2012, and Associate Professor **Valerie Thomas** participated in the climate change convention, together with **Mica Keck**, a junior environmental resource management major. About her experience at COP 24, Keck said, "This trip only intensified my desire to work in global environmental policy and completely validated the science background I'm currently gaining in my major. It was an invaluable experience that I want to continue to draw from, to research, to make connections with, and hopefully create a future in, for myself and for the rest of the world."

COP 24 had many accomplishments, but also some drawbacks worth mentioning.

- One major political issue during the convention was the reaction to the Intergovernmental Panel on Climate Change's (IPCC) Special Report on Global Warming of 1.5°C. The decision of COP 21 in Paris (2015) to adopt the Paris Agreement (PA) invited the IPCC to provide a special report "on the impacts of global warming of 1.5°C above pre-industrial levels and related greenhouse gas emission pathways" by 2018. On October 7, 2018, the report came out with an analysis of the measures and actions needed to achieve the 1.5°C goal and the impacts associated with an increase of 1.5°C. The IPCC report was not "welcomed" by a group of countries at COP 24, and its findings were not included in the decision text. The text only makes reference to "welcoming" the "timely completion" of the report.

- Another issue dealt with the next round of nationally determined contributions (NDCs), which was mainly procedural. There was no call to increase much-needed ambition in the upcoming new NDCs. However, there was a pledge from the European Union and another 25 developed and developing countries, called the "High Ambition Coalition," to "step up" their reduction of greenhouse gas emissions.

The major outcome of COP 24 was the completion of the Paris Agreement Work Program, also called The Paris "Rulebook." The parties adopted rules and procedures on several different articles of the Paris Agreement: mitigation, finance, stocktake process, adaptation, and transparency, among others. Article 6 on market approaches, the use of internationally transferred mitigation outcomes (ITMOs), and the use of a sustainable mechanism for the generation of a tradable emissions reduction scheme was the only article that the parties were not able to agree on, and it will continue to be discussed at COP 25.

Great news for finance (Article 9 of the PA)! The COP decision stated that there will be "a new collective quantified goal" by 2025 to support climate finance, and this goal will be greater than the current one (mobilization of \$100 billion/year by 2020). Furthermore, as a precursor to COP 24, there was a pledge by countries and groups of countries of ~\$2 billion for climate finance, with a record amount (\$129 million) to be allocated to the UNFCCC Adaptation Fund. Also, Norway and Germany pledged to "double their contributions" to the Green Climate Fund (GCF) next year, which will be the fund's "first replenishment" phase.

In the case of Transparency (Article 13 of the PA), which was a big and important topic for the U.S., "common modalities, procedures, and guidelines (MPGs)" were adopted, and the transparency framework applies to all parties – developed and developing countries – except for least-developed countries and small-island developing states.

Campus tree inventory of more than 10,000 trees to aid 2018 Campus Master Plan



Working together, FREC and Virginia Tech's Facilities Department have completed a collaborative inventory and analysis of more than 10,000 landscape trees spread out across 900 acres of the campus. The project provides crucial information as Virginia Tech moves forward with its 2018 Campus Master Plan and will be a useful resource in future development initiatives.

"In planning and managing urban forests, information is essential," said **Eric Wiseman**, associate professor of urban forestry. "There is a saying in natural resource management that you have to understand the resource before you can manage it, and that's where this inventory comes into place. It provides a baseline of information that allows Virginia Tech to evaluate the quality and composition of our campus forests across a wide range of criteria."

Wiseman has been integral in motivating the university to invest resources in the project. The result is a comprehensive database in which almost all campus trees have been identified, plotted, photographed, measured, and evaluated for condition and maintenance needs.

A key finding of the campus inventory report estimates that the replacement value of all inventoried trees is \$30.6 million. This appraisal of Virginia Tech's urban forest as a capital asset is a crucial motivator for maintaining and preserving trees, but only scratches the surface in capturing the full impact of having a healthy urban forest on the campus.

"Functionality — a crucial element to urban forests — is understanding what we can do to make trees more beneficial to people," Wiseman said. "We have a walkable campus and want to encourage students and staff to walk to move around our campus. In order to make that a possibility, people need shady, attractive spaces to walk in." Campus trees also play an important role in reducing operational costs for the university

by keeping buildings cool and mitigating runoff during high-volume storms. They also are important to Virginia Tech's wider commitment to campus sustainability efforts.

Much of the legwork for the project was done by **Peter Stewart**, a FREC master's student with 10 years of experience as an arborist. Through dedicated funding from the Facilities Department, Stewart documented approximately 8,500 trees from August 2017 to March 2018. Those trees were combined with a 2012 inventory of the old-growth forest near Lane Stadium to complete the campus inventory.

"Working on this project was challenging and rewarding," Stewart said. "I appreciated being able to draw on the expertise of the Facilities Department's Office of University Planning and GIS unit, and the Department of Forest Resources and Environmental Conservation — for example, for help in identifying unfamiliar tree species or mapping out planning districts in GIS. For me personally, the tree inventory provided a useful bridge from my previous experience to academic and research work."

