

SP TLIGHT

MSU Fisheries & Wildlife
Spring 2014

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

A Buck in the Muck

Wetlands and White-Tailed Deer



Muting the Debate on Mute Swans

GWIS: Engaging and Empowering Women Scientists

One Fish, Two Fish, Where Fish for Whitefish?

ALSO INSIDE: Pattullo Award Winning Literary Works: The Metallic Predator and The Rockaways, Freshwater Electrofishing, Interning for the U.S. Fish and Wildlife Service, & MORE!

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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13 Natural Resources Building
East Lansing, MI 48824
www.fw.msu.edu

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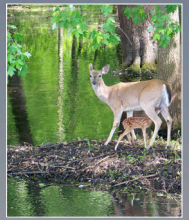
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**Interested in being a part of SPOTLIGHT?
Contact Lisa Peterson (peter710@msu.edu) to submit an article or join a committee!**

Stephanie Longstaff snaps a picture of the rising sun over water.

Stephanie Longstaff's cover photo of a doe and her fawn was chosen by popular vote in a voluntary poll of Department of Fisheries & Wildlife faculty, staff, and students.



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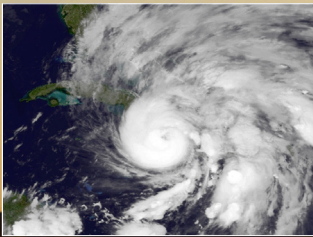
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Letter from Dr. Mike Jones

Wow! Another issue of SPOTLIGHT is ready to hit the streets. With this issue – the 10th – our graduate students have reached double figures for what is undoubtedly our leading instrument for showcasing what’s great about Fisheries and Wildlife at MSU. I may be like a broken record (how many readers still understand this simile, I wonder?), but I can’t resist saying, once again, how much we (my FW faculty colleagues and I) appreciate the terrific work of the SPOTLIGHT team to put this magazine together each year. This year those thanks begin with Coordinator Lisa Peterson and Design Directors Amber Goguen and Marielle Peschiera, but extend to the many other contributors and editors that team up to produce a magazine that I, for one, always look forward to reading – and showing off!

So what’s in store for our readers this time around? On the research front, you’ll be treated to the ideal FW “trifecta” of a wildlife project, a human dimensions project, and a fisheries project. Stephanie Longstaff writes about the importance of Michigan’s wetlands for white-tailed deer, and vice-versa – the subject of her Masters project, which she completed last spring. Corey Jager tells us about her Masters project on an ethical analysis of the issue surrounding mute swans in Michigan – an invasive species for which control tactics stir up many passions. And Abby Lynch outlines her Ph.D. research on commercial whitefish fisheries in the Great Lakes and the risks to their sustainability that might be posed by anticipated changes in Michigan’s future climate.

You’ll learn about the many fellowship award-winners among our students and will be treated to the Ambrose Pattullo award-winning essays by Nathan Snow and Nick Skaff. Nathan writes about “metallic predators”, aka automobiles, highlighting the dangers and costs of wildlife-vehicle collisions. Nick tells a fictional story of the aftermath of Hurricane Sandy in a New York City public housing area, as an object lesson on environmental justice and the social consequences of climate change.

During my tenure as Department Chair I have

developed a much greater appreciation than I had previously for the challenges faced by women in STEM (Science, Technology, Engineering and Mathematics) disciplines. Many of these challenges are very subtle, and those of us (males particularly) who feel we might be enlightened about gender issues, have a lot to learn about this. So I am especially pleased that this issue of SPOTLIGHT also profiles the Graduate Women in Science (GWIS) chapter at MSU. Diana Guzmán Colón writes about her experience with GWIS and particularly the “Girl’s Math and Science Day”, where female mentors in STEM fields meet with middle and high school girls to serve as role models for an academic career in STEM.

Also in this issue is an interview with former Ph.D. student Aaron Berger, who has been suffering in New Caledonia for the past couple of years, and reflects on his experience here at MSU; a short essay by Madison Hall on her experience as an intern with the Fish and Wildlife Service’s Division of International Conservation in Washington, D.C. last summer; a “shocking” article by Joe Nohner – check it out; and a profile of Weiming Li’s

research group, who most of us don’t get to bump into very often, since they work out of “FW North” in Giltner Hall.

This will likely be my last opportunity to write this column for SPOTLIGHT magazine. My term as Chairperson of Fisheries and Wildlife will end in June, and I’m looking forward to returning to the regular faculty ranks in FW. Engagement with our graduate students has truly been one of the most rewarding aspects of being the department chair, and I will miss these interactions. All of the rest of us – faculty, staff, alumni, and partners – should be very grateful for the terrific culture of our graduate program, which is responsible for the success of this magazine, our annual GSO symposium, and the exceptionally high caliber of our graduate students as a whole. My sincere thanks to our graduate students, and to the rest of you – *enjoy another great issue of SPOTLIGHT.*



Spotlight on Student Research & Awards

Awards

David Burt and **Amber Goguen** received the Joseph G. Schotthoefer Memorial Student Award from the Safari Club International Michigan Involvement Committee.

Jessica Caton received the Academic Achievement Graduate Assistantship award from the MSU Graduate School for being a first generation scientist and the Massive Open Online Course Development Fellowship from the Gates Foundation Grant.

Andrew Crosby and **Marta Jarzyna** received the Graduate School Research Enhancement Award.

Hope Draheim received the Painton Award for the Cooper's Ornithological Society for best paper published in the Condor in the past four years.

Amber Goguen received a National Science Foundation Graduate Research Fellowship.

Marissa Hammond received the 2013-2014 Janice Lee Fenske Excellence in Fisheries Management Fellowship from the FW Department.

Marta Jarzyna received the Graduate Student Organization travel grant.

Yang Li received the 2013 Great Lakes Fishery Commission travel award.

Abigail Lynch received the Paul W. Rodgers Scholarship from the International Association for Great Lakes Research; the J. Frances Allen Scholarship, honorable mention for the John E. Skinner Memorial Fund Award, and 1st place in the student writing contest from the American Fisheries Society; a Coupled Human and Natural Systems Fellowship from the International Network of Research on Coupled Human and Natural Systems; a Graduate Student Study Abroad Fellowship from MSU; and a Disciplinary Leadership Award from the MSU Council of Graduate Students.

Shylene Mata received a Ford Foundation Pre-Doctoral Fellowship to support her graduate study over the next three years. She also received two grants from the MSU Center for Latin American and Caribbean Studies (the CLACS and Tinker Scholarships) to support her summer 2013 fieldwork.

Joe Nohner received the Clark Hubbs Associate Research Award from the American Institute of Fishery Research Biologists in order to moderate a Muskellunge and Northern Pike symposium, present his research on Largemouth Bass, and attend the American Fisheries Society Annual Conference.

Julia Novak received the Ph.D. Study Abroad Fellowship from the Office of Study Abroad for spring and summer of 2013, and she received the Foreign Language and Area Studies Fellowship for Tamil study from the US Department of Education for the 2012-2013 academic year.

Pablo Reeb received the Neal A. Jorgenson Travel Award to attend the International Plant and Animal Genome XXI San Diego Conference and received the best presentation award at the 4th Ibero-American Biometric Meeting.

Nathan Snow received the Ambrose Pattullo Fund for Environmental Issues Graduate Fellowship in Literary Works for his article "The Metallic Predator" and a USFWS fellowship to attend the 2013 Conservation Careers Symposium.

Bryan Stevens received a travel award from the Biometrics Working Group of The Wildlife Society for attending the 2012 national meeting of The Wildlife Society.

Kara Stevens received a Dissertation Completion Fellowship from the MSU College of Agriculture and Natural Resources for the fall semester 2013.

Research

Nathan Snow published "Capture success higher near roads for San Clemente Island foxes" in the Wildlife Society Bulletin with Dr. William Andelt. This article provides further evidence that roads are a focal feature of the landscape affecting the threatened San Clemente Island fox.

Abigail Lynch published "The Four Fs of Fish: Communicating the Public Value of Fish and Fisheries" in Fisheries with Bill Taylor. This piece highlights the need for fisheries scientists to communicate the importance of fisheries to audiences that do not regularly interact with fish or fisheries.

Bryan Stevens published "Wildlife mortality from infrastructure collisions: statistical modeling of count data from carcass surveys" in Ecology with Brian Dennis. This paper used stochastic population models to develop a likelihood-based approach for modeling wildlife-infrastructure collision count data. **Bryan Stevens** also published "Mapping sage-grouse fence-collision risk: spatially explicit models for targeting conservation implementation" in the Wildlife Society Bulletin with David Naugle, Brian Dennis, Jack Connelly, Tim Griffiths, and Kerry Reese. This paper developed spatially explicit models of sage-grouse fence-collision risk in breeding habitats across 10 of 11 U.S. states inhabited by the species.

