Department of FOREST RESOURCES
University of Minnesota

College of Food, Agricultural and Natural Resource Sciences

University of Minnesota

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WE WELCOME YOUR FEEDBACK!

This year, the Department of Forest Resources convened a commitee to update and expand the department's existing diversity plan. The committee included students, staff and faculty who scanned current best practices and collaboratively drafted goals, objectives, and strategies for our teaching, research and engagement. Faculty, staff, and students had several opportunities to comment on the draft plan, and we now seek your insights. We welcome your perspectives, knowing that your contributions will help to make the Department of Forest Resources more welcoming and inclusive. Please provide comments by November 15, 2017.

Visit **z.umn.edu/inclusion** to read our draft Diversity and Inclusion Plan and provide comments. You may also email comments to Professor Ingrid Schneider (ingridss@umn.edu).

UNIVERSITY OF MINNESOTA

THE DEPARTMENT OF FOREST RESOURCES

Forest Scene

Leading the way with education, research and outreach

FALL 2017 - ISSUE 19

New beginnings

This August, I was honored to be appointed by CFANS Dean Brian Buhr as the Head of the Department of Forest Resources. The amazing faculty, staff and students make my job incredibly enjoyable and rewarding. The support of friends and stakeholders also make me excited to serve in this new role.

In my first month as Head, the Department underwent review by an accreditation team from the Society of American Foresters (SAF) to assess our undergraduate curriculum, specifically the Forest Ecosystem Management and Conservation and Urban and Community Forestry tracks in our Forest and Natural Resource Management (FNRM) major. As one of the nation's oldest forestry programs, the U of M's forestry curriculum has been continuously accredited since 1935. The feedback we received from the review team during their visit was extremely positive, and I am confident that they found our program exceeding the standards for continued accreditation. During their visit, the review team met with faculty, staff, students, employers, alumni and stakeholders, among others. The review team commented on how engaged our faculty and staff are with land managers, landowners and policy-makers in addressing forest and natural resource issues in the state and beyond. I could not agree more. As you will see in this issue of the newsletter, the Department of Forest Resources exemplifies the Land Grant Mission through its teaching, research and outreach.

- Mike Kilgore, Professor and Department Head

Not too hot, not too cold: Uncovering the mystery of leaf size variation

Have you ever wondered why leaves are different sizes? We know that leaves are much larger and broader on average in tropical ecosystems than in boreal forests and deserts. Why is this? Forest Resources Professor Peter Reich is part of an international team of researchers that uncovered the mystery of why leaves vary in shape. Their research was published as the cover story in the journal *Science* this fall.

There has been a widespread belief that leaf size is primarily a function of water availability and heat dispersion. The belief held that a large leaf could not lose heat fast enough on a hot day and would overheat. Reich and his team discovered that the answer is more complicated.

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WHAT'S INSIDE

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Professor Ian Wright from Macquarie University in Australia, a former postdoctoral student and long-term collaborator of Reich, led the international team of scientists from Australia, the U.S., Canada, Spain, Argentina, and China. Their research findings showed that the "old" theory was true in certain places, but in a large part of the world, nighttime temperature and risk of frost damage to leaves are the limiting factors of leaf size. They coupled new theories with analysis of tens of thousands of leaves from over 7,600 species to generate equations for predicting the maximum viable leaf size anywhere on the planet based on the risk of overheating during the day and freezing at night.

Scientists and technicians from Forest Resources setting up data loggers at the Cloquet Forestry Center. August 2008.

The team discovered trends that hold true for plants across climate zones in different continents and across plant types. Findings confirmed that the risk of overheating during the day in hot and dry regions controls maximum leaf size there; however, in tropical ecosystems, no temperature-related limits to leaf size exist, given that there is enough available water for cooling by transpiration. The key findings that were not apparent from previous research showed that in much of the world, maximum leaf size is controlled by risk of frost at night rather than risk of overheating.

"It was long thought that overheating was the primary limit to leaf size. But the data didn't fit," said Reich.

"For example although much of the tropics is wet, leaves can still get very hot in tropical heat, yet many tropical leaves are big. On the other hand, leaves in cooler parts of the world are unlikely to overheat, but many of them are small. Our team took a different approach. We asked whether cold as well as heat could be problems for large leaves," noted Reich. Professor Wright, the lead investigator, added, "Larger leaves have thicker, insulating 'boundary layers' of still air that slows their ability to dissipate heat and cool themselves in hot, dry weather and that also slows their ability to draw heat from surrounding leaves and branches on cold nights, heat that is needed to compensate for longwave energy lost to the cold, nighttime sky."

