Kemp's Point

A newsletter of the Kemp Natural Resources Station

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Students Explore Wisconsin's Forest History

Page through any Northwood's local newspaper these days and you're bound to find stories about land and it's relationship to people. Whether it be lakeshore development, wetland conversion, forest management or conservation issues, it is clear that natural resource professionals, both today and in the future, must be prepared to address these topics. This summer two UW-Madison professors joined forces to help address this need with the introduction of a new course, "Wisconsin's Once and Future Forests."

Sayner native and Kemp employee, Gary Kellner, shares some Star Lake history with the students gathered near a 1930's Civilian Conservation Corps site.

This 3-credit interdisciplinary course examined the impact that historical and ecological factors had in shaping Wisconsin's forests. Nancy Langston, an environmental historian, holds a joint appointment with the Institute of Environmental Studies and the Department of Forest Ecology & Management. Ray Guries, a forester, is with the Department of Forest Ecology & Management. Together, they guided students, examining the social and economic forces that led to extensive forest clearing in the 19th century, and the subsequent political, legal and environmental forces that helped shape forest recovery during the 20th century.

According to Dr. Langston, natural resource professionals cannot manage land without considering the relationship people have with it. The goal of this course was to provide students with insights into the dynamic and often fractious nature of human interactions with forests. Society's relationship with forests is at times both ancient and modern, giving rise to diverse perspectives on forests, their values, and ever-changing public policies governing ownership, access and use. Conflicts over forest resources shape science, policy, management, and ultimately the relationships between people and forests.

Discussions in the course explored questions such as: How have human settlement and exploitation patterns impacted the forest landscape? How have forests and communities recovered from past destructive practices? Historically, who has had access to Wisconsin forests? How did that access change with the advent of industrial forestry; federal, state and county forestry programs; and environmental protection? Whose perceptions of the relationship between humans and nature have defined the ways in which we use and manage forests?

The legacy of destructive harvesting and failed attempts at agriculture still linger in many parts of Wisconsin, a legacy that is well represented in Wisconsin's environmental literature. This exploration of Wisconsin's forest history followed several pathways, including a review of forces that

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shaped land settlement and forest exploitation, and early efforts aimed at conservation. Students examined several important themes of forest loss and recovery articulated in the writings of Aldo Leopold, Sigurd Olsen, Ben Logan, Josie Campell, Ruth Engelmann, and other Wisconsin and regional writers.

Also covered were several important pieces of legislation that promoted public acquisition of forestland and forest recovery, and more recent efforts aimed at the creation of parks and protected areas such as the Kickapoo Valley Reserve. Controversies abound regarding the best ways to ensure that forest resources are sustainable and continue to provide an array of ecological, economic and cultural services. These controversies were explored through selected readings, discussions, guest speakers, student projects and a field trip to Wisconsin's forests.

The four-day field trip included stops at Leopold's Shack, the Menominee Reservation, the Northern Highland-American Legion State Forest, a remnant of 'virgin forest' in the Chequamegon National Forest, visits to ghost logging towns and abandoned homesteads in the cutover, the Black River State Forest, and the Kickapoo Valley Reserve.

Kemp Station was a stop over point on the trip. While here, the students visited Star Lake, which was once a booming logging town. Between 1894 and 1908, this was the largest logging operation in northern Wisconsin, producing approximately 1.5 billion feet of pine lumber. However, visitors today find a quiet town with little evidence of such activity.

I tagged along with the group when they went to the Star Lake area. Our first stop was along a county road where, in a cleared field with scattered small trees, a lone sign stood — "Star Lake – CCC Camp – Company 650 – 1933-42." The Civilian Conservation Corps was a New Deal Era program, providing jobs to people nationwide. Here at Star Lake, work included tree planting to promote reforestation in the cutover area.

The group explores the area where a logging camp once bustled with activity.

Next we stopped along another quiet road, and tromped through a line of trees leading to an open field scattered with young trees. As we peered out over this area devoid of buildings and human activity, Drs. Langston and Guries painted a picture of what it looked like when it was a bustling logging camp. It was challenging to imagine rows of small homes where loggers and their families lived while working in the area.

Dr. Guries explained that when the logging work was done, the camp was literally taken apart, board by board, and moved to Columbus, WI. Eventually

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Kemp Research Report: Seeing the Fungus for the Trees

What would you say if asked to name three things found in a forest? 'Trees' would be an obvious choice. Maybe 'birds,' 'squirrels,' and other such creatures would make your list. 'Wildflowers' and 'insects' may be popular choices as well. What about 'fungus?' For UW-Madison post-doctorate student, Dan Czederpiltz, fungus would top the list, and for good reason.