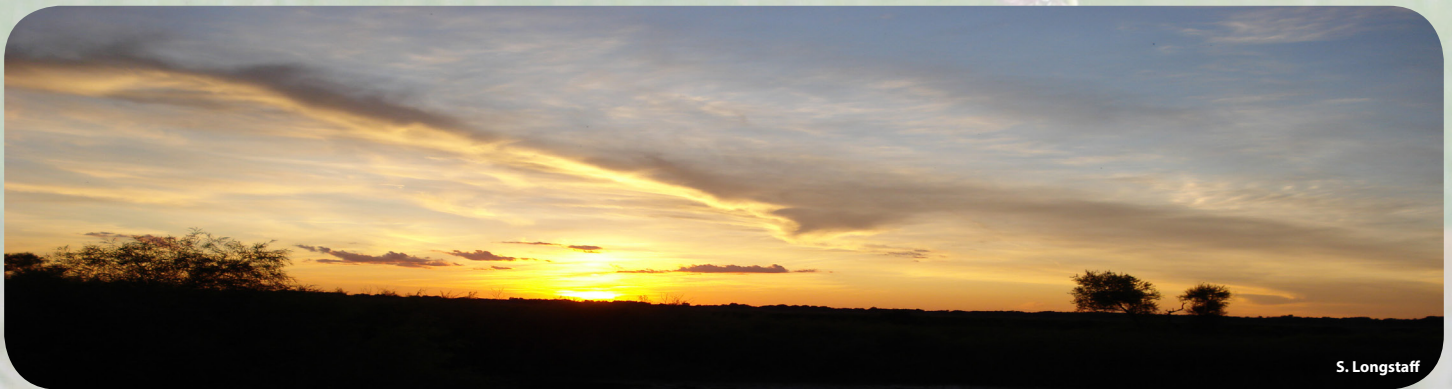
Pablo Reeb published "Evaluating statistical analysis models for RNA sequencing experiments" in Frontiers in Genetics with Juan Pedro Steibel. This paper proposes how to generate datasets that can help researchers decide between competing analysis models or assess the reliability of results obtained with a designated analysis program in the context of high-dimensional RNA sequencing data.

A Buck in the Muck

Wetlands and White-Tailed Deer

By Stephanie Longstaff

As the sun starts to peak up over the horizon and the fog begins to melt away, the shapes of the marshes and wetlands seem to come alive as the dawn light reflects and dances off the water. Not much is moving this time of morning. But as light cascades over the pools of water and across stretches of plants dancing in the soft, summer breeze, ducks begin to paddle out into the marsh and start munching on breakfast. Mallards, with their dark green heads shimmering gold in the early morning sun, are the most common species. Small pied-billed grebes that stay close to shore are dotted throughout the wetlands, and great blue herons seem to be standing watch over their kingdom. As the sun rises higher in the sky a pair of snowy white trumpeter swans cautiously glide out to the center of the marsh with six of their young in tow. It's not only ducks and waterbirds in the wetlands, deer can also be seen dotted throughout the shallow areas grabbing a bite to eat and moseying along.



S. Longstaff

In Michigan, white-tailed deer are so common that folks hardly notice them standing on the side of the road eating or running through a corn field. Some might even consider them pesky because of how destructive they can be to crops and gardens. But it hasn't always been this way. Before European settlement of the Midwest, deer were almost rare with estimates as low as 2 deer per km². Today, it is not uncommon to find densities of 10 deer per km². This is great news for hunters but can be a challenge for natural resource managers. The greater the deer numbers, the more they eat; and the more deer eat, the more ecosystems are changed. Deer are primarily forest dwelling animals but will venture out into croplands, grasslands, and wetlands for feeding, hiding from predators, and temperature regulation. With increased deer numbers, farmers started complaining about high levels of crop damage and forests seem to be almost empty of plants. This concerns

natural resource managers because with less forest growth comes less food for other wildlife, fewer flowers, fewer species of plants, and fewer species of wildlife using forested areas. When further research was conducted to find out where deer in Michigan were spending their time, it was discovered that deer mainly use forest but were also frequently using wetlands.

If high densities of deer are eating and changing our forests for the worse, how might they be impacting wetlands? Wetlands are important wildlife habitat providing valuable stopping points for migrating waterfowl to rest and refuel for their journeys and for resident species to raise young in the summer time. Michigan has already lost many natural wetlands to agriculture and urban development. The remaining wetlands are critically important wildlife habitat but also at high risk to being overused by deer. Therefore, it is important to protect the ones that remain.

White-tailed deer habitat in wetlands

For our first research objective we looked at the landscape to see how it provided resources for white-tailed deer survival. We used aerial photographs to help depict the landscape of SNWR and the immediate surrounding area. Using these photos, we classified every colored feature on the image as a kind of plant cover, soil type, or as open water. We then used a habitat-suitability model based on past research on deer-vegetation use to determine what characteristics in the landscape were important for white-tailed deer. By combining our constructed land cover map and the deer habitat-suitability index model, we generated a map that showed the degree of good habitat for white-tailed deer throughout SNWR and its surrounding area. This is represented on the map below with colors indicating the percent suitable habitat for deer.

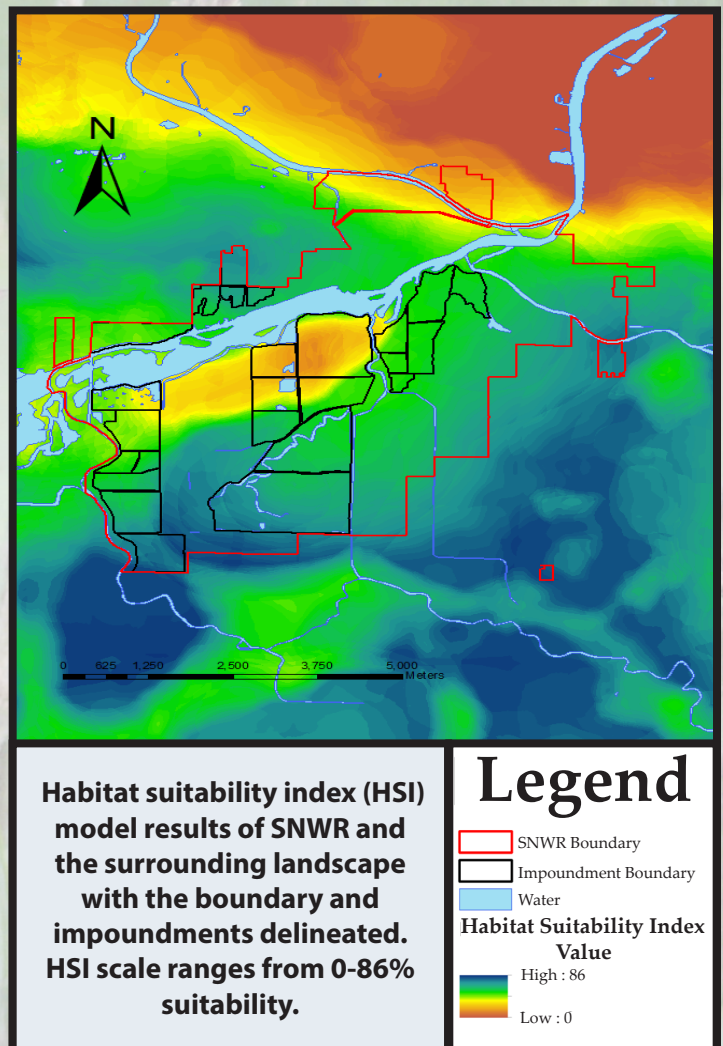


S. Longstaff

Because of these concerns, we wanted to determine 1) how well wetlands provide habitat for white-tailed deer and 2) whether deer are using wetlands as habitat as much as some research suggested. Our study was conducted at the Shiawassee National Wildlife Refuge (SNWR). SNWR is located just outside of the city of Saginaw in the Lower Peninsula of Michigan. This area was chosen because managers were seeing wetland plant damage caused by what they thought to be deer grazing. This was a concern because SNWR provides wetland habitat for migratory and residential waterfowl. During fall and spring bird migrations, over 270 different species of birds are seen using SNWR, with thousands of birds using the refuge during peak migration. The refuge is specifically managed for migratory and wetland bird species and it is important for managers to adequately provide resources for these birds. To determine how deer may be impacting these management objectives we did a twofold study.



S. Longstaff



From our map we found that wetlands provided highly suitable habitat for deer. We found that over 76% of the refuge provided suitable habitat for white-tailed deer that ranged in quality from 53% to 86%. Overall, the majority of SNWR appears to provide excellent habitat for deer. This could mean that wetland-dominated areas outside of SNWR could also provide excellent deer habitat.



S. Longstaff

they manage the landscape, but that deer are not completely bad news for wetland bird species. However, since the landscape provides highly suitable land for white-tailed deer, if populations of deer are not managed they could grow even larger and have similar effects on wetlands as they have in forests.

