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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!
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.”

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In Memoriam: John F. Hosner, Honorary Founding Dean

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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.”

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Virginia Tech forestry program ranked best program in the U.S. for 2018!

College Factual has released information stating that Virginia Tech’s forestry program was ranked 1 out of 30 nationwide, making the program the best in the U.S. for 2018! FREC has achieved this ranking 2 years in a row and was also ranked 1 out of 1 in the state of Virginia, making it the best in the state.

College Factual, located in Troy, New York, is a leading source of college data analytics and insights, with a strong focus on student outcomes. Their mission is to help all types of students discover their best-fit college and major so they can enjoy their college experience and graduate with less debt. College Factual provides coverage for over 2,500 colleges and universities, 350 college majors, for students in over 160 countries.
Kelly Cobourn is working on a project that may bring us a step closer to the reality of scientists using computers to predict the impact of climate change and other stressors on international food security, migration, and civil conflict. They would then use those predictions to increase the availability of vital resources.

Cobourn is part of a team of researchers that brings together experts in artificial intelligence, model coupling, hydrology, agronomy, and economics. Her work will contribute to an understanding of food security via the integration of socioeconomic and biophysical models, as well as the streamlining of data tools used in assessing food security issues.

In considering the complex interplay between humans and environmental issues such as climate change, the researchers are working to develop models that illustrate how farmers make decisions about food production. They will then create models to help explain how those decisions affect, or are affected by, strains on the environment and social systems.

The four-year project, called MINT for Model INTEGRATION, is led by Yolanda Gil, professor of computer science at the University of Southern California’s Information Sciences Institute. It is funded with a $13 million grant from the Defense Advanced Research Projects Agency (DARPA) as part of DARPA’s World Modelers program.

By automating data collection and modeling, the team will be able to greatly reduce the amount of time needed to connect models across disciplines, which will lead to a fuller understanding of the intersection between human activity and the environment.

Over the next four years, the researchers will develop models of human activity and impacts on natural resources to create predictions for certain parts of the world based on such factors as climate change and crop yields.

“I’ll primarily be developing models and creating human behavior and policy scenarios,” Cobourn said. “The computational experts know how to automate the data collection and modeling process, but they may not have background in the disciplines that are working on these problems. The other disciplinary experts and I will help them bring together things like agronomic and economic models in a way that makes sense.”
Study forecasts growth rates of loblolly pine trees through first half of 21st Century

Research using ecological forecasting to predict how changes in temperature, water, and concentrations of carbon in the atmosphere in the Southeastern United States may affect future growth rates of trees was published in a study in *Ecological Applications*. The study brings together efforts from two projects funded by the U.S. Department of Agriculture, the first of which was known as PINEMAP, which had hundreds of researchers collect forest growth data from the past 35 years and develop mathematical models to quantify how pine forests may respond to climate change.

Led by Assistant Professor Quinn Thomas, the second project focused on quantifying uncertainties in how climate models predict how forest and agricultural ecosystems, along with decisions like the timing of crop or forest harvest rotations, influence climate temperature and precipitation patterns. Thomas noticed the way weather data can help meteorologists predict future weather patterns, leading him to develop a new research project to forecast productivity through the middle of the 21st century.

Thomas and team members from FREC — Master’s student Annika Jersild, Postdoctoral Associate Evan Brooks, Associate Professor Valerie Thomas, and Professor Randolph Wynne — built on data and concepts from the two projects to develop a common analytical framework that can be combined with predictions from climate models to produce an outlook for the future. Data on the diameter of trees, the number of leaves produced in a given year, and how much water is evaporated from the forest are all fed into a model representing the process of forest growth. Then, using statistical methods similar to those used in weather forecasting, the model is adjusted based on those data to account for uncertainties.

Researchers looked specifically at conditions in the Southeastern United States, often referred to as the “wood basket of the United States” for its productive forests. They focused their attention on planted loblolly pine plantations, an important source of timber for the region.

“We found that in this region, there will be about a 30 percent increase in productivity between now and the middle of the century,” Thomas said.