"It should be no surprise then that these mechanisms influence plants closer to home too," Reich said. "Minnesota's deciduous plant species, like maples and oaks, must cope with the risk of frost, in spring and fall, and those that stay green all winter, like our pines and spruces, must deal with much deeper cold. As a result, maple and oak leaves are smaller than banana leaves, but much bigger than needles of pines and spruces. We can throw a parka and hat on to stay comfortable at 30 below zero, but since leaves can't, they have to adapt any way they can. "

The team's results are important for creating more accurate models of global vegetation, which will allow scientists across the world to predict vegetation changes locally and globally due to climate change. Predicting vegetation changes will facilitate climate change adaptation.

Field technician fixing LI-COR machine for measuring respiration rate in plants. July 2011.

Faculty Highlight: Kristen Nelson

Professor Kristen Nelson contributes to the interdisciplinary strength of the Department of Forest Resources with her research and teaching in human dimensions of natural resources. She seeks to know what, for example, is the role of community leaders in wildfire preparedness and what are the complexities of paying community members to conserve forests. Her research is local to global in scale, from studying turfgrass fertilization in the Twin Cities to researching grazing restrictions in Nepal. What unites her scholarship in a wide array of contexts is her interest in the interplay between human communities and environmental changes.

Her research informs her teaching in courses like Environmental Conflict Management, Leadership, and Planning, in which students simulate a conflict negotiation within the framework of a real environmental issue in the Lake States. Nelson also teaches courses on environmental policy, law, and problem-solving, core curriculum within the Forest and Natural Resource Management major, Environmental Sciences, Policy and Management (ESPM) major, and Fisheries, Wildlife and Conservation Biology major. She also supports undergraduate curriculum by bringing University writing initiatives and collaboration back "home" to CFANS.

The Writing Enriched Curriculum (WEC), explains Nelson is a "conversation at the University level that illuminates writing as one of the primary elements of the academic experience, for undergraduates, for faculty and for everyone." Central to her work with WEC was evaluating key attributes of writing and taking an inventory of writing components within the ESPM curriculum. It was determined that ESPM has some of the most rich and varied writing assignments ranging from outreach flyers to video scripts to policy briefs. Now in the third year of exploration of writing in ESPM, Nelson is seeking input from employers on how to prepare students for writing in different contexts beyond academia.

Departmental Updates

Faculty and Staff

In July, Mae Davenport was appointed to full professor, and in September, she was appointed as Director of Graduate Studies for the Natural Resources Science and Managment Graduate Program. She has served as interim in this role since June of 2016.

In July, Professor Andy David was named Director of the Cloquet Forestry Center and Hubachek Wilderness Research Center. He had served as interim in this role since November 2015.

SAF Convention

In November, faculty, staff, students and alumni will attend the Society of American Foresters National Convention in Albuquerque, NM. If you are attending the SAF Convention, we hope you will attend an alumni and friends reception. The details are as follows:

University of Minnesota Alumni and Friends Reception
Thursday, November 16, 2017, 6:30-8:30 p.m.
Albuquerque Convention Center, Santa Ana Room
Hors d'oeuvres served with a cash bar

Academic programs

A team of three reviewers from the Society of American Foresters visited Green Hall over three days in September to review the curriculum of the Forest Ecosystem Management and Conservation track and Urban and Community Forestry track within the Forest and Natural Resource Management major.

85 students are enrolled within the Forest and Natural Resource Management program for Fall 2017.

325 students are enrolled within the Environmental Sciences, Policy and Management program for Fall 2017.

30 students enrolled in the Introductory Field Session in August at the Cloquet Forestry Center. This has been the highest enrollment in over ten years.

In Spring 2018, Associate Professor Joe Knight and Unmanned Aerial Systems Coordinator Dan Heins are offering a new course entitled Drones: Data, Applications, and Operations. Students will get to practice piloting drones and will explore principles and techniques of drones, applied to natural resource and environmental issues.

Student Spotlight: Grace Ditch

Grace Ditch knows the value of exploration. Her early experiences exploring in the woods formed the foundation of her love of the outdoors that eventually drew her to the field of forestry. Grace is a senior in FNRM with a track in Forest Ecosystem Management and Conservation. She grew up in a suburb of Chicago and spent summers at her grandparents' cabin in northern Wisconsin. "The cabin was where I had my first encounters with forests, frogs, wildflowers and bugs. I remember the distinct joy of finding an unfamiliar treasure on the forest floor."

This past spring, Grace explored the forest floors of Costa Rica, where she studied abroad in a program in tropical ecology and conservation. There she took courses in Spanish, tropical diversity, tropical community ecology, and human dynamics in the tropics, lived with a host family, and conducted an independent research project on bryophyte diversity in agricultural windbreaks. Besides study abroad experiences, FNRM students express that the Cloquet Field Session is their most memorable time in the program. Grace said the same!

"I loved being immersed in forestry for those three weeks, and had the opportunity to bond over the unique experience with other people in my major."

After graduation, Grace plans to pursue graduate school, perhaps in Minnesota or the west coast. Her advice to future students? Grace says, "Get involved and get to know your peers! Developing friendships with the people in this department has been one of my best experiences here."