SNWR invites hunters during a modified hunting season (a few selected weekends) every fall to help manage the deer herd so that the refuge can continue to provide habitat for wetland birds. Without deer population control, we could potentially see wetlands with fewer plants, fewer flowers, and fewer ducks swimming about. So the next time you're out wandering through the wetlands looking for birds, you might want to keep an eye out for a big buck or deer trails and start planning your fall deer-hunting adventure.



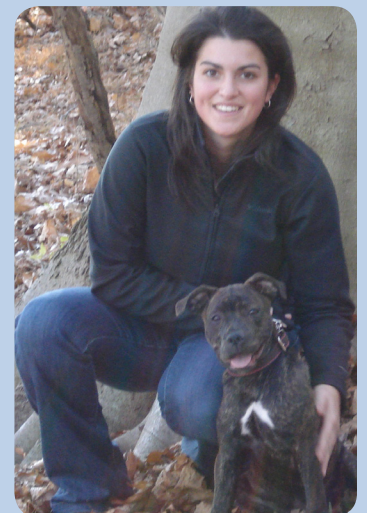
S. Longstaff

White-tailed deer use of wetlands

To address our second objective, we conducted a driving survey around the property of SNWR at dawn or just before dark where we counted the number of deer and birds within the wetlands. We compared presence/absence of deer to presence/absence of birds in the wetlands to see if deer were deterring wetland birds from using those same areas.

We found that not only were deer present at SNWR, but that they were found in wetlands on a daily basis. When we compared deer presence/absence to bird presence/absence in wetlands, we found that deer didn't appear to affect how the wetland birds used the same areas. This is probably because deer may use wetlands for cover to move towards their preferred foods in nearby crop fields. Our results provide good and bad news for the managers at SNWR. The results suggest that managers need to be careful in how

Stephanie Longstaff was a master's student working under Dr. Rique Campa, and graduated in May 2013. Her research focused on how deer herbivory was affecting wetland ecology. She is currently a Ph.D. candidate at North Dakota State University, where her research focuses on wetland ecology.



Interview with Alumnus

Aaron Berger

Ph.D., 2011



Spotlight: *Tell me a bit about what you did when you were at MSU.*

Aaron: I was at MSU

for about 3.5 years as a doctoral student in the Quantitative Fisheries Center with main advisors Drs. Mike Jones and Jim Bence. My dissertation work focused on modeling techniques useful for fisheries management decision-making. My projects specifically looked at estimating stock status, population trends, and indicators for comparing alternative management strategies for Lake Erie percid (walleye and yellow perch) populations.

Spotlight: *What are you doing now?*

Aaron: I am working in Noumea, New Caledonia for the Secretariat of the Pacific Community or SPC. Here I share responsibilities for providing model-based management advice on stock (conservation) and fishery (economics) sustainability issues for the main tuna and billfish species in the West and Central Pacific Ocean.

Spotlight: *What motivated you to apply?*

Aaron: In all honesty, it was a mix of the idea of trying something different and getting international experience. The more I learned about the location, the position, and the organization, the more enthusiastic I became. After finding out that big names such as Carl Walters and Ray Hilborn had spent time there early in their careers, I figured it must be a good place to grow and further develop experiences in applied international fisheries science and management.

Spotlight: *Tell me about adapting to New Caledonia?*

Aaron: The primary spoken language in New Caledonia is French followed by the native languages of the indigenous Kanak tribes. Lucky for me, as I didn't speak a lick of French upon arrival and now only know enough to get by, English is spoken at work. Despite the language barrier and no winter, adjusting to living in the sub-tropical south Pacific has been pretty smooth.

Spotlight: *What at MSU do you think best prepared you for your position now?*

Aaron: The good people within and associates of the Quantitative Fisheries Center, hands down.

Spotlight: *What is a typical "day in the life" for you?*

Aaron: Most days at work are spent coding and running models, writing white papers and management briefs, or preparing presentations to give to non-technical audiences. After a long day in the office I just cross the street to the beach and access the 24,000 km² UNESCO world heritage site lagoon and 1,500 km long barrier reef.

Spotlight: *Do you have any advice for FW students who might wish to follow in your professional footsteps?*

Aaron: My advice would be to get involved with the agency or authority that is in charge of managing the resource you are working on. This experience can provide very useful insights into how science can be used to inform 'on the ground' management, how management decisions are actually being made, and the types of information that managers are currently seeking from scientists. The ability to interact with, interpret, and respond to decision makers in terms of analytical solutions to problems/questions is a sought-after skill.

Spotlight: *Anything that you'd recommend as a MUST to students new to East Lansing?*

Aaron: A must, especially for a student new to the Big Ten, would be spending a brisk autumn day tailgating and taking in the big show - a Big Ten football game.

Spotlight: *Are there any other Spartan fans in New Caledonia?*

Aaron: Unfortunately, I'm pretty sure I am the only one. If asked, most New Caledonians would wonder if the Spartans were a new Australian rugby team. Rugby rules the roost down under.





Muting the Debate on Mute Swans

Integrating Ethics into Management Conversations

By Corey A. Jager

The Michigan Department of Natural Resources (DNR) recently implemented lethal population control strategies to address the perceived ecological and social threats mute swans pose within the state. However, these management policies triggered opposition from some stakeholders and resulted in a contentious public debate. On one hand, the rapidly expanding population of mute swans is considered detrimental to human communities and native species, such as the trumpeter swan. On the other hand, many stakeholders oppose control on the grounds that mute swans are intrinsically and aesthetically valuable. Each side exemplifies the differing notions of what constitutes healthy social and ecological systems and what intervention strategies are acceptable. The question arises: should we control mute swans in Michigan to protect people and native wildlife, or should we protect mute swans to preserve an aesthetically pleasing species? And if we are to control mute swans, should we employ lethal methods? The answers to these questions are complex and involve both scientific and ethical discussions.

In practice, management decisions are often guided by scientific information. This information helps us better understand elements

of the natural world by describing what species are present, what biological interactions are occurring, and how ecosystems influence and are influenced by human activities. Although science provides necessary information to aid resource management, science alone cannot tell us why we should or should not value native species, minimize human-wildlife conflicts, exploit resources, or improve ecosystem aesthetics. The answers to why we manage resources are guided by our values and ethics. Thus, management of natural resources is inherently based on a combination of scientific information and ethical values. The combination of science and ethics allows us to make fully-informed and ethically justified management actions. However, ethical discourse is often vacant from management discussions.

Ethical argument analysis is one tool for systematically bringing ethical dimensions into resource management decisions. This involves building and critiquing ethical arguments. These arguments then illuminate the things we value, why we value them, and inform us how we can respond logically to different, and often conflicting, sets of stakeholder values.

Most management decisions are based on reasons that justify a given action or belief. These

reasons form the foundation of arguments and provide the basis for determining which actions are appropriate. The Michigan DNR cites three reasons for managing mute swans: 1) they are aggressive toward humans; 2) they out-compete native wildlife; and 3) they destroy wetland habitat by uprooting aquatic vegetation. Let's use argument analysis to decompose the first reason into an ethical argument with two premises. For our first premise we provide empirical facts or descriptions about the way the world operates, which relies on some type of data or assumptions (i.e., Michigan mute swans are aggressive toward humans). For our second premise, we must state the ethical considerations that infer our values (i.e., we should protect human safety).

In order to reach a logical conclusion a connection between the empirical and ethical premises should exist to justify a desired action, and both premises should be recognizable in the conclusion. In this case, we conclude that mute swans should be controlled or removed to limit the threat they pose toward public safety.

The next step in argument analysis is to evaluate the empirical and ethical premises for truth, accuracy, and controversy. Controversy is often triggered by divergent values; however, truth and accuracy of premises are also frequent sources of contention. For instance, are mute swans really that aggressive? Most of what we know about mute swan aggression toward humans comes from anecdotal and circumstantial evidence. Are these stories persuasive enough to warrant the removal of swans from the landscape? How many stories

are enough, or should we work to collect more conclusive evidence to ground the empirical premise before we take action? Most people, if not all, will agree it is good to protect human safety. However, the resulting consequence of limiting such conflict — in this case the killing of mute swans — triggers the contention in this argument.