He cautioned, however, that there is uncertainty around those predictions, depending on specific parts of the region. Despite these uncertainties, however, the future of ecological forecasting looks bright.

The study, “A mid-century ecological forecast with partitioned uncertainty predicts increases in loblolly pine forest productivity,” is available online in Early View format in advance of publication in an upcoming issue of *Ecological Applications*. 
FREC hosted the 41st Annual Council on Forest Engineering (COFE) Meeting at the Williamsburg Lodge in Colonial Williamsburg July 15-18. The meeting was co-chaired by Chad Bolding and Scott Barrett with the theme Revolutionary Traditions, Innovative Industries. Meeting attendance was approximately 70 from 7 countries (Brazil, Canada, Italy, New Zealand, South Africa, Sweden, and U.S.) and 21 U.S. states.

The meeting began with a Sunday night icebreaker reception followed by Monday general sessions, a Tuesday field trip, and Wednesday concurrent technical sessions. General session topics included Innovations in Machine Design, Efficiency, and Safety; and Global Forest Engineering Innovations. Invited industrial speakers included Chris Harwood of John Deere; Mike Duncan of Caterpillar; and Steve Jones of Peterson Pacific. Invited global innovations speakers included Dr. Kris Brown, New Zealand; Dr. Luc Lebel, Canada; Dr. Lars Eliasson, Sweden; Dr. Raffaele Spinelli, Italy; and Mr. Angelo Moura, Brazil. Sixteen students were also in attendance representing Laval University-Canada, Auburn University, Virginia Tech, University of Georgia, Northern Arizona University, University of Montana, West Virginia University, and the University of Stellenbosch-South Africa. Concurrent technical session topics included The Role of Forest Operations; Supply Chain Efficiency; Operational Efficiency; Forest Roads and Site Impacts; The Logging Workforce; Biomass; Harvesting Productivity and Costs; and Trucking and Transportation. Of the 53 presentations, 16 papers will be peer-reviewed and edited into a special issue of the *International Journal of Forest Engineering* entitled “Forest Engineering Innovations and Advancements,” which will be published in 2019.

A full-day field trip on Tuesday included stops at the Enviva Biomass Northampton pellet mill in Garrysburg, NC, a BBQ lunch and awards ceremony at the Franklin Business Center in Franklin, VA, and visits to both Southeast Fiber Supply and Jerry D. Rose Logging to observe high production in-woods chipping of both hardwood and softwood species.

COFE presented the 2018 Student Communication Award to Patrick Grove for his paper entitled “Timber Theft: Financial Impacts and Prevention in the U.S. South.” The Operator Award was presented to Davis Rose of Southeast Fiber Supply, who is a core supplier of microchips to the local Enviva Biomass pellet facilities.

Special thanks are extended to our sponsors: Enviva Biomass, Fibria Cellulose, Huber Engineered Woods, Council on Forest Engineering, John Deere, Virginia Tech Department of Forest Resources and Environmental Conservation, and International Union of Forest Research Organizations (IUFRO) for their support of the meeting.
Teaching and Research Faculty

Jay Sullivan - Professor and Head

Greg Amacher - Julian N. Cheatham Professor of Forestry

W. Michael Aust - Professor

Scott Barrett - Assistant Professor and Extension Specialist

M. Chad Bolding - Associate Professor

Amy Brunner - Associate Professor

Harold Burkhart - University Distinguished Professor

David Carter - Assistant Professor

T. Adam Coates - Assistant Professor

Kelly Cobourn - Assistant Professor

Carolyn Copenheaver - Associate Professor

Stella Schons DoValle - Assistant Professor

Keith Goyne - Professor and Associate Dean

Jason Holliday - Associate Professor

Bruce Hull - Professor

Jeff Marion - Unit Leader/Scientist, Cooperative Park Studies Unit, USGS Patuxent Wildlife Research Center

John McGee - Professor and Geospatial Extension Specialist

Kevin McGuire - Associate Professor

Daniel McLaughlin - Assistant Professor

John Munsell - Associate Professor and Extension Specialist

Philip Radtke - Associate Professor

Stephen Schoenholtz - Professor and Director of the Virginia Water Resources Research Center