Jack Rosenberger, the Office of University Planning's landscape architect, said that the campus tree inventory will prove useful in the university's decision-making processes concerning construction and landscaping. "With accurate data, we can overlay our tree map on proposed designs early in the process to help with decisions like building location and orientation, and site plan features so we don't remove valuable trees," Rosenberger explained. "We hope this will be a tool we can use to understand the dollar value of trees on campus as well as the ecological systems benefits and the human health benefits of our trees."

In addition to offering suggestions about where the university can improve tree canopy coverage, the report outlines which species tend to thrive on the increasingly urbanized campus and how future planning for tree planting can maximize species diversity and resilience. To meet these goals, the university is moving forward with the hiring of a campus arborist to supervise decision-making about this crucial resource.

While Wiseman believes that the campus tree inventory will be a key resource for campus planning projects for years to come, he noted that the information in the inventory is already being utilized by campus planners. "A specific example that the university is currently working on is routing the western perimeter road that will run between the Corporate Research Center and Price's Fork Road, more or less paralleling Route 460 West," Wiseman said. "There are a lot of high-quality trees along that route, and having those trees inventoried has been helpful in trying to figure out how to best meander the roadway through that area."

Southwest Virginia explores herb, medicinal, forest product economics

Forest farming and medicinals dominated the conversation in Wise, Virginia at last July's agriculture conversation with Sen. Mark Warner, organized by Appalachian Sustainable Development (ASD). By the end of the meeting, Warner told the gathering he was blown away by what he had just heard. "This is much cooler, a more developed notion than I was aware of a half an hour ago," Warner said after hearing about ongoing efforts in the region to develop, from forest resources, jobs and businesses that don't include cutting down trees.

At the beginning of the meeting, Associate Professor **John Munsell** gave the senator and others a quick lesson on what constitutes non-timber forest products. They fall into four categories: medicinals, like botanicals and fungi that make their way into the herbal product industries; edibles, like ramps and mushrooms; decorative products, like florals; and nursery crops, like sap for syrup. Munsell encouraged the group not to think only about ginseng, since it has an inflated market because of the Hong Kong supply chain. Forest farming allows you to track where something has come from, to create a traceable supply chain, Munsell said. A sustainable supply can be leveraged against higher price points.

Also capturing attention at the session were notions like these:

- Certified organic, forest-farmed, sustainably harvested medicinal herbs could fetch as much as 10 times the price as those wild-harvested.
- About half the medicinal herbs in the \$7 billion herb industry already come from the Appalachian region.
- What people read on the label is not necessarily what's on the inside.
- The Appalachian School of Pharmacy wants to establish a center and lab that would test the herbs in supplements and certify their quality to address troubling concerns over what's in them now, including heavy metals.
- There are land owners and land seekers, with thousands of acres in Southwest Virginia that could potentially be put into forest farm and field production.
- Just one acre of land has production opportunity, with existing and new organizations in place to assist in training those who have interest.

Katie Commender ('16 M.S. forestry) regional marketing and logistics coordinator for ASD and herself a forest farmer, called the region a hot spot of biodiversity. There are so many herbs that grow well and are native here, Commender said, it's just a matter of capitalizing on it and growing them sustainably.

Collectively as a group, she said, "What we're trying to create is a niche market where large herbal buyers are willing to pay a premium price point for certified forest-grown material" in a process that is transparent, traceable, and sustainably managed.

As one example, she held up black cohosh, which is used to treat hot flashes and is historically undervalued at its wild-harvested price of about \$4 per pound. In just a couple of years, Munsell said, they have seen the price jump to about \$30 per pound for the medicinal that is certified organic and sustainably harvested.