Argument analysis allows us to illuminate these areas of uncertainty and controversy and work systematically to address any weakness in our premises. Perhaps in the case above we can seek more scientifically grounded data on mute swan conflicts — where, why, and to who do they occur? Or, perhaps we can seek alternatives to lethal control that might reduce conflicts with

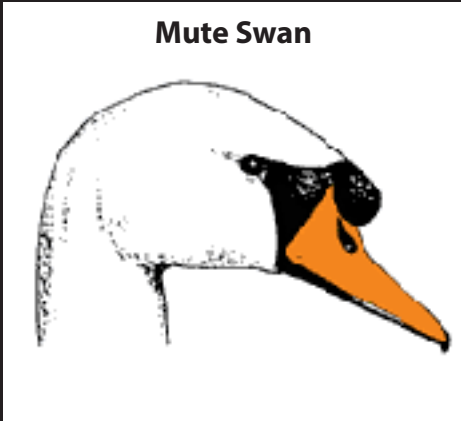
mute swans, such as educational campaigns about mute swan nesting behavior. Evaluating premises in this way allows us to identify and prioritize research needs and confirm that our management actions reflect the things we value, such as human safety. We can then reveal if those values align with



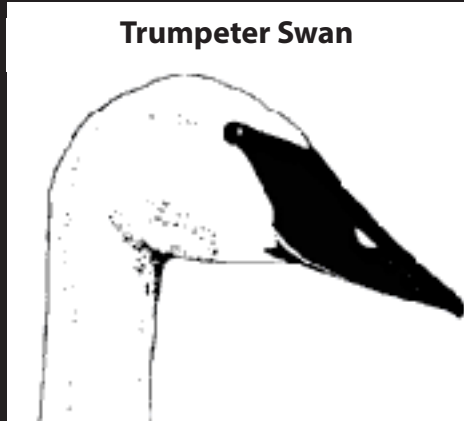
social and environmental research to confirm that our actions are justified. Moreover, this process can help us identify reasonable, logical, and ethically defensible approaches to address conservation issues.

The complexities of mute swan management are echoed throughout many resource management issues. Michigan's natural resource managers are faced with divergent societal values in a variety of arenas, including decisions over how to manage gray wolves,

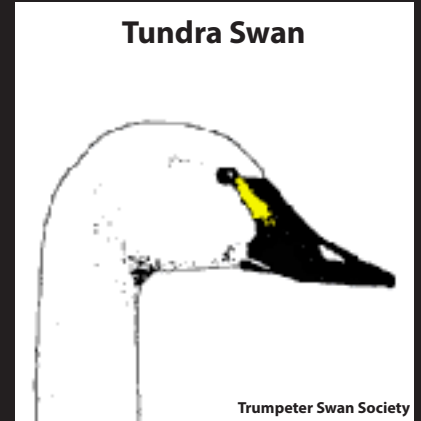
Mute Swan



Trumpeter Swan



Tundra Swan



Trumpeter Swan Society

Three swan species inhabit or migrate through Michigan: mute swans, trumpeter swans, and tundra swans. The trumpeter swan is native to Michigan and is currently listed as a state threatened species. Habitat loss and hunting nearly wiped out trumpeter swan populations in the early 1900s, but they have since recovered to a sustainable level. Tundra swans are also native to Michigan, but only migrate through the state in the spring and fall, with each stopover lasting about a month. Mute swans have now become more prevalent than native swan species with a population size estimated to be over 15,000 in Michigan. The rapid and widespread growth of the mute swan population resulted in their invasive species designation in North America, which removes them from federal protection by the Migratory Bird Treaty Act. This exclusion allows state wildlife agencies to manage populations as they deem necessary. Many states, including Michigan, have developed management plans to reduce or eradicate mute swans. Michigan's long term goal is to reduce the statewide mute swan population by ninety percent. This goal will primarily be achieved by culling and supplementary nest and egg destruction.

how to prevent Asian carp from entering the Great Lakes, and how to integrate biodiversity into land management plans. In many decisions we find that certain values become exclusively considered and exploited, such as the value of protecting native species over an invasive species. Luckily, argument analysis provides a more systematic and explicit means of identifying values and priorities. Ethical argument analysis clarifies scientifically and non-scientifically rooted concerns and allows us to tease out justified approaches to management. So, are we justified in our decision to control mute swans in Michigan even if some values are being overridden? This question highlights the fact that management of natural resources requires hard decisions about which values we prioritize.

There are many scientific models, methods, and theories to help guide resource management decisions. Rarely, however, do these ideas acknowledge the ethical dimensions of conservation actions. Thus, by explicitly

accounting for ethical dimensions in the management process, we have the opportunity to craft policy reflective of diverse stakeholder values in a justified fashion. By thoughtfully and systematically addressing the ethical dimensions of conservation discussions, we can work toward answering difficult questions facing resource managers, like whether or not and how we should control mute swans in Michigan.

Corey Jager is a 2013 master's graduate student who worked with Dr. Michael Nelson. Her research focused on the social and ethical dimensions of Michigan's mute swan management.



Contact Cory at: Cory_jager@yahoo.com

FW DEPARTMENTAL FELLOWSHIP AWARDS

Hal and Jean Glassen Conservation Medicine Fellowship

Hal and Jean Glassen were avid hunters who believed in the scientific management of wildlife. Lifelong conservationists, they supported research and programs aimed at habitat improvement, sustainable harvest through controlled hunting, and understanding the carrying capacity of land for wildlife. The purpose of this award is to recognize a student

ISIS KUCZAJ

committed to the study of Fish and Wildlife Disease Ecology and Conservation Medicine.



Graduate Program: Fisheries and Wildlife, EEBB; Ph.D.

Advisor: Dr. Jean Tsao

Graduate Research: Lyme disease ecology— understanding variation in vector behavior and how this affects disease risk.

Motivation to Apply: The Glassen Foundation is a wonderful organization that provides support for various aspects of conservation and hunter safety, and I met the criteria for applying and financial need.

Benefits of the Fellowship: This fellowship provided support for one semester, connected me with members of the Glassen foundation, and gave me the opportunity to present my research to them.

Dr. Howard A. Tanner Fisheries Excellence Fellowship

Dr. Howard Tanner is an alumnus of the Department of Fisheries & Wildlife earning his Ph.D. under the direction of Dr. Robert Ball – a well-respected limnologist. Dr. Tanner has served as the Chief of the Fisheries Division and Director of the Michigan DNR. He also served as the Director of Natural Resources for the College of Agriculture and Natural Resources at MSU. Dr. Howard Tanner has been a longtime supporter of Great Lakes water related issues and this fellowship recognizes students who are committed to fisheries research related to the Great Lakes, connecting waterways, or tributary streams.

ABIGAIL LYNCH

Graduate Program: Fisheries and Wildlife, EEBB, ESPP; Ph.D. **Advisor:** Dr. Bill Taylor

Graduate Research: Decision support for harvest management of Great Lakes lake whitefish for a changing climate.

Motivation to Apply: I was motivated to apply for this award because I am currently working with Dr. Tanner on a vignette entitled “Fisheries decision making: Advice from the introduction of Pacific salmonids into the Great Lakes” for the upcoming AFS publication *Future of Fisheries: Perspectives for Emerging Professionals*. Through this valuable mentoring experience, I have learned a great deal from Dr. Tanner about the evolution of fisheries management in the Great Lakes.

Benefits of the Fellowship: I am so honored to be a recipient of the 2013-2014 Tanner Fellowship. Particularly because I know Dr. Tanner, I am so grateful for this opportunity and hope my dissertation research honors his commitment to the resource. I will specifically use the fellowship to assist with funding the collection and dissemination of my Great Lakes fisheries research to the scientific, professional, and stakeholder communities.



BRANDON ARMSTRONG



Graduate Program: Fisheries and Wildlife; Ph.D.

Advisor: Dr. Cheryl Murphy

Graduate Research: Determining the sub-lethal effects of environmental contaminants on fish reproduction through the development of physiological-based computational models.

Motivation to Apply: I was motivated to apply for the Tanner fellowship because our current understanding of sub-lethal effects on populations is rudimentary, and I believe my research will help advance our knowledge in a significant way. These models will aid in the protection of fish populations by enhancing our understanding of persistent, bioaccumulative toxins found throughout the Great Lakes region.

Benefits of the Fellowship: This fellowship will provide support for leadership academy tuition, which will develop my skills of relaying the importance of understanding sub-lethal effects of contaminants on individuals and populations beyond the scientific community.

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.

LISA PETERSON

Graduate Program: Fisheries and Wildlife, M.S.

Advisor: Dr. Mike Jones

Fenske Mentor: Dr. John Dettmers, Senior Fishery Biologist, Great Lakes Fishery Commission

Motivation to Apply: To me, the most appealing thing about the Fenske fellowship was the opportunity to work on a project with an agency mentor. This was the type of experience I could not pass up. I knew I would get to pick apart the mind of my mentor, John, and get a taste of what working at an agency was like. Also, having a project that had to be useful to the GLFC seemed like a challenge that would be a great accomplishment.

Fenske Project: For my Fenske project I put together a structured decision making framework for decisions about dams. Barrier removal and modification has become a very important topic in the natural resource world. But the issue is full of conflicting objectives, such as restoring connectivity versus preventing lamprey spread. Managers need to think about many objectives and possible consequences when making decisions about barriers. The purpose of my framework is to make these issues more approachable and provide managers with a roadmap to coherent, transparent, and well-made decisions.

Lessons Learned: The Fenske project has opened up my eyes to the many hard choices natural resource managers are faced with, as well as the complications that come with barrier projects themselves. Also, getting the chance to work at the GLFC secretariat office in Ann Arbor was a wonderful opportunity for networking and getting an inside look at what the commission does.



Ambrose Pattullo Fund for Environmental Issues Graduate Fellowship for Literary Work

The purpose of this award is to recognize students who are interested in current environmental issues and who have written about these issues for possible publication in a literary outlet aimed at non-scientists, including the general public.

