FOREST SEASONS
Fall 2015
NORTHERN ARIZONA UNIVERSITY
College of Engineering, Forestry & Natural Sciences
The Newsletter of the NAU School of Forestry

Large-Scale Project Launched on Southwestern White Pine

A collaborative team of researchers from the United States and Mexico, led by Associate Professor Kristen Waring, has begun an exciting new research project funded by the National Science Foundation. The team, which includes members from four universities and two units of the U.S. Forest Service, will study ecological and evolutionary processes affecting the current and future distribution of southwestern white pine (*Pinus strobiformis*; SWWP), an important tree species of mixed conifer forests in the U.S. Southwest and Mexico. At a total of $4.1 million over five years, this is believed to be the largest research project ever awarded to a School of Forestry faculty member.

The overall goal of this complex project is to determine how gene movement among populations, adaptation to white pine blister rust and drought, heritable changes beyond DNA mutations, and a changing environment interact to govern the distribution of southwestern white pine. To meet this goal, the team will utilize the following tools at field sites or labs in Arizona, Oregon, Virginia, and Mexico: 1) tree disease resistance testing; 2) use of unmanned aerial vehicles to assess the physiological condition of trees; 3) common gardens; 4) genomics; 5) epigenetics; and 6) landscape ecology and genomics computer modeling. In addition to addressing the key research questions as they relate to SWWP, this project is expected to serve as a prototype for forecasting complex ecosystem behavior that could be applied to other ecosystems. The project will also provide high-quality educational opportunities to both graduate and undergraduate students. Two PhD students and one master's degree student will be recruited to work on this project at NAU, and several other students have already been employed as technicians or conducted undergraduate research projects; others will soon be serving as volunteer workers (e.g., to plant seedlings in common gardens). Students from Oregon State University, Virginia Commonwealth University, and Universidad Juárez del Estado de Durango will also have the opportunity to participate in this project.


Dr. Kristen Waring (right) with her former PhD student, Dr. Betsy Goodrich.


Jayson Fasthorse Begay records data on southwestern white pine seedlings at the NAU Research Greenhouse.

As with most research projects, this one builds on a foundation of ongoing and previous research, including SWWP-related collaborations with U.S. Forest Service Forest Health Protection, the NAU Merriam-Powell Center for Environmental Research, and doctoral research conducted by School of Forestry alumna Dr. Betsy Goodrich, who completed her PhD in May 2015.

Executive Director's Message

Dear Alumni and Friends:

I hope you enjoy this latest issue of Forest Seasons. This issue places a lot of emphasis on our research, which has never been stronger. We currently have nearly 50 externally funded grants totaling approximately $7 million and are engaged in projects from here in northern Arizona to places as far afield as Spain, Greece, China, and Indonesia. This research funding, along with the new faculty we have added over the past few years, is helping to keep our graduate program strong and productive. One "spin-off" of all this research activity is that it draws in visiting scholars from around the U.S. and the world to work with our faculty. Some of our recent international visitors are featured on page 5.

We have also paid close attention to the needs of our undergraduate students. One of the highlights in this area is the implementation of the most significant curriculum revision in almost 15 years. We started introducing this over a year ago and it will be completed during the 2015-2016 academic year, when several new or revised senior-level courses are taught for the first time. Among other things, the revisions are designed to strengthen some areas of instruction, such as GIS, and to reconfigure the way we teach other subjects such as biometrics, silviculture, and our capstone course.

Another area of significant progress is in the expansion and creation of funds that provide scholarships, travel opportunities, and other resources for our students and faculty. Some of this progress is highlighted on pages 6 and 7, and it owes everything to people like you… the alumni and friends of the School of Forestry!

Sincerely,

Jim Allen

Professor Martha (Marty) Lee and Brian Poturalski (BSF, 1991), a Recreation Staff Officer with the Coconino National Forest, were recognized late last year for their dedication and contributions to wilderness stewardship. The two received the Forest Service's Wilderness Legacy Award. They started working together in 2000 to develop a class that provides NAU students with a solid wilderness background and includes exposure to current wilderness management issues, field work in local wilderness areas, and a chance to develop wilderness management products.