After spending part of a day in the field with Dan and Lymaris Ibarrondo, a visiting biology undergraduate from the University of Puerto Rico, I have a much greater appreciation for the fungus among us. The research site we visited was an aspen stand and according to Dan, at least 500 species of fungi probably live there. That's a higher level of diversity than you would see for almost any other group of organisms! It is no wonder Dan associates fungus with a forest.

Many fungi form intimate relationships with plants such as trees, and these relationships can profoundly affect the health of both the fungus and the plant. If both the plant and the fungus benefit from their relationship, it is considered *mutualistic*. But if the fungus benefits at the expense of the plant, it is known as a *parasitic* relationship. This summer Dan and Lymaris collected samples for two projects, one looking at mycorrhizal fungi and their mutualistic relationship with trees. The other is a study of Armillaria, a genus of mushroom-forming fungi, which includes at least one species that can attack and kill tree roots, thus having a parasitic relationship with trees.

Lymaris (left) and Dan collect soil samples in an aspen stand.

During my visit with Dan and Lymaris, they collected soil samples for the mychorrizal fungi project. This study is funded by the Forest Products Laboratory in Madison, which is a USDA Forest Service facility. The purpose of the study is to identify fungi that *help trees grow*. The Forest Products Lab also has a research lab in Puerto Rico, which is how Lymaris became involved with the project. She came to Wisconsin for 10 weeks to gather samples and to learn more about research techniques.

The term "mychorriza" is a Greek word that literally means "fungus root", and it refers to the fungal sheath that coats the outside of many tree roots. Many mushroom-forming fungi produce these types of structures, which are known more specifically as ectomychorrizae (*endo*mychorrizae live *inside* the root). To the trained eyes of Dan and Lymaris, the mychorrizae could be seen in the collected soil – it had to be pointed out to me. Often dark in color, fine and somewhat stringy, I have seen similar fungus in soil before, but never gave it much thought. I have new respect for it now that I understand its function in nature.

One of the main things mycorrhizal fungi do is give phosphorous to the tree. Phosphorous moves very slowly through the soil, but fungi are good at scavenging it. With large networks of filamentous cells that grow throughout the soil, fungi can easily transport phosphorous to the growing tree roots.

In addition, mycorrhizae can help the roots take up water, and can also form a barrier that protects the roots against some pathogens. Plants with mycorrhizal fungi tend to grow faster and healthier than plants without. True to the mutualistic relationship, in return

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for all that fungi do for the tree, the plant provides sugars and other nutrients to the fungus.

Using molecular techniques, the specific mycorrhizae in each soil sample will be identified by analyzing its DNA. According to Dan, the way "helpful fungus" had been identified in the past was to wait until the mycorrhizae produced mushrooms and then these were identified. But some species may only produce mushrooms every couple of years, or may only produce mushrooms under conditions that occur very sporadically (once every ten years, or even every 50 or 100 years). It is also possible for a fungus to play many important ecological roles underground, but it may never make mushrooms in a particular environment. Therefore, identifying mychorrizae by mushrooms makes it difficult to know what fungi are present in a forest. The newer, molecular techniques that look at fungal DNA on roots do not require fruiting bodies, thus researchers can readily see the community that's really there.

Dan's post-doctorate research is a follow up on the work done by Dr. Glen Stanosz of UW-Madison's Department of Plant Pathology. Here, the focus is another fungus called Armillaria, or more commonly known as the Honey Mushroom. When Dr. Stanosz was studying this fungus and its effects on aspen stands, it was thought that only one species of Armillaria existed and that it varied greatly in its appearance and its ability to kill trees. However, later research revealed that there are many different species of Armillaria, all of which look somewhat similar but may have different ecological niches. Dan hopes to determine which species are present in aspen stands in northern Wisconsin, and to determine if different Armillaria species are performing different ecological roles. This will aid in understanding how various Armillaria species help shape a stand of trees such as aspen. In addition, it is hoped that this research will help foresters understand if certain management practices, such as very short harvest rotations, can lead to population explosions of "bad" Armillaria species.

Although some Armillaria species only infect dead wood, others are strong pathogens, such as Armillaria mellea, that attack and kill healthy tree roots. In general, Armillaria gets its nutrients from breaking down plant tissues such as wood, but when the wood runs out, the fungus forms root-like structures known as rhizomorphs. Rhizomorphs look like black shoelaces, and can grow long distances through soil or on the outer surface of roots and logs. When rhizomorphs from the soil contact and infect the root system of a tree, the fungus starts to produce a large white fan of tissue under the bark, known as a "mycelial fan". At his research sites, Dan and Lymaris chopped into stumps looking for both rhizomorphs and mycelial fans, both sign of Armillaria.

Molecular techniques will be used to analyze the DNA of Armillaria samples. Identification can be completed in 5-6 hours. Before this method was available, it would take 3-6 months to identify a species. It was necessary to grow them in the lab and do mating studies. Not only are mating studies time consuming, they are also very difficult to perform.

