MSU Fisheries & Wildlife SPOTLIGHT

Spring 2012

Produced by Graduate Students in the Department of Fisheries & Wildlife at Michigan State University

BYCATCH in Saginaw Bay

Bringing light to mucky waters

How does GLOBALIZATION impact Nicaraguan fishermen?

Tackling the decline in recreational fishing

Fellowships, GIS, and MORE

Special AQUATIC Issue!

MSU Fisheries & Wildlife
SPOTLIGHT

Spring 2012
Issue 8

FW SPOTLIGHT is a magazine written, edited, and designed by graduate students in the Department of Fisheries & Wildlife at Michigan State University.

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For electronic copies of current and past issues, please visit
fw.msu.edu/~gso/spotlight.php

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www.fw.msu.edu

Rachel Teets gets down and dirty to see how much muck has accumulated along the Saginaw Bay, Lake Huron shoreline. ***See page 6 for how FW research helps predict and potentially alleviate these shoreline-fouling events.*** **(photo: *M. Bammer*)**

Contents:

Dr. Brian Roth's cover photo of a Saginaw Bay trap net catch was chosen by popular vote in a voluntary poll of Department of Fisheries & Wildlife faculty, staff, and students.

SPOTLIGHT ON:

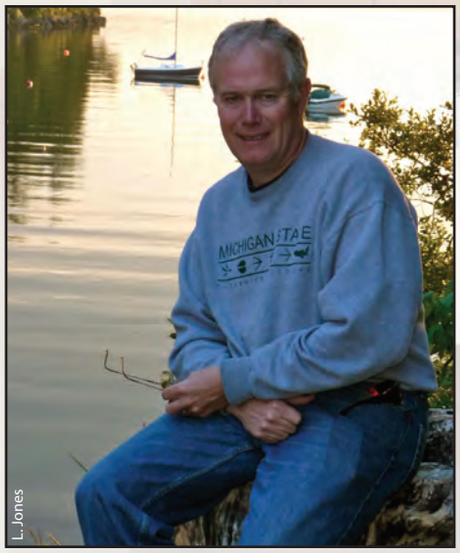
Letter from Dr. Mike Jones:

When I became Chairperson of the Fisheries and Wildlife Department in 2008, I quickly learned that one of my most important tasks was to find ways to showcase our successes and strengths. We live in a very competitive world for funding and being able to back up our claims of being one of the best FW departments in the nation with real examples is very important. Happily, I am regularly presented with opportunities to do this, thanks to the remarkable work of our faculty and students. But I honestly don't think there is anything we do that is more effective at achieving this goal than this magazine – SPOTLIGHT – and it is once again a privilege to be able to introduce you to this issue.

This, the eighth issue of SPOTLIGHT, is highlighted on the cover as a "Special Aquatic Issue," and – as a "fish guy" myself – that sounds great to me. Don't despair if your leanings are more in a terrestrial direction; you can find articles that talk about panda habitat in China, birds in Michigan, and the many wildlife research projects going on in Gary Roloff's lab. But please do take a look at the other articles and you'll get a sense of the amazing diversity of work we do in aquatic systems alone.

Kim Winslow (née Peters) will take you to Saginaw Bay in eastern Michigan and tell you about the challenges faced in nearshore habitats because of the accumulation of "muck" – benthic algae on the once sandy beaches. The causes of this muck proliferation remain somewhat of a mystery, but its presence has important ecological and social consequences. Kim will take you to Saginaw Bay, and **Eric MacMillan** will keep you there, moving offshore to discuss the commercial fishery. Eric writes about bycatch – the harvest of fish that are unintentionally caught in gear being used to harvest other species. Here too is an issue with important social and ecological dimensions: is discarding incidentally harvested fish wasteful, and is this bycatch mortality likely to be important for sustainability?

The intersection of the ecological and social dimensions of a fishery are surely also central in small artisanal fisheries along the Caribbean coast of Nicaragua, where **Kara Stevens** is conducting her research on the effect of globalization on fisheries. Kara tells a fascinating story of how improved access to the region where she works and an increasingly global market for commercial fish products may have profound effects on the way of life in this remote part of Central America. Her work is part of a "Coupled Human and Natural Systems" (CHANS) project funded by NSF. I can't help thinking that



so much of our work in Fisheries and Wildlife could be described as CHANS.

Another feature of our work that unites us across research themes and locations is ever improving research technology. In this issue of SPOTLIGHT, you will learn about how Geographic Information Systems (GIS) technology is being used in many of our labs to study such diverse questions as pressure on giant panda habitat in China, the fragmentation of river fish habitats in the U.S. caused by dams, and changes in bird distributions in Michigan potentially caused by climate change.

Last, but by no means least, **Jared Myers** and **Carson Prichard** write about their outreach efforts with the Capital Region Big Brothers Big Sisters, and the mid-Michigan Steelheaders, to introduce less fortunate youths in Lansing to the joys of recreational fishing. We are all aware of the general trend toward decreased participation in fishing and hunting. It is wonderful to see our graduate students teaming up with others to try and reverse this trend. The more we can do to nurture an appreciation for nature in our citizens, the better the outcome for our natural resources.

Enjoy this latest issue of SPOTLIGHT. *I know I did!*

Department of Fisheries & Wildlife
Michigan State University

Spotlight on Student Awards

-Compiled by Jodi Kreuser

Andrea Bowling was awarded Best Poster at the 2011 Fisheries & Wildlife Graduate Student Organization Research Symposium.

Xiaodong Chen was awarded the Gill-Chin Lim Award for an Outstanding Dissertation in Global Studies.

Arthur Cooper, Jacqueline Fenner, Jared Ross, Darren Thornbrugh, Ralph Tingley, and Daniel Wieferich received the 2011 Scientific Achievement Award in Support of Fish Habitat Conservation from the National Fish Habitat Action Plan Board. The team included Peter Esselman, Bill Taylor, and Lizhu Wang and was lead by Dana Infante.

Kari Dammerman received the Norman S. Baldwin Fisheries Science Scholarship, awarded by the International Association for Great Lakes Research and sponsored by the Great Lakes Fishery Commission.

Lissy Goralnik, Marta Jarzyna, Isis Kuczaj, Daniel Linden, Abigail Lynch, Andrea Miehls, Sara Smith, Marty Williams, Wu Yang, and Chiara Zuccarino-Crowe received Travel Grant Awards. MSU supported travel sources include: Department of Fisheries & Wildlife; Fisheries & Wildlife Graduate Student Organization; College of Agriculture and Natural Resources; Ecology, Evolutionary Biology, and Behavior Program; The Graduate School; Environmental Science and Policy Program; International Studies Program; National Aeronautics and Space Administration (NASA)-MSU; and International Association for Landscape Ecology.

Lissy Goralnik, Scot Libants, and Daniel Linden were awarded Dissertation Completion Fellowships from the College of Agriculture and Natural Resources. The fellowships allow students to devote themselves full-time to writing their dissertations.

Lissy Goralnik received a Summer Retention Fellowship from the College of Agriculture and Natural Resources.

Lissy Goralnik, Shauna Hanisch, Corey Higley, Michelle Jacques, Emily Johnston, Brian Langseth, Daniel Linden, Stephanie Longstaff, Abigail Lynch, Eric MacMillan, Kevin McDonnell, Trevor Meckley, Andrea Miehls, Jared Myers, Clint Otto, Carson Prichard, Julie Rose, Kiira Siitari, Jody Simoes, Shikha Singh, and Chiara Zuccarino-Crowe received Department of Fisheries & Wildlife Special Recognition Fellowships.

Tiffanie Hamilton was awarded the Jack Berryman Research Fellowship.

Seth Herbst was awarded the 2011 Robert C. Ball and Betty A. Ball Fisheries and Wildlife Fellowship.

Vanessa Hull was awarded a NASA Earth and Space Science Fellowship.

Michelle Jacques was awarded a C.S. Mott Predoctoral Fellowship in Sustainable Agriculture.

Emily Johnston was awarded the J. Wallace and Martha C. Wallace Endowed Scholarship from the Zoology Department for her work with avian disease ecology.

Jodi Kreuser was awarded Best Oral Presentation (Prospective) at the 2011 Fisheries & Wildlife Graduate Student Organization Research Symposium.

Hanna Kruckman was awarded the Janice Lee Fenske Excellence in Fisheries Management Fellowship to work with the Michigan Department of Natural Resources.

Brian Langseth received the Council of Graduate Students Leadership Award.

J.P. Lawrence won the "In Captivity" category for his photo in the Amphibian Ark's International Calendar competition.

Dan Linden and Abigail Lynch received Summer Fellowships from the MSU Ecology, Evolutionary Biology, and Behavior Program.

Abigail Lynch was awarded The William W. and Evelyn M. Taylor Endowed Fellowship for International Engagement in Coupled Human and Natural Systems.

Abigail Lynch and Bob Montgomery received Graduate School Research Enhancement Awards.

Abigail Lynch, Nathan Snow, and Kara Stevens received Pre-Dissertation Travel Awards from International Studies and Programs at MSU.

Eric MacMillan and Kyle Molton were selected as 2012 John A. Knauss Marine Policy Fellows by the National Sea Grant College Program.