Dr. David Auty joined our faculty as an Assistant Professor in the fall of 2014. A specialist in forest products and wood science, Dr. Auty fills an important gap left by the retirement of Professor Robert Larson in 2010. Dr. Auty is originally from England, studied for his doctorate in Scotland, and most recently had been working at Laval University in Quebec City, Canada. More information about Dr. Auty and his research interests can be found at **nau.edu/auty**

Student Highlights

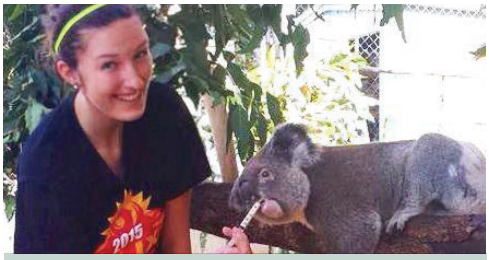
A landowner (in blue shirt) discusses his mixed-species plantation with a forest health class from SCU.

Student Participates in Exchange Program with Australian University

In 2004, the School of Forestry entered into a student exchange agreement with the School of Environment, Science, and Engineering at Southern Cross University (SCU), in New South Wales, Australia. In a typical year, one or two of our students take advantage of this opportunity, most commonly by spending a semester at SCU during their senior year. This program is just one example of a larger trend in undergraduate education to internationalize curricula. It is widely suggested that students with some level of international experience have better job opportunities and maintain a life-long interest in global affairs.

The most recent student to participate in this program is Marlee Monahan, who spent her final semester as an NAU forestry major at SCU. In addition to taking a forest health class needed to complete her BSF degree (and that was taught by NAU forestry alumnus J. Doland Nichols), Marlee took a class in marine coastal ecosystems that included weekly field trips to the nearby coast. She also managed to travel extensively and to serve as a volunteer at a koala rescue center. She reported that the staff at SCU were very friendly, that the international office regularly put on trips so that students could see more of Australia, and that she made friends from quite a few different countries. Marlee had a great experience and encourages more students to take advantage of this wonderful opportunity.

Marlee Monahan at the Great Barrier Reef.



Marlee at the Koala Rescue Center.

Student crew member Tyler Richwine, BSF, 2015.

Students Gain Hands-On Experience in Centennial Forest

By working over parts of the school year and summer, forestry students recently completed a thinning project on a 40-acre parcel of the NAU Centennial Forest. The main management goal of the project was to improve forest health by removing many of the small diameter trees, thereby reducing the risk of bark beetle infestations and crown fire. Another very important goal was to give some of our students the opportunity to develop practical field skills. Of the 16 students who worked on this project, 10 received training as sawyers. The project was overseen by Centennial Forest Manager Cheryl Miller and also had input from Associate Professor of Forest Entomology Richard Hofstetter. Funding for this project was provided by the Arizona State Forestry Division's Western Bark Beetle Initiative Grant Program, which is in turn funded by the U.S. Forest Service.

Professor Conducts Research in Europe to Improve Our Understanding of Insect Hearing

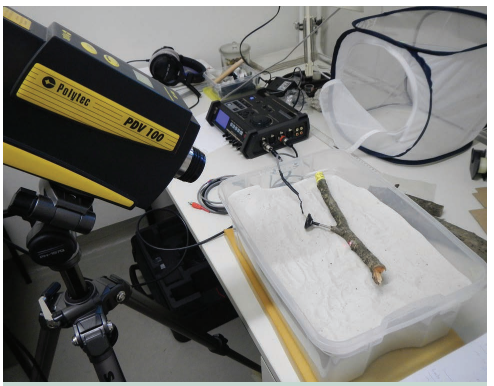
Associate Professor Richard Hofstetter in Glasgow, Scotland, where he investigated bark beetle sound perception.

Dr. Hofstetter used a micro-CT scanner to create 3D imagery of a bark beetle.