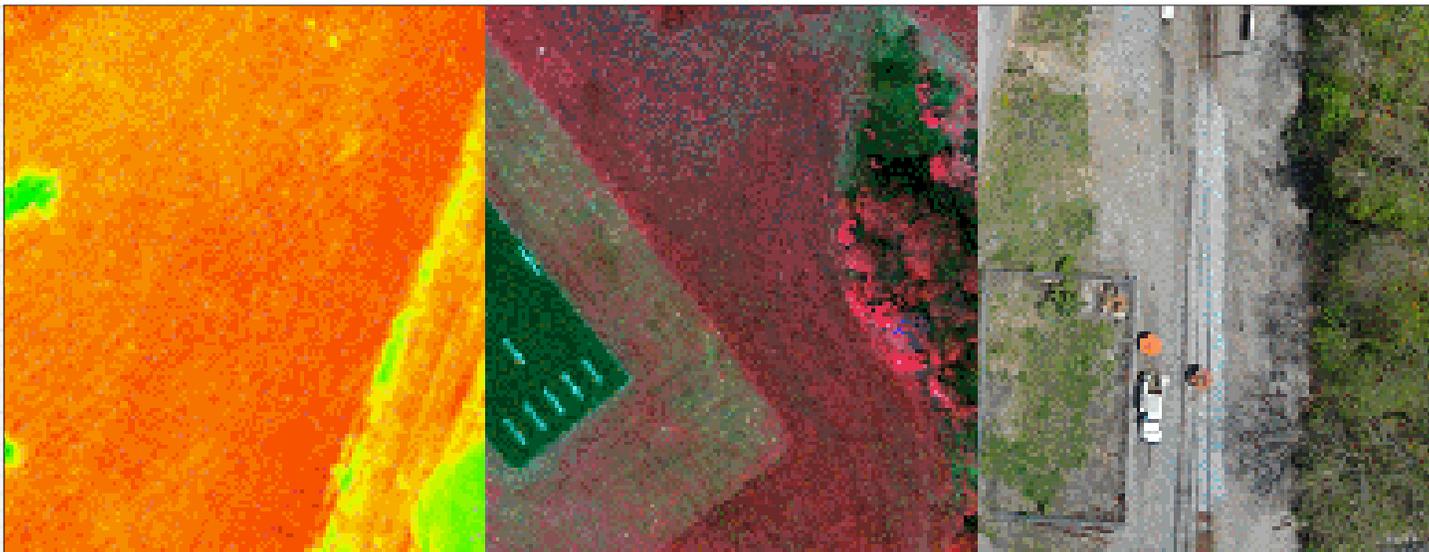
Farmers are beginning to take advantage of this. In 2016, a national company took a leap of faith and bought black cohosh at \$25 per pound. Another local grower got \$60 per dry pound last year, which is 10 times the wild-harvest price. Because of that, there's been a lot of interest and energy.

Richard Nicholas, chair of pharmacy practice at the Appalachian School of Pharmacy in Grundy, Virginia, is a clinical pharmacist and naturopathic physician who uses and prescribes botanicals.

"When we're prescribing these herbs, we want to know that we have a quality herb," he said, adding that one of the biggest issues they face is adulteration. A 2015 exposé revealed that DNA analysis of the products showed that what's in the bottle is not the plant. Half the time, they don't even have the part of the plant that has the medicinal value, he said. The pharmacy school wants to establish a lab that does quality assurance, where it identifies the herb and verifies that the product contains the proper constituents.

ASD Executive Director Kathlyn Terry said they are on the cusp of really amazing opportunities. "We hope that this is going to be the epicenter," she said, stressing the need for processing facilities here. "We can't do it tomorrow, but that should be the goal."

Warner said what he heard about the potential sounds like another pillar in a sustainable economy in Southwest Virginia. And he wasn't the only one who was excited. Two people with funding connections – one in community banking and another who works for Virginia Community Capital – said from the audience they had the means to help and would.



New professional development workshop offered: Mapping with drones

Small unmanned aircraft systems (sUAS, aka drones) represent a potentially transformative technology. Both fixed-wing and rotor-based sUASs can carry an array of sensor payloads (including true color, Near InfraRed (NIR), multispectral, thermal, etc.). In addition to being fairly cost-effective, these systems are also user-friendly and are emerging as important tools for natural resource professionals.

The Virginia Tech Department of Forest Resources and Environmental Conservation, in partnership with the college's Conservation Management Institute (CMI), has been offering sUAS workshops at different locations across the commonwealth. The workshop, entitled

“Mapping with Drones,” is designed to prepare researchers, non profit employees, and commercial operators to take the FAA's remote pilot knowledge test (often referred to as the Part 107 exam). Emphasis on safe practices is central to the course.

The three-day workshop provides participants with the following:

- An understanding of FAA and sUAS lingo;
- A comprehensive knowledge of current federal commercial sUAS regulations (aka Part 107);
- Discussions on sUAS platforms (fixed-wing and multi-rotor), sensors (including true color, NIR, multispectral, thermal), and associated applications; and
- sUAS project workflows, including compliance with FAA regulations and safe practices; an overview of sUAS operation planning software, check sheets, and smartphone apps; demonstrations of fixed-wing and multi-rotor aircraft (contingent on weather and other local conditions/regulations) of both autonomous and manual operations; and a comprehensive presentation and demonstration of image processing software techniques and options (generating image mosaics, Normalized Difference Vegetation Index (NDVI), etc.).

Online payment and registration is required. Additional information about this workshop can be accessed at www.virginiaview.net/workshops_MappingUAS

Are you interested in having a workshop in your region? Additional workshop locations can typically be organized and scheduled on request, as long as there is sufficient demand. For further information, contact **John McGee** (jmcg@vt.edu).



International IUFRO/SOMENS/NEMO meeting

Blacksburg's colorful October foliage welcomed over 100 forest mensurationists from around the world to a joint IUFRO Division 4.01, SOMENS (Southern Mensurationists) and NEMO (Northeastern Mensurationists) meeting.