John Seiler - Alumni Distinguished Professor

Michael Sorice - Associate Professor

Marc Stern - Professor

Brian Strahm - Associate Professor

R. Quinn Thomas - Assistant Professor

Valerie Thomas - Associate Professor

Eric Wiseman - Associate Professor

Randolph Wynne - Professor
On the edge of Virginia Tech’s campus, on a stretch of farmland that few students ever visit, a sequence of small boxes is 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, 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 Envōk, 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 place 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 (CALS) School of Plant and Environmental Sciences, are participating in the project.

Matthew Fisher, the principal investigator for Innovative Wireless Technologies, described the site as an ideal location to test the system’s capacities.

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“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, 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.
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.
Research Faculty

Timothy Albaugh - Research Associate
Ralph Amateis - Senior Research Associate
Evan Brooks - Research Scientist
Carol Franco - Senior Research Associate
Kyle Peer - Senior Research Associate & Superintendent, Reynolds Homestead
Forest Resources Research Center
Kiandra Rajala - Research Assistant
Kirsten Silvius - Senior Research Associate
Matthew Sumnall - Postdoctoral Associate
David Walker - Research Associate

Extension Faculty

Jennifer Gagnon - Coordinator, Virginia Forest Landowner Education Program
Michelle Prysby - Virginia Master Naturalist Director
Adjunct Faculty

Janaki Alavalapati - Professor
Christopher Anderson - Professor
Scott Bailey - Research Geologist
Gwenlyn Busby - Research Associate
David Chojnacky - Unit Leader (retired)
John Coulston - Research Forester
Alex Finkral - Senior Forester
Jennifer Knoepp - Research Soil Scientist
William Lakel - Water Quality Program Supervisor
Christopher Maier - Research Biological Scientist
Rafael Rubilar - Associate Professor
Erik Schilling - Senior Research Scientist
David Soucek - Associate Research Program Leader
Jared Westbrook - Assistant Professor
Jeremy Wimpey - Assistant Professor

Emeritus Faculty

Robert E. Adams
Gregory N. Brown
Gregory J. Buhyoff
James A. Burger
Harry L. Haney, Jr.
J. Michael Kelly
Jeffrey L. Kirwan
W. David Klemperer
William A. McElfresh
Robert L. McElwee
Richard G. Oderwald
Marion R. Reynolds, Jr.
Joseph W. Roggenbuck
Robert M. Shaffer
David Wm. Smith
Harold W. Wisdom
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.

“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 (continued on page 17)
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.”
Administrative and Technical Staff

Administrative Staff

Tiffany Brown
Program Administrator

Kathryn Hollandsworth
Program Support Technician

Terri Keffert
Volunteer Coordinator - Albemarle County VCE Office

Stacey Kuhar
Office Support Specialist

Tracey Sherman
Web and Program Support Technician

Mary Williams
Assistant to the Department Head

Technical Staff

Deborah Bird
Forest Research Assistant

Reilly Henson
Project Technician

David Mitchem
Senior Laboratory Specialist

John Peterson
Laboratory Specialist Advanced

E. Tal Roberts, Jr.
Laboratory Mechanic

Clay Sawyers
Forestry Research Manager
Faculty

Marc Stern was promoted to professor as approved by the Virginia Tech Board of Visitors following its June 4 meeting. Stern’s background includes B.S., Cornell University (natural resources), 1998; M.S. Yale School of Forestry and Environmental Studies (social ecology), 2002; Ph.D. Yale University (social ecology), 2006.

Ralph Amateis received recognition at the 40th Annual Meeting of the Forest Modeling Research Cooperative in appreciation for his 40 years of dedicated service to the cooperative.

Mike Aust received the university’s 2018 William E. Wine Award for Teaching Excellence. The award was established in 1957 by the Virginia Tech Alumni Association in memory of William E. Wine, Class of 1904, who was a former rector of the Board of Visitors and Alumni Association president.

