Field Notes

Iowa State University
Department of Natural Resource Ecology and Management
Graduate Student Magazine Volume 3: 2012

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Welcome to the third edition of Field Notes! As in previous issues, you'll find articles that address graduate student research in Forestry and Animal Ecology at Iowa State University. In addition, you'll enjoy reading about some of the more humorous situations you can find yourself in while conducting fieldwork, and learning where some recent alumni have found employment upon completion of their programs at Iowa State. Winners of the annual photo contest are included for your viewing enjoyment.

With this issue, we welcome the newest faculty member to our Department, Dr. Robert Klaver. Dr. Klaver joined our faculty this past winter, moving from South Dakota State University to Ames to serve as Leader of the Iowa Cooperative Fish and Wildlife Research Unit in the NREM Department.

I've served as the faculty advisor to the Field Notes Editorial Committee since the production of its inaugural issue. I want to thank Michaeleen Gerken, a Forestry doctoral student, who led the charge in Field Notes' conception, design and production for two years before handing the reins over to our current lead editor, Lynne Gardner, an Ecology and Evolutionary Biology doctoral student whose home department is NREM. I am so impressed with our graduate students not only in terms of their research endeavors, but also their teaching, outreach, departmental citizenship, and academic breadth. Our students possess abilities to look beyond the confines of their chosen major fields of study to integrate theories, techniques and practices from diverse fields of study such as sociology, communications and agronomy, among others, to better address natural resource issues in Iowa.

We have specific purposes in mind for each issue of Field Notes that we publish. This year, we are especially proud to include an article written by an undergraduate student conducting research in addition to articles highlighting graduate-level research in the Department. Another new feature to this edition of Field Notes is an effort to use printed copies to recruit teachers, naturalists and instructors at community colleges to use our publication as an educational tool with their students. And because Field Notes is written without using a highly technical or specialized vocabulary, it can be enjoyed by anyone that has an interest in natural resources research and management in Iowa.

Check out the latest addition to our graduate student outreach efforts, the Field Notes website (http://www.nrem.iastate.edu/news/fieldnotes.php). While the site is still under construction, check back now and again to learn of tools and lesson plans that can be used with classrooms and program audiences, and other enhancements that we have planned for 2013!

- Rebecca Christoffel

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A summer day in a typical northern Minnesota bog would normally be filled with the sounds of the breeze whistling through black spruce and tamarack trees, interspersed with the calls of songbirds and the buzz of insects pollinating flowers of Labrador tea and leatherleaf. The S1 bog at the Marcell Experimental Forest north of Grand Rapids, MN, however, is not a typical bog; and during the summer of 2012 those normal sounds of summer were obscured by the calls of research scientists and the buzz of construction crews. Marcell is the location for an ambitious and innovative new experiment being undertaken by the Department of Energy’s Oak Ridge National Laboratory (ORNL) in conjunction with the US Forest Service’s Northern Research Station (NRS), focusing on understanding the potential impacts of future climate change on the world’s peatlands. The SPRUCE project (Spruce and Peatland Responses Under Climatic and Environmental change) will simulate varying levels of warming, along with elevated atmospheric carbon dioxide (CO2), to understand how this important ecosystem will respond to changes in earth’s climate. “The Marcell Experimental Forest has a history of research in peatlands going back over 50 years. Marcell is the only experimental forest in the US that has a focus on understanding these carbon-rich ecosystems,” explains NRS Soil Scientist and NREM faculty affiliate, Randy Kolka, a coordinator for the project. “As the NRS and ORNL developed the SPRUCE study, our fundamental long-term research in peatlands led us to Marcell and ultimately to the S1 bog.”

Peatlands are a type of wetland bogs because of high water levels, acidic conditions, low nutrient concentrations, and cold temperatures. This slow breakdown of plant material results in a build-up of organic matter over thousands of years, creating a layer of carbon-rich soil known as peat that can be several meters thick.

My first visit to a northern bog many years ago left a lasting impression that peatlands were special places. The fragrant smell of the Labrador tea and the feel...
of the trees bouncing as I walked on the soft moss surface - as if visiting a Dr. Suess-inspired ecosystem made of mushrooms and pillows - made me feel like I was in a place very different from the crop fields and muddy creeks of my home. Despite feeling worlds away, northern peatlands are linked to Midwestern crop fields and the livelihoods those fields support through the regulation of the atmosphere and our climate. Scientists are interested in how climate change will affect long-term carbon storage, and peatlands store a lot of carbon – nearly 30% of carbon on the earth’s land surface is contained within peatland soils. Randy Kolka explains: “Peatlands have been mitigating elevated carbon dioxide in our atmosphere and if their capacity as carbon sinks is decreased or eliminated, those feedbacks could have dramatic impacts on our current rates of carbon dioxide increases in our atmosphere, and hence, climate change.”

The SPRUCE project will elevate CO$_2$ levels and warm the air and soils in large open-topped chambers to simulate what the climate in this region might look like in 100 years. Scientists at ORNL and NRS, as well as several universities including Iowa State, will determine the impacts of a changing climate on the balance of carbon within this important ecosystem. Slow decomposition rates normally result in bogs acting as carbon sinks – taking carbon out of the atmosphere and storing it belowground in the ever-accumulating peat. Warming the air, however, could result in stimulating the break down of the carbon-rich peat soils and release CO$_2$ back to the atmosphere – a response that will lead to further climatic changes. Although no individual weather event can be directly tied to climate change, recent studies suggest that more frequent extreme weather such as the drought of 2012 and the floods of 2008 and 2010 in Iowa are a consequence of climate change -- a pattern that could become even more frequent if carbon-rich ecosystems such as peatlands begin releasing CO$_2$ to the atmosphere.

The summer of 2012 saw the beginnings of the infrastructure of SPRUCE, with the construction of four 8-foot wide by 350-feet long boardwalks that provide access to the 17 chambers being built. Boardwalks provide access within this fragile environment where repeated disturbance from walking across the bog surface would have disastrous impacts to the processes being studied. While the 35-foot diameter experimental chambers continue to be constructed, work has already begun to start understanding the ecological processes at work within the bog. Environmental monitoring equipment, including instruments to record light, water levels, snowpack, precipitation, and above- and belowground temperatures, have been installed since 2010. More recently, work has begun studying the response of biological processes to these environmental conditions, providing a baseline for comparing with future results of the experimental manipulations.

**Warming the air, however, could result in stimulating the break down of the carbon-rich peat soils and release CO$_2$ back to the atmosphere.**

continued...
In May 2012, I began working with Colleen Iversen, staff scientist at ORNL. Our work measures root production of the trees, shrubs, grasses, and forbs within the S1 bog. We are investigating the roots of these plants to understand what controls root production in this little-studied environment. The roots we are studying are different from the big roots that are used to anchor the plant in the soil. Most of the roots we observe have a diameter that is less than the thickness of a penny, and in the case of some of the shrubs, less than the thickness of a human hair. Iversen says, “Plants use these ‘fine’ roots with a narrow diameter to acquire nutrients and water so that they can survive and thrive in the bog. Roots are quickly grown in response to changes in the soil environment, and often only live for a few days or weeks. Changes in root growth and death can contribute an important feedback to the global carbon cycle because dead roots contribute substantially to the build-up of organic matter in the soil.”

In order to study roots without disturbing the peat, a digital video microscope system known as a minirhizotron is used. The minirhizotron camera allows us to monitor root appearance and disappearance at different soil depths throughout the growing season. The camera is inserted belowground through a clear plastic tube and images are collected on a weekly basis in order to track the growth and death of roots over time. Additionally, we can begin to understand the ecology of some of the other little-studied organisms belowground such as mycorrhizae – specialized fungi that form symbiotic relationships with roots – and specialized aquatic invertebrates like predacious diving beetles. This is one of the first studies using minirhizotron technology in a peatland, and each time I go into the field I get excited thinking I might observe something never seen before.