FREC graduate students **Corey Green** and **Sheng-I Yang**, and Research Associate **David Walker** made presentations and Associate Professor **Phil Radtke** moderated a session during the meeting. The featured keynote address was delivered by University Distinguished Professor **Harold Burkhart**, who was recognized during the conference banquet by his many colleagues and graduate students for his 50 years of teaching and research contributions to forest mensuration.



Forest Modeling Research Cooperative Annual Meeting

The 40th Annual Meeting of the Forest Modeling Research Cooperative (FMRC) was hosted by the Virginia Department of Forestry (VDOF) in Charlottesville December 5-6, 2018.

VDOF Research Program Manager Jerre Creighton led a field trip to the Appomattox/Buckingham State Forest on the first day that included 30 participants representing the forest products industry across the South. The group visited forest management stand establishment, thinning, fertilization, and pruning activities in loblolly pine plantations growing under intensive management on the Virginia Piedmont.



During the indoor session of the second day, FREC personnel **Harold Burkhart**, **Ralph Amateis**, and **David Carter** and graduate students **Corey Green** and **Sheng-I Yang** summarized projects completed during the year and ongoing work toward incorporation of auxiliary information into forest inventories and error partitioning in decision support systems. Research plans and goals for the coming year were established.

At the end of the meeting, Amateis was presented with a plaque recognizing his 40 years of service to the FMRC. The mission of the FMRC is to develop tree growth and stand development models that advance the science of forest modeling and provide

land managers with decision support capabilities needed to practice economically viable and environmentally sustainable forest management.

Dedication and passion elevate Virginia to second on Champion Trees National Register

Just outside Hutcheson Hall on the Virginia Tech campus, a champion tree hides in plain sight. Its green leaves turn bright scarlet in the fall, and its orange-red bark peels in thin, papery layers. The *Acer griseum*, more commonly known as paperbark maple, is the largest of its species known to exist in Virginia.

The identification and registration of big trees in Virginia, including 13 on the Virginia Tech campus, is a passion project for **Eric Wiseman**, associate professor of urban forestry. Wiseman coordinates the Virginia Big Tree Program, which has been identifying the state's big trees since 1970. "Our mission with the Virginia database is twofold: to document the big trees in the state and to advocate for their conservation and care," said Wiseman. "We have a section on our site called 'Protecting Trees' that details the three main threats to big trees, which include storms and lightning, construction and soil disturbance, and land development."

Wiseman's efforts have recently elevated Virginia into second place on the Champion Trees National Register maintained by American Forests. Virginia's tally of 88 champion and co-champion trees trails Florida's 132 trees and ranks just ahead of third-place Texas, with 81 trees.

Virginia is a surprise contender considering its size and level of urbanization. Wiseman notes that the state's high ranking reflects the hard work of dedicated individuals. Wiseman said, "It's not so much that Virginia is a bastion of big trees; it's that we have people who are passionate about big trees and keen to go out and find them."

Byron Carmean's passion for finding and documenting big trees truly stands out. Carmean, who earned a horticulture degree at Virginia Tech in 1970, started searching for and documenting big trees in 1983 after seeing the state's big tree list published in the Virginia Forestry Association's magazine. "I started looking down the list with some interest. I'd see one and think, 'I think I've seen one bigger than that.' I got in touch with Gary Williamson, who was working as a ranger at Northwest River Park in Chesapeake, and he mentioned that he had seen a couple of trees that he thought were very big. We got together and found a winged sumac that became a national champ," Carmean said.

Carmean's and Williamson's contributions to the database are significant: they share credit for 53 of Virginia's 88 national



This paperbark maple outside Hutcheson Hall is one of 13 state champion trees located on the Virginia Tech campus.

champion and co-champion trees, and have discovered an additional 269 state champion and co-champion trees. The magazine *American Forests* credits Carmean and Williamson with identifying more national champion and co-champion trees than anyone else in the country.

Three factors go into measuring a tree: trunk circumference, tree height, and the average spread of the tree's crown. While some trees require specialized tools to accurately assess a tree's score, most can be measured using a yardstick and a 100-foot measuring tape. Big tree hunting can be done anywhere. Many Virginia state and national champion trees grow in city centers, on college campuses, and at historically significant sites like Arlington National Cemetery, Monticello, and Montpelier.

When asked what continues to inspire his passion, Wiseman said, "As a certified arborist for over 20 years, I think I'm drawn to the trees on an individual level. Because I understand tree anatomy and physiology, I have an appreciation for the fact that these gigantic organisms can live for so long. And I get excited about the mathematics of it. Sometimes trees are straightforward to measure, but other times you have to incorporate some heavy-duty geometry and trigonometry to figure out how to score them."

The Virginia Big Trees website (bigtree.cnre.vt.edu) has information about how to measure and report big trees, as well as a comprehensive database detailing Virginia's current state and national champions. To ensure that the Virginia Big Tree database is up-to-date and accurate, all trees need to be recertified every 10 years. This process includes verifying that the tree is still alive, identifying any threats to its well-being, and assessing whether a tree's score should be adjusted. The program is always looking for volunteers for recertification efforts; interested individuals should visit the website for more information.