Adam Coates received the 2018 FREC Teaching Award.
Carolyn Copenheaver received the Society of American Foresters Carl Alwin Schenck Award for Excellence in Forestry Education in 2018. She also received the Virginia Tech College of Natural Resources and Environment Diversity and Inclusion Award.

Susan Day received the Award of Merit from the Mid-Atlantic Chapter of the International Society of Arboriculture in 2018. She also received the Pathways Grant Recipient Award in 2018.

Jennifer Gagnon received the Most Effective at Engaging the Public Award from the Alliance for the Chesapeake Bay and the U.S. Forest Service in 2018.

Daniel McLaughlin was the invited keynote speaker at the Southeast Rural Community Assistance Project, Inc., Water is Life Annual Meeting in Roanoke.

Michelle Prysby and the Virginia Master Naturalist program received the Outstanding Volunteer Project Award from the Alliance of Natural Resource Outreach and Service Programs in 2018.
Jacob Diamond, a Ph.D. student working with Dr. Daniel McLaughlin, was awarded the 2018-2019 A.B. Massey Outstanding Ph.D. Student Award. This award is presented to a doctoral student in the department who has displayed outstanding academic, scientific, and professional leadership.

Chris Dukes, an M.S. student working with Dr. Adam Coates was awarded the Outstanding Teaching Assistant Award for 2018-2019. This award is presented to a student in the department who has displayed outstanding teaching excellence as a teaching assistant.

Maddy Grupper, an M.S. student working with Dr. Mike 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.

Amanda Pennino, a Ph.D. student working with Dr. Brian Strahm was awarded the “Best Presentation of Session” award at the Soil Science Society of America (SSSA) International Annual Meeting.

Tyler Weiglein, an M.S. student working with Dr. Brian Strahm, 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, CA in early January 2019. Tyler also received the 2018-2019 H.E. Burkhart Outstanding Master’s Student Award. This award is presented to a master’s student in the department who has displayed outstanding academic, scientific, and professional leadership.
Jacob Diamond is a fourth-year Ph.D. student expected to graduate in May 2019. Jake has been remarkably productive during his Ph.D. research, with projects (both dissertation and others) spanning systems, scales, and disciplines. For his core dissertation work, he is exploring hydrologic impacts of the invasive emerald ash borer in the Upper Great Lakes region, with implications for landscape-scale management efforts.

Jake has many other projects, including hydrologic analysis of south Florida wetlands and new applications of terrestrial LiDAR, and is lead author on two synthesis articles. These research efforts demonstrate an impressive range of new ideas and quantitative skills, ranging from catchment hydrology and biogeochemistry to plant-water relations. Further, Jake has been a leader in the department and beyond. Jake served as president of the FREC Graduate Student Association and led multiple outreach efforts involving local K-12 schools. He led the VT team that finished 1st in category and 2nd overall in the NYU Policy competition.

Jake was also selected to co-chair the 2019 Gordon Research Conference on Catchment Science. Last, he was a selected and fully funded participant in the 2017 São Paulo School of Advanced Science on Climate Change in Brazil.

Christopher Dukes is a second-year M.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.

Chris 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. Chris will be presenting his research at the Biennial Southern Silvicultural Research Conference in Shreveport, Louisiana in March 6, 2019.
Corey Green and Sheng-I Yang, both doctoral students in forest biometrics, were co-instructors of FREC 2214, Introductory Land and Field Measurements. This three-credit course is fundamental to junior and senior courses that follow in the forestry curriculum. With an enrollment of 95 students, two lectures and three lab sections meeting each week, this was a major commitment, but they rose to the occasion and provided an excellent, well-structured and delivered course.