NATHAN SNOW

Graduate Program: Fisheries and Wildlife, EEBB; Ph.D.

Advisor: Dr. William Porter

Graduate Research: Reducing uncertainty in managing wildlife-vehicle collisions

Motivation to Apply: I was looking for a publishing outlet for a non-scientific paper. I came across this fellowship and realized this could provide the outlet and provide a monetary fellowship. I greatly appreciate being awarded this fellowship.

Name of Literary Piece: "The Metallic Predator." See pages 15-17.



NICHOLAS SKAFF

Graduate Program: Fisheries and Wildlife, ESPP; Ph.D. **Advisor:** Dr. Kendra Spence-Cheruvellil

Graduate Research: Landscape Ecology, Landscape Limnology

Motivation to Apply: I've been interested in creative writing and short story writing for a long time, and I've recently come to realize that it's a great way to disseminate ideas about environmental protection and social justice. Typical news stories can effectively facilitate change, but they often fail to make an emotional connection with the reader in the way a fictional story can. I decided to write and submit "The Rockaways" after reading about the horrible conditions in New York City public housing projects following Hurricane Sandy. I thought it was a dramatic and sad situation that more people should hear about. I really appreciate the FW Department's support and their willingness to foster nontraditional forms of environmental outreach and expression.

Name of Literary Piece: "The Rockaways." See pages 18-21.



THE METALLIC PREDATOR

By Nathan Snow

A flash of fearful eyes. I lock my brakes. Sounds of screeching rubber and a sickening smash reach my ears. My head pounds with adrenaline as I skid to a stop. Everything becomes still. I surprise myself by murmuring, "I think I am alive" from my near speechless lips. My eyes regain focus as if waking from a dream, and I register a fractured windshield. Beyond the spider-web of cracked glass I catch a glimpse of movement. "What is that?" Slowly I recognize the moving pieces: brown fur and mangled legs, thrashing about along the side of the road. "What just happened?" Then I realize, and my heart begins to sink.

Today, wildlife-vehicle collisions (WVCs) occur at unprecedented rates. The United States Federal Highway Administration estimates that 1 to 2 million WVCs occur every year with deer alone. Deer are involved in 3 out of 4 collisions that have insurance claims filed, but moose, bears, and many other terrestrial species are also frequently struck. Chances are, if you drive an automobile you have struck a wild animal, and you will again someday soon. You may strike a squirrel and barely notice, or you may strike a deer and wreck your car. According to the Insurance Institute for Highway Safety, only about 200 WVCs per year result in human fatality. We most often feel the damage from collisions in our wallets, with insurance claims averaging \$3,019 per collision. Overall, collisions with deer cost an estimated 1 billion dollars each year for motorists in the United States. In addition to economic costs, there are other negative aspects

of WVCs to consider. Automobiles kill and injure wildlife through vehement crashes. Many animals die instantly from the blunt-force trauma. However, many animals survive the initial impact only to die slowly from their injuries a few minutes, hours, or even days later. Even though an animal may run away after the initial strike its chances of survival are low.

I struck something. Some creature I never saw approaching. My mind provides a flash of memory.

Something smashed sidelong onto the hood of my car, and in an instant was gone again. Now it lies broken in a ditch, in deathly contrast to the otherwise tranquil forested land.

The deer is still clinging to life, but kicking less frequently now and breathing more laboriously. I realize this creature is slowly dying. "I hope the suffering ends soon," as heavy guilt sweeps over me. Then, in the next instant, the more pragmatic thoughts start to emerge in my mind. I notice the broken window and missing side mirror on my passenger door. "This is going to be expensive," I sigh.

The undeniable truth is that our society accepts WVCs as unfortunate but tolerable consequences of fast-paced, modern life. We rationalize that these collisions are not our fault and resolve that WVCs occur because of bad luck, because animals are senseless to the risk, or because animals are overabundant. This resolve has cleared our consciences for many years but not without a price. The price we are paying today is heaps of wrecked vehicles and rotting animal carcasses and, surprisingly, a lack of plans to stop the carnage.

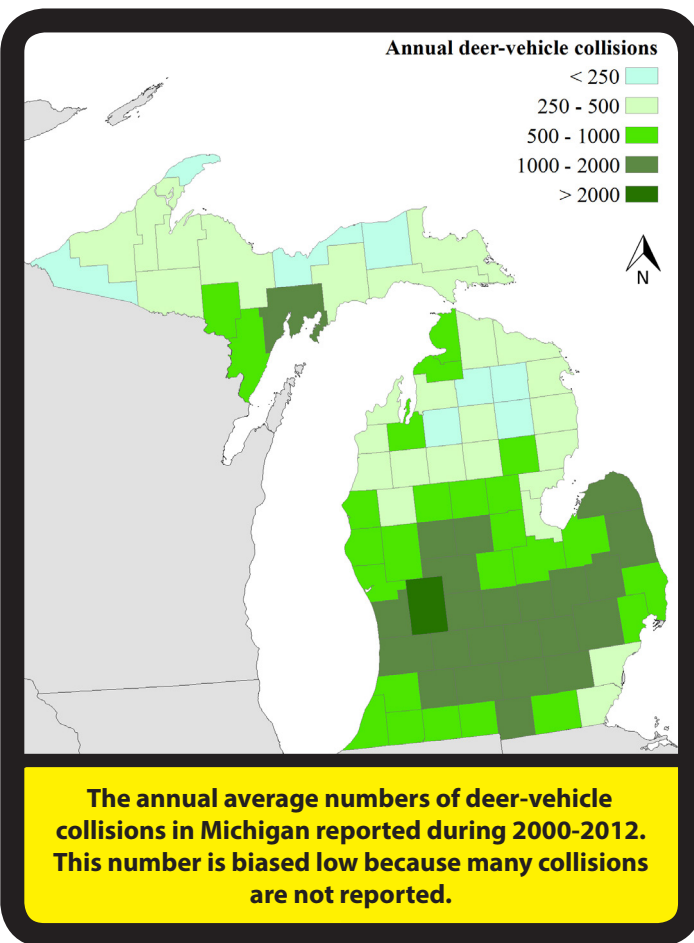


This young buck failed to cross a single lane of I-69 during the twilight hour of an early November evening. The driver left the scene without checking to see if the deer was dead or alive.

A WVC is a lose-lose situation desperate for a solution, yet we can't seem to reduce the wanton regularity of these events occurring. One reason may be the enormity of this multifaceted problem. Roads now extend to every corner of the United States, dividing wildlife habitat even in the most remote locations. Because of the broad spatial extent of these road networks, multiple species are affected. However, wildlife managers have limited abilities and funds to address the issue of WVCs. Instead, managers are constrained to indirect solutions when possible, such as increasing hunter-harvest quotas to reduce wildlife populations that will hopefully reduce the number of WVCs.

Passing motorists inch by inspecting the scene. Suddenly I feel embarrassed and ashamed, and I ignore them, not willing to acknowledge their uneasy stares. I wonder what they are thinking. "Do they have empathy, I wonder," or is it criticism?" Maybe they are considering themselves lucky that it wasn't them. Regardless, their stares are branding us (deer and me) as victims, but victims of what?

My travel mug of coffee is overturned and draining on the floor. My favorite radio program is still droning through the speakers. "What should I do first?" I wonder. "Inspect my car, call the police, or check the deer?" It becomes difficult to make any decisions as my mind



Modern (left) warning signs alert motorists to high risk moose-collision areas in Maine. Closely spaced reflective poles (right) create a solid line of reflected light for passing motorists, allowing easier detection of moose moving onto the road. (photo: N. Snow)



searches for explanations. "I was following the speed limit and was paying a reasonable amount of attention," I think. "Perhaps I should have been driving even slower; it is dawn." But I was late for work, not that it matters anymore. "What should I do now?"