EmpowerU!

Extension faculty Michelle Prysby and Jennifer Gagnon are collaborating on a new program called EmpowerU! that will help forest landowners and natural resource volunteers grow their skills to meaningfully engage decision-makers on the topic of invasive species.

Through a series of online learning activities and an in-person workshop, participants learn about who makes decisions related to invasive species management, where to find reputable information about invasives, and how to use influence, framing, questioning, and listening in interactions with decision-makers.

This training is supported by a grant from the Renewable Resources Extension Act (RREA). Educators at University of Minnesota Extension are the primary investigators for the grant and the curriculum developers, and Virginia is one of many states partnering to administer the program. Learn more at www.virginiamasternaturalist.org/empoweru.html.

Thomas shares Ecological Forecasting Outstanding Publication Award



Assistant Professor Quinn Thomas and co-authors from the PINEMAP project were awarded the Ecological Forecasting Outstanding Publication Award by the Ecological Society of America at their 2018 meeting in New Orleans. The award, given annually in recognition of an outstanding scholarly publication (peer-reviewed journal article, book chapter, or book) published within the last three years in the emerging field of ecological forecasting, was for the paper: Thomas, R.Q., et al. 2017. Leveraging 35 years of *Pinus taeda* research in the southeastern US to constrain forest carbon cycle predictions:

regional data assimilation using ecosystem experiments. *Biogeosciences* 14:3525-3547.

The paper was cited for its innovation in statistical methods that combines diverse data from historical field studies of loblolly pine with a mathematical pine ecosystem model. These methods allow for the calibration of the ecosystem model to reflect 35 years of research studying how forests respond to environmental change, including sensitivities to elevated C², drought, and nutrients. The Bayesian modeling approach is specifically designed to be used to estimate key uncertainties when forecasting the future growth of loblolly pine stands.

The paper was supported by two U.S. Department of Agriculture grants and included many co-authors from FREC: **Evan Brooks, Annika Jersild, Randy Wynne, Harold Burkhart, and Tom Fox**. Data from the Forest Productivity Cooperative and the Forest Modeling Research Cooperative were used in the paper.

Outdoor Recreation Planning class visits Natural Bridge



Associate Professor **Michael Sorice's** Outdoor Recreation Planning and Management class visited Natural Bridge State Park on October 5. The class worked with Lynn Crump from the Virginia Department of Conservation and Recreation to outline ideas to include in the master plan of Natural Bridge State Park.

Carolyn Copenheaver receives Society of American Foresters Award for outstanding forestry education

Carolyn Copenheaver, associate professor of forest ecology, has been honored with the 2018 Carl Alwin Schenck Award from the Society of American Foresters. Copenheaver is the first woman to receive this honor in its 30-year history. The award is given annually to a faculty member who demonstrates exceptional devotion to the instruction of forestry and to the development of teaching methods that impart knowledge of forestry through dynamic communication skills.

“In her teaching and interactions with students, Dr. Copenheaver’s passion and commitment are difficult to match, and she is a model of exceptional engagement with the teaching endeavor,” wrote **Jay Sullivan**, department head, in Copenheaver’s nomination letter.

Copenheaver, who has taught at Virginia Tech for 18 years, has an extensive record of publications in leading forestry and forestry pedagogy journals, including 23 papers that she has published with 70 graduate students. She teaches a junior-level course in Forest Ecology and Silvics, a graduate course in Advanced Forest Ecology, and a team-taught course in Field Experience.

She emphasizes merging content teaching with lessons that will help her students practice communicating their understanding of forestry. “One thing I try really hard at, in both my undergraduate and graduate classes, is doing a lot of soft-skill work,” Copenheaver said. “This is something that started when I spoke to professional foresters who had just interviewed some Virginia Tech students. They said, ‘On paper these students look great, but they walk into the room and they have trouble talking to you about the subject.’

And I thought: we never practice that. We tend to give exams on paper, and our students have to write their knowledge, but they don’t necessarily have to speak their knowledge.”

Copenheaver has worked to change that, integrating oral exam requirements into her classes and incorporating formal and informal elements into the classroom experience to encourage students to sharpen their communication and professionalism skills.

A testament to Copenheaver’s influence is the fact that one of her award nomination letters was written by the 54 students in her Forest Ecology and Silvics course. “Dr. Copenheaver is a perfect candidate for this honor because she is truly devoted to the instruction of forestry and pays individual attention to all students to ensure that they have everything they need to succeed academically and professionally,” the students wrote. “She has encouraged us to grow in our own professional development and teamwork skills by providing opportunities to engage in teams on projects relevant to current topics in forestry and investigate our own interests and observations in forest ecology in the field.”