Andrea Miehls received a First Place Oral Presentation Award at the MSU Council of Graduate Student Academic Conference and received the Distinguished Student Speaker award for the 2011 fall semester from the MSU Ecology, Evolutionary Biology, and Behavior Program.

Marisa Rinkus received the Love of Learning award from the Phi Kappa Phi collegiate honor society and was awarded a Gender, Justice, and Environmental Change Dissertation Completion Fellowship from the MSU Center for Gender in Global Context.

Jared Ross was awarded the Cornelius M. Schrems Scholarship for work toward the mission of Schrems West Michigan Trout Unlimited.

Jody Simoes received an award from the Great Lakes Council of the Federation of Fly Fishers.

Nathan Snow received the Albert W. Franzmann and Distinguished Colleagues Memorial Award from the journal Alces for dissertation research.

Mao-Ning Tuanmu received the Best Student Presentation Award for his oral presentation at the 2011 US-International Association for Landscape Ecology annual meeting.

Jeff White was awarded Best Oral Presentation (Retrospective) at the Fisheries & Wildlife Graduate Student Organization Research Symposium.

Chiara Zuccarino-Crowe received a Clark Hubbs Associate Research Award from the American Institute of Fishery Research Biologists to present at the 2011 American Fisheries Society's annual meeting.

MUCKY WATERS

Why Saginaw Bay beaches are no longer hot spots for Michiganders

by Kimberly A. Winslow (née Peters)

Kim Winslow (née Peters) recently graduated with a Master's in Fisheries and Wildlife under Dr. Scott Peacor. Her work focused on benthic algae that leads to "muck" along Saginaw Bay (**background photo;** *R. Teets*) and was part of a larger project assessing how anthropogenic stressors impact the Saginaw Bay ecosystem. She hopes to use the scientific training she gained from her Master's to pursue Great Lakes policy work.

Contact Kim at: **kannpeters@gmail.com**

Although algae are a natural and necessary element in aquatic ecosystems, too much algae can cause a number of water quality issues. Excessive algal growth can harm fish and amphibian communities, create foul tasting drinking water, and negatively impact tourism due to the unpleasant smell and appearance of thick, green water. Furthermore, these algal blooms die and wash on shore, creating the unsightly and unpleasant smelling detritus known as 'muck,' which fosters harmful bacterial growth and may result in beach closures. Ultimately, too much algal growth deters beach-goers, discourages water consumers, and disheartens beachfront landowners, which together comprise a substantial economic sector in many Great Lakes states.

"...scientists know little about the composition, cause and dangers of the muck..."

A Persistent Problem

In the late 1970s, researchers pinpointed an overabundance of phosphorus, a nutrient necessary for beneficial and nuisance algal growth, as a primary cause for muck in the Great Lakes. Phosphorus enters our waterways through a variety of human actions, including fertilizer applications, livestock waste, and dishwasher detergents. Essentially, research showed that human actions far from waterways affect the aesthetics and usability of our water resources. In response, legislators passed a phosphorus reduction program to alleviate algae issues throughout the Great Lakes region.

Although the phosphorus reduction program proved effective in many ways, recent reports of muck on the beaches of Saginaw Bay, Lake Huron (an area of the Great Lakes plagued by muck for decades) have raised new complaints from local residents and lake users.

To make the issue worse, scientists know little about the composition, cause, and dangers of the muck, especially in Saginaw Bay. The bay ecosystem is affected by complex, inter-related factors like invasive species, changing weather patterns, and variations in the nutrient allocation throughout the system. Therefore, the Peacor lab and our colleagues at Eastern Michigan University, LimnoTech Inc., Wayne State University, and the Great Lakes Environmental Research Laboratory are working to understand the effects of these factors on algae and Saginaw Bay.

New Research

My research concentrates on benthic algae, which is the algae that grows along the bottom of lakes and rivers. Benthic algae is primarily influenced by light, substrate (what the algae physically grows on), and nutrients like nitrogen and phosphorus. As noted above, previous research has identified phosphorous as a prime suspect for high levels of benthic algal growth, which ultimately leads to muck. Although phosphorus regulations were effective in the past, the way phosphorus acts in the system now may be different because of factors like invasive species, changing weather patterns, and changes in nutrient cycling. Therefore, although certain regulations worked previously, they may no longer provide effective relief from the algal issue we are experiencing today.

This leads us to one of the most important questions: will a higher reduction in phosphorus reduce the amount of muck washing up along the shorelines of Saginaw Bay, or will we need to explore other options besides phosphorus regulation? Numerous management options exist for reducing phosphorus inputs to waterways. However, strict regulations tend to be expensive for stakeholders. For instance, many counties in Michigan are implementing a ban on phosphorus in dishwasher detergents. Another stricter regulation would be to manage the amount or timing of fertilizer application on local farm operations, but this ultimately pressures an already stressed sector of the economy. Before implementing a potentially expensive management strategy to act on this algae issue, we must see if the management option will work in the first place. To understand this, we first need to know more about the conditions that enable or hinder algal growth in the Saginaw Bay. My research was designed to address a small piece of this question: What characteristic of Saginaw Bay makes it habitable for benthic algae: a high level of phosphorus or something else entirely?

By better understanding the growth dynamic of benthic algae and factors that may inhibit excessive algal growth, future research can focus on potential control methods to alleviate the muck issue, in both Saginaw Bay and the Great Lakes region. Moreover, our collaborative research could improve the aesthetics around Saginaw Bay, thereby helping affected residents, tourism industries, and management of similar freshwater systems. While all systems are different, what we learn about the algae and effective management strategies in Saginaw Bay may be relevant to other freshwater systems that struggle with similar issues.

Since benthic algae is not filling every habitable space in Saginaw Bay, we know that adjusting substrate will not dramatically effect its growth; therefore, substrate is not the limiting factor for our benthic algal community. Thus, my research looked at algae in many different natural light and phosphorus conditions. The complexity of these conditions in Saginaw Bay suggested the need for field research, as opposed to subjecting algae to artificial laboratory conditions. This way, I could look at which natural levels of light and phosphorus elicited both the healthiest and least healthy algae in unaltered habitats. I measured the light levels reaching benthic algae with in situ light readings and I measured the amount of

Kim examines muck build-up at her study site on Saginaw Bay. Her research aims to better understand benthic algae growth to improve algae management solutions.

D. Miller

phosphorus in algal samples collected via SCUBA around the bay. Samples were taken back to the lab and extracted for tissue phosphorus content. Based on where my samples fell in the range of light and phosphorus levels from previous studies, my research indicates that benthic algae in Saginaw Bay grow in both light and phosphorus limiting environments. This means both light and phosphorus are vital growth factors to consider in future management.

This finding presents managers with a more complex issue; although a reduction in phosphorus will likely lead to a reduction in benthic algae, managers must also consider what impact their phosphorus reduction strategy will have on light availability. For instance, reducing run-off from local farms by mandating certain tilling practices would mean less phosphorus entering waterways. This strategy usually reduces the amount of sediment run-off as well, and with less sediment in the water column, more light can reach the bottom where the nuisance algae grows. Ultimately, decreasing farm run-off into the bay reduces phosphorus inputs, but may lead to increased light availability to benthic algae, which leads to a less predictable change in benthic algal growth. Other management options, like banning phosphorus-based detergents or repairing leaky septic systems, would reduce phosphorus and not effect light. Although effective management options must consider two factors (light and phosphorus), even small changes in human behavior around Saginaw Bay and other Great Lakes shorelines may lead to substantial improvements in the aesthetics and enjoyability of nearby beaches. For example, residents can make active, smart choices about their phosphorus use and not impact the light environment -- pick detergents that are phosphorus free; apply lawn fertilizer only when needed and be aware of potential run-off events; and maintain working, efficient septic systems. All in all, being mindful of the phosphorus footprint may have positive results in the future.

"...even small changes in human behavior around Saginaw Bay and other Great Lakes shorelines may lead to substantial improvements..."

Community Impacts

Muck wash-up is unpleasant for water consumers, beachgoers, and property owners around Saginaw Bay due to its offensive odor, foul appearance, and potential for harmful bacteria growth. Because of the importance of the issue and limitations in knowledge about the system, research is essential to understand the bay system and formulate management recommendations. My research provided an important piece to this puzzle by addressing what factors influence benthic algal growth in the bay habitat. From this, we learned that benthic algal growth is already limited by its environment. Although additional research is necessary to understand exactly how much phosphorus needs to be reduced to elicit a significant change in growth, my research structured what information we still need in order to craft effective policy to hopefully reduce benthic algal growth and restore the integrity of Great Lakes beaches.

In addition to its offensive odor and foul appearance, muck wash-up around Saginaw Bay may also harbor harmful bacteria.

GIS Mapping Solutions for Conservation

In today's tech-driven world, we routinely rely on geospatial technology to help us with our everyday activities, such as driving the shortest route home using a GPS navigation system, locating top-rated restaurants using a smart phone, and exploring the most remote corners of the world from our desktop using Google Earth. In this way, many of us are frequent users of a **Geographic Information System (GIS)** interface, although few of us may be aware of it. GIS is a computer-based system that integrates hardware, software, data, methods, and people, and it helps us manage, analyze, and display data based on geographic locations. GIS allows us to understand, interpret, and visualize spatial data and reveals new relationships, patterns, and trends that otherwise would be impossible to characterize.