George Hahn is a second-year Ph.D. student working on forest fire ecology in central Appalachian hardwood forests. George has been responsible for establishing boundaries and pre-fire forest assessment and sampling for 24 burn units on the Fishburn Forest. George 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 Dr. Adam Coates and two additional co-authors, George 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. George also has proposals that were accepted for oral presentations at the Biennial Southern Silvicultural Research Conference and annual meeting of the Appalachian Society of American Foresters, in early 2019.
Xinde (James) Ji completed his doctoral work in 2018. In his dissertation, he examines the adaptive behavior undertaken by producers of irrigated agriculture in response to changes in temperature and water availability. Answering these questions has proven challenging because of a paucity of data on the property rights that govern the water available for use at the scale of the farm. His work addresses this challenge by combining field-scale geospatial data on water property rights and water deliveries with remote sensing data on agricultural land-allocation decisions. He uses a variety of complementary theoretical and empirical approaches to explore questions such as: How does membership in irrigation districts offer benefits from risk pooling that offset the risk in water availability created by water rights? How do temperature and water availability interact to affect agricultural land rents? How do weather deviations influence the formation of farmers’ subjective expectations over climate and what are the implications for resource use?

James’ work generates new insight into how human institutions and climate interact to affect agricultural decision-making and economic welfare in arid and semi-arid regions that depend on irrigation. He has published his work in the Canadian Journal of Agricultural Economics and presented at prestigious professional conferences and workshops, including the World Congress of Environmental and Resource Economists, the Heartland Environmental and Resource Economics Workshop, and the University of Colorado Boulder Environmental and Resource Economics Workshop.

Emma Thompson is an M.F. student working with Dr. Adam Coates. Emma 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. She will present a poster on this work at the Biennial Southern Silvicultural Research Conference in March in Shreveport, Louisiana.
Carolyn Copenheaver hosted two undergraduate students, Kaylen Bendolph and Makael Harris, from the University of West Alabama through Virginia Tech’s Multicultural Academic Opportunity Program Summer Undergraduate Research Internship. They participated in a 10-week program of professional development workshops, GRE-practice sessions, and undergraduate research. They were biology or environmental science majors at the University of West Alabama, and Dr. Ketia Shumaker from their home institution helped mentor these undergraduates on their projects.

Kaylen studied the dendroclimatic relationships across the geographical range of sugar maple. Makael studied the temporal changes in the relationship between climate and radial growth of sugar maple.
Andrew Johnson worked on undergraduate research in Spring 2018 related to fuel quantification and classification on the Fishburn Forest. Along with Caleb Keen, Andrew 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 completed an independent study with Dr. Adam Coates. The goal of this independent study was to produce a manuscript for Forest Ecology and Management comparing long-term burned watersheds to unburned watersheds near Charleston, South Carolina.

Caleb Keen worked on undergraduate research in Spring 2018 related to fuel quantification and classification on the Fishburn Forest. Along with Andrew Johnson, Caleb helped sieve and process soil samples taken from Coastal Plain burned plots. Results from those samples were used to produce one publication in Forests. During summer 2018, Caleb was employed as an undergraduate research technician, assisting George Hahn and Chris Dukes with pre-fire forest assessment, research design, fuel sampling, and soil sampling on the Fishburn Forest. Caleb assisted Dr. Coates and DOF personnel with an 11-acre prescribed burn on the Fishburn Forest in November 2018.
2018 FREC Advisory Board Members

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Marcus Comer - Virginia State University, Petersburg, VA
The Virginia Forest Landowner Education Program (VFLEP), coordinated through FREC by Jennifer Gagnon, develops and delivers educational programs and materials about sustainable forest management to over 10,000 Virginia forest owners annually.

Specific goals of VFLEP include:

- providing woodland owners with the knowledge and tools they need to practice sustainable forest management;
- increasing the health and productivity of Virginia’s 10.1 million acres of privately-owned woodlands;
- generating public understanding and support for the management of Virginia’s vast forest resources;
- conserving Virginia’s woodland base.

In 2018, VFLEP offered 19 landowner programs. These included:

- Beginning Landowner Weekend Retreats (2)
- On-line Woodland Options for Landowners
- Fall Forestry & Wildlife Field Tours (3)
- Tree Farmer Dinners (4)

Over 800 woodland owners, who owned over 55,000 acres of land, attended one or more of these programs. In addition, VFLEP conducted 6 trainings for 110 natural resource professionals, and 19 presentations on woodland-management related topics were given across Virginia.