Learning what species of Armillaria exist in northern Wisconsin aspen stands will help landowners make better forest management decisions. For example, if it's learned that a particular stand is home to an Armillaria species that could negatively impact the growth of aspen, the landowner can decide to manage for another tree species, such as conifers.

The main thing that Armillaria is known for is being the "Humongous Fungus". Because of its rhizomorphs, a single genetic "individual" of Armillaria can spread as a large, inter-connected fungal network, thus covering many acres of a forest. It is estimated that a single individual can persist for hundreds or even thousands of years in the soil (with only glaciation affecting its growth), and can weigh tens of thousands of pounds. In 1992, Armillaria made the front page of the New York Times when an individual of Armillaria in Michigan's Upper Peninsula was unofficially crowned the largest and oldest living organism. This

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Kemp Summer Experience Shapes Future College Plans

Sam Kwiatkowski describes himself as having been the weird kid in school who was forever catching snakes and frogs. Now a senior at Lakeland Union High School in Minocqua, Sam has always had an interest in science. Knowing this, Sam's father suggested he apply for a summer job at Kemp Station. It was a good match and as a result of his summer at Kemp, Sam has some new ideas about what his future may hold.

From assisting with general maintenance to helping researchers in the field, Sam had a wide variety of tasks and experiences. His maintenance work included painting the gazebo, smokehouse and boatslip. He installed ridge caps where needed, mowed lawn and helped with general clean-up around the Station. Following a couple of our summer storms, there were plenty of downed trees to be cut up, wood to be split and brush to be burned. And as Gary Kellner carefully chose and positioned each stone in Kemp's new fire ring area, Sam kept the fresh mortar coming.

While the maintenance work was good and satisfying, Sam admits his most favorite experiences occurred while working with visiting researchers. Two days in the field with Dr. Jim Fralish, Southern Illinois University, and Ph.D. student, Lucy Tallman, Washington State University, introduced Sam to field data collection and sampling. He helped dig soil pits to obtain soil samples and recorded data on site vegetation, including tree density, species and diameters.

Two different researchers, both with sites in the Sylvania Wilderness Area of the Ottawa National Forest, took advantage of Sam's assistance as well. He helped Jon Martin, University of Minnesota, assemble scaffolding and he had the opportunity to use sophisticated monitoring equipment to measure tree photosynthesis 80 feet above the ground. On another day, Sam helped Ankur Desai, Penn State University, hook up a spaghetti-tangle of cabling and sensors to monitor sap flow in trees.

Sam Kwiatkowski looks forward to a career in science.

Brent Ewers, UW-Madison, enlisted Sam's help to decommission several research sites near Park Falls where they were studying how trees and the atmosphere interact across various forest habitats. And back at Kemp, Sam helped Anna Pidgeon, UW-Madison, place cover boards to track salamander populations across the Station.

Despite his fear of heights, Sam's favorite research experience was climbing scaffolding high above the forest canopy. He said that he felt like a bird or a monkey (in northern Wisconsin?!). He was able to see people walking on a nearby trail who had no idea he was there.

At Kemp, Sam especially enjoyed learning the basics of using a fancy Global Positioning System to plot his location. And the storm thrown trees provided him with a lesson in safe chain saw use.

According to Sam, his work at Kemp completely changed his look on career possibilities. Prior to this summer, he was considering his father's suggestion of becoming a forester. Sam didn't really know what a forester did, thinking a forester was primarily a logger, but now he knows differently. During his time spent with researchers he asked a lot of questions about their projects, why they chose their field of study and how they arrived at the position they are currently in. All of this broadened his perspective and influenced his next step after high school -- college.

Next fall Sam hopes to enroll in Nicolet College's transfer program and take science and technology

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sparked an intense debate about what constituted an "individual," and whether organisms with discrete sizes and shapes, such as blue whales and giant sequoias, should be considered differently from organisms that can grow indefinitely in any direction.

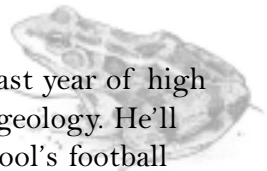
Since the time of the New York Times article, it has generally been accepted that aspen trees in fact form the largest living genetic individual of any species. This is because a single aspen tree can spread via its roots, and can send up new trees from its root system. (This is called "suckering.") This means all of the aspen trees created from one root system are genetically identical, and an entire aspen stand may be one genetic individual. If you were to dig up an entire aspen stand and weigh it, it would weigh a lot! If you were to dig up all of the Armillaria in that aspen stand, it would probably be the second largest living individual (no longer the world champion, but still plenty big!).