GIS has propelled the fields of modern ecology and biodiversity conservation. With the advance of GIS technology and the increasing availability of geo-referenced data, scientists now have an unprecedented capacity to map and assess ecological patterns and processes at broad spatial scales and to monitor changes through time. GIS also provides an excellent tool for informing natural resources management and biodiversity conservation decisions and is widely used in the education, research, and outreach work of the FW department. In this article, we present three examples of how GIS is being used by FW graduate students. These examples cover a wide range of issues on diverse species and at various spatial and temporal scales.

-Wei Liu and Mao-Ning Tuanmu

Mammalian diversity in the Americas (higher to lower diversity). An example analysis using GIS, conducted by Dr. David M. Williams, Research Associate in the Quantitative Wildlife Lab.

Application of GIS in Panda Conservation Research

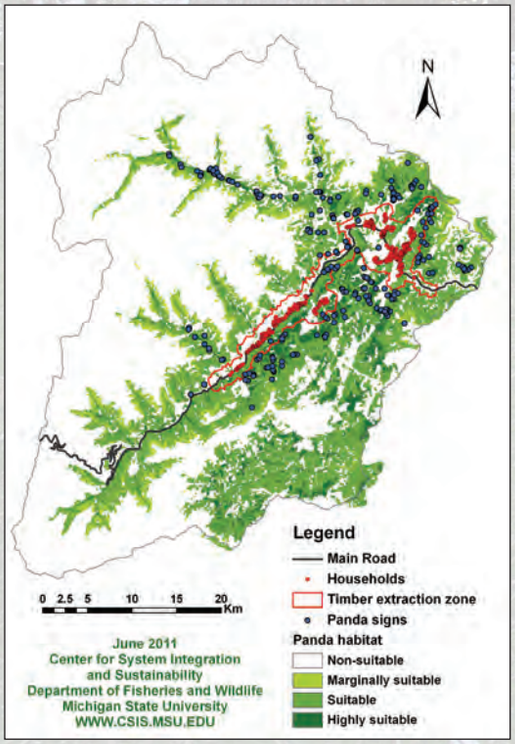
Bamboo growing under the forest canopy (background photo; *W. Liu*) is a staple food of giant pandas (left).

As the panda group in the Center for Systems Integration and Sustainability, we have spent the last 15 years studying the complex interactions among people, panda, and policy in China. We collect a broad spectrum of data and use a variety of analytical approaches to study how the natural and human components interact across the landscape. GIS enables us to identify spatial and temporal patterns that will help inform the conservation of giant pandas in a human-dominated landscape.

Knowledge about the changes of giant panda habitat in time and space is critical for panda conservation. Using GIS, we integrate the data collected in the field with the information extracted from remotely sensed satellite imageries to identify many important determinants of panda habitat across large spatial extents and over time. For example, bamboo growing under forest canopy provides a staple food for panda, but it is challenging to obtain large-scale information on bamboo distribution because canopy trees interfere with the direct detection of bamboo by satellite sensors. To overcome this challenge, we characterize seasonal dynamics of vegetation biomass using multiple satellite images that distinguish bamboo from canopy trees, then we identify where forest stands with bamboo are located by spatially correlating those satellite-derived vegetation features with the forest and bamboo cover measured in field plots. GIS also allows us to better evaluate habitat quantity and quality (e.g., connectivity) across the entire panda distributional range. By combining our information on suitable habitat with the boundaries of current natural reserves, we are identifying gaps in giant panda conservation to make suggestions for establishing new reserves or adjusting current reserve networks in China.

GIS is also important for tracking human activities that drive the changes of panda habitat, such as wood extraction, agricultural expansion, and road construction. For example, local people in Wolong Nature Reserve rely on forests for fuel and construction material, but the residents must overcome the rugged topography to transport their logs. We use path distance analysis in GIS to approximate the physical cost of such activities and characterize the changing effects of roads on traveling costs with network analysis in GIS. Based on past wood extraction sites identified with household interviews, we can delineate the zone under recurrent human disturbance, then integrate this zone with changes in forest and panda habitat and ultimately confirm a cause-effect relationship between wood extraction activities, forest and habitat degradation, and spatial avoidance of this zone by wild pandas (**see map**).

Finally, GIS expands our capacity to project future habitat changes. For example, we are interested in how simultaneous forest restoration and tourism development affect forests and pandas, as well as how global climate change is going to impact the future of panda habitat. GIS will play a critical role in tackling these interesting and important issues and help us find ways to reconcile the trade-off between human livelihood and species conservation.



GIS analysis indicates spatial avoidance of human disturbance zones by pandas in Wolong Nature Reserve.

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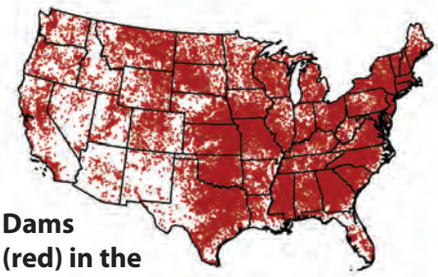
Fragmentation by Dams: Assessing River Connectivity from a Fish's Perspective


A. Cooper

The life of migrating fish is full of challenge. They spend much of their adult life evading predators and disease, then must exert a significant amount of reserve energy to make their way back upstream to reproduce. When they try to make this tough journey, fish are often blocked from suitable habitat by dams. To aid in this spawning process, as well as to ensure future generations of fish, we need to better understand where the most problematic river fragmentations occur and where we can best mediate or remove dams to enable passage to upstream fish spawning grounds.

Using datasets containing 80,000 of the largest dams (U.S. Army Corps of Engineers) and over two million river reaches (U.S. EPA and USGS), I am developing a new spatial approach to assessing river fragmentation by dams for the conterminous U.S. In this project, I am using GIS to calculate river fragmentation measures, including the distance to the nearest dam in the upstream and downstream direction from each river reach (sections of river between tributary junctions), the total number of dams between a stream and its terminal outlet (i.e., ocean or Great Lake), and the total length of connected river reaches between dams.


Dams (red) in the conterminous U.S.

I am using this information to address two objectives: 1) generate a descriptive account of the distribution and regional differences in river fragmentation for the conterminous U.S., and 2) assess the impacts of river fragmentation on fish communities in Michigan, Wisconsin, and Minnesota using an indicator species analysis (i.e., a statistical approach that identifies representative species of particular habitat conditions). Ultimately, these river fragmentation measures will allow me to analyze rivers from a fish's perspective, explore habitat connectivity, and identify the species that are most sensitive to fragmentation by dams. It will also aid in the conservation and management of rivers and inform dam removal scenarios by providing data on the connectivity gained from the removal of a particular dam.

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Aquatic Landscape Ecology Lab

Using GIS to Evaluate Range Shifts among Michigan Bird Communities


W. Porter

From plants to polar bears, climate change has the potential to alter the distribution of our Earth's flora and fauna. Although every species responds differently to climate change, many species may be forced to alter their distribution because of changing environments. Birds are an excellent group for studying large-scale species responses to climate change; they are abundant, have diverse life histories, and occupy a variety of habitats.

My research incorporates GIS technology to investigate if statewide ranges of Michigan bird species have shifted in recent decades. To test for this, I am analyzing occurrence records from the Michigan Breeding Bird Atlas, a comprehensive dataset collected during two statewide surveys from 1983-1988 and 2002-2008. With more than one million records for over 200 breeding bird species, the mapping tools and database management in GIS are well suited for managing and analyzing this extensive data set. I am combining GIS with statistical software to analyze key range dynamics for each bird species. Spatial analysis tools in GIS help to quantify changes in the center of statewide distributions and shifts in statewide range boundaries. The computational power of GIS supports a distribution analysis for thousands of locations across the state, which identifies areas of localized colonization and extinction.

If I find evidence of systematic shifts in bird ranges, this suggests that fundamental ecological changes, like climate change, may be driving that pattern. Evaluating the influence of climate change is complex; however, the large temporal and fine spatial scales of my research may provide compelling results for advancing our understanding of how birds may be responding to climate change. With this understanding, we hope to help inform conservation strategies in the face of changing climate conditions.

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Quantitative Wildlife Lab

Interview with Alumna
Katie Kahl
The Nature Conservancy


J. Simoes

Spotlight: *What are you up to?*
Katie: I am a Climate Change Ecologist for The Nature Conservancy's (TNC) Great Lakes Project, based in Lansing.

Spotlight: *What kind of projects are you involved in?*
Katie: I work with TNC staff and our partners throughout the Great Lakes basin to help develop climate adaptation strategies for the conservation work we do. I also translate what we mean by "climate adaptation" through case studies that highlight our work in forest, coastal, agricultural, and urban environments (and impacts on policy and partnership building).

Spotlight: *Is your focus research, communication, or conservation action? Who are the consumers of your work?*
Katie: All of those things. I translate and communicate how conservation decisions are being made using climate change science for conservation practitioners and policy makers.

The Nature Conservancy
Protecting nature. Preserving life.™

Spotlight: *With whom do you collaborate?*
Katie: I work with a team of scientists who have expertise in aquatic ecology, forestry, landscape ecology, climate science, avian ecology, agriculture, and GIS. We also employ policy, philanthropy, marketing, and communications staff to collaborate with partners at universities, state and federal government agencies, and other NGOs.