Perhaps the least-understood processes and the most innovative research at the SPRUCE experiment involve the tiniest organisms that are rarely, if ever, seen: soil microbes. Whether peatlands continue to be a carbon sink or turn into a carbon source depends on the bacteria and fungi that live within the peat soils. These microbes decompose the roots and other organic material in peatlands, recycling the nutrients necessary for plant growth and releasing CO₂ back to the atmosphere. “Microorganisms are...”

Each time I go into the field I get excited thinking I might observe something never seen before.
the engines that drive carbon and nitrogen cycling in the soil. For example, decomposition is a microbial process - most microbes live off of dead plant material. To break down this material, microorganisms send enzymes out of their cells into the environment. These enzymes liberate nutrients, which can then be taken up by plants, completing the cycle,” explains Kirsten Hofmockel, Assistant Professor in the Ecology, Evolution, and Organismal Biology department at Iowa State and a researcher on the SPRUCE study. The Hofmockel lab studies microbes to understand how climate change affects their enzymes, and the consequences for nutrient cycling in peatlands. “Elevated CO₂ can increase how much carbon trees send to their roots, which increases the growth and activity of microorganisms in the soil. This can accelerate decomposition and the amount of nitrogen available to support plant growth, potentially creating a positive feedback,” explains Hofmockel. This feedback could result in faster cycling of nutrients in this ecosystem where decomposition – and nutrient cycling – is typically slow, having important consequences for carbon balance in peatlands.

Once the experiment is up and running in the spring of 2014, there is little doubt that the sounds of the wind in the trees, songbirds calling, and insects buzzing will be the predominant sound in this bog again. But with the construction of boardwalks, experimental chambers, and the monitoring equipment associated with them, the S1 bog at the Marcell Experimental Forest will not just be a carbon sink or a home for birds and insects. The valuable information gathered over the next ten years in this innovative experiment means this peatland will serve a higher purpose: helping us understand the responses of a critical ecosystem to future climate changes. Of one thing we can be sure – it will never again be considered a “typical” northern bog.

More information on this project can be found on the SPRUCE website:

mnspruce.ornl.gov

Todd Ontl is a PhD student majoring in Ecology and Evolutionary Biology working with Lisa Schulte Moore and Randy Kolka. He spends most of his time studying the impacts of the roots of bioenergy crops on soil organic matter pools in agricultural landscapes. However, he took a break from this work for 4 months during the summer of 2012 to endure incessant deer flies and mosquitoes while living in a 14-foot camper with his dog in the northwoods of Minnesota.
Even the biggest fish that you’ve ever caught begins life smaller than a grain of rice! But, with a little luck and a few successful growing years, a fish that started out so small and insignificant will put a bend in your rod and put up a serious fight. Through a collaborative effort between ISU and the Iowa Department of Natural Resources (IDNR), these tiny fish are helped along their journey to overcome the seemingly insurmountable odds to make it into an angler’s creel.

In 1981, the first larval hybrid striped bass (*Morone chrysops × saxatilis*) were stocked into Saylorville Reservoir near Des Moines, Iowa. Later, they were introduced into Pool 14 of the Mississippi River, Iowa. Since then, sac-fry (recently hatched fish with yolk sac) have been shipped in from out-of-state and stocked throughout many Iowa lakes and rivers. Known locally as a “wiper,” the hybrid striped bass was first produced in the mid-1960s by crossing a female striped bass with a male white bass. A match not common in nature, the hybrid striped bass is a combination of an oceanic/estuarine species and a land-locked freshwater species. This fish is a preferable species for use in aquaculture and for recreational fisheries as it has very fast growth, fairly good survival, and is more resistant to diseases than other similar species.

The main purpose for introducing this new species was to provide Iowa anglers with a relatively unique opportunity to catch this trophy size fish locally. Currently, the record hybrid striped bass for Iowa is 18 pounds, 15 ounces, and was caught in the Des Moines River in September of 1997. The IDNR has set a minimum length of 24 inches to qualify hybrid striped bass for the Master Angler Award, and listed the Mississippi River, Lake Macbride, Saylorville Reservoir, Three Mile Lake and Lake Manawa as locations that qualifying fish have been caught.

Another goal for this fish’s introduction is for it to act as a biological control of pervasive gizzard shad. Cruising open-water, hybrid striped bass are known to feed heavily, and almost exclusively, on gizzard shad when they are present. Gizzard shad directly compete with many game fish species (e.g. sunfish, crappie, and largemouth bass) and can have negative impacts on their growth and survival by feeding on the same microscopic zooplankton that the larval gamefish initially rely on. Having a multitude of negative ecological effects in Iowa, the gizzard shad and its eradication is of great interest to many fisheries biologists.

Just a few short years before a hybrid striped bass begins to consume Iowa’s problematic gizzard shad or provide anglers with an exciting game fish, it starts its life journey as a sac-fry shipped to Iowa from Kansas, Oklahoma, or Arkansas. This is where my Master’s research project comes into play. I am a fisheries

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**A match not common in nature, the hybrid striped bass is a combination of an oceanic/estuarine species and a land-locked freshwater species.**

Graduate students Eric Mammoser and James Wamboldt hold adult hybrid striped bass collected in a southern Iowa reservoir. (photo A. Patillo)
A few years back, the IDNR began culturing hybrid striped bass fry. Typically, fry are cultured for 30–45 days, to allow them to reach the preferred stocking size of about 2 inches (fingerlings). During this phase of culture, survival is relatively low, making it a critical stage for the fish's development and success in the wild. By allowing fry to reach fingerling stage in aquaculture ponds, they have a greater chance of survival when stocked into Iowa lakes and rivers. Once stocked, this additional boost in growth and development early in life allows the hybrid striped bass to better avoid predation from resident fish.

In Iowa, fish are cultured to fingerling size in a combination of earthen and plastic-lined culture ponds at multiple state hatcheries. Ponds range greatly in size and are designed to be accessible and drainable to increase ease of harvest once fish are of desired size. Typically during this stage of culture, fry rely entirely on naturally-occurring food within the ponds. If this food source becomes depleted, poor growth and survival will result. To date, meager and inconsistent production of hybrid striped bass has occurred, which begs the question, what can be done in Iowa to achieve greater and more consistent annual survival?

When stocked into our culture ponds, hybrids are only 0.1–0.2 inches long and feed on naturally occurring prey, such as microscopic zooplankton and tiny bottom-dwelling aquatic insects. Some culturists will also feed their fish a commercially produced pellet food at this early stage. However, an artificial diet is not essential because the hybrid striped bass fry can survive on the naturally occurring food within the pond. To boost zooplankton production in our nursery ponds, we fertilize them with alfalfa meal twice per week. As the alfalfa breaks down, it provides the required source of nitrogen to stimulate an algal bloom within the pond. As they are the primary base of the pond food web, algae are consumed by the zooplankton which in turn is eaten by the hybrid striped bass fry.

One objective of our project was to establish the correct fertilization regime for Iowa's nutrient-rich water. Pond fertilization is a delicate balance between boosting primary production enough to allow for sufficient zooplankton growth and over-fertilizing, causing poor water quality. Ultimately, poor water quality will lead to insufficient growth and survival of the fish due to low dissolved oxygen, elevated pH, and possible ammonia toxicity. Along with fertilization, we are looking into the importance of feeding our hybrids a commercial diet once natural prey items begin to dwindle. By providing a commercial diet, we could improve overall survival and possibly reduce the amount of time it would take fish to grow to our 2-inch goal.