Landowner education materials included four print issues of the quarterly Virginia Forest Landowner Update that were sent out to over 7,200 landowners, and 12 e-newsletters that were sent out to over 4,900 subscribers. These newsletters contain current woodland and wildlife management information, as well as descriptions of upcoming landowner education programs.

In 2018 VFLEP continued a strategic planning process that included a needs assessment of 10,000 woodland owners across Virginia. The results of this assessment are being analyzed and will be available later in 2019.

The VFLEP Team includes Jennifer Gagnon, Coordinator, Adam Downing, Neil Clark, Jason Fisher, and Bill Worrell, District Forestry & Natural Resources Extension Agents. In addition, most of their work is conducted in collaboration with the Virginia Department of Forestry, the Virginia SFI State Implementation Committee, the Virginia Tree Farm Foundation, and other natural resources partners in Virginia.
The Virginia SHARP (Sustainable Harvesting and Resource Professional) Logger program (http://sharplogger.vt.edu/) coordinated by Scott Barrett, has been a Virginia Tech Forestry Extension Program since 2002. The SHARP Logger program provides training in the principles of sustainable forestry, environmental protection, and workplace safety. The program receives support from Sustainable Forestry Initiative (SFI) program participants operating in Virginia through the Virginia SFI State Implementation Committee (http://virginiasfi.org/). The vast majority of all logging businesses in Virginia have received training through the Virginia SHARP Logger program. The program offers a three-part “core” program for participants to become SHARP Loggers, and then there is a continuing education (CE) requirement to maintain their SHARP Logger status. In 2018, there were a total of 5 core programs and 23 CE classes offered across Virginia. Over 900 individuals attended at least one training to receive credit through the SHARP Logger program in 2018. In addition to traditional classes offered across Virginia, the SHARP Logger program also has a total of eight online CE trainings. The SHARP Logger Program works with the District Forestry and Natural Resources Extension Agents, the Virginia Department of Forestry, and many others in Virginia’s forest industry to provide training opportunities to loggers across Virginia.
The Virginia Master Naturalist (VMN) program is a statewide corps of volunteers providing education, outreach, and service dedicated to the beneficial management of natural resources and natural areas within their communities. Directed by Michelle Prysby, the program aims to extend the capacities of both state and local natural resource agencies and organizations to be able to achieve their missions in new ways, engage new audiences, and work towards creating a citizenry more informed about and involved in natural resource conservation and management.

The VMN program currently has 2,000 active volunteers who reported service in 2018. These volunteers contributed significant volunteer time in the areas of education, citizen science, stewardship, and chapter administration, amounting to more than $5 million in contributions to natural resource conservation in Virginia (based on IndependentSector.org value of a volunteer hour). Since the program’s inception in 2005, VMN volunteers have contributed more than one million hours of service with a value of more than $28 million to the Commonwealth of Virginia.

In 2018, VMN volunteers contributed more than 43,000 hours of stewardship to improve local natural resource conditions on more than 400 sites through invasive plant management in parks, planting of habitats for pollinators and other wildlife, trail maintenance of hundreds of miles of trails, and litter cleanup events.

Volunteers also contributed more than 64,000 hours of time to dozens of citizen science studies of birds, phenology, mammals, butterflies, stream health, and more. Among these was a new set of bat monitoring studies aimed at improving understanding of bat abundance and diversity in Virginia. Volunteers in four VMN chapters worked with partners such as the Virginia Department of Game and Inland Fisheries and the North American Bat Monitoring Program to develop study protocols. Throughout the summer, they visited field sites regularly, recorded bat echolocation calls using bat detectors, and identified them using computer software. The data are shared with scientists to help inform bat conservation efforts.