Spotlight: *What classes at MSU best prepared you for your current position?*
Katie: I think the diversity of coursework I took best prepared me, because my job relies so heavily on understanding the interconnectedness of different systems. My previous work experience with local government, land conservancies, and state and federal agencies helps too.

Spotlight: *What do you wish you had done at MSU that you didn't have the chance to do that would help you in your job?*
Katie: I wish I had taken more environmental policy and economics courses.

Spotlight: *Is there anything in the Lansing area you can recommend to new students to do before they leave?*
Katie: Sesquicentennial Swirl at the Dairy Store, a State Capitol tour, tailgating, and getting out of the East Lansing area to see more of this beautiful state! Saugatuck Dunes State Park and Sleeping Bear Dunes are must-sees.

Spotlight: *What advice do you have for FW students who might want to follow in your professional footsteps?*
Katie: Find the people who do the job you want. Ask them what their work is like and what experience you should get to prepare you for the field. Ask yourself again if that is really the job you want. Repeat.

Spotlight: *Any Spartan stuff around your house?*
Katie: We fly a big Spartan flag on MSU home game days!

Spotlight: *What else can you tell us about the transition between school life and work life?*
Katie: Natural resource and conservation decisions are made with or without your research contribution, so try to get your work into the hands of those who can use it to help them make more informed decisions.

-Interview conducted by Lissy Goralnik

Quantifying the bycatch of Saginaw Bay's commercial trap net fishery

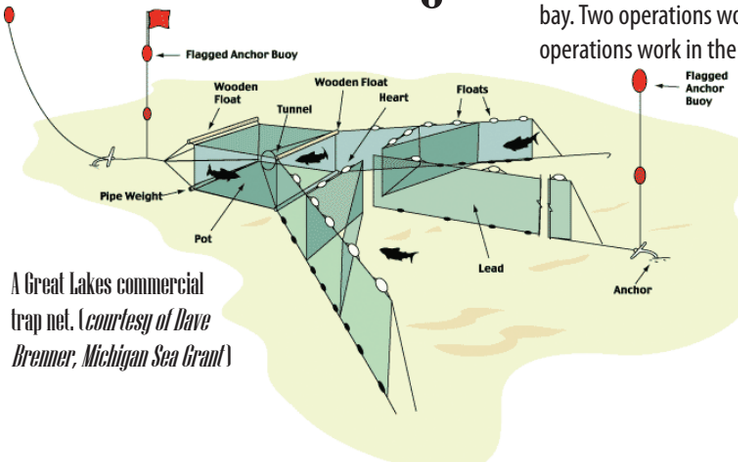
by Eric MacMillan

Commercial trap net boat in Saginaw Bay, Lake Huron. (*E. MacMillan*)

After months of anticipation and preparation, I was finally out on a boat with commercial trap net fishermen on Saginaw Bay, Lake Huron. While nervous because I did not know what to expect from the fishermen, I was also excited because I knew my research had the potential to significantly impact the policy and management of Saginaw Bay's fishery resources. I was studying the bycatch, or unintended catch, of the commercial fishery, specifically the bycatch of walleye (*Sander vitreus*) and lake trout (*Salvelinus namaycush*), species commercial fishers are not currently allowed to harvest. Walleye and lake trout are ecologically and economically important native species of Saginaw Bay and they support a robust recreational fishery. Stakeholders and managers have raised concerns that the commercial trap nets incidentally catch, and potentially kill, thousands of pounds of these bycatch species each fishing season. So, my task was to determine the magnitude of bycatch in the fishery by observing trap net harvests aboard commercial vessels. Bycatch in Saginaw Bay's trap net fishery had never been quantified prior to this study. But, I wondered as I climbed on the boat, how were the commercial fishermen going to react? This is a contentious issue in Saginaw Bay, often involving conflicting views from various stakeholders. Would the fishermen view me as an objective observer?

While my research goal was to analyze the potential biological

The Saginaw Bay commerical fishery:



A Great Lakes commercial trap net. (*courtesy of Dave Brenner, Michigan Sea Grant*)

Commercial fishermen in Saginaw Bay operate in both the shallow water inner (depth < 10 m) and deep water outer (20 m < depth < 40 m) bay. Two operations work in the outer bay and six operations work in the inner bay. The main target species in the inner bay fishery include lake whitefish (*Coregonus clupeaformis*) (in colder months), yellow perch (*Perca flavescens*), and channel catfish (*Ictalurus punctatus*). The outer bay fishery targets lake whitefish. In 2010, the Saginaw Bay trap net fishery harvested nearly 550,000 kg of fish. Of that total harvest, over 400,000 kg was lake whitefish with the majority being harvested in the outer bay (291,000 kg).

Saginaw Bay commercial fishermen primarily use trap nets for harvest (**see diagram**). Trap nets are a passive form of entrapment gear in which fish encounter vertical mesh netting, swim to deeper water along this netting, and eventually get funneled into the pot of the net. Ideally, fish are kept alive until harvest when caught in a trap net, though this is not always the case.

implications of commercial fishery bycatch in Saginaw Bay, I was also curious about any socioeconomic implications that bycatch might have for the stakeholders. Is it fair to the commercial and recreational fishers to throw overboard thousands of pounds of a valuable resource? Is it a good use of the resource and is it good for the system? The commercial fishermen were not shy to voice their opinion on this issue. Their collective complaint was that the walleye and lake trout bycatch and bycatch mortality was a waste of a valuable resource. They want to keep those fish as a food and income source, instead of wasting them by throwing them overboard. Then again, recreational fishers, the other principle stakeholder group concerned with Saginaw Bay's fishery resources, do not like to see their target species (i.e., walleye or lake trout) thrown overboard dead by another fishery. They would rather catch those fish themselves. Though I interacted with both user groups and could not help but be sympathetic to both claims, I also recognized that these considerations were not the primary goal of my research. I was in charge of the numbers. My task was to identify the magnitude of the problem. Then, fisheries managers can determine what, if any, mitigating solutions are appropriate.


E. MacMillan

With the trap net fishery, most fish caught are kept alive until the commercial fishermen retrieve their nets. This keeps their product fresh and, ideally, allows for the live release of bycaught species.

I spent May through August 2010 onboard Saginaw Bay commercial fishing vessels counting fish. The fishermen voluntarily allowed me on their boats and were a bountiful source of information regarding trap net fishing and the commercial fishing industry in the Great Lakes. I was onboard a fishing boat whenever the weather allowed the fishermen

What is bycatch?

Bycatch is the unintended catch or harvest of organisms not directly targeted by fishing. Bycatch has been implicated in the decline of several important marine and freshwater fish stocks, compromising economic gain from those stocks and ecological stability in those systems. Common bycatch in marine fisheries includes charismatic fauna such as sharks, turtles, and seabirds, in addition to other commercially or recreationally important fish species such as red snapper (*Lutjanus campechanus*), Atlantic croaker (*Micropogonias undulates*), and redfish (*Sebastes* spp.). In marine systems, scientists estimate that upwards of 40% of the global catch is bycatch.

Bycatch in Great Lakes commercial fisheries is not well understood, but may have significant ecological and economic implications. Common bycatch species in the Michigan licensed waters of Lake Huron include ecologically and economically important lake trout (*Salvelinus namaycush*) and walleye (*Sander vitreus*).


E. MacMillan

Walleye discarded overboard from a trap net boat. Some are discarded dead, some immediately swim away, and others float on the surface where they are subject to numerous stressors including sea gull predation and high air and water temperatures.

Eric recorded counts of all bycaught fish using a mounted video camera (below) and also took counts of floating fish while onboard the fishing vessels (right).


E. MacMillan

to fish, and while onboard, I had a video camera set up to record all fish that were caught during each trap net lift. Additionally, I counted the number of fish that were floating after being thrown overboard. These floating fish are one source of bycatch mortality. However, there were other sources of mortality that I was not able to account for such as sinking fish or fish that may be injured, swim away, and die a few hours or days later. Therefore, my data provides a baseline estimate of total mortality, but does not represent an exhaustive count. In addition to counting bycatch, I wanted to learn what factors most influence bycatch and bycatch mortality so that managers may be able to devise mitigation strategies. Therefore, I recorded environmental and fishing practice data such as air and water temperature, the length of time the nets were in the water between each time the fishermen checked them (soak time), and net depth.

Fisheries bycatch can have significant biological implications. Critical bycatch can occur when the species incidentally caught may be threatened or endangered (e.g., bluefin tuna). Unsustainable bycatch has also been documented when a population declines as a result of bycatch. Alternatively, bycatch may be sustainable when levels of bycatch do not affect stock sizes. I observed approximately 20 percent of the commercial trap net fishing effort in Saginaw Bay during summer 2010 and observed over 8,500 walleye and over 3,600 lake trout caught. While this may seem like a lot of fish, these levels may be sustainable. My estimates will soon be implemented into Michigan Department of Natural Resources stock assessment models to determine how, or if, bycatch and bycatch mortality is affecting walleye stock sizes.

Managers now have baseline estimates of how much bycatch and bycatch mortality occurs as a result of the Saginaw Bay commercial trap net fishery. Additionally, my research indicates several factors, including soak time and surface water temperature, that strongly dictate survival of incidentally caught fish. Fishers and fisheries managers may be able to use this information to reduce bycatch mortality.