Unfortunately, it is extremely difficult to quantify the importance of a commercial fish feed in the diet of larval fish. Although consumption of the feed has been observed within our ponds, a direct relationship between feed consumption and tissue growth has not yet been identified. Because the feed can also act as a fertilizer by producing an
algae bloom and elevating zooplankton populations, observed fish growth is difficult to directly link to feed consumption. It is important to minimize the use of commercial fish feed, as it is very expensive and typically accounts for the greatest percentage of the incurred costs of aquaculture. In an attempt to quantify this relationship, we collaborated with the Stable Isotope Paleo Environments Research Group (SIPERG) on the ISU campus. Our goal was to directly link a commercial fish feed to increased tissue growth of the hybrid striped bass fry. To accomplish our goal, we used a relatively new technique in the field of fisheries science called stable isotope analysis. Using carbon and nitrogen isotopes, we were able to trace the flow of energy from the bottom of the food web, to its top predator. In doing so, we estimated that over 60% of the muscle tissue in the fish was assimilated from natural food items within the pond. Additionally, fish that were cultured in isolated ponds which were not fed the commercial diet had similar growth and survival as the fish within the feed treatments.

These small but important steps towards enhancing production techniques are at the forefront of hybrid striped bass research in Iowa, and are essential for maintaining this new trophy fishery within the state. Along with enhancing production techniques, fisheries managers will need to monitor local waters to better understand ecosystem level impacts of adding this new predator into Iowa lakes and rivers. We have expanded our research with the IDNR to do just that. Using stable isotope analysis, we are currently investigating the impact that adult hybrids have on fish communities in Iowa reservoirs. In the end, all of our efforts are centered on getting these magnificent fish into the hands of local anglers. \[\]
What do you think of wildlife?
Preliminary results of a statewide survey

By Andrew Stephenson

July 6th, 2012 – This is the day I delivered eleven, 2½ foot-long US Postal Service mail trays to the rear delivery door of the Ames post office on Kellogg Ave. In these boxes were 5,626 pristine white envelopes containing the hopes and dreams of one eager graduate student. Within each envelope was a hand-signed cover letter and booklet survey I hoped would be returned. A weeks' worth of preparation: stuffing, sticking, signing, and general envelope nurturing preceded transfer to the mail cart for sorting. Emptying each box of crisp, clean envelopes, I watched with dismay as envelope corners bent and buckled as the pile amassed. It was only with the fall of the last envelope that I was finally able to breathe a sigh of relief, forgetting for a moment that in two weeks I would have to do it all again.

In all, I have signed my name over 10,000 times since June, removed 4,636 staples, scanned 6,954 pieces of paper, and thankfully licked zero stamps. At this point you may be thinking, “Is this guy a graduate student or a paper-pusher?”

Well, the goal of my research is to understand some of the ways in which people interact with, think about, and acquire information regarding Iowa’s wildlife, and who would know better than Iowans themselves? The surveys were sent to randomly selected individuals from across the state in hopes of obtaining a sample that represents the diversity of beliefs held by Iowans. This project is the first of its kind in Iowa; previous surveys focused primarily on land owners, farmers, hunters and anglers. My survey is designed to gather baseline information on many aspects of public thought and perceptions of Iowa’s wildlife. The data we gathered along with that of similar future projects will allow us to track changes in tendencies of Iowans over time. It will be increasingly important for management agencies to understand the thoughts and opinions of stakeholders as new non-traditional funding sources for wildlife management are identified and implemented. We plan to use this information to help the Iowa Department of Natural Resources (IDNR) develop management strategies that better reflect the desires of all Iowans and create effective ways to share information with the diverse populace.

With over 40% of the surveyed recipients having responded, we have some interesting insights into their thoughts about wildlife. Although seemingly obvious but previously only available...
Andrew Stephenson is an MS student double majoring in Wildlife Ecology and Sustainable Agriculture. He is advised by Dr. Rebecca Christoffel and his primary interests include anything about large carnivores, human-wildlife conflict resolutions, and people’s perceptions of wildlife.

Figure 1.1 – Percent of all respondents that identified a species as fitting under their definition of wildlife.

Conservationists may find success using a proxy species that shares the same habitat to build support, or by targeting a specific habitat entirely. But what causes certain animals to be disregarded as wildlife? Perhaps it is simply a lack of knowledge about a particular species, and more outreach and education may help resolve this. Educators can be more effective in the delivery of their messages if they know how people get their information about wildlife. Another question on the survey asked individuals what information sources they use to learn about Iowa’s wildlife and related issues. Figure 1.2 demonstrates that some information sources may be more useful when trying to reach a broader audience. For example, it seems that more people rely on television news broadcasts and wildlife shows than conservation professionals for their wildlife information. Understanding the different media for distributing information about Iowa’s wildlife could increase people’s exposure to targeted information while reducing overall costs. Social media doesn’t currently register as a major source for information on Iowa’s wildlife, but in 5 or 10 years it could be as important to people for wildlife-related news as newspapers are today.

The next step in this project is to compare data from this survey to a comparable survey of IDNR employees to determine how similar the sentiments of state agency employees that manage wildlife are to those of the public. This comparison will identify areas of discord between the two groups and help agency personnel understand how best to address them. Through the process of self-reflection the IDNR will be in a better position to effectively communicate both internally and with the public, reflect through measurable actions the desires of all stakeholder groups, and increase trust with the public. It is our hope that all Iowans will have a voice in the management of Iowa’s wildlife, and this project is an important step in making that a reality.

I want to thank my friends, undergraduate and graduate students, who helped in the long process of preparing the survey, without whom I might still be stuffing envelopes. I also invite you all to think about what wildlife means to you and to stay tuned for more results from this survey.

Figure 1.2 – Percent of respondents that use a particular information source to learn about Iowa’s wildlife and related issues.

Figure 1.3 Flow chart of future research and possible outcomes from a comparison of perceptions of stakeholders and Iowa Department of Natural Resources (IDNR) employees.

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Towards a healthier approach: increasing forest complexity in a managed forest

By Eddie Shea

It’s 5:16 a.m. and I am stumped. “It’s too early for this,” I think to myself, turning my head from side to side, trying to refocus my attention on the unidentified melody coming from a distant perch high up in a red pine tree. I’m on the Chippewa National Forest in northern Minnesota and it’s a beautiful morning. Mosquitoes surround me as I stand listening, their steadfast drone testing my mettle, not to mention my head net, gloves, socks, and every other crevice they can find leading to a meal. Bees of all stripes buzz past as they busily move from flower to flower. I catch myself grinning as a bumble bee works to gain position under a slouching harebell flower; one of countless invisible handshakes carried out on this day between plant and animal. A male chestnut-sided warbler returns my attention to the chorus of songbirds—and to the yet unidentified bird—as it flutters out to the edge of a young northern red oak, gauging my presence from a distance of two feet before announcing his claim to this area with an idyllic “pa-pa-pleased-to-meetcha!” I give a mental nod and record his presence. Feeling confident I have documented the birds in this area, I continue along the transect, maintaining focus on the mystery bird as I walk closer. Its song rings familiar, yet holds a unique quality all to itself. I can see the bird ahead, still perched on the red pine. “Oh, come on!” I mumble as the bird swoops down and lands on a nearby snag. It’s an American redstart—extremely common here. Feeling slightly outdone, I take note of his distinct song, record his presence, and continue on.

Surveying forest songbirds is difficult. The chorus of simultaneous chirps, warbles, and trills can be overwhelming at times, especially when the birds are in near-continuous motion; keeping track of who is who is a daunting task. Yet, through an increased understanding of songbird community health we look to gain a stronger insight into the overall health of this forest, and potentially into the health of other forests as well.

A Brief History

Prior to European settlement in the region, forests of the Great Lakes states were remarkably different than what exists across this landscape today. The level of forest complexity is one important difference; pre-settlement forests were much more diverse in structure and composition, and as a result, more functionally diverse. Both within a particular area and across the forest landscape, stands varied in tree size and age structure, were composed of a mixture of species, both living and dead, held diverse understory plant communities, and occurred in a variety of patterns which changed over time. What drove this complexity and change over time was periodic natural disturbance such as fire, wind, and disease. When a natural disturbance occurred, certain biological elements of the pre-disturbance forest—such as standing dead trees or small patches of unburned forest—would survive, providing critical habitat for wildlife and vegetation, and influencing the post-disturbance forest. In turn, important ecosystem functions would be maintained.