In addition, volunteers made more than 141,000 contacts through educational programs in their communities that totaled 43,000 hours of service. These programs included day camps and afterschool programs for youth in partnership with 4-H, talks for local community groups, and activities at numerous special events, such as local Earth Day celebrations. In just one example of their environmental education work, VMN volunteers in many chapters helped provide Meaningful Watershed Educational Experiences for K-12 youth. They led educational activities to teach youth how watersheds function, how to measure water quality in streams, and about the stewardship actions they could take to help protect their local watershed.
On top of their contributions to these many conservation projects, VMN volunteers also contributed more than 37,000 hours managing our local chapters. The unique structure of the VMN program relies on volunteers to lead the day-to-day local operations of the program, including recruiting new volunteers, organizing training courses, developing local projects and partnerships, and tracking volunteer activities. Several hundred VMN volunteers provide this local leadership, without which the program would not exist.

Besides Prysby, the VMN program team includes, Tiffany Brown (VMN project assistant and FREC administrative staff), and Terri Keffert (VMN volunteer coordinator and part-time FREC staff).

Some of the significant initiatives for the program in 2018 were:

- Launching of a new VMN chapter on the Middle Peninsula.
- A third series of regional Leadership Days, at which we provided training in volunteer management, diversity and inclusion, and other leadership skills to 119 volunteer leaders in local Virginia Master Naturalist chapters. Ninety percent of participants stated that participating in a Leadership Day helped them feel more effective in their leadership role, and 93% stated that their participation gave them new ideas that they plan to implement within their chapters.
- VMN Statewide Conference, an annual gathering of VMN volunteers from across the state at which we provide continuing education to build the volunteers’ skills and knowledge. In 2018, more than 200 attendees came together for dozens of different concurrent sessions in Fredericksburg and neighboring natural areas.
- Continued fundraising in partnership with the Virginia Tech Foundation, raising critical funds to continue our program operations.
- Continued engagement of the seven state agencies that co-sponsor and co-fund the project, furthering joint projects such as monitoring of the Virginia Department of Game and Inland Fisheries Birding and Wildlife Trails.
The Virginia Geospatial Extension Program (VGEP), coordinated by John McGee, provides GIS, GNSS, remote sensing, and small unmanned aircraft system (sUAS) education, outreach, and program support to an array of stakeholders across Virginia. Several examples of programs from 2018 include:

- GeoTEd-UAS: The Geospatial Extension Program continued working on a multi-year NSF project called Geospatial Technician Education Program for Unmanned Aircraft Systems (GeoTEd-UAS). Through GeoTEd-UAS, VGEP developed a curriculum chart of the major tasks and duties required by the drone industry. This chart now forms a foundation for sUAS curriculum development for various colleges and universities across Virginia. VGEP hosted educational opportunities on drone operation, safety and data processing. The GeoTEd-UAS Institute, for example, is a six day intensive UAS boot-camp.

- Mapping with Drones represents a new workshop opportunity that is being offered by VGEP. This three-day workshop is designed to help prepare Virginia’s workforce to implement small unmanned aircraft systems (sUAS). In addition to preparing participants for the FAA’s Remote Pilot Certificate exam (Part 107), the workshop also offers instruction on safe operation practices and provides participants with an overview of sUAS platforms, sensors, and image processing options. Workshops are held across the Commonwealth.

- Online Geospatial Tutorials: VGEP, in partnership with VirginiaView and other partners, has developed low-cost geospatial tutorials to support the needs of educators and industry. The tutorials are available as eBooks and hardcopy texts on Amazon (eBooks are free to “Prime Members”). Video tutorials are also available through VGEP’s YouTube Channel. The collection includes:
  - Working with Lidar using ArcGIS Desktop
  - Remote Sensing Analysis in an ArcMap Environment: 2nd Edition
  - Remote Sensing with ArcGIS Pro
  - Wintermester: Each January, a select group of Virginia Tech students embark to Panama for a two-week Wintermester experience. Through this course, students explore the intersection of culture, economy, and ecology. Students explore historic Panama City, “the canal,” live among the indigenous Guna, and camp in remote rain forests. Students are active learners at the Cocobolo Research Station and work with scientists from Panama, Colombia, the Netherlands, and the United States.
Harold Burkhart was a keynote speaker at a conference on New Frontiers in Forecasting Forests held in Stellenbosch, South Africa, where he addressed the topic of Uncertainties in Predictions of Growth and Yield.