Copenheaver said that she was particularly proud that her students had helped her garner this award, which required a two-step application process. She was selected as a candidate for the award by the Appalachian Society of American Foresters regional chapter and



then had to submit letters of recommendation to the national SAF.

Copenheaver is pleased to be the first woman to receive the award, given in honor of Carl Alwin Schenck, a pioneer in forestry education in the United States. She notes, however, that she does not expect to be the last woman honored, as forestry is becoming a more diverse field of study. “There weren’t a lot of women in forestry when I was going to school, and I think that’s changing,” she said. “My class is now up to about 45 percent female, whereas when I first started teaching, my classes were almost entirely male. That’s a sign that the discipline is becoming more diverse, and I happen to be on the edge of that change.”

Two other FREC faculty members have received the Schenck award in the past: **David Wm. Smith**, professor emeritus of forestry, in 1990; and **John Seiler**, the Honorable and Mrs. Shelton H. Short Jr. Professor of Forestry, in 1998.

Copenheaver earned her bachelor’s degree from Juniata College, her master’s from the University of Maine, and her doctorate from Pennsylvania State University.

Coates is active in professional fire societies

In fall 2018, Assistant Professor **Adam Coates** was selected as a member of the International Association of Wildland Fire's Inclusivity and Diversity Committee.

Coates was also awarded certification as an Association for Fire Ecology Wildland Fire Ecologist.

In the Advanced Wildland Fire Ecology course (FREC 4414), 13 undergraduate students earned certifications as Virginia Department of Forestry Certified Prescribed Burn Managers.

Coates taught three modules during a certification course in Charlottesville in September 2018. He also conducted an 11-acre prescribed burn on the Fishburn Forest on November 29, 2018, with the Virginia Department of Forestry.

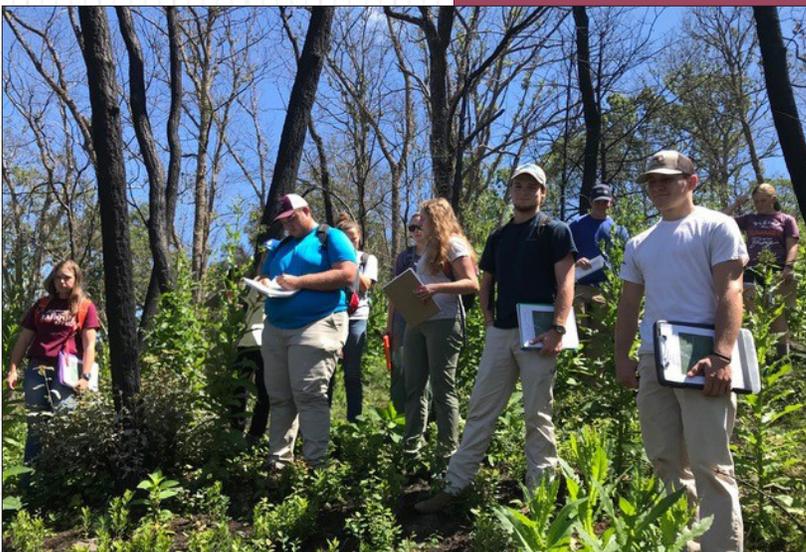


A prescribed burn conducted on the Fishburn Forest, November 29, 2018

La' Portia Perkins (M.S. student) and George Hahn (Ph.D. student) collecting fuel samples on the Fishburn Forest, September 2018



Advanced Wildland Fire Ecology and Management (FREC 4414) students evaluating the short-term impacts of a May 2018 wildfire in Bland County, September 2018



Spotlight on FREC students



Annie Ligush, an environmental resources management major, received a \$1,000 Undergraduate Research Grant from the Global Change Center at Virginia Tech. Annie will work with Associate Professor **Brian Strahm** to address the vulnerability of soil carbon stocks under different climate change scenarios. Soils represent the largest actively cycling pool of carbon on the planet, greater than the sum of the atmosphere and all terrestrial vegetation. The susceptibility of this carbon reservoir to decomposition under climate change (i.e., increased temperature and altered moisture) poses a significant feedback to the climate system. This is particularly true of the carbon-rich permafrost soils of northern latitudes.

Annie's study will utilize an existing NSF-sponsored project focused on the mechanisms of carbon stabilization across a host of National Ecological Observatory Network (NEON)

sites to focus specifically on three observatories in Alaska. Upper and lower soil mesocosms will be incubated for one year in a 2 (temperature) x 3 (moisture) factorial design to determine the potential for future climate alteration to affect the carbon balance of these systems.

Master's student **Tyler Weiglein** received the Robert J. Luxmoore Graduate Student Travel Award from the Forest, Range & Wildland Soils Division of the Soil Science Society of America (SSSA) to present his research at the 2018-2019 International Soils Meeting co-hosted by SSSA in San Diego, California, in early January 2019.



The Luxmoore award provides up to \$1,000 to defray travel costs for graduate student members of SSSA who are presenting their research at the annual conference. Tyler's research focuses on investigating continental-scale controls of soil organic matter decomposition, which has the potential to better our understanding of carbon-climate feedbacks that could either mitigate or exacerbate climate change.