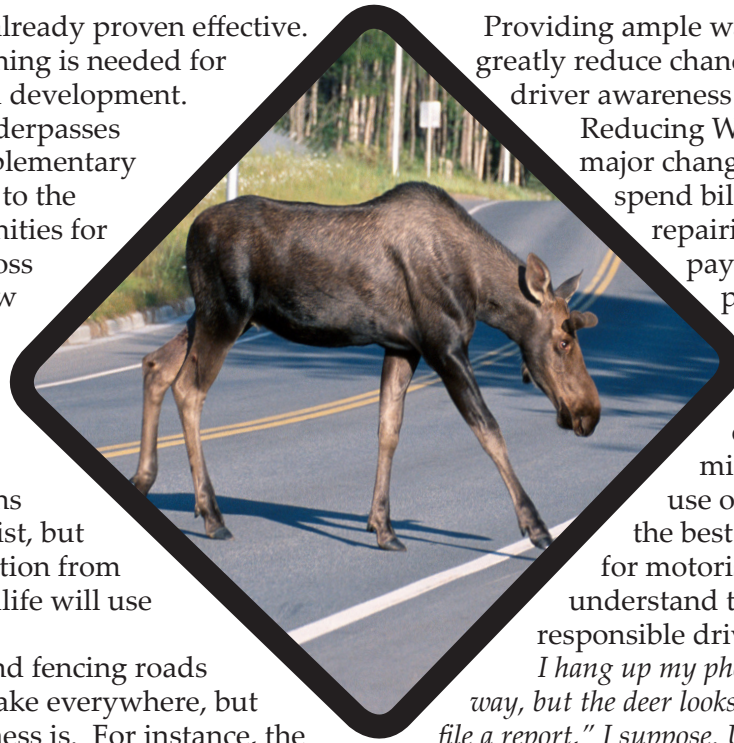
Many motorists are closely acquainted with white-tailed deer-vehicle collisions. More than one million deer-vehicle collisions are estimated to occur annually throughout the United States with many of these in the Midwest. Michigan's deer population has exploded since the 1950s corresponding with the abandonment of marginal agricultural land to shrub and woodlots. Today's remaining fallow and cultivated fields provide all-you-can-eat smorgasbords of food for deer and fragment landscapes in ways that provide excellent habitat for deer to thrive. Coincidentally, deer are less able to avoid automobiles because today's vehicles are more abundant, faster, and quieter than ever before.

Substantially more dangerous than hitting a deer is hitting a moose. Driving through the northern forests and broccoli fields of Maine yields an average of 700 moose-vehicle collisions per year, including 200 incidences of human injuries and an average of 3 fatalities. Adult moose are the largest land mammal in North America and can weigh over 1,000 pounds. Today, moose thrive on abundant seedlings that take root after forest clear-cutting and on nutritious broccoli fields. Moose traverse large expanses of land in search of food resources, often moving across busy highways along the way. Too often this search ends abruptly. A moose near the road is surprisingly hard for motorists to see because of their dark coloration and long legs that extend above the beam of headlights. Many motorists never see the moose until it is undercut by their front bumper.

Although WVCs can never be completely eliminated, reducing the frequency is possible and a

number of solutions have already proven effective. More wildlife-related planning is needed for both road construction and development. Wildlife crossings (e.g., underpasses and overpasses) with complementary fencing that direct animals to the crossings provide opportunities for wildlife to safely move across roads. Simple culverts allow passage for smaller species such as turtles, snakes, coyotes, and bobcats. Larger underpasses are needed for deer, moose, and bears. In many locations these structures already exist, but need improvement or isolation from human activity before wildlife will use them.

Building underpasses and fencing roads are not feasible actions to take everywhere, but increasing motorist awareness is. For instance, the Maine Department of Transportation is using new tactics (see left) to capture the attention of motorists and help motorists detect moose near roads. New research is also identifying critical locations where these tactics are most useful.



Providing ample warning for motorists can greatly reduce chances of WVCs by increasing driver awareness and slowing traffic.

Reducing WVCs will also require major changes in spending. We spend billions of dollars each year repairing our automobiles and paying inflated insurance premiums because of WVCs. Instead, shifting some of these dollars to conduct research and construct wildlife crossings might be a more efficient use of resources. Ultimately, the best defense against WVCs is for motorists to educate themselves, understand the risks, and be responsible drivers.

I hang up my phone. The police are on the way, but the deer looks dead already. "At least I will file a report," I suppose. Until now, wildlife-vehicle collisions rarely crossed my mind. I casually assumed they were beyond my control. Now I am idling on the roadside with a dead deer, my day ruined, and my car in disrepair; I start to believe otherwise. "There must be ways to avoid this," I think.

TIPS FOR AVOIDING WILDLIFE-VEHICLE COLLISIONS

RECOGNIZE ANIMAL BEHAVIOR:

- Be vigilant when driving through preferred habitats, during dawn or dusk when many species are moving, or during active times of the year such as the breeding season (Oct-Nov) for deer.

ADJUST DRIVING HABITS:

- Don't speed, don't assume an animal along the roadside will stay in place, don't be a distracted driver, and don't swerve.

ALWAYS BE AWARE!

WHAT TO DO IF YOU ARE INVOLVED IN A WILDLIFE-VEHICLE COLLISION

SAFETY FIRST:

- If you or a passenger is injured, immediately call 9-1-1.
- Move your vehicle to a safe location away from approaching traffic or use emergency flashers.

IF THE ANIMAL IS INJURED:

- Do not try to move or touch an injured animal.
- Call police or a conservation officer to euthanize the animal; do not leave an injured animal to die.
- Depending on the state it may be illegal for motorists to kill injured animals.

IF THE ANIMAL IS DEAD:

- If the animal is in a lane of traffic it may be necessary to move it.
- File an accident report.
- Depending on the state it may be legal to salvage meat for yourself or a charitable organization.

CONTACT YOUR AUTO INSURANCE COMPANY:

- Animal-related damages are often claimed under comprehensive coverage (not collision coverage).

The Rockaways

By Nicholas Skaff



Photo by Mike Pedersen

Preface

Climate change promises to bring about striking and pervasive environmental shifts that are unprecedented in human history. Perhaps one of the most unheralded, yet potentially devastating changes will be an increase in sea surface temperature (SST). Between 1970 and 2004, the SST of the world's oceans increased by 0.5 degrees Celsius. As this upward trend continues, climate scientists hypothesize that the frequency and intensity of tropical storms and hurricanes will increase. Evidence of this trend is already emerging. Although there is some support for an increase in hurricane frequency in the North Atlantic, the most widespread trends to date involve changes in hurricane intensity. Research shows that the number of category 4 and 5 hurricanes has nearly doubled since the 1970's and that the proportion of these high-powered storms has gone from around 20% of all hurricanes to approximately 35% over this same time period.

Two unusually destructive hurricanes in the United States over the past decade, Hurricane Katrina in 2005 followed by Hurricane Sandy in 2012, have lent credence to climate change predictions. These storms caused an almost incomprehensible amount of economic damage and have had a lasting impact on affected communities. Although many Americans will be vulnerable to an increase in the frequency of severe storms, the poor and other socially marginalized groups typically bear the brunt of these incidents. In New Orleans, African-American communities had long been relegated to areas most susceptible to flooding. Not surprisingly, when Hurricane Katrina

struck, these communities suffered most severely. This problem was compounded by the heavy reliance of low-income individuals on public transit, which made rapid evacuation difficult. The circumstances surrounding Hurricane Sandy in New York City echoed many of the injustices that occurred in New Orleans. Impoverished residents of private and public housing projects lacked the resources to evacuate and were forced to face the storm virtually unassisted. Many communities were left without electricity, water, and heat for nearly a month, while they watched wealthy areas of Manhattan quickly return to normal.

Without a fundamental change in the way natural disasters are managed by federal, state, and local authorities, we can expect many more stories of injustice as climate change progresses. Scientific research can and should be a vehicle for this management change. For instance, research showing that the number of severe storms will increase by 15% over the next several decades could enable decision-makers to plan and budget more efficiently. Proper resource allocation and other forms of science-informed disaster planning can help improve human security across all levels of society. However, this must be achieved in conjunction with a reprioritization of equitable resource allocation. While the following narrative is a fictional account of life in New York City public housing following Hurricane Sandy, the events are loosely based on actual incidents reported by the New York Times and other news organizations.

The Rockaways

The fruit sellers had fled, but their wares remained, floating quickly down Broadway. A watermelon here, a few apples there, occasionally a bobbing mango. They tumbled past four Starbucks, past Bloomingdale's, and past the high Venetian windows lining the entryway of the Crowne Plaza Hotel. It was daytime, but dark; Times Square's incessant brightness was muted by a thick blurring rain.

Twenty miles to the southwest in the Rockaways, Queens, Calvin smiled as he thought about Times Square's desolation. He appreciated the ruggedness of a flooded New York. It was more like the New York he knew in the Booker House projects. Fourteen concrete blocks. Housing two thousand people. Overlooking a limitless cool gray Atlantic.

All the tenants had been asked to evacuate, but most families in the upper floors had stayed.

"There's gonna be looters," cautioned Calvin's 75 year-old neighbor Samuel a few days earlier. "Gotta stay and protect my property," he continued.

"What do I care about looters?" Calvin thought. He glanced at the ceramic cats his grandmother had lined proudly on the living room cabinet with the peeling mahogany veneer. Calvin lived with his grandmother on the eighth floor of building fourteen and looters were the least of his worries. He looked over to the window, the apartment's sole source of light since the storm knocked out the power the day before. Grandma was leaning forward in her wheelchair with her forearms braced against the windowsill. She stared intently at the driving rain, peering out from among the blankets and comforters piled high on her shoulders and lap.

Two weeks had passed since the storm's initial thrashing and Booker House still lacked electricity, running water, and heat. The building reeked. Since there was no water to flush the toilets, most residents were forced to use a garbage pail lined with a plastic shopping bag. Although these bags were always rushed to the garbage shoot for immediate disposal, the odor lingered and enveloped everything. To make matters worse, most families were running dangerously low on food and drinking water despite the occasional visit from Red Cross volunteers. Uptown Manhattan's power had been restored three days after the storm, but no one Calvin talked to seemed surprised.