Today, forests in the Great Lakes States look much different. Following the end of the cutover—the east to westward clearing of forests in Michigan, Wisconsin, and Minnesota—in the early 1900s, most forest land that...
was not converted to crop land either regenerated naturally or was replanted as monocultures. As forests began to regenerate, the U.S. Forest Service, still relatively new at that time, focused primarily on managing for timber production, while fire, viewed as destructive to forests, was suppressed to the extent possible. As a result, forests, crafted from a rich legacy of periodic natural disturbance, lost much of their complexity and character.

A Paradigm Shift

Over time, concern for long-term forest health has led to a gradual shift away from viewing managed forests solely for their timber value toward a more holistic understanding of forests as complex, dynamic systems, in what is today coined ecological forestry. In a broad sense, ecological forestry looks to more fully account for the many different values—be they ecological, social, or economic—a healthy forest provides. Dr. Brian Palik, a research ecologist with the U.S. Forest Service’s Northern Research Station who has developed several studies focusing on ecological forestry—including the study I am a part of—sums it up by saying, “The basic idea is that managing for wood in these forests is not the exclusive objective, but rather it is one of several objectives that include ecological sustainability.”

One way ecological forestry seeks to reduce the disparity between natural forests and forests managed for timber production is by leaving a portion of the harvested area uncut, in various spatial patterns and sizes. This process is called variable retention harvesting. And in a red pine forest in northern Minnesota, a long-term experiment aimed at increasing forest complexity is evaluating variable retention harvesting to more fully understand a host of issues related to the long-term health of the forest. One of those issues, the maintenance of wildlife biodiversity, is what I am interested in. For my part, I am looking at how the spatial pattern of retained trees influences the forest songbird community as this forest regenerates following harvest (Figure 1).

Through past scientific research we know that songbirds respond positively to increasing levels of forest complexity. We also know that the amount of retained trees in combination with varying patterns of retention influence songbird community response to harvesting. What we know less about, however, is how the spatial arrangement of retained trees impacts the forest songbird community. Through this research...
we are gaining a stronger idea of that. For instance, since the inception of this study in 2003, the songbird community has shown a significant increase in abundance, richness, and diversity in response to retention harvesting compared to unharvested control sites. Further, research from the 2012 field season revealed songbird community divergence between the different retention patterns. At this point you may be asking “why the difference now?” Well, looking at this from a vegetative perspective in terms of resource competition, the availability of resources (e.g. nitrogen and sunlight), and competition for them should vary depending on the spatial pattern of the retained trees. Over time, this should result in differences in vegetation structure as differences in resource availability slowly manifest themselves. In turn, songbirds should respond to the differences in vegetation structure, which is what we are beginning to see. We expect this trend will continue into the future as the different retention treatments continue to respond and diverge according to the spatial pattern.

**Looking Forward**

In the study of ecology there is a common thread woven into our understanding of nature: the idea that everything is ultimately connected in some way. When I am out in the field surveying songbirds, this idea is no doubt on my mind; that is, in a broad sense, what’s good for the songbird community is probably good for the forest system as a whole. But understanding forest songbird health also has practical importance for many people. The U.S. Fish and Wildlife Service recently reported that nearly 77 million people participated in wildlife viewing in 2011, spending $55 billion in the process—more than hunting or fishing. Thus, songbird health is not only good for the forest system overall, it’s good for the neighboring communities. Armed with a stronger understanding of how to balance societal needs for timber products AND wildlife, we all benefit.

**Eddie Shea** is a Master's student majoring in Wildlife Ecology in the Landscape Ecology and Sustainable Ecosystem Management lab, under the direction of Dr. Lisa Schulte Moore. Broadly, Eddie is interested in how land use decisions can be steered towards a more sustainable future. For more information, visit:

http://www.nrem.iastate.edu/landscape/
Thirty undergraduate students in the Forestry program spent three weeks last September at Fall Forestry Camp on Michigan's Upper Peninsula. Dr. Rick Hall was lead instructor for the course, assisted by Dr. Monlin Kuo and Dr. Rebecca Christoffel. Students and instructors were housed and fed at the Ford Forestry Center, which is owned and managed by Michigan Technological University.

Students gained valuable field experience visiting with a local landowner regarding his management for early successional forest habitat. Clear-cutting aspen is used to regenerate stands and provides critical habitat for many birds, including American woodcock (or timberdoodle) and yellow-winged warblers. They also met with various forestry professionals, including staff from United States Forest Service, Michigan Department of Natural Resources, The Nature Conservancy, and Bessemer Plywood. Fall Forestry Camp is a long-standing tradition in the NREM Department, and is critical in the development of close-knit cohorts of Forestry majors. Students attend Camp as part of the sophomore series of courses, forming bonds that will help them be successful for the rest of their time at ISU. Camp has been held in many states across the country including Michigan, Alabama, Montana, and elsewhere.

NREM Welcomes New Faces

Dr. Bob Klaver

Bob began work in the NREM Department on January 15, 2012 as the Leader of the Iowa Cooperative Fish and Wildlife Research Unit. He joins Dr. Clay Pierce, Assistant Unit Leader for Fisheries, and Dr. Rolf Koford, Assistant Unit Leader for Wildlife. (Dr. Koford retired August 31, 2012 after serving 18 years in the Iowa Cooperative Research Unit.) He is excited to work at the Iowa Unit with its long tradition of excellence in teaching and research. Bob completed his PhD at South Dakota State University with Dr. Jonathan Jenks in December 2001. His dissertation was on an analysis of habitat selection at multiple spatial scales of white-tailed deer in the Black Hills. Prior to moving to Ames, Bob worked in the U.S. Geological Survey Earth Resources Observation and Science (EROS) Center in Sioux Falls. Previous to Sioux Falls, he served as the regional GIS coordinator for the Portland Area office of the Bureau of Indian Affairs. Bob received his MS in wildlife Biology from the University of Montana in 1979 where he was supported by the Montana Cooperative Wildlife Research Unit. He studied the last native population of bighorn sheep in the Bitterroot Mountains, Idaho and Montana. After his MS, he worked as a wildlife biologist on the Flathead Indian Reservation. Bob is interested in studying wildlife populations and their habitat selection for conservation and management. He has studied multiple species of amphibians, birds, and mammals. 

Dr. Klaver with a sharp-tailed grouse during a study on the effects of wind energy on prairie grouse. (photo T. Runia)
Fieldwork: Not for the faint of heart

The trials and tribulations of fieldwork can be frustrating, sometimes even infuriating, but, when all is said and done, they make for some darn good stories. The following anecdotes offer a glimpse into the reality of fieldwork experienced by NREM’s own faculty and students - the painful, the embarrassing, the exasperating, and the hilarious!

**Kinetic friction at work**

Bob Klaver (COOP Unit Leader, professor NREM)

As a Master’s student studying Bighorn sheep in the Montana/Idaho Bitterroot Range, I conducted many backpacking expeditions tracking Bighorn sheep. I spent several months on their winter range and was looking forward to following them on their migration to their spring range across the Bitterroot Divide. I was working alone on this multi-day trip, so I had all the necessary equipment and survival gear packed strategically into my large backpack, with matches tucked snugly into the back pocket. The spring snow was hard, with fairly good footing; however, coming down a moderate slope, I lost my footing and went sliding down the slope like a turtle on its back. Finally, I came to a stop, stood up, and brushed myself off. As I collected myself, I became conscious of the smell of sulfur and burnt nylon. As I removed my pack, it hit me - the matches were on fire! During my descent, my pack generated enough friction against the snow to light all the matches I had so carefully stored in the back pocket of my old frame pack. Luckily, only a small hole was burnt in the pack and I had packed extra matches. Crisis averted.