School of Forestry Associate Professor Richard Hofstetter spent two months of his sabbatical in Europe to better understand how insects communicate acoustically, particularly focusing on sound perception by beetles.

Hofstetter first visited the Center for Ultrasonic Engineering at the University of Strathclyde in Glasgow, Scotland, (top left) in June, where he worked with Dr. James Windmill and Dr. Joe Jackson in their state-of-the-art engineering labs dedicated to bioacoustics and ultrasonic technology development. The objective of this research was to determine the presence of hearing organs ("ears") in bark beetles, and to compare and contrast the acoustic structures and sound profiles of bark beetles with other insects that are known to communicate with sound. To date, the hearing mechanisms in most insects, including bark beetles, are unknown. To locate potential hearing organs, Hofstetter used a high-resolution micro-CT scanner that allowed for 0.1 *u*m pixel size with 3D image visualization (top right). This is the first 3D internal imaging of a bark beetle. Hofstetter was also an invited speaker at University of Strathclyde Summer Seminar, presenting a talk titled "Can acoustic technologies be used to protect trees from pest insects?"

Dr. Hofstetter next visited the Natural History Museum in Berlin and the Max Planck Institute of Chemical Ecology in July in Jena, Germany, where he continued to study acoustic communication in beetles with Dr. Andreas Wessel and Dr. Peter Biedermann. The Natural History Museum houses one of the largest animal sound archives in the world and has a long tradition in animal acoustic research. Using a portable laser vibrometer, Hofstetter recorded sounds of locally collected ambrosia beetles within tree materials (bottom right) to determine what sounds are produced by beetles within their galleries. Results from this research could improve acoustic technologies to detect and repel ambrosia beetles within trees. Like bark beetles, ambrosia beetles have recently been among the most devastating forest pests in many countries worldwide. Hence, insights into their biology can provide new avenues for successful bio-control strategies against invasive beetles. While at the Max Planck Institute, Hofstetter discussed research projects with graduate students and also gave a presentation titled "Effects of the host plant on symbiotic associations of bark beetles" in their weekly seminar series.



A laser vibrometer was used to capture beetles' sounds.

Visiting Scholars Spend Time at the School of Forestry

While it is fairly common for School of Forestry faculty to spend time working with colleagues in other countries, scholars from other countries also come to the School of Forestry, and lately it seems like they are doing so in increasing numbers. The visiting scholars who have been with us recently are highlighted below.

Dr. Sitti Latifah (center) from the University of Mataram (UNRAM) in Indonesia spent three months in the School of Forestry last fall, courtesy of a fellowship from the Indonesia Ministry of Education. Dr. Latifah has been working closely for several years with Professor Yeon-Su Kim (left) to build research capacity at UNRAM and to conduct research on issues related to a U.N. initiative known as Reducing Emissions from Deforestation and Degradation (REDD+). During her stay in the U.S., Dr. Latifah visited classes, attended a scholarly writing workshop and, along with Dr. Kim and several of their colleagues, co-authored a presentation on REDD+ at the XXIV International Union of Forest Research Organizations (IUFRO) World Congress in Salt Lake City.

Dr. Fabio Albuquerque, who is originally from Brazil but completed his doctoral training in Spain, recently completed two years at NAU working with Regents' Professor Paul Beier on a project they call "Conserving Nature's Stage" (CNS). CNS is a strategy for prioritizing conservation sites that can represent most species in a few sites. Because the world lacks good maps of where species occur, Dr. Albuquerque developed procedures to prioritize sites based on geodiversity (diversity of soils and topography). In 2015, Drs. Albuquerque and Beier published five papers demonstrating that geodiversity is a good surrogate for biodiversity, and explaining the new procedures they developed. In August of this year, Dr. Albuquerque started a tenure-track faculty position as a biogeographer at Arizona State University.