Calvin's feet were raised on the wicker coffee table lying crooked in front of the couch. He tipped his head backwards to look at his grandma. Over the last week she had abandoned her perch at the windowsill and had become somewhat withdrawn. Nothing Calvin said seemed to elicit a response, emotional or

verbal. She always sat in the kitchen with her back to the open oven door. They were lucky to have a gas oven.

It issued a faint heat to the shadowed apartment. The gray light made everything look cold except for the area surrounding the glowing stove. As Grandma repositioned herself on her chair, Calvin noticed something unusual. She pursed her mouth and closed her eyes, not as if to sleep, but tightly as if...

"Grandma, are you okay?" Calvin whispered as he approached her chair, knelt down and gently touched her leg.

"Yeah, Calvin, I'm ok."

As he rose to go back to the couch, he thought he felt a large round object on top of her knee.

"What is that?" he asked.

No response. Grandma's eyes were closed.

Calvin slowly lifted the blankets piled across Grandma's lap and realized that there was nothing on her knee. Rather, her joint had swollen to nearly twice its normal size. He lifted her pant leg. Her leg was a pale blue color and covered in a web of her dark protruding veins. Blood wasn't circulating properly below the knee.

"Have you been taking your arthritis medicine?"

No response.

He spun quickly to her pillbox on the counter beside the oven. There were no pills filling any of the tiny boxes cordoned off for each day of the week.

"Why didn't you tell me!"





It was two o'clock. If he left now, he could walk to one of the few undamaged pharmacies before it closed. The closest was ten miles away in Jamaica, Queens, and the subway wasn't running anywhere near the Rockaways, although it had been operating uptown for days.

He hefted his winter coat to his shoulders and walked over to Grandma.

"I need to go get your medicine. Without blood flow you might get gangrene." Calvin closed his eyes as if to shut out the thought.

"I didn't want to be a bother," she whispered. "The pharmacy is so far."

"Listen, when I'm gone you have to leave the window open a crack. I know it makes the apartment cold, but you need to leave it."

Calvin had heard from Samuel, his neighbor, that an elderly woman on the fifth floor died soon after the storm. She had been using her oven for heat without opening a window for ventilation and the carbon monoxide had asphyxiated her.



Calvin stepped half out the door and turned toward the kitchen, "remember leave the window open."

The hallway was almost completely dark. Pale light seeped beneath the narrow cracks of each apartment doorway forming thin bands of illumination along the floor. In these strips of light he could see cigarette butts scattered across the moldy, stained carpet. Calvin was glad he couldn't see more. When he entered the stairwell, light was gone completely. He was met only by impenetrable darkness and the ripe smell of mold. He groped for the railing and made his way down, one cautious step at a time until he reached the exit doorway.

Despite the overcast skies, Calvin couldn't stop squinting as he stepped outside. He started walking down Rockaway Beach Boulevard toward the Cross Bay Bridge with a duffel bag hanging from his shoulder. He planned to fill it with food and water after picking up his grandmother's prescription.

He had been walking for about forty-five minutes, when several police cars flew past him. A few minutes later, another police car approached, but at a vigilant pace. As the car passed, Calvin turned his head and made eye contact with the officer sitting on the passenger side. His gaze was stony. The car continued on and turned at the intersection directly ahead of him.

He kept walking down the street, stepping heavily with his eyes downturned and tracing the sinuous cracks in the gray crumbling cement. As soon as he had crossed the intersection down which the slow police car had just turned, he heard a car start behind him and slowly drive in his direction. He didn't raise his eyes from the ground as he walked. The car approached. His heart quickened. He could barely breathe. It moved past him on his right. For a second, he raised an eye towards it.

He unclenched. It was an old Ford Taurus with rust bubbling beneath the faded green exterior of the driver's side door. Relieved, he looked upwards towards the bridge, which was now in sight and lined with cars at a standstill.

A smile had grown on his face, but faded, quickly. Not twenty yards ahead standing on the sidewalk were the two officers that had passed him in the car. They had circled around the block and parked further up on the street.

They spoke and the words came to him through a haze of panic.

"What's in the bag?" the officer he had made eye contact with demanded.

He could not respond.

The officer stepped forward so that he and Calvin were nose to nose. He spoke more loudly now, almost screaming, "What's in the bag!"

Calvin was able to mumble something about his grandma and medicine.

"Put your hands against the fence."

He placed both hands high on the rusted chain link construction barricade lining the sidewalk. One of the officers slammed him forward and pressed his face to the cold metal. The cop then patted him down and slipped the wallet from his back pocket. The other looked inside his empty duffel bag.

He knew what they were thinking. He knew what they thought he planned to put in the bag and it wasn't food and water.

Calvin continued to grip the fence. The officers soon realized that he carried nothing incriminating, but he heard them talk about bringing him in on a disorderly conduct charge. He, like everyone in the Rockaways, knew that that's what cops do when they're suspicious, but can't think of any legitimate charge. They were still talking about it, when Calvin heard a sharp skidding noise followed by the low growl of an accelerating engine. He was still facing the fence and couldn't see the street, but he heard the cops scrambling to their car. They left him without saying a word.

Calvin squeezed the fence for several more minutes.

He started towards the bridge.

It had been dark for several hours when Calvin finally entered Booker House building fourteen with his now heavy bag pulling at his shoulder and neck.

He reentered the pitch-black stairwell and started climbing. The immensity of the darkness made him feel lost even though he had been counting the flights of stairs so that he would not miss the eighth floor. He thought about old Samuel and other neighbors he would never meet. How they, like him, risked their lives and wellbeing in the slippery darkness of the stairwell in order to leave their apartments. How they, like him, were treated not as victims, but criminals, if they did make it into the light without incident.



In that darkness, he also thought about the hollow obliviousness of the traders on the floor of the New York Stock Exchange who had returned to work just a few days after the storm's devastation. He imagined them discussing their weekend trips to the Hamptons while buying and selling shares in a single day worth more than he would earn in his whole life.

To Calvin, injustice would be Hurricane Sandy's legacy. It would overshadow and defame so much resilience and strength.

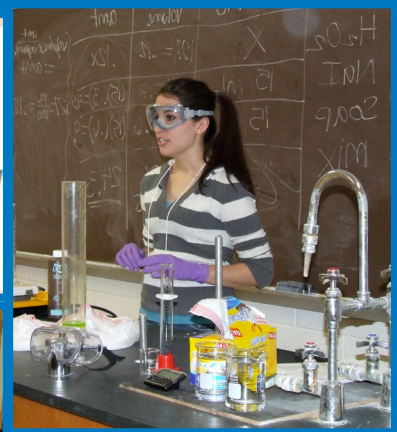
He reached his front door and opened it. It was dark inside, but he could see that his grandma had moved her wheelchair from the kitchen to the living room. She was sitting quietly with her eyes closed. The apartment was strangely warm.

Calvin approached her from behind and raised a trembling hand to her slumped shoulder. The room was completely silent and he did not breath. Grandma raised her hand from her lap and calmly patted Calvin on the wrist. He knew life would go on in the Rockaways.



GWIS: Engaging and Empowering Women Scientists

By Diana Guzmán Colón



Here at MSU there is a place where women scientists can gather together and discuss the issues faced by women in the sciences.

HANDS-ON SCIENCE IN THE BPS BUILDING!

The Mu Sigma Upsilon Chapter of the Graduate Women in Science (GWIS) organization was founded at MSU with the goal of fostering careers in science. They approach this goal by providing fellowships, employment opportunities, outreach activities, and forums to discuss public policy, careers, and education. Here you can find support, connect with mentors, and attend women-oriented workshops about balancing career and family, while keeping your emotional well-being intact.

The GWIS chapter at MSU has done a tremendous job of nurturing a professional environment with opportunities for comradery, community outreach, and education. It can be intimidating for a woman to follow a STEM (science, technology, engineering, and mathematics) career, when most of the field and leadership positions are traditionally dominated by men. Although there has been a significant increase in representation of woman in the sciences, there is still the question of how to attract and retain women in the science fields. It is important to have a system that promotes female representation, creates a learning environment that discourages gender discrimination, and provides a supportive network. It is known that mentorship and networking are vital for advancing a career in science. At a young age, having role models from the same gender in STEM fields is a key factor for shaping confidence, character, and determination as the child grows up. The GWIS chapter has been successful in providing mentorship to middle and high school girls as well as undergraduates. Additionally, through several outreach activities, GWIS acknowledges and celebrates the presence of the many women scientists on the campus as well as their achievements.



GWIS hosts an annual Middle School Girls Math and Science Day at MSU where presenters from various STEM fields conduct hands-on activities for girls to learn about how fun science and math can be!