**A full moon at noon**

Rebecca Reeves (Graduate student, NREM)

Several years ago, I was working as an environmental education intern at a local farm. It was my job to bring loads of kids down to the creek to catch crayfish and to talk a little bit about why streams are important. So there I was on my first day; the sun was bright, the kids were having a grand time playing in the mud and catching the stream life, and everything was swell.

Around noon, the hayride arrived to bring us back for lunch. On the ride back, one of the little girls dropped her shoe. I reassured her that everything would be ok, and that I would go get it while they were eating lunch. Once we got back, I hopped in a rusty old pickup truck with a kid who was barely old enough to drive and we bounced all the way back to the creek. I quickly crossed the stream and retrieved the wayward sandal. The water was clear, bright, and gurgling over some deceptively slippery stones. About halfway back across the creek, my foot slid out from under me and I narrowly avoided falling in and doing the splits. However, my pants weren't so lucky... I heard a big “rrriiiiiiiiiiiiiii” and they split from the back pocket clear on down to the back of my knee! My bottom was now being tickled by the warm summer breeze. I carefully made my way back to the truck, amidst the uncontrollable giggles of my driver. I managed to find a blanket to wrap around my waist while I returned the shoe and escaped home for lunch and a new pair of pants. What a first day!
My field technician and I left the Rice Lake Field House one early morning in June with high aspirations of what we would accomplish. First stop, collect fyke-nets and quantify vertebrates at one of my research wetlands. We paddled our canoe out to the first net and began what had become a very routine sampling procedure: identify, count, and weigh all the captured vertebrates. Fyke-net number one was a piece-of-cake, only two painted turtles and a few fish. The second net also proved to be a simple task, putting us ahead of schedule and off to a very solid start. Then came infamous fyke-net number three...

Even from 10 feet away we could see the frenzied movement of several large snapping turtles, festering and angry from spending the night in a netted prison. We decided the best course of action was to haul the net onto shore. Once on shore, we proceeded to dump the turtles out, section by section. This process proved to be tricky, as the hissing turtles were less than pleased about their predicament. We were nearing the end of the net when I bent down to pick up the next section, and SNAP! A particularly angry snapping turtle bit down on my ring finger and the pain was excruciating. Over the next 20 minutes, I grappled with heavy thoughts about the meaning of life and death and pleaded with the turtle to let me go! I tried reasoning with it and telling it what a poor snack my tiny finger made, but to no avail. After what seemed like an eternity, my field tech was able to pry the turtle’s beak open with pliers and my finger was finally free! I had lacerations from my knuckle to the nail bed (and still have a scar). Thankfully, after a tetanus shot, some antibiotics, and a long weekend, I was back in the field.

The 50 funnel seed traps I set out on my bison transects last spring were a good lesson in what can go wrong in the field. I buried them all at ground level over spring break according to carefully researched plans.

The idea was for seeds dispersed by wind or gravity to fall into the plastic funnels and be caught in a mesh bag attached underground. I didn’t want deer mice or voles getting into my seed traps and eating my data, so I made sure the funnel openings were small enough to keep them out.

A few weeks later, while up to my elbows in dead bobcats (completely different story), I got a call from the maintenance tech at the wildlife refuge. He’d been out working in the bison enclosure and found several of my seed traps rolling free across the prairie. He said they all looked like they’d been chewed up... I ran out to the field site the next day to see what was up and discovered that, although the funnel openings were small enough to exclude mice, tiny masked shrews could fit in them just fine and they thought the funnels made great burrows. In fact, up to 6 masked shrews could fit in one, and have a big shrew party before they all got stuck and starved to death. The wonderful, wafting smell of dead shrew then attracted local coyotes that subsequently dug up half my seed traps and chewed the ends off the funnels to get to the gooey shrew centers.

I ended up installing shrew-proof screens and staking down all my funnels with giant nails. I had the problem solved in a week or so, with no coyote troubles since. The goal was to be able to compare the types of seeds dispersed by wind or gravity to the types dispersed in bison dung and shed hair. Of course, the very next month, when I went out to collect the seed trap bags I found this: I guess the bison had other plans...

Hatchling snapping turtle. (photo T. Grant)

The bite is definitely worse than the bark
Kristine Maurer (Graduate student, NREM)

Man vs. Wild
Pete Eyheralde (Graduate student, NREM)

Rebecca and Kristine are Master’s Students in Wildlife Ecology. They both work in wetlands and sometimes feel like their lives could be part of a terrible sit-com.
Assessing the impacts of an aquatic toxicant on bottom-dwelling invertebrates

A common, but somewhat controversial practice in fishery management is the use of piscicides to aquatic ecosystems that have become dominated by invasive or undesirable fish species. Rotenone is a naturally occurring compound that is used for the targeted removal of fish. It is convenient because it degrades quickly in natural environments and is, consequently, not very harmful to humans at low concentrations. However, there is some uncertainty about its effects on non-target aquatic organisms. Bottom-dwelling, or benthic, invertebrates are of particular interest because they serve as an important food source for fish. If you’re going to kill all the fish in a pond with rotenone, knowing the potential impact on an important component of the food web would be of interest to natural resource managers. We evaluated how various concentrations of rotenone used to target gizzard shad (*Dorosoma cepedianum*), a nuisance species in small Midwestern impoundments, affect certain groups of invertebrates and the entire invertebrate community as a whole. This research was supervised by Iowa State University PhD student Jesse Fischer, and was part of a larger project evaluating the use of low-dose rotenone applications to selectively eradicate gizzard shad. Funding was provided by the Iowa Department of Natural Resources (IDNR), which was also experimenting with low-dose rotenone applications at the time.

My experiment was conducted using 15 large “tanks” known as mesocosms, located at the Iowa State University Aquatic Research Facility. We essentially tried to simulate miniature lake ecosystems in the mesocosms. The first step was to fill every mesocosm with approximately 5 gallons of sediment from a nearby pond. Because the sediment was from a pond, it already held an abundance of invertebrates. Twelve individuals of a common mussel, the giant floater (*Pyganodon grandis*) were also stocked into every mesocosm. Filling the mesocosms with water posed a larger challenge. This task was accomplished by setting up a pump in the pond and running a hose 620 feet from the pump down to the mesocosms. Each mesocosm held approximately 660 gallons of water, which, when multiplied by 15, meant we needed a total of 9900 gallons! It was well into the night before we finished filling them. An important lesson learned during the course of this project was to expect delays. We hoped to apply the treatments in September, but the rotenone did not arrive until late October. Five treatment levels of rotenone were used: 0 parts per billion (ppb), 3 ppb, 6 ppb, 9 ppb, and 12 ppb. Sediment samples were taken prior to and two weeks after the treatments to sample benthic invertebrates. The giant floaters were also pulled out after the treatments had been applied. A consequence of taking the samples so late in the

Gizzard shad (*Dorosoma cepedianum*), a nuisance species in small Iowa lakes. (photo M. Flamming)
year was that the water began to freeze over, forcing us to smash through a layer of ice before we could get to the sediment below and collect the samples. Once the collection was finally complete, the long arduous task of picking out every single invertebrate began.

Collecting all of the invertebrate data took several months to complete. We found 19 taxonomic groups, the vast majority being Chironomidae (a type of midge larvae) and Oligochaeta (aquatic earthworms). In both the pre-treatment and post-treatment samples, these two groups made up over 90% of the entire community. Our analysis revealed similar abundances of invertebrate taxa before and after rotenone applications. Similarly, no mortality for any of the giant floaters was observed.

Naturally, our next questions were, why did we not observe an effect, and how did our results compare to those of other studies? This research was part of a larger study that was attempting to find a concentration of rotenone to selectively kill gizzard shad without harming other sport fish. Because of this, the concentrations we used were significantly lower than those commonly used to kill off an entire system. Other literature has suggested that higher concentrations of rotenone (e.g., > 500 ppb) do have some effect upon benthic invertebrates, although the impact may be variable depending on the type of organisms present and the concentration of rotenone used.