Understandably, fungi are important members of a forest, not only because of their diversity, but also because of the critical ecological roles they play. Next time you're in a forest, take a look around and notice the different types of fungi. Careful observation may even reveal what a given fungus does for a living. You just might find yourself looking at fungi with a whole new perspective. *(K.O.)*

Dan's interest in fungus began with a mushroom book his mother gave him when he was about 15 years old. He collected mushrooms and worked hard at identifying them. This challenge became his motivation. As an undergraduate botany student at UW-Madison, his inspiration to become a mycologist came from professor Tom Volk. Dan loves to eat mushrooms; however, he cautions that to eat wild ones, you really need to know what you are harvesting. Dan earned his Masters and Ph.D. degrees in a dual 5-year program in the Department of Plant Pathology at UW-Madison.

Future Plans *(Cont'd from Page 5)*

courses in addition to general education requirements. After two years there, he'd like to transfer to a four-year school. Although he doesn't know which school he'd like to transfer to at this point, he's received lots of recommendations. It seems each researcher Sam worked with thought he should go to their college! The opportunity to study abroad appeals to him and he has his sights set on British Columbia or Mexico. He's not sure what he'll major in exactly, but he knows it will be science and would like it to be something unique and specialized.



But for now, Sam will enjoy his last year of high school, taking both biology and geology. He'll continue as a member of the school's football and track teams and this winter he'll have fun snowboarding with friends. By the way, Sam's friends no longer think he's weird if he chases a snake or frog – they've gotten used to his hobbies. *(K.O.)*

Forest History *(Cont'd from Page 2)*

it was realized that it was too costly to move homes in this fashion, so loggers' homes were later kept on railcars, enabling camps to move from one area to the next more quickly and less expensively.

As we walked through the field, an occasional remnant of human occupation surfaced in the form of old equipment, a rusted can and an apple tree—not a tree typically found in a northern forest. If a rusted can were like a seashell, perhaps holding it to ones ear would reveal the sounds of the logging camp!

For the students, this new course added an important dimension to their education. It placed the science of forest ecology into the real world context that shapes forest use. *(K.O.)*

Spreading the Word About Good Forest Management

by William Klase, UW-Extension Headwaters Basin Educator

Have you ever asked your neighbor's advice about fixing a problem with your house? Or maybe where you can find an honest mechanic for your car? How about who to talk to regarding your taxes? A group of enthusiastic and outgoing private woodland owners decided they want to be the people you talk to about your forest and the management activities you may want to undertake therein.

The University of Wisconsin Extension, in cooperation with the Wisconsin DNR, created an educational series for woodland owners called the Master Woodland Stewards Program. The program provides in-depth training on forests and forestry in exchange for a commitment to do community outreach on sustainable forest management. A combination of classroom instruction and outdoor experiences teach participants the basics of forest ecology, forest management techniques, managing for wildlife habitat, business decision and planning tools as well as sources for technical and financial assistance. Kemp Natural Resources Station was chosen as the host site for this summer's program because of its unique combination of classroom facilities and abundant forest resources just outside the door. Participants were able to talk about aesthetics and recreational opportunities as they walked along the nature trail. Additionally, the blowdown area within the old growth hemlock stand provided a venue to discuss how forests are renewed and how forest management mimics these processes.

Graduates of the program are asked to pass on what they have learned to fellow woodland owners and other citizens within their community. Their outreach efforts may range from talking with their neighbors, to hosting a field day at their property for other woodland owners or students, or meeting with groups within their community and sharing the virtues of good forest management. They can provide advice on a wide range of forestry related topics, direct folks to good sources of information, and refer woodland owners to honest and conscientious foresters and loggers. Watch for an announcement in your local newspaper to find out who these folks are in your area and how they can help you.

If you would like to learn more about the Master Woodland Stewards Program, contact John DuPlissis at (715) 346-4128 or College of Natural Resources, 1400 Franklin Street, Stevens Point, WI, 54481-3897.

Spring 2003 Outreach Session

Long before a person could pick up a bottle of maple syrup at the store, early Wisconsin inhabitants made their own syrup. Tapping trees, collecting sap and making syrup was a common springtime activity. This spring, a "back-yard sugarbush" will be established once again at Kemp Station and you are invited to attend a program about maple syrup. UW-Madison Ph.D. student, Matt Thomas,will give a presentation on some of his research on the historical and cultural significance of Native American sugarbushes in northern Wisconsin. Then Kemp's own "sugar-meister," Gary Kellner, will share his experiences and techniques of gathering sap and making maple syrup.

Because the timing of this program is dependent on spring temperatures, a date will be set in early March. If you are interested in this program and would like to be contacted when a date and time is scheduled, please contact Karla at (715) 358-5667 or kemp@calshp.cals.wisc.edu.

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