Drs. Yunge Zhao and Mingxiang Xu, from the Chinese Academy of Sciences Institute of Soil and Water Conservation in Yangling, China, spent about five months here during the previous academic year. Their work in China is mainly focused on outcomes of the Grain-for-Green project—one of the most extensive payment for ecosystem services programs ever undertaken in the world—in the Loess Plateau, one of the world's most eroded regions. They were hosted by Assistant Professor Matt Bowker and worked with him and his lab group on issues related primarily to biological soil crusts.

Dr. Blanca Céspedes González is a visiting postdoctoral scholar from Toledo, Spain. Her 11-month stay at NAU is funded by a research grant from the regional government of Castilla-La Mancha in Spain. Dr. Céspedes is carrying out a modeling study using a computer model of tree growth to assess how pine-oak forests in the Mediterranean region of Spain will change as the climate warms. The model incorporates different fire regimes, permitting Dr. Céspedes and Dr. Nikos Fyllas, a Greek scientist who originally developed the model, to draw implications about conservation and management of important forest ecosystems. Dr. Céspedes' research is linked to similar studies in the U.S. Southwest, where dry pine-oak forests also face challenges from changing climate and fire patterns. In October 2015, Dr. Céspedes will give a presentation comparing the Mediterranean and southwestern forests under climate change.

Dr. Asier Herrero Mendez is a visiting scholar from the Department of Plant Biology and Ecology, Faculty of Science and Technology, University of the Basque Country, Spain. He arrived this past spring and will be working for two years with Professor Tom Kolb and others on a project aimed at understanding impacts of climate warming on demographic processes of ponderosa pine, particularly regeneration and recruitment of seedlings to saplings.

Update on the Charles O. and Mary Minor Forestry Professorship

The Minor Forestry Professorship was created by alumni and friends of the School of Forestry to honor the founder of the School and his wife, Mary. This fund will permanently support an elite faculty position at Northern Arizona University, reserved to attract or retain an eminent scholar whose work substantially advances the discipline. Among the many that have supported this fund, we would like to recognize Dr. Merton Richards, NAU retiree and friend of Dr. Minor, who, with his wife Corbin Vandemoer, recently made a significant gift to the fund through a charitable gift annuity. Dr. Richards taught at the School of Forestry for 18.5 years and had the pleasure of working with, and learning from, Dr. Minor as a member of a teaching team in the Semester B forest management unit. He incorporated economics, policy, and recreational use of forest lands into Semester B units. Cory Vandemoer, during her employment with the U. S. Forest Service research station, consulted frequently with Dr. Minor in her efforts to analyze forest service research data. Dr. Richards says, "Chuck and Mary Minor were always helpful and supportive of Cory and me as we joined the forestry family at NAU. We cannot think of the School of Forestry without thinking of Chuck and Mary Minor." The Minor Professorship still has a distance to go before we can move forward; it is a high funding priority for the School of Forestry.

Update on the Wally Covington Student Travel Award

In our last issue, we introduced the Wally Covington Student Travel Award, which was created by Drs. Dan Binkley (BSF, 1977) and Mike Ryan (MSF, 1978). In addition to the founding gifts by Drs. Binkley and Ryan, we would like to thank all those who contributed to this fund in response to the request we sent to many of you this past spring. We would also like to thank our former dean, David Patton, for his very generous gift that allowed us to start helping students even before the fund reached its full endowment level. Thanks to Dean Patton's generosity, we were able to support the participation of six students in the annual meeting of the Southwest Section of the Society of American Foresters, as well as to help a PhD student complete an experiment that was conducted in Hilo, Hawaii, for her dissertation research. We look forward to helping many more students!

In Memoriam – Rusty Richardson

Rusty Richardson was a strong supporter of School of Forestry scholarships.

Frederick Henry (Rusty) Richardson, 90, passed away peacefully at his home Ruston, Louisiana, in August of 2014, shortly after our last newsletter went to press. After serving as a naval aviator during World War II, he completed a degree in forestry from Louisiana State University and then spent his entire career with the U.S. Forest Service in Arizona and New Mexico, except for three years when he was assigned to the Office of Inspector General in San Francisco. Rusty was a friend of founding dean Charles O. Minor and faculty member Martin Applequist dating back to their days at LSU, and that friendship was a key reason why he established three scholarships for our students. Each scholarship bears both Rusty's name and the name of a professional colleague and friend of his, including Leonard Dearborn, Dean Gossard, and Alvin Teague. The funds for these scholarships were established as charitable gift annuities, and two of them will be awarded for the first time at our Honors Convocation in April 2016.