Alumni Spotlight: Emily Ball ('02)

Emily Ball ('02) knows that a career is often like a winding path, not a straight road. She also knows the value in seeking jobs that can give her transferable skills and that can serve her in any position. She now works as a forester for the City of Lakeville, a job that was preceded by a host of diverse experiences. Like many students in our programs, she "found" urban forestry in an introductory class in which she heard Professor Gary Johnson speak. After that, she knew urban forestry was right for her. "It was the perfect fit for my restless mind because you have to learn about so many diverse disciplines from soil science to tree biology, then apply that knowledge by planting or pruning. I also liked the idea of working with people and the educational aspect including writing and speaking."

As an undergraduate, she had internships teaching children about water quality and fishing, working as a tree inspector and arborist assistant, and with Gary Johnson in U of M Extension. After graduation, she sought out ways to experience new cultures and work environments, like tending plants at an 18th century landscape garden in the English countryside and working at a coffee shop, managing people. It was this management experience that helped earn her a job as Assistant Forester for the City of Minnetonka. After less than two years, the city forester resigned and she was promoted to the position of head forester, where she worked for nearly 13 years. She now works as City Forester for the City of Lakeville. "This is an exciting position that involves building the program from the bottom up in a rapidly developing community, and one that affords me more time to actually take my kids out to the park on some of our most beautiful Minnesota days." Does it sound like Emily likes her job? Here is her advice to future urban foresters:

"Figure out what unique skill set you can offer a community and hone that skill. Basically try to follow your passion, get experience and don't stop learning!"

Community Partnership: White Earth Nation

The White Earth Math and Science Summer Academy, now in its 19th year, is a collaboration between the University of Minnesota and the White Earth Nation. Stephan Carlson and Charlie Blinn, both faculty in Forest Resources with Extension appointments, have been teaching classes at the Summer Academy for most of the last 19 years. When it was formed, tribal elders, teachers and University faculty partnered to address issues of high dropout rates and erosion of cultural knowledge among youth on the White Earth Indian Reservation. They sought to boost tribal students' interest and knowledge in math and science and ground the teachings within Ojibwe culture and tradition. The place-based curriculum has blended Ojibwe language, history, nutrition and crafts, content that is taught by tribal educators and elders, with forestry, soil science, water ecology, fisheries, wildlife biology and management, and horticulture, taught by University of Minnesota faculty. In some families, the second generation of students are now going through the program. Parents are glad that their children get to have the same kind of experiential learning experiences that they did as kids.

More recently, the curriculum has incorporated STEM principles and technology like GPS. As an example of a lesson, elders discuss how traditional navigation techniques were used to help their ancestors seasonally move across landscapes and how they would prepare and hide food in caches for their journey. The students learn about food caches, select examples of foods which may have been hidden, go to locations where they hide their "food caches" and store a GPS waypoint. They then trade GPS receivers with another group to locate the other group's food cache.

Youth sit inside the "Climate Chaser," a trailer in which they interviewed and recorded tribal elders speaking about climate changes over their lifetimes.

In a report prepared by Stephan Carlson and collaborators, program outcomes have shown an increase in students' math and science scores on standardized tests as well as increases in high school graduation rates. Relationships built between University faculty and staff from the White Earth Nation's Natural Resources Department have helped summer interns in that Department seek four-year college degrees at the University of Minnesota. Through the connection, tribal resource managers enrich University curriculum by bringing indigenous perspectives to classes. A member of the White Earth Nation's Natural Resources Department annually provides guest lectures in University courses about perspectives of tribal members and management of natural resources on the Reservation.

As in most years, in 2017, 45 youth in grades four through eight participated in the three-week program which was based at the school Circle of Life Academy. In many years, the program is built around a theme. This summer focused on how phenology, the study of seasonal changes over time for plants, insects and animals, helped participants develop skills to observe the natural world. They learned to listen and observe plants and animals while journaling, recording observations on a phenology website and connecting Ojibwe language to their observations.

"Indigenous people have always used phenology, to survive and live", says Tribal Language and Culture teacher, Rob Tibbitts. "We don't call it that, but it is what our culture is all about, when to rice, collect maple sap, trap or hunt and when to harvest birch bark."

"The study of phenology is all tied to our native ways of knowing", said Tribal Wildlife Biologist, Doug McArthur. "My hope is that this hands-on discovery becomes second nature for our kids." As part of the phenology theme, youth interviewed elders about climate change for later production into a podcast. Tribal elders' most common observations included lack or the loss of the moose, winters with less snowfall, earlier ice out on lakes and the early return of geese and loons.

Youth stand alongside a tribal elder outside of the Climate Chaser. Sam Graf, Outreach Coordinator for Backyard Phenology, pictured on the left, helped students with the interviews.