Though my results provide important insights into the issue, many questions still remain. Is bycatch and bycatch mortality of this magnitude sustainable? How does bycatch fluctuate from year to year and what are bycatch rates in other months of the year? Furthermore, whether or not fish populations are impacted from bycatch mortality of this magnitude, is it wasteful to throw thousands of pounds of fish overboard? Given the potential biological and socioeconomic implications of fisheries bycatch, a greater understanding of the magnitude of bycatch and bycatch mortality in the Saginaw Bay trap net fishery should be a management priority. Many marine and Great Lakes fisheries maintain long-term monitoring programs in order to determine the magnitude of bycatch on an annual basis. A similar program might be useful in Saginaw Bay.

In the end, my fears about spending time aboard the commercial fishing boats were unfounded. The fishermen were kind and also generous with their knowledge and experiences. They clearly enjoyed their time on the water and even taught me a few tricks of the trade. In the end, we were interested in the same goal: a well-managed fishery. The health of Saginaw Bay's fish populations and ecosystem are important to them and to their livelihood. Hopefully, this research will help to maintain the resource in a way that serves everyone's needs.


B. Roth

Eric MacMillan

Eric completed his M.S. in July 2011 under Dr. Brian Roth. Selected for the 2012 Dean John A. Knauss Marine Policy Fellowship Program, Eric is currently completing his fellowship in Washington, D.C. with NOAA Fisheries, Office of Habitat Conservation.

Contact Eric at: emacmill@gmail.com

The Department of Fisheries & Wildlife offers four annual fellowships to graduate students. The 2011-2012 awards are:

Robert C. Ball and Betty A. Ball Fisheries and Wildlife Fellowship

Dr. Robert C. Ball, a well-known and respected limnologist and the Director of the Institute for Water Research, was one of the first members of the faculty in the Department of Fisheries & Wildlife. Dr. Ball and his wife, Mrs. Betty A. Ball, established this fellowship as a means of providing deserving graduate students with the opportunity to study fisheries, limnology, or water research.

DEPARTMENT FELLOWSHIPS

Visit
fw.msu.edu/fellowships.htm
to apply.

Applications due
January 20, 2012.

Name: Seth Herbst

Graduate Program: fisheries and wildlife, Ph.D.

Advisor: Dr. Dan Hayes

Graduate Research: My graduate work will focus on the population and recruitment dynamics of walleye populations in Mullett, Burt, Pickerel, and Crooked Lakes located in the northern Lower Peninsula. These lakes are sometimes collectively called the Inland Waterway, and are interconnected by the Crooked and Indian Rivers. These lakes have both sport angling harvest and Native American (tribal) harvest, which jointly lead to potential overexploitation. I will be working closely with the Michigan Department of Natural Resources (DNR) in my research to help provide an understanding of movement and recruitment dynamics throughout the system to allow for more sustainable management of these fisheries. Moreover, these lakes have undergone substantial limnological change over time and are experiencing the added stress of zebra mussels and potentially round goby.

Motivation to Apply: My interest in fisheries began during summer fishing trips with my grandparents in Wisconsin. Spending time fishing with family on the shores of small rivers and streams made me realize that the fishing experience was about more than just catching fish - it also built closer family relationships. The fishing experiences I had as a kid created an awareness of the value of our fisheries and the importance of protecting and managing fish populations to sustain fishing opportunities for future generations. My passion for fisheries led to my B.S. degree in fisheries and watershed science and biology from the University of Wisconsin-Stevens Point, my M.S. degree in natural resources-aquatic ecology and watershed science from the University of Vermont, and my graduate work here at MSU.


R. MacWilliams

Benefits of the Fellowship: I am fortunate to be the recipient of the Robert C. Ball and Betty A. Ball Fisheries and Wildlife Fellowship for 2011-2012, which is a generous source of funding given to an incoming graduate student committed to the study of fisheries, limnology, or water quality.

The Janice Lee Fenske Excellence in Fisheries Management Fellowship

This fellowship honors the legacy of Jan Fenske, the first female Fisheries Biologist in the history of the Michigan DNR's Fisheries Division. It is designed to facilitate interactions for a FW graduate student with professionals from a sponsoring agency through the implementation of a fisheries research or management project of mutual interest to the agency and student. For more information, please visit: **fenskefellow.wordpress.com**.

Name: Chiara Zuccarino-Crowe

Graduate program: fisheries and wildlife, M.S./Ph.D., EEBB, and ESPP

Advisor: Dr. Bill Taylor

Fenske mentor: Dr. Charles Krueger, Science Director, Great Lakes Fishery Commission (GLFC)

Graduate research: I am evaluating the effects of Lake Superior's lake trout refuges on populations of different species in the native fish community.

Motivation to apply: Interdisciplinary collaboration is the key to a holistic approach to conservation. The GLFC presents an ideal learning opportunity for how to coordinate fishery management across multiple jurisdictions in an ecologically and socially complex system.

Fenske project: Efficacy of Aquatic Protected Areas (APAs) in the Great Lakes for fisheries management and implications for future research. Objectives included: (1) Evaluation of an existing GLFC report on Great Lakes APAs to provide recommendations on related research priorities, (2) Assistance with data management preparations for an acoustic telemetry project involving a lake trout refuge on Lake Huron, and (3) Development of a practical understanding of the functions of an international fishery commission through interactions with the GLFC Secretariat and attendance at GLFC meetings.

Lessons learned: The most notable lesson I learned was the importance of maintaining collegial relationships. The camaraderie shown amongst GLFC

members and partners appears to be integral to the committee members' abilities to fulfill their roles and make progress towards building consensus in basin-wide fishery research and management programs.

Application beyond fellowship: Through the GLFC, I have been exposed to many learning opportunities and have made contacts that will continue to be a valuable resource in both my graduate research and my future career.

Name: Corey Higley

Graduate program: fisheries and wildlife, M.S.

Advisor: Dr. Dan Hayes

Fenske mentor: Nicholas Popoff, Tribal Unit Coordinator, Michigan Department of Natural Resources

Graduate research: The effect of temperature on mayfly growth and emergence.

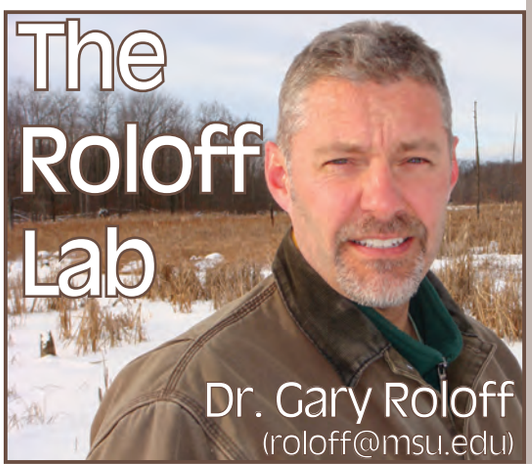
Motivation to apply: Fisheries resources in the Great Lakes support a multi-billion dollar commercial and sport fishing industry, sustain culturally important traditional subsistence activities, and provide a myriad of ecosystem services. Finding the delicate balance between these values in a complex political atmosphere is an imperative and often difficult task for managers. Management is further complicated by the fact that social, political, and economic boundaries for these resources frequently differ, making a system of shared, cooperative management increasingly important.

Fenske project: The 2007 Inland Consent Decree seeks to provide long term protection and stability of inland fishery resources under the separate jurisdictions of the State of Michigan and five sovereign tribal governments. This Fenske Fellowship, through the State of Michigan, will provide the Executive Council of the 2007 Inland Consent Decree with a comprehensive report summarizing the implementation of the Decree.

Lessons learned: Fishery management is more than just managing fish; successful management also relies heavily on managing the resource users themselves, and effective communication is absolutely essential. This fellowship has taught me how important perceptions and expectations of management are to stakeholders, and demonstrated the value of strong communication strategies in co-managed systems.

Application beyond fellowship: I have always appreciated the role of science in effective policy making. In co-managed systems, cooperation in scientific research, independent of policy, can be an easy and effective tool to increase efficiency and improve a knowledge base. My work with Nick and Dan has taught me that these tensions can be overcome, and a healthy partnership between state and tribal governments is possible.

The Roloff Lab



Being a faculty member in the Department of Fisheries & Wildlife at MSU has been and continues to be one of the most rewarding experiences of my career. I came to MSU over six years ago after working for more than a decade as a wildlife biologist with the forest products industry. My experiences with the industry undoubtedly shaped my research interests, teaching philosophy, and expectations for graduate students. I have broad interests in wildlife-habitat relationships, particularly how human activities influence the distribution and population dynamics of vertebrate wildlife. This theme underscores the work in our lab. We are working on projects exploring how forest management influences wildlife. We are developing techniques for excluding black bears from managed bee hives, using a Geographic Information System to more accurately portray wildlife resource selection in radio telemetry studies, understanding mongoose population ecology in Puerto Rico, and studying how snowshoe hare populations respond to historic land use and climate change in Michigan. *Welcome to the Roloff lab!*

Dan Linden is a Ph.D. candidate who completed a Master's degree at MSU with Rique Campa, during which he modeled habitat potential for Canada lynx in Michigan. He received a B.S. in wildlife biology and management from the University of Rhode Island. His dissertation research examined the role of tree retention as habitat for birds in timber harvest units of the Pacific Northwest. Part of his research involved monitoring cavity nests of woodpeckers using a custom-built infrared camera system to determine relationships between snag retention practices and reproductive success. His research interests include the application of hierarchical modeling and Bayesian inference to landscape ecology and biodiversity conservation.