The invertebrates in our study were taken from a somewhat turbid pond with heavy siltation. The abundance of Chironomidae and Oligochaeta was not surprising in this case due to their known tolerance of aquatic habitat degradation and pollution. However, rotenone may have a more noticeable impact upon invertebrates that are known to be more sensitive, such as Ephemeroptera (mayflies). For example, when rotenone concentrations of 3000 ppb were applied in a Utah trout stream, Chironomidae and Oligochaeta survived, but certain Ephemeroptera species disappeared and did not re-colonize the area until at least two months later. These results imply that while rotenone applications may not always have a major impact in systems dominated by tolerant species, extra caution should be taken when dealing with systems containing more sensitive species.

The concentration of rotenone is another key factor that needs to be taken into consideration. The species found in our study may have been tolerant of the low concentrations we used, but they are likely tolerant only to a certain point. For example, an old, but well-known study done in the 1950s found that Chironomidae populations were tolerant up to 500 ppb but died at concentrations greater than this. Similarly, Oligochaeta populations were eliminated at concentrations of greater than or equal to 2,000 ppb. What these results imply for our study is that even though the species we found were tolerant of low rotenone concentrations (e.g. < 12 ppb), they may not be tolerant at higher concentrations.

Overall, our study indicated that the tolerant taxa found in Iowa’s lakes are largely unaffected by low-dose rotenone applications used to selectively eradicate undesirable fish species. However, some concerns are still warranted. As already discussed, rotenone does have an effect upon the invertebrate community when using higher concentrations or when the system is dominated by less tolerant species. Also, our study did not evaluate the effects of rotenone upon other non-target organisms such as zooplankton or amphibians. While research on these topics may still be needed, our initial results suggest low-dose rotenone treatments can be used without eradicating the invertebrate community.

Michael Sundberg is a senior majoring in Animal Ecology with an option in aquatic sciences. He currently works as a lab technician for Jesse Fischer. His academic advisor is Dr. Timothy Stewart.
A non-invasive approach to studying lead exposure in bald eagles in Iowa

By Billy Reiter-Marolf

If you are a landowner and were lucky enough to have bald eagles nesting on your property last winter, you may have received a phone call from me, “Hi, I am a graduate student at Iowa State University and I was wondering if I could collect some bald eagle poop from below the nest on your property?” The common response was, “You want to collect WHAT!?!?” After some explanation on my part the majority of folks happily obliged, but I understand why some would be perplexed by my interest in collecting the feces of a bird that now seems almost common in Iowa.

This was not always the case, which is part of the reason why people find bald eagles so fascinating. Millions of viewers watch the famous Decorah bald eagle webcam each nesting season, and thousands of participants flock to eagle appreciation events that occur around the state every winter. However, it wasn’t that long ago that the sight of a bald eagle soaring over the Iowa landscape was a rare occurrence. Hampered by habitat loss, poaching, the overhunting of prey, and the toxic effects of DDT, nesting eagles were absent from Iowa for more than 70 years. Since the late 1970s the number of nesting bald eagle pairs has dramatically increased, and now thousands of eagles regularly winter in Iowa. In 1977 there was only one bald eagle nest in Iowa, but in 2012, there were more than 275 active nests throughout the state! This dramatic comeback is largely due to the banning of DDT in 1972 and the eagle’s long tenure on the Federal Endangered and Threatened Species List until 2007.

Although numbers of bald eagles have been increasing, wildlife rehabilitators continue to report cases of lead exposure in eagles and other raptors. They have also detected a relationship between cases of lead exposure and the timing of upland and big game hunting seasons. Environmentalists have inferred that lead exposure in eagles and other raptors may be linked to the ingestion of lead ammunition, while gun advocacy groups consider any discussion about the banning of lead ammunition as an attack on gun rights. Because of the complexity of the debate, Iowa lawmakers have yet to take decisive action on the lead issue.

It is well documented that lead is a poisonous substance to all animals, including humans. In Iowa lead slugs are commonly used for deer hunting, lead shot and bullets are used for upland and small game hunting, and lead sinkers and jigs are standard for fishing. As it accumulates in an animal, either through direct ingestion or by eating another animal that has it in its body, lead increasingly disrupts the nervous, circulatory, and reproductive systems. An exposed animal can experience diminished growth, stunted development, abnormal metabolism, difficulty learning, altered behavior, impaired reproduction, and reduced survival. High levels of lead exposure can severely damage the central nervous system resulting in stupor, convulsions, coma, and death. This is a real concern because in Iowa, more than half of eagles admitted to raptor rehabilitation...
centers between 2004 and 2008 had ingested lead. But how prevalent is lead exposure among nesting and wintering (non-breeding) bald eagles that don’t end up in the hands of a rehabilitator? To address that question, samples from free-flying eagles are necessary.

*...it wasn’t that long ago that the sight of a bald eagle soaring over the Iowa landscape was a rare occurrence.*

While blood samples might be the most desirable and commonly-used biomarker (biological substance) for lead testing in humans, the potential for negative impacts resulting from physically handling birds and climbing nest trees make blood sampling less than ideal in large-scale field studies. I chose to collect fecal samples because it is non-invasive and more logistically feasible. Fecal samples have been used to measure lead exposure in other birds but they have not yet been used as biomarkers for lead in bald eagles.

I was interested in determining if there are relationships between lead exposure and specific parts of the state and different times of the year. I hypothesized that eagles nesting near the Mississippi River would likely utilize fish and waterfowl as their primary food sources, while eagles nesting further from the Mississippi River may resort to scavenging during the winter and early spring when most water bodies are frozen and fish are less accessible. As a result non-Mississippi River eagles may be more likely to scavenge on hunter-killed deer carcasses and gut piles containing lead during and immediately following the antlerless deer season, which in Iowa closes at the end of January. To test that idea, I collected samples from nests close to the Mississippi River and others that were in different parts of the state. I also sampled nests at two different times of year, once in late winter and once in the spring.

*...more than half of bald eagles admitted to raptor rehabilitation centers between 2004 and 2008 had ingested lead.*

Another important question of this study is how do fecal lead levels correlate with blood lead levels? I hope to answer that question with the help of three Iowa raptor rehabilitation centers: Saving Our Avian Resources (S.O.A.R.) in Dedham, the MacBride Raptor Project in Cedar Rapids, and the Wildlife Care Clinic in Ames. These partners are collecting blood and fecal samples from every bald eagle admitted to their care, regardless of injury or illness. With these additional data I hope to determine how blood lead levels and fecal lead levels are correlated, to better interpret what our fecal samples are telling us about lead exposure in the free-flying population.

The 2012 field season was remarkably warm and dry, which made fieldwork relatively easy.
I visited 110 nests and collected more than 75 samples from wintering eagles. I took every precaution to minimize disturbance and also monitored several nests within 24-72 hours after my first visit to make sure I wasn’t causing nest abandonment. After collection, all samples were inspected under a dissecting microscope and then sent to University of Iowa’s State Hygienic Laboratory in Ankeny for lead testing.

Currently I am awaiting results and planning for the next field season. I hope this study will improve our understanding of lead exposure in free-flying eagles in Iowa, provide additional insight about feces as a biomarker for lead, and help to further inform the lead ammunition debate. This research is funded by a State Wildlife Grant and an American Eagle Foundation grant and permitted by the U.S. Fish and Wildlife Service and the State of Iowa. Invaluable partners include the Iowa Department of Natural Resources, the Upper Mississippi National Fish and Wildlife Refuge, Saving Our Avian Resources, the MacBride Raptor Project, the Wildlife Care Clinic, volunteer nest monitors, dozens of private landowners, and field technician and NREM alumna, Maria Dzul.