Maddy Grupper, a master's student working with Associate Professor **Michael Sorice**, was one of the winners of the 2018 Nutshell Games hosted by Virginia Tech's Center for Communicating Science. Contestants had just 90 seconds to communicate their graduate research in a clear, engaging way and were judged by members of the Blacksburg community. Grupper discussed public trust of drinking water in her presentation, "What Are We Drinking?"

Grupper joined fellow students Susan Chen and Brenen Wynd in taking top honors at the third Nutshell Games, held October 27 at the Moss Arts Center.

Hosted by Virginia Tech's Center for Communicating Science and held in conjunction with the Virginia Tech Science Festival, the Nutshell Games featured 29 graduate students presenting their work without slides, charts, or posters. Each of the three received a \$500 prize. All of the contestants will receive a professional-quality video recording of their talk.

Doctoral student **Amanda Pennino** was awarded "Best Presentation of Session" for the talk that she gave at the Soil Science Society of America (SSSA) International Annual Meeting.

Fostering collaboration with other North American soil science societies, the SSSA hosted scientists, professionals, educators, and students at the International Soils Meeting. "Soils Across Latitudes" was held Jan. 6-9, 2019, in San Diego, California, in collaboration with the Canadian Society of Soil Science and the Mexican Society of Soil Science.



Spotlight on FREC students

(continued from page 14)



George Hahn, a doctoral student working on forest fire ecology in central Appalachian hardwood forests, has been responsible for establishing boundaries and pre-fire forest assessment and sampling for 24 burn units on the Fishburn Forest. He has also traveled to the Monongahela National Forest in West Virginia to study prescribed fire and wildfire effects on forest regeneration. He presented preliminary results from his research at the Central Appalachian Fire Learning Network meeting held in Blacksburg in November 2018. Along with his advisor, Assistant Professor **Adam Coates**, and two additional co-authors, Hahn produced one publication that is currently in press with the *Natural Areas Journal* to summarize prescribed fire effects on water quality in the eastern U.S. Hahn

has also served as a TA the past three semesters within the department and had proposals accepted for oral presentations at the Biennial Southern Silvicultural Research Conference and annual meeting of the Appalachian Society of American Foresters.

Chris Dukes is a master's student working on the long-term response of forest soils in the southern Appalachian Mountains to repeated prescribed fires over a 20-year period. Duke assisted **George Hahn** with the establishment of 24 burn units on the Fishburn Forest and the collection of data related to prescribed fire and wildfire effects on forest properties on the Monongahela National Forest in West Virginia. He will be presenting his research at the Biennial Southern Silvicultural Research Conference in Shreveport, Louisiana, in March. Dukes has served as a TA within the department the past three semesters.



Emma Thompson is a master of forestry student who started her degree program in August 2018. As part of her project, she has studied wildfires in West Virginia and Virginia to determine differences in fuel consumption and soil disturbance with changes in fire intensity and severity. Thompson will present a poster on this work at the Biennial Southern Silvicultural Research Conference in March in Shreveport, Louisiana.



Forestry majors **Andrew Johnson** and **Caleb Keen** worked on undergraduate research in spring 2018 related to fuel quantification and classification on the Fishburn Forest. They helped sieve and process soil samples taken from Coastal Plain burned plots. Results from those samples were used to produce one publication in *Forests*.

In fall 2018, **Andrew Johnson** completed an independent study with Assistant Professor Adam Coates. The goal of the project was to produce a manuscript for Forest Ecology and Management comparing long-term burned watersheds to unburned watersheds near Charleston, South Carolina. Results from this research were presented by Coates at the Soil Science Society of America conference in San Diego in January 2019.

During summer 2018, Caleb Keen was employed as an undergraduate research technician, assisting graduate students **George Hahn** and **Chris Dukes** with pre-fire forest assessment, research design, fuel sampling, and soil sampling on the Fishburn Forest. Keen assisted Assistant Professor Adam Coates and Virginia Department of Forestry personnel with an 11-acre prescribed burn on the Fishburn Forest on November 29, 2018.

Timberbeast competition showcases forestry skills

The Virginia Tech Forestry Club hosted a “Timberbeast” event at the New River Valley Fairgrounds in Dublin on February 22. Competitors from seven colleges tested the skills they are developing in their forestry studies.

Physical events included archery, axe throwing, chain throw, bow saw, log roll, Jack and Jill crosscut saw, men’s crosscut, women’s crosscut, knife throw, women’s log chop, and men’s log chop.

Knowledge tested included diameter at breast height, estimation and dendrochronology, compass and pace, wildlife identification, wood technology, and wood identification.

(continued on page 17)



Timberbeast competition showcases forestry skills

(continued from page 16)

Representatives of similar clubs came from West Virginia University, Clemson University, Warren Wilson College, Haywood Community College, and Montgomery Community College. About 60 people competed in the physical and technical events.