Contact Dan at: **lindend1@msu.edu**

Bob Montgomery is a Ph.D. candidate who holds a Master's degree from the University of Washington and a B.S. from the University of Minnesota. His research strives to determine how organisms adjust their decision-making in response to abiotic and biotic factors, anthropogenic disturbance, and individual condition. Bob develops quantitative assessments of landscape structure to model the habitat and resource selection of a variety of species including whales, wolves, moose, elk, and seals. His work has been published in numerous journals including Environmental Management, Endangered Species Research, and the Journal of Wildlife Management.

Contact Bob at: **montg164@msu.edu**

Clint Otto is a Ph.D. candidate studying the effect of timber harvesting on Michigan wildlife. The primary goal of his research is to determine the effectiveness of retaining structural elements, such as live-trees and coarse woody debris, for conserving amphibians and songbirds in harvested forests. Clint's research will evaluate and improve the Michigan Department of Natural Resources current structural retention guidelines for state forests. He received a B.S. from the University of Wisconsin-Stevens Point and a M.S. from Towson University in biology. Clint's research interests include population ecology and demographic estimation of non-game species.

Contact Clint at: **ottoclin@msu.edu**

Tammy Otto is a M.S. student who is developing techniques to minimize conflicts between black bears and bee keepers in Michigan. Her project goals include the development of a portable bear exclusion fence and an outreach program for bee keepers dealing with problem black bears. She received her B.S. degree from the University of Wisconsin-Stevens Point, where she double majored in biology and art. She has worked for the Maryland Department of Natural Resources, the National Aquarium in Baltimore, and the United States Geological Survey. Much of her professional experience involves avian husbandry, including work with the whooping crane.

Contact Tammy at: **ottot@msu.edu**

Rachael Thames is a new M.S. student who completed her B.S. in fisheries and wildlife at MSU with an emphasis on wildlife ecology and management. Her interests include mammalian and amphibian ecology, forest ecology, and the impacts of human disturbance on wildlife populations and communities. Rachael's research explores the effect of coarse woody debris removals on salamander population dynamics in harvested forests in northern Michigan. Additionally, she uses experimental field enclosures to observe the role of repeated sampling disturbances on salamander movement and behavior.

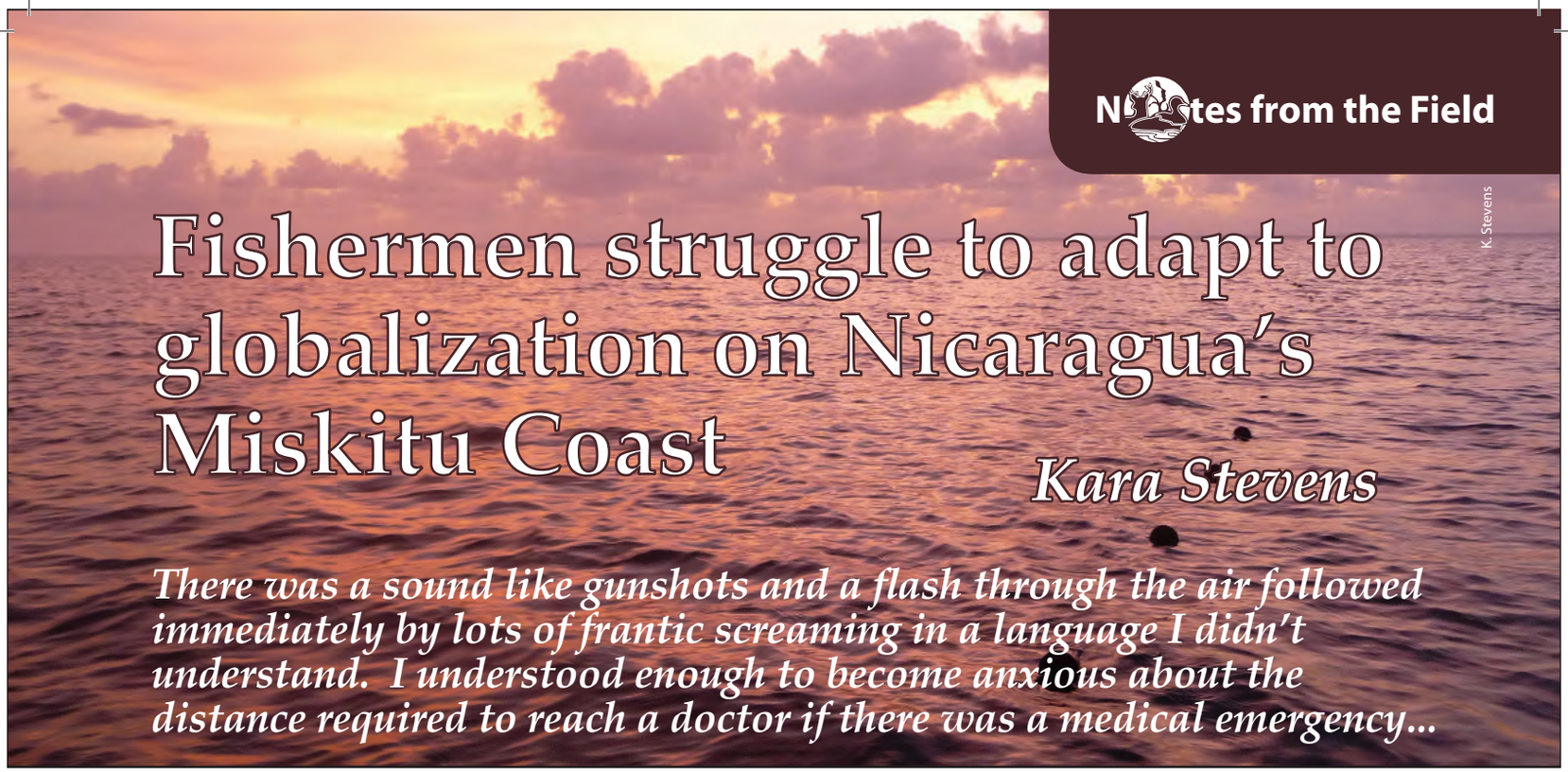
Contact Rachael at: **thamesra@msu.edu**

Incoming Students:

Tim McBride, Western gray squirrels and timber management

Diana Guzmán-Colón, Mongoose ecology in Puerto Rico

David Burt, Snowshoe hare occupancy in Michigan



Fishermen struggle to adapt to globalization on Nicaragua's Miskitu Coast

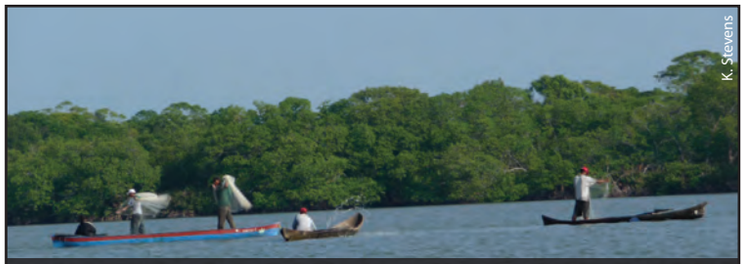
Kara Stevens

There was a sound like gunshots and a flash through the air followed immediately by lots of frantic screaming in a language I didn't understand. I understood enough to become anxious about the distance required to reach a doctor if there was a medical emergency...

It turned out some kids kicked a soccer ball that caused the collision of two electrical wires, which emitted a spark that ignited a palm-thatch roof of someone's home. In the intense dry weather on Nicaragua's Atlantic Coast, flames quickly set alight the dried palm leaves. Luckily for the homeowners, the entire community was outside enjoying the sunny Sunday afternoon. It was extinguished quickly with buckets of water and there were no injuries or major damage. Unfortunately, there are greater problems facing Nicaraguan fishing communities that cannot be solved so easily.

I was sitting on Ernesto's porch getting ready to resume my interview. The accident with the electrical line had interrupted us as I was asking him about how he sells his fish. Just a typical day of research on Nicaragua's Atlantic Coast. Ernesto is an artisanal fisherman in Raitipura, one of many small communities on the edge of Pearl Lagoon. I am conducting a series of interviews with fishermen to identify fishing practices that might promote the sustainable management of the lagoon, which is threatened by recent development and overfishing.

A young Miskitu fisherman perches on the edge of the dugout canoe to control his main sail as he heads across the lagoon.



Fishermen congregate on the mangrove edge to catch shrimp with cast nets.

Artisanal fishermen are small-scale, primarily subsistence harvesters. In Pearl Lagoon, their use of relatively destructive gill nets, as well as their catch and release behavior, have a direct impact on the sustainability of the fishery, so I am interested in first understanding how often they use these techniques. As recent road construction connects this previously remote area to new markets, fishermen's practices and communal norms are shifting. Some fishermen have altered their seasonal gear restrictions and size limits to meet new demands introduced by the road, though not all fishermen are responding in the same ways. The factors influencing these changes in individual behavior are the subject of my research. I am looking at how a fisherman's economic status, social network, and catch rate affect changes in his behavior.