Billy Reiter-Marolf is an MS student in NREM, co-advised by Dr. Julie Blanchong and Dr. Stephen Dinsmore. He has a BS in Wildlife Biology and Management from the University of Wyoming and a BFA from the School of the Art Institute of Chicago. Prior to becoming a MS student in 2011, he was an AmeriCorps member and Iowa Breeding Bird Atlas coordinator with the Iowa DNR’s Wildlife Diversity Program.
Tyler Harms received his MS in Wildlife Ecology from ISU in 2011. Under the direction of Dr. Stephen Dinsmore, Tyler studied the abundance and habitat associations of secretive marsh birds in Iowa. In addition, he examined differences in detection rates of secretive marsh birds among various survey periods, information which will assist in refining regional and national survey protocols for this group of birds. Currently, Tyler works as a Research Associate at Iowa State University serving as the biologist for the Iowa Multiple Species Inventory and Monitoring (MSIM) Program, a joint project between ISU and the Iowa Department of Natural Resources. MSIM is a statewide survey of 9 wildlife taxa including birds, mammals, reptiles, amphibians, dragonflies, butterflies, fish, freshwater mussels, and terrestrial snails. Tyler’s primary role as biologist for the project is to relate species presence or absence to habitat characteristics in order to inform habitat restoration and management, as well as develop models that will predict species occurrence based on habitat information. In addition, Tyler will be evaluating population trends for species of greatest conservation need (SGCN) in Iowa to determine which species require conservation action.

Rachel Peacher received her MS in Sustainable Agriculture in 2011 under the direction of Drs. Dick Schultz and Tom Isenhart. With the cooperation of the USDA-ARS Cropping Systems and Water Quality Unit in Columbia, Missouri, her research looked at the impacts of different land uses on stream bank erosion in small streams in northeastern Missouri. Rachel returned to her home state of Tennessee, where she is an adjunct professor of Biology at Austin Peay State University, teaching at both the main campus and the Fort Campbell Education Center, which reaches active duty military and their families.

Dr. Mustafa Tufekcioglu earned both his MS and PhD (2006, 2010) in Forest Biology at ISU. The goal of his research was to determine sediment and phosphorus losses from grass filter, forest buffer, row-crop, and pasture stream bank soils, a critical issue for stream ecosystems in the Midwestern U.S. In 2010, Mustafa returned to his native Turkey where he is an assistant professor at Artvin Coruh University in northeastern Turkey. He teaches courses in watershed management, water and soil conservation, fluvial processes in geomorphology, and stream corridor processes and restoration. In addition, he participates in a number of projects that aim to protect soil and water at the watershed level. He is also a research participant in a European Union project involving countries that border the Black Sea. This project aims to utilize new technologies for the best use of stream water in the suppression of wildfire.
Where are they now?

Recent graduates find exciting careers

**Eric Katzenmeyer** worked with Dr. Clay Pierce in the Iowa Cooperative Fish and Wildlife Research Unit for his MS in Fisheries Biology, which he completed in 2010. In his research Eric used aging structures from a variety of fish in Clear Lake, Iowa to determine factors influencing fish growth during the early stages of a zebra mussel invasion. Since graduating Eric has worked with the Minnesota DNR's watercraft inspection program, educating boaters about invasive species and inspecting and decontaminating boats to stop the spread of aquatic invasive species. He and his wife Kati have been enjoying spending time with their twin girls, Claire and Isabel, born in May of 2011.

**Dr. David Miller** earned his PhD in 2009 in Ecology and Evolutionary Biology under Dr. David Otis. For his dissertation research Dave focused on understanding the breeding biology of mourning doves in central Iowa. While at ISU he helped design and implement a national recruitment monitoring program for mourning doves that is used to inform harvest management decisions for the species. He is currently a post-doc at the USGS - Patuxent Wildlife Research Center working on amphibian monitoring and will be joining the faculty at Pennsylvania State University in January of 2013. There he will teach population dynamics and wildlife management courses and hopes to continue research on doves, frogs, and other wildlife populations. Dave and his wife Amber Wiewel (MS Ecology & Evolutionary Biology, ’11) will welcome their first child in the spring of 2013.
I’m pretty sure Jerry Franklin was wondering who the weirdo was that was following him around and taking photos of him like the paparazzi during his entire visit to Iowa and Minnesota. That would be me, Rayma Cooley, Jerry’s number two fan; only second to Dr. Lisa Schulte Moore. Actually before Dr. Schulte Moore, I had no idea who Jerry was from the mailman. Her adoration for Jerry in my Forest Stand Dynamics class had me curious. She kept reiterating something to the likes of, “He’s kind of a big deal.” Needless to say, Jerry Franklin was on my radar, and I was intrigued. So, I did a little research.

Um, hello! He is pretty much the reason why old growth forests were saved from complete annihilation in the Northwest during the spotted owl controversy in the 1990s (he was on President Clinton’s Forest Ecosystem Management Assessment Team). Jerry literally wrote the books on our current logging methods, forest biodiversity conservation, and sustainability.

So, it’s already awesome that Jerry has this amazing background, right? But what put me into the category of “Crazy #2 Fan”, you ask? Spotted owls! The owls are the reason I’m in the fields of forestry and ecology in the first place! I’m slightly obsessed. Come to my apartment—owls everywhere! Actually, don’t come to my apartment—but you can take my word for it. In 2007, I was a field technician in Shasta-Trinity National Forest in northern California surveying for Northern spotted owls. This single experience changed my life. Something finally clicked in my niche-finding quest, telling me, “This is it!” So, fast-forward to now: me, California-native, spotted owl freak, in Iowa; Jerry Franklin, spotted owl legend, conservation guru, in Iowa. HELLO DESTINY! Okay, this article is actually supposed to be more focused on this really cool weekend field trip Dr. Schulte Moore took our Forest Stand Dynamics class on. However, I don’t think I could adequately express my experience without giving you the above background.

So, after Dr. Franklin gave the 2012 Errington Lecture at Iowa State, he joined our class on a caravan for a weekend of field study in northern Minnesota. Chippewa National Forest is located in the very southern range of the northern boreal forests in Minnesota. I was completely spellbound by the jewel-toned leaves of the maples and aspen that overtook my peripheral. Towering white pine and scruffy black spruce, glass lakes and mossy bogs, and an incredible array of wildlife make up this ecological treasure. In the center of it all are a few very concerned scientists at the USDA Forest Service’s Northern Research Station in Grand Rapids.

Research ecologists Dr. Brian Palik and Dr. Sean Fraver have the weighty, challenging task of informing the management of our public forests in the light of climate change, exotic species invasions, and disturbance (to name a few); all while accommodating harvest and other resource needs. Brian and Sean are involved in a multitude of long-term studies that first began over 60 years ago on the Chippewa National Forest. In addition to incorporating many of Jerry Franklin’s forest management methods, Brian and Sean are also using their decades of experience in these woods to...
proactively address the issues our forests our currently facing, as well as the impending ones. One of their most prominent experiments involves harvesting trees in such a way that attempts to mimic a naturally occurring disturbance, like wind or fire; this process is called emulation silviculture. Instead of traditional harvesting, which creates habitat fragmentation, these scientists are interested in using harvesting techniques that would produce a landscape resembling a natural disturbance. This involves leaving some quality and diverse species of trees behind in the forest along with woody debris and upturned soil. A scenario like this might closely replicate trees blowing down in a wind event or a low intensity fire.

As Brian and Sean stood before the class, describing their experiments and trials, and Jerry looked on like a proud, wise old owl passing the baton, I realized what a special gift I had been given to be standing there with a multitude of generations leading the new generation in forestry. The collective years of experience, the lessons learned, the challenges of old and new, and the incredible advancements that can only be described as labors of love. These pioneers have experienced it all.

Now it’s our turn. This is a very exciting time. Future generations can look back and say, “Look what they did to conserve this valuable resource!” We can be the catalyst! We have the opportunity and duty to take the lessons learned, face the unresolved challenges of the last generation, and improve management for the generations to come. Let’s grab that baton and fly!