At the end of the day Virginia Tech earned first place overall. Clemson was second and West Virginia third.

Virginia Tech's Forestry Club is open to all majors and run by the College of Natural Resources and Environment. The university describes it as being made up of very close friends.



Spring 2019 Seminar Series

The Forestry Graduate Student Association, the FREC department, and the Graduate Affairs Committee have teamed to initiate the 2019 Spring Seminar Speaker Series. This series is hosting presenters from three distinct groups that are all integral to the success of our department:

1. Graduate students within FREC presenting their current and past research to faculty, peers, and the Virginia Tech community;
2. Speakers internal to the Virginia Tech community who provide insight into different facets of our college campus environment; and
3. External speakers who have excelled in their academic or industry careers and provide valuable research dissemination on relevant topics within FREC, including ecosystem science and management, economics and policy, and water resources.

The seminar is held weekly on Fridays in Fralin Auditorium throughout the spring semester. Refreshments begin at 9:30 a.m. in the atrium and presentations begin at 10 a.m. in the auditorium. The remaining schedule is below.

3/1/19	Menah Pratt-Clarke - Diversity and inclusion in academia	Vice President for Strategic Affairs and Vice Provost for Inclusion and Diversity, Virginia Tech
3/8/19	Christine Goodale - Forest biogeochemical cycling	Professor, Department of Ecology and Evolutionary Biology, Cornell University
3/22/19	Yusuke Kuwayama - Water resources, ecosystems, and environmental policy	Fellow and VALUABLES Consortium Director, Resources for the Future
3/29/19	Yude Pan - Forests and the global carbon cycle	Research Scientist, Northern Research Station, U.S. Forest Service
4/5/19	Carol Franco - Climate change adaptation and mitigation policy	Senior Research Associate, FREC
4/12/19	Rachel Hammer - Linking soil respiration and environmental variables Wyatt McCurdy - Measuring post-harvest forest response with remote sensing	M.S. Student, FREC M.S. Student, FREC
4/19/19	Daniel Pratson - Motivations within environmental education organizations Pete Stewart - Cost-share funding and urban tree preservation	M.S. Student, FREC M.S. Student, FREC
4/26/19	FREC Graduate Student Poster Showcase	N/A

Alumni corner



Alumnus **Andrew Vinson** ('16 M.S. forestry) has worked for the Virginia state government in several different capacities.

Following his graduation from Clemson University in 2014 with a degree in forest resource management, Vinson came to Virginia Tech to attend graduate school where research

focused on water quality best management practices for timber harvesting. Upon graduation, he worked in FREC as a research associate under Assistant Professor **Scott Barrett**, as well as filling the role of instructor for the Forest Harvesting course in fall 2016.

In 2017, Vinson moved to an extension associate position to work with the SHARP Logger and VFLEP programs, helping to provide outreach and continuing education programs to Virginia's logging workforce and forest landowner base statewide.

In August 2018, Vinson transitioned to a different state agency, the Virginia Department of Forestry. He presently works as a water quality specialist for seven counties in the western region of the state, where his job is focused on enforcing Virginia's silvicultural water quality laws. He is passionate about getting the opportunity to work with many different loggers, foresters, and landowners to ensure that forest operations are not adversely impacting the waters of Virginia. Vinson occasionally comes back to FREC to give guest lectures for several different courses as a way to share his knowledge with future natural resource managers, and serves as communications chair for the Virginia Division of the Society of American Foresters.

Commemorative trees

Each spring since 1992, a tree is planted on the Virginia Tech campus to commemorate the graduation of undergraduate students from the college's four academic departments: Fish and Wildlife Conservation, Forest Resources and Environmental Conservation, Geography, and Sustainable Biomaterials.

Students gather with friends, family, and faculty at the conclusion of the college's commencement ceremony to plant the commemorative tree. During the ceremony, a symbolic item from each department is placed into the tree planting hole, and students pitch in to plant the tree. FREC faculty lead the sourcing of the commemorative tree each year. A species having cultural or ecological significance to rural and urban forests of the United States is selected.

John Seiler, Alumni Distinguished Professor of Forestry, has been involved with tree selection and sourcing almost every year since the commemorative tree plantings began. **Eric Wiseman**, associate professor of urban forestry, has helped Seiler in recent years and led a group of undergraduate students in fall 2018 to create a website for the trees. He will eventually put metal tags on the trees to identify them and the year they were planted.

We encourage alumni to send us photos or stories about their experiences with planting the trees.
<https://www.plantsmap.com/organizations/25261/collections/33343>.

December 2018 Master's and Doctoral Graduates!

Dana Beegle	Rachel Pence
Steven Kruger	Kiandra Rajala
Raymond Lee	Xiaoyan Sheng
Peter Meadema	

Welcome New Graduate Students!

Johanna Arredondo	Adam McClure
Christen Beasley	Pedro Sartori
Robert Howell	

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