Burkhart was also an invited speaker for the 30th Anniversary Celebration of Modelo Nacional de Simulation (MNS), a Chilean forest modeling consortium based in Concepcion, Chile.

David Carter assisted in hosting the annual Latin America Forest Productivity Cooperative meeting in Sao Bento do Sul, Brazil.

Adam Coates was selected as an Inclusivity and Diversity Committee Member for the International Association of Wildland Fire.

Kelly Cobourn is part of the DARPA World Modelers Program project that develops technology to rapidly couple human and natural systems models to study food security in South Sudan. International collaborators include the British Geological Survey, Gates Foundation, IST Research, Kimetrica International and SRI International.

Cobourn is also part of the NASA Land Cover/Land Use Change Program project that is a study of the incentives that influence household decisions about whether to convert land into small-scale plantation forests in the state of Andhra Pradesh, India. International collaborators include Indian Institute of Technology, International Paper APPM India, and University of Gothenburg.

Jeff Marion presented at the 9th International Conference on Monitoring and Management of Visitors in Bordeaux, France, and the 7th World Trails Conference in Santiago de Compostela, Spain.

John McGee hosted a study abroad in Panama in Wintermester 2018.

Randy Wynne, along with students Paige Williams and Snehal More, travelled to India in December to initiate the filed data collection and to meet with agency and university collaborators as part of the NASA Land Cover and Land Use Change project.
Refereed Publications


Refereed Publications
(continued)


Frensley, B.T. 2018. Investigating the links between lesson characteristics, student engagement, and outcomes at a residential environmental education program. Chair: M. Stern.

Goerlich, D.L. 2018. The value of Cooperative Extension’s public benefit explored through enhancements to forest ecosystem services provision. Chair: M. Mortimer.


Steinmetz, A. 2018. ‘It should’ve never been broke out’: Understanding participation in the Conservation Reserve Program in Southwest Kansas and Southeast Colorado. Chair: M. Sorice.
FREC GRADUATE ENROLLMENT OVER TIME

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Graduate Degrees Awarded

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The American Chestnut Foundation
American Forest Management
American Tree Farm System
Appalachian Sustainable Development
Appalachian Trail Conservancy
Arborex, LLC
APRIL
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Bayer CropScience LP
BTG Pactual
Bureau of Land Management
Campbell Global, LLC
Campo Forestal SA
CHS, Inc
City of Virginia Beach
Consortium of Appalachian Fire Managers and Scientists
Cotopaxi
Crop Production Services-Timberland Division
DARPA
Deforsa
Deltic Timberlands
Department of Defense Strategic Environmental Research and Development Program
Department of Education
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Dougherty & Dougherty Forestry
Evans Properties
eXtension Foundation
Fibria
Florida Grown
Forest Investment Associates
Forestal Bosques del Plata (Argentina)
Forestal Mininco
Forestry & Land Resource Consultants
FuturaGene
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National Science Foundation DEB Long Term Ecological Research
National Science Foundation EAR Geobiology and Low Temperature Geochemistry
National Science Foundation Smart and Connected Communities
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NorthBay Environmental Education Foundation
North Carolina Forest Service
Oak Hill Fund
Omya International
Pheasants Forever
The Powell River Project
Rainforest Alliance
Rayonier
Renewable Resources LLC
Resource Management Service
Roseburg Forest Products
Smurfit Carton de Colombia/Venezuela
Superior Pine Products Company
Sustainable Forestry Initiative Virginia
State Implementation Committee
Suzano
Syngenta
Terena, S.A.
Texas A&M University
Timberland Investment Resources
Tree Research and Education Endowment Fund
US Department of Energy
US Endowment for Forests & Communities
US Fish & Wildlife Service
US Geological Society
USDA Agricultural Research Service
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USDA Natural Resources Conservation Service
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Virginia Department of Forestry
Virginia Department of Game and Inland Fisheries
Virginia Department of Mines, Minerals, and Energy
Virginia Department of Transportation
Virginia Forestry Association
Virginia Institute of Marine Science-Center for Coastal Resources
Management
Virginia Museum of Natural History
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