Artisanal fishermen generally use low-technology traditional methods for fishing, and thus use less fuel, destroy less habitat, and harvest less bycatch. However, globally artisanal fishermen harvest an equal number

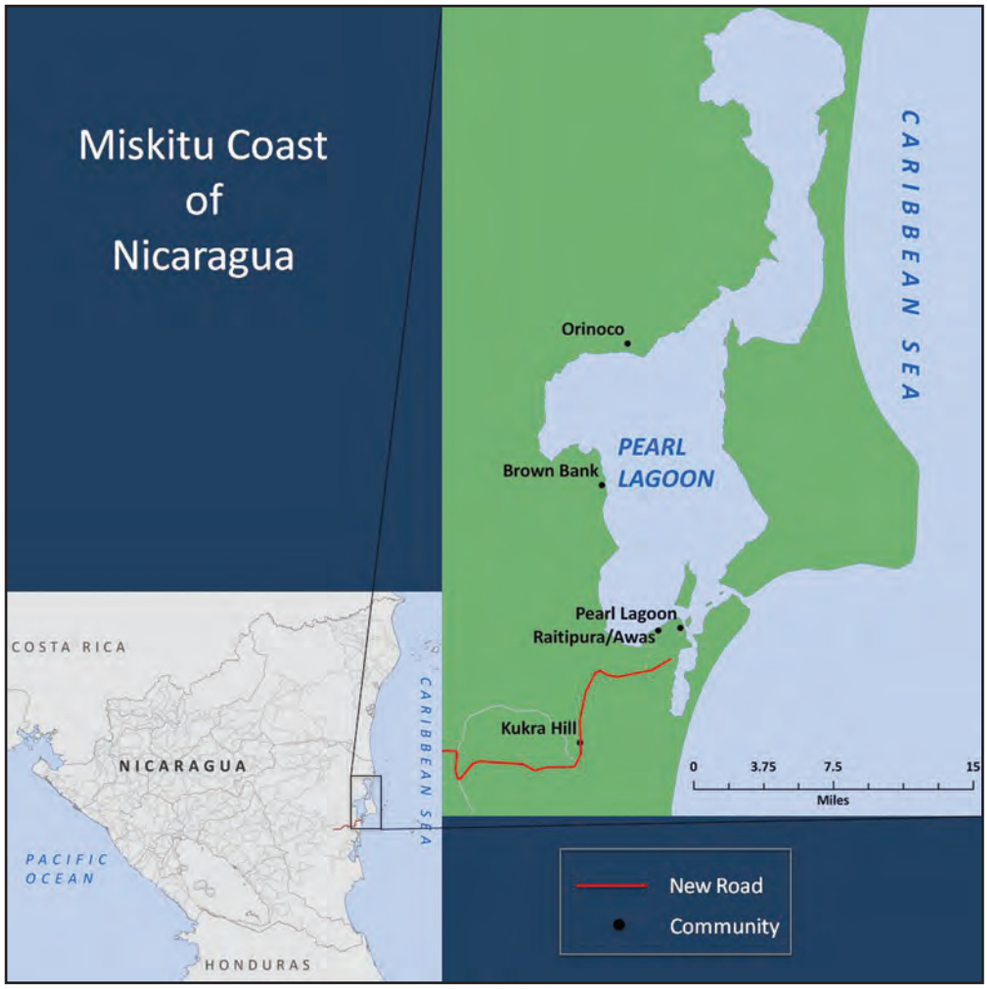
of fish to the large-scale industrial operations. While artisanal fishermen have a potentially large impact on fishery sustainability and are therefore a critical part of coastal fishery management, their activities are poorly monitored because they are numerous and geographically dispersed. Because a big part of fisheries management is managing human behavior, perhaps a bigger part than even managing fish populations, only when we understand why an individual fisherman engages in particular extractive practices can we attempt to influence how, where, and when he does so.

Ernesto earns an income by catching catfish, weakfish, snook, and jack with various gear types, which he sells to a local middleman for 50–75 cents (USD) a pound. His fish are increasingly sent out to distant markets, mainly the United States and Spain. With almost no central government oversight, fishing practices have been controlled by restrictions in tightly knit communities that have been in place for generations. This type of management is being challenged now as new buyers come from the western part of the country for blue crab, shrimp, and fish.

Interestingly, Pearl Lagoon's blue crab is sent to the east coast of the U.S., not far from the Chesapeake Bay, which historically was the most productive blue crab fishery in the world. In the short term, fishermen in Pearl Lagoon are benefiting from the competitive prices and numerous buyers, but they face potential long-term declines in fishery production due to unrestrained harvest. Communities have been struggling to adapt to these rapid changes and to cope with an ongoing decline in fish abundance over the last decade.

If Ernesto does not make enough income from fishing, he has few other options for supporting his family. While road development facilitates the movement of people living in remote areas, the introduction of new markets can have both positive and negative outcomes. Understanding the impact of connecting remote areas via road is the purpose of the large project (in which my research is embedded): "Globalization and the Connection of Remote Communities," led by Professors Dan Kramer and Gerald Urquhart (*National Science Foundation, Coupled Human and Natural Systems #0815966*).

A type of snook locals call 'big bone' captured in a gill net is destined for the market.



Kara Stevens

Kara Stevens is a Ph.D. student in the Department of Fisheries & Wildlife at MSU. She studies community-based fisheries management in Nicaragua and is interested in working on conservation in the midst of social and environmental change.

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Tackling the decline in Recreational Fishing

Call it an addiction. Call it an obsession. Call it whatever you want. As kids, we wanted nothing more than to be outside fishing. We spent countless hours rigging tackle, exploring shorelines, and casting toward spots that were sure to hold the next *big fish*. This love for fishing gave us a deep appreciation for natural places and ultimately steered us towards careers in fisheries.

Research shows that fewer people are spending time outdoors. This means fewer kids get the opportunity to know that same joy we had on the water when we were young. We recognize our passion for fishing and other outdoor activities did not happen by accident. Important figures in our lives took the time to introduce us to the sport of fishing and teach us the importance of conservation.

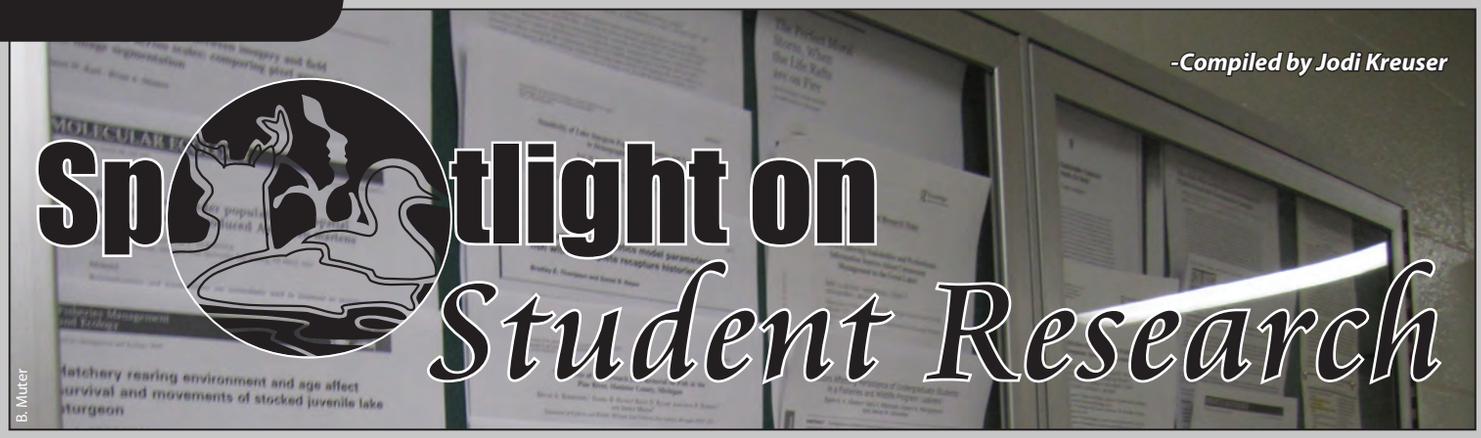
Mentors can be integral in breaking down barriers that might otherwise deter youth from fishing, camping, hunting, hiking, and other outdoor activities. Because a lack of knowledge about these activities is often one of the barriers to participation, we organized an event with the Capital Region Big Brothers Big Sisters (BBBS) to teach local youths and their mentors some introductory fishing skills. Other important collaborators included Project F.I.S.H. (Friends Involved in Sportfishing Heritage - an MSU affiliated program) and the Mid-Michigan Steelheaders (a local chapter of the Michigan Steelhead and Salmon Fisherman's Association). The event was generously supported by the Youth Education and Stewardship Legacy Fund, an endowment administered by the MSU Department of Fisheries & Wildlife.

The Capital Region BBBS invited participants who were interested in learning to build their own fishing lures. In March 2011, 15 youths and their mentors (i.e., "Littles" and "Bigs") met at MSU for the workshop. We kicked things off with a pizza party, which allowed us to spend time with the participants, learn their names, and get them excited about the day. Lunch was followed by an ice-breaking event where each participant was given either the head or tail of a Michigan fish and asked to find the volunteer holding the other half of his or her fish. The teams then identified their fish and shared information with the whole group about each fish's characteristics.