Me, with my new hero, Jerry, in an experimental black ash stand.

Rayma Cooley is a first year Forestry Master’s student in the NREM department, advised by Dr. Peter Wolter. She is a northern California native who enjoys photography, owls, Guns N’ Roses, and playing outside. Her research looks at vegetation regeneration in various fire severity gradients in northern boreal forests.

Dynamics of Forest Stands class learning about different disturbances in the boreal forest. (photo R. Cooley)

Rayma Cooley

Dynamics of Forest Stands class learning about different disturbances in the boreal forest.

Merrill person (center) and classmates learning about different disturbances in the boreal forest.

Dynamics of Forest Stands class learning about different disturbances in the boreal forest.

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It’s early morning as we push our canoe through bulrush, smartweed, and arrowhead out into the shallow, still water. The humid Iowa air hangs over the prairie wetland like a vaporous pillow as we paddle to our first sampling station. Gliding over thick beds of aquatic plants, past a scattering of whirligig beetles and the occasional leopard frog, we approach our first fyke-net. I am curious what we will find today...stickleback, black bullhead, tiger salamanders, or perhaps a Blanding’s turtle? It is incredible that so much life occupies and depends on such a small body of water. This tiny freshwater island provides essential habitat not only for insects, fish, and amphibians, but also for water birds and other terrestrial wildlife. Furthermore, it provides services important for humans like recharging the groundwater table, filtering contaminants, and mitigating floods. Sadly, not all prairie pothole wetlands are so rich with life; many wetlands in Iowa support little diversity and wildlife. Which begs the question: why? What ecosystem features influence the condition of Iowa prairie pothole wetlands and consequently drive differences in their ability to support wildlife?

### Table 1. Example of characteristics and their relative abundance in degraded and healthy wetlands.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Degraded Wetland</th>
<th>Healthy Wetland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Non-native Species</td>
<td>Abundant</td>
<td>Rare</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

The North American prairie pothole region (Figure 1) is considered one of the most important wetland areas in the world and supports more than 50% of the North American migratory bird population. Prior to European settlement, it is estimated that 4 to 6 million acres of wetlands pocketed the Iowa landscape, much of which was concentrated in the Des Moines Lobe of the prairie pothole region (Figure 1). Unfortunately, around 95% of Iowa’s wetland area...
disappeared, primarily as a result of draining and filling for agricultural purposes.

Remaining wetlands are often threatened by nutrient and sediment loading as a result of agricultural and urban runoff. Invasions by organisms such as large, bottom feeding fishes (e.g. common carp, black bullhead) also pose an increasing threat to these ecosystems. In order to protect and manage the remaining prairie wetlands in Iowa, it is essential we understand the causal relationships between the chemical, morphological, and biological features that influence wetland condition. The objective of my Master’s research was to identify indicators of wetland condition and develop a list of reliable and cost-effective variables to assess wetland features.

I developed a model describing the relationships among wetland features (Figure 2). Each box in the model represents an ecosystem feature known to influence or respond to wetland condition. Within each box is a list of variables that can be used to quantify each feature. For example, the variable turbidity, a measurement of water cloudiness, can be used to describe the wetland feature, trophic state. Effects cascade down, such that outcome variables at the bottom of the model are a response to preceding features. Tiger salamanders and aquatic invertebrates (e.g., insects, crustaceans, and molluscs) were used as outcome variables because past research conducted in Iowa prairie pothole wetlands suggests that these animals are sensitive to habitat degradation and thus can serve as indicators of wetland condition. To test my hypotheses, I collected information concerning wetland morphology (geophysical characteristics of a wetland), trophic state (amount of primary production), salt contamination, tiger salamanders, and fish, aquatic plant, and aquatic invertebrate assemblages (composition and abundances) from 34 permanent prairie pothole wetlands in north-central Iowa. Following data collection, the causal model was reduced to include only one variable from each feature box. Selection was based on sensitivity to or relative influence on wetland condition and cost effectiveness. Variables selected for statistical analysis included: average depth, total fish biomass, chloride, turbidity, plant cover, invertebrate species richness, invertebrate biomass, and tiger salamander biomass. Using a combination of tests,

![Field sites with (A) and without (B) large-bodied fishes](image)

Gladfelter (A) and Gabrielson (B) wetland sites represent degraded and healthy wetlands respectively. (photos T. Grant (A), K. Maurer (B))

Figure 2. Predicted causal relationships among prairie pothole wetland features. Boxes representative of ecosystem features contain variables that were used to measure each feature. Arrows indicate predicted causal relationships, and extend from the group of causal variables at the arrow base to the affected variable(s). P/A = presence absence, CPOM = coarse particulate organic matter.
I quantified the direction and importance of relationships and patterns between invertebrate taxon densities and wetland features.

Results from this study supported several of my hypotheses. Specifically, results suggest that fish have significant direct and indirect affects on wetland condition. For instance, results indicated high fish biomass, largely contributed to by common carp and black bullhead, had a positive effect on turbidity. These large bottom feeding fishes spend much of their time rutting around in the bottom sediments for food. This sediment disturbance re-suspends particles and releases nutrients from the sediment back into the water column. The result is an overall decrease in water clarity due to increases in primary production and suspended solids in the water column; nutrients from fish poop can compound this effect.

We almost sank our canoe counting and weighing the samples.

The consequence of this reduction in water clarity is a decline in the aquatic plant community. As turbidity increases, less light is able to penetrate the water column because it bounces off suspended particles, like algae, and is scattered back into the atmosphere. This reduction in light penetration makes it very difficult for aquatic plants to succeed. Furthermore, my results suggest that by decreasing plant abundance, turbidity and fish biomass had negative effects on invertebrate diversity and densities. Aquatic plants provide essential habitat for both invertebrates and tiger salamanders, as they are an important source of food, refuge, and provide surfaces for egg deposition. Additionally, results indicated fish have a direct negative impact on tiger salamanders most likely through predation and resource competition. Wetland depth also played a role in the condition of my study wetlands as deeper wetlands supported greater abundances of fish. As a result, depth had a negative effect on plants, tiger salamanders, and invertebrate diversity and biomass. It is evident from these results that aquatic invertebrates, tiger salamanders and aquatic plants are all sensitive to degraded ecosystem condition.

For example, Gladfelter (Picture 1A) was one of the most degraded wetlands included in my study, yet we captured almost 100 kg of black bullhead in our fyke-nets over just 24 hours! We almost sank our canoe counting and weighing the samples. Results of this study seem to suggest the removal of large-bottom feeding fishes along with reduction of depth and connectivity could improve the condition of prairie wetlands here in Iowa.

Kristine Maurer is a Master’s student in NREM, advised by Dr. Timothy Stewart. Originally from the Twin Cities, MN, she completed her undergraduate degrees at the University of St. Thomas. Following college she worked in a limnology lab at the University of Minnesota and interned with the Catalina Island Conservancy Invasive Plant Program, CA. Her primary interests include community and ecosystem ecology of lentic, freshwater systems and environmental policy. Funding for this research was provided by the IA DNR and USEPA.
Field Notes Photo Contest Winners!

Overall winner
Dall sheep in Polychrome Pass
Denali National Park, Alaska
Billy Reiter-Marolf

First place
Category: Animal
Steller Sea Lions, Kenai Fjords, Alaska
Billy Reiter-Marolf

2nd place
Category: Animal
Trumbull Lake Wilson’s Warbler
Kevin Murphy

continued...
First place
Category: Plant
Breakfast for Bees
Anna MacDonald

2nd place
Category: Plant
Big Blue Morning
Anna MacDonald

First place
Category: People in Nature
Boy and Bison
Dr. Lisa Schulte Moore

First place
Category: Landscape
From Black Comes Green
Rayma Cooley

2nd place
Category: People in Nature
Freddy and the Hog-nose
Dr. Lisa Schulte Moore

2nd place
Category: Landscape
Flood Waterline
Tyler Grant