New Scholarship Available – Dyer Family Forestry Scholarship

Jacob Dyer (BSF, 2006) and his family recently established a scholarship in the School of Forestry. The Dyer family have been farmers for many generations and Jacob was the first to attend and graduate from college. This scholarship honors the enrichment of lives and opportunity gained through education. It will support first-generation students that show promise as future leaders in forest science or forest management. The Dyer Family Forestry Scholarship will begin awarding recipients in fall 2016.

Alumni Updates

Kamie (Fuller) Long, BSF, 2003

After graduation Kamie (above) was hired by the Colorado State Forest Service – Golden District. In 2005 she transferred to the Grand Junction District where she was the Assistant District Forester until this past May. Kamie is now the Acting District Forester for the Grand Junction District, covering five counties in Western Colorado. She is lucky enough to have a lot of variety in her job, including visiting with landowners and discussing wildfire mitigation measures, assisting with forest health management, and supporting district communities with urban forestry issues. She earned her International Society of Arboriculture (ISA) Certified Arborist certification in 2006, became ISA Tree Risk Assessment qualified in 2013, is a Master Gardener through Colorado State University Extension, and is the Chair of the Grand Junction Forestry Board. She lives in Grand Junction, Colorado with her husband and two dogs. She was on campus this past spring and spent some time tending the memorial for her father, Donald Fuller (BSF, 1974), which is located next to the lower side entrance to the forestry building.

Fenner Yarbrough, MSF, 2006

After graduation, Fenner worked for the Arizona Game and Fish Department Research Branch for 11 years, where he worked closely with the NAU Ecological Restoration Institute on wildlife responses to forest restoration throughout the state as well as numerous other projects involving bighorn sheep, mule deer, and black bears. Since November, he has been employed by the Washington Department of Fish and Wildlife as the District Wildlife Biologist for the North Puget Sound Region. This position involves working on setting hunting seasons, tracking harvest information, and managing elk and waterfowl populations throughout the Puget Sound region. Fenner and his family live in Bellingham, Washington.

Tyler Johnson, MSF, 2008

Tyler has been the Regional Botanist for the Rocky Mountain Region (R2) of the U.S. Forest Service since February. This position oversees the rare plants and native plant materials program for all of the national forests and grasslands in Colorado, South Dakota, Kansas, Nebraska, and most of Wyoming. After completing his MSF degree, Tyler first served as the Forest Botanist for the Lincoln National Forest in Alamogordo, New Mexico, then spent a year in New Zealand researching an invasive shrub called gorse. Previous to taking his current position in February, he was a NEPA Specialist/Botanist on the Bridger-Teton National Forest in Jackson, Wyoming, for four years. Tyler's work experience with the Forest Service has focused mostly on the conservation and management of rare and endangered plants as well as the management of noxious and invasive plants. He lives in Golden, Colorado with his wife, Mari.

Invest in Our Students

Invest in the Future of Forestry

Are you interested in contributing to funds that help the next generation of foresters earn top-notch degrees and protect our forests? Learn more about gift opportunities at **nau.edu/invest-in-forestry**

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The School of Forestry's Logging Sports Team was a highly visible (and audible!) presence at football and basketball home games this past year. The team fired up a chainsaw after touchdowns and other important game highlights, and cut a cookie, which not only helped contribute to the post-score celebrations, but also reminded everyone of why our sports teams are called the Lumberjacks!

Forest Seasons is a newsletter for Northern Arizona University School of Forestry alumni and friends.
We welcome your feedback on the newsletter and encourage you to stay in touch.
Please feel free to call us at 928-523-3031 or visit us at **nau.edu/forestry** or on Facebook at **facebook.com/NAUForestry**