Once the Bigs and Littles had a better understanding of fish they can catch in Michigan, we walked them through the process of building their own in-line spinners and crawler harnesses, which are versatile lures that can be used to catch many different fish. The participants caught on quickly to the process of lure-building and decorated their lures with colorful beads, tubing, and stickers. We shared advice about what colors or style of lures might work best in different fishing conditions, which was a nice opportunity to help participants connect their new skill with fishing more generally. We also talked with the participants about the collective responsibility of sportsmen and women to protect and conserve our natural resources for future generations.

As lure builders ourselves, we know the gratification of catching fish with handmade lures and we hoped to convey this feeling to the participants. Although no fish were caught that day, ***Continued on page 23***

A workshop participant proudly displays a new lure (*top of page*). Volunteer Jim Bedford instructs participants on the finer arts of lure building (*left*). Participants learn that lure building requires focus and creativity (*right*).



Spotlight on Student Research

-Compiled by Jodi Kreuser

Check out the brag board in the basement of the Natural Resources Building to see recent publications from our students, faculty, and staff.

Lissy Goralnik published "Embracing the learning paradigm to foster systems thinking" with G. Habron and L. Thorp in the International Journal of Sustainability in Higher Education. This paper discusses an undergraduate specialization in sustainability linked to the pedagogy of teaching and learning that might be applicable for other universities in support of the UN Education for Sustainable Development effort.

Dan Linden published "Modeling habitat potential for Canada lynx in Michigan" with Rique Campa, Gary Roloff, Dean Beyer, and Kelly Millenbah in the Wildlife Society Bulletin. This paper illustrates how habitat modeling can assist conservation efforts for a federally listed species.

Abigail Lynch published "Forging new perspectives of fisheries science and management" in the July 2011 issue of Fisheries on her 2009-2010 Fenske Fellowship.

Clint Otto published "Using multiple methods to assess detection probabilities of forest-floor wildlife" with Gary Roloff in the Journal of Wildlife Management. This paper demonstrates the utility of power analyses for exploring study design tradeoffs in research and monitoring programs that estimate species occupancy across space and time.

Clint Otto published "Comparing cover object and leaf litter surveys for detecting red-backed salamanders, *Plethodon cinereus*" with Gary Roloff in the Journal of Herpetology. This paper highlights the importance of accounting for imperfect detection when sampling cryptic species such as terrestrial salamanders.

Nathan Snow published "Characteristics of road-kill locations of San Clemente Island foxes" with W. F. Andelt and N. P. Gould in the Wildlife Society Bulletin. This manuscript identifies where hot-spots of road-kills occur and highlights new options for reducing fox-vehicle collisions.

Nathan Snow published "Effects of roads on survival of San Clemente Island foxes" with W. F. Andelt, T. R. Stanley, J. R. Resnik, and L. Munson in the Journal of Wildlife Management. This manuscript shows that road-kills are reducing survival of island foxes, yet the foxes are not responding to the increased threat.

Nathan Snow published "A field evaluation of a trap for invasive American bullfrogs" with G. W. Witmer in Pacific Conservation Biology. This manuscript shows the effectiveness of a new tool for removing invasive bullfrogs. Invasive bullfrogs are implicated in reducing native amphibians throughout the world.

Kara Stevens published "Large mammals surviving conflict in the eastern forests of Afghanistan" with colleagues from the Wildlife Conservation Society in Oryx. This paper highlights the resilience of vulnerable species after decades of war. The study detected a new species for Afghanistan, the common palm civet, which constitutes a range extension for this species.

Kara Stevens published "Examining complexities of forest cover change during armed conflict on Nicaragua's Atlantic Coast" with Lindsay Campbell, Dan Kramer, Jerry Urquhart, and Jiaguo Qi in Biodiversity and Conservation. This study used remote sensing to demonstrate that forest cover increased as Nicaragua's civil war intensified. This has interesting implications for post-conflict conservation intervention.

Mao-Ning Tuanmu and **Wei Liu** published an article entitled "Temporal transferability of wildlife habitat models: implications for habitat monitoring" with Andrés Viña, Gary Roloff, Zhiyun Ouyang, Hemin Zhang, and Jianguo Liu in the August 2011 issue of the Journal of Biogeography. This article reports an assessment of the effects of predictor variables on the ability of habitat models to characterize wildlife habitat beyond the modeled time periods. It also provides guidance for habitat monitoring through the integration of high-temporal-resolution remotely sensed imagery and modeling.

7th Annual

Graduate Student Research Symposium

Friday, February 24, 2012

Learn about the diverse research being conducted by graduate students in the Department of Fisheries & Wildlife.

Student Talks:
9 am to 5 pm

Keynote Address: **5 pm**
Dr. Zeb Hogan, University of Nevada-Reno, National Geographic Emerging Explorer

To register, please visit:
http://fw.msu.edu/~gso/gsosymp/

Continued from page 21 the participants glowed as they showed off their favorite customized lures. They left with a tackle box full of their own handmade lures and an invitation to the Dr. Bill Earl Youth Fishing Program.

Spearheaded by the Mid-Michigan Steelheaders with support from the MSU Department of Fisheries & Wildlife and many other groups, the Dr. Bill Earl Youth Fishing Program also strived to introduce kids from the Lansing area to the sport of fishing. Three different events were held during the first three weeks of May, each at a different location in the greater Lansing area. The events were organized so that students visited three different learning stations: tackle rigging, casting, and regulations/etiquette. Each event culminated with a chance for participants to put their new knowledge, plus a brand new rod and reel (provided free of charge), into action.

We hope the experience the Bigs and Littles shared building lures will lead to even more memorable experiences on the water. By partnering with BBBS, Project F.I.S.H., and the Mid-Michigan Steelheaders, we believe both mentors and mentees gained the confidence to get out and explore Michigan's lakes and streams together.

The authors thank John Hesse for his contributions to this article.

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Quantitative Fisheries Center

FW HOROSCOPES

Sorceress Siitari reveals all...

Aquarius *(Jan 20–Feb 18)*: Granted a teaching assistantship, this will be the year for you to work on the virtues of compassion and patience. You can't use leghold traps to control the undergrads, at least not until the IACUC forms are processed.

Pisces *(Feb 19–Mar 20)*: Just like the fishermen, you know that the sea is dangerous and the storm terrible, but neither you nor they have found this sufficient reason to stay ashore. Unlike you, however, the fishermen know how to work their GPS.

Aries *(Mar 21–Apr 20)*: After endless hours in the lab, broken relationships, and compromised health due to a vitamin D deficiency, you'll be rewarded with the knowledge that a robot has been invented to pipette with far less error and intermittent crying.

Taurus *(Apr 21–May 20)*: Take time to invest in yourself in the coming year. Challenge yourself to practice introspection, as it will clarify your path toward spiritual enlightenment. And while you're doing that, grade some papers.

Gemini *(May 21–Jun 20)*: The duality of your character makes it impossible for you to decide if what you are feeling in your heart is love or the residual effects of that electroshocking accident.

Cancer *(Jun 21–Jul 21)*: The only thing your stakeholder groups will agree on this year is increasing the bag limit for know-it-all graduate students.

Leo *(Jul 22–Aug 21)*: Despite the lack of employment in your field, your education remains relevant as optimal foraging theory comes in to play while you're collecting recyclables after football games.

Virgo *(Aug 22–Sep 21)*: Rachel Carson challenged mankind "to demonstrate our maturity and mastery, not of nature, but of ourselves." You could start by putting on some pants.

Libra *(Sep 22–Oct 22)*: This year promises good luck in love. You and your match will have uncanny compatibility, rooted in a shared obsession for ornithology. Thank goodness, because no one else wants to hear your detailed theories on the phylogeny of little brown birds.

Scorpio *(Oct 23–Nov 21)*: Venus will be in the seventh house this March. Unluckily for you, this cosmic configuration really interferes with telemetry equipment.

Sagittarius *(Nov 22–Dec 20)*: Even your most conservative models predict the collapse of civilization as we know it. Of course, you'll never be able to personally verify the accuracy of your assertions because you'll still be inside scripting R code.

Capricorn *(Dec 21–Jan 19)*: Attention to detail has never been a priority for you. The stars just want to point out that your lunch is dangerously close to your necropsy gloves.

-conjured by Kiira Siitari

Cory's Corny Corner

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FW SPOTLIGHT |

GUIDE TO GRAD SCHOOL: *Advice from the Field*

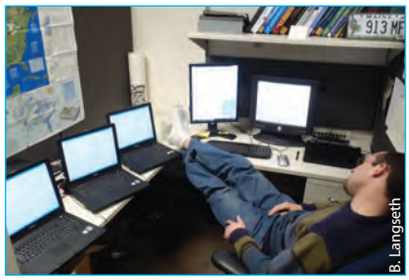
Always look UP.

...and DOWN.

Find *music* in everything.

Speak softly, but carry INTIMIDATING sampling gear.

Avoid *amorous* amphibians.



Enjoy some quality time with your analyses.

Compete with the best of 'em.

Be a *prima donna.*

Remember labmates are life savers.

Love your study species.

Take a moment to **celebrate!**