Girl's Math and Science Day is the largest outreach activity of the year for GWIS. This free event brings girls from middle and high schools around the Lansing area to campus in order to see and experience the kind of research that female scientists are performing here at MSU. Participants take part in different science and math activities that are both interactive and fun. This past year, the event took place at the Biomedical and Physical Sciences (BPS) building, where the classrooms were converted into forests, graveyards, living habitats for

bees and plants, genetic investigation labs, and even sites to calculate probabilities.

Each station at this event had a unique and educational experience. The girls were involved in activities such as touching bones from archeological projects, learning how to do a streak plate technique, and watching bacteria under a microscope. They also had the opportunity to touch a real bee hive and learn the importance

of having these insects in our ecosystem. Math, of course, is also an important career pathway, and our graduate students designed a fun way for the girls to calculate probabilities and measure circumferences. At the end of the day, the event concluded with an ice cream social, where the students attended a mini lecture by a woman scientist on campus and a Q&A session with MSU student researchers.

The main goal of this outreach activity is to engage the girls in science and provide a unique learning experience outside of the typical school environment. The interactions with graduate students also exposed these girls to the broad range of career possibilities inside the STEM fields. Activities like this begin to close the gap between science and the public.

GETTING INVOLVED WITH GWIS

To create a strong network of women scientists, GWIS has various committees with different goals: outreach, undergraduate, and professional and social development. These three committees provide a place for everyone to participate in the GWIS organization!

The outreach committee is responsible for planning science-related activities, such as the Girl's Math and Science Day, that bring together and engage those in the community and on campus. This includes girls who come from low-income households and may not otherwise have the chance to experience science. These activities often include collaborations with other science organizations, such as the MSU Museum, Hunter Park Garden House, and the College Ambition Program.

The undergraduate committee focuses on providing support for those interested in graduate school, including a mentoring program that pairs an undergraduate with a graduate student who shares their interests. Many students have taken advantage of this program and found it valuable and rewarding on both a professional and personal level. This committee additionally offers helpful workshops on the graduate school application process.

The professional development and social committee focuses on professional development workshops. These workshops have covered topics such as how to create a professional website and LinkedIn profile, conflict management, negotiating a faculty position, grant writing, and emotional well-being.



Silent Spring: A few GWIS members were selected for the Rachel Carson Exhibition at the MSU Museum, which showcased research by women scientists at MSU.



GWIS signature t-shirts and fundraising: "This is what a scientist looks like" campaign.

Programs like GWIS are unique in our institution because they give graduate students the opportunity to not only share research with non-scientists and undergraduates, but also to discuss topics relevant to female scientists. These are not traditional topics of academia conversations. GWIS is open to everyone who supports women in science and the goals of the organization, and we always welcome new members or volunteers. GWIS has general meetings twice per semester to discuss new ideas and possible activities with several social activities and fundraisers taking place throughout the year as well. If you are interested in participating in any of our activities, want to become a member, or just want to find out more, email us at gwis.msu@gmail.com! Or find us on Facebook as: GWIS (MSU chapter)

Thank-you to the GWIS for providing the photos for this article.



Diana Guzmán Colón (diana.ecorevo@gmail.com) is a recent MS graduate from the Department of Fisheries & Wildlife where she worked with Dr. Gary Roloff.

Interning for the U.S. Fish & Wildlife Service in D.C.

By Madison Hall

Claudine Andre is the founder of famed bonobos primate sanctuary, Lola ya Bonobo. Located outside the capital city Kinshasa in the Democratic Republic of Congo, Lola ya Bonobo takes in many young bonobos as rescues from illegal animal trafficking, orphans of military conflicts occurring in bonobo habitat, and orphans of mothers fallen victim to the bush meat trade. I was lucky enough to meet with the charismatic Andre twice over a period of six months as part of my internship with the U.S. Fish & Wildlife Service's Division of International Conservation.

Once inside the modern offices of the USFWS DIC, you become a member of a team effort to protect the wildlife that make their homes in many of the most critically endangered habitats in the developing world. Through the Wildlife Without Borders program, the USFWS DIC is able to support, coordinate, and promote programs and research that directly impact and protect keystone species and their habitats, such as elephants, rhinos, primates and marine turtles, to name only a few. Using a variety of methods, the expert USFWS DIC team is led by proven wildlife conservation leaders, many of whom have spent years in the field, directly interacting with the people, problems, and species they now oversee.

Another powerful tool the USFWS DIC utilizes is educational outreach through a variety of mediums both online and off. A recent partnership with the Detroit Tigers baseball team supports tiger research programs. The USFWS DIC's partnership with the U.S. Postal Service raises funds through sales of the Save Vanishing Species stamp. First issued in May, 2011, the iconic stamp features an Amur tiger cub, and sells for 55 cents each, with 10 cents going directly to the Wildlife Without Borders' Multinational Species Conservation Funds. As of this writing, nearly two million dollars have been raised, funding more than 1,800 grants for a wide variety of initiatives.

My work as an intern with the USFWS DIC included creating an interactive map of ongoing grant work in Africa; researching potential outreach projects for Gabon, Africa; familiarizing myself with wildlife video work; reviewing climate change impacts statements; the Save Vanishing Species stamp; and presenting my own Dissertation Proposal to a USFWS audience.

As a summer intern, I was also given the chance to participate in several outings geared toward further familiarizing the interns with the broad spectrum of multi-faceted ongoing activities in which the USFWS DIC is involved. Highlights included day trips to the USFWS Nature Conservation Training Center in Sheperdstown, WV, the Department of Interior building in Washington, D.C., and the Patuxent Wildlife Research Center in Maryland where research on Whooping Cranes is ongoing.

A similar opportunity to the one allowing me to sit down with Claudine Andre took me to the Smithsonian Institute's National Zoo, where I met with panda and Andean bear handlers. This visit was a particular highlight for me as it augmented my own dissertation research with behind the scenes expert tours and meetings.

The insights I gained and friendships I made during my internship were invaluable. I was afforded the opportunity to be mentored by conservation leaders, which is an experience that I will take with me into all future careers. I look forward to the day when I can be the mentor and use my expertise to assist others in their development, "paying it forward" professionally.

Madison Hall is an FW doctoral student working with Dr. Scott Winterstein. You can contact her at madisonh@msu.edu.

At Right: Madison Hall and Claudine Andre, Founder of Lola ya Bonobo Sanctuary, D.R. of Congo.



Freshwater Electrofishing

By Joe Nohner

“The juice is on!” I shouted over the roar of the generator. As the words left my mouth orchestrated chaos erupted in front of me. Nine-foot nets plunged into the water, scooping largemouth bass as they arched toward the surface in front of our boat. Nets swung into the waiting hands of another researcher, transferring stunned fish into the livewell before technicians returned their focus to the water in front of our boat.

Electrofishing may be one of the most adrenaline-packed moments in the professional life of a fisheries biologist. The technique is used to capture fish by temporarily stunning them with electricity, and can be astonishingly adaptable and effective.

While the technique has been in existence since 1883, its popularity for scientific collection began in 1974 when researchers from the University of Wisconsin created the first boat-mounted electrofishing system. Even as the technology

celebrates its fortieth birthday this year, new applications and techniques are constantly emerging.

The principle behind electrofishing is simple. Two electrodes, one negative (anode) and one positive (cathode) are placed in the water, and the difference in voltage between the electrodes generates an electrical field. As electricity passes between the electrodes it also passes through fish in the water column. When performed correctly electrostaxis occurs as the fish’s muscles involuntarily contract. Closer to the electrode the electrical field becomes more concentrated, and fish are immobilized in a state of muscle contraction called tetany. After recovery in a livewell most fish can be released with no serious injuries.

Below: Boat electrofishing is a great way to sample larger, deeper areas, such as the lake seen here. Joe Nohner drives the boat while fellow researchers Dana Castle and Marissa Hammond collect the fish.



N. Snow

Methods of Electrofishing

The Backpack

The simplest electrofishing method uses a backpack electrofisher powered by a rechargeable battery. The crew leader wears a backpack and operates the anode wand to manipulate an electric field. The cathode is typically a wire that trails from the backpack. As the electric field passes over fish, they are immobilized and netted by the crew. Backpack electrofishing is often used to target fishes in shallow water, small streams, or other situations where agility may be the most important factor to successfully capturing fish. The battery power source in backpack electrofishers provides much greater control over the application of power than generator-powered systems. Electricity can be applied continuously, in pulses, or in smaller bursts of pulses, allowing the researcher to minimize fish injuries while achieving electrofishing efficiency objectives.

The Barge

In larger, wadeable streams a barge electrofisher provides more power through a gas-powered generator. The crew leader tows the barge that powers multiple anode wands and allows the electrofishing crew to cover a deeper, wider area.

The Boat

In lakes and non-wadeable streams a boat electrofisher may be required. Electrofishing boats can sample fishes at greater depths and reach locations that are otherwise unavailable while wading. Boat electrofishing is often conducted during the nighttime, when fish tend to be located in shallower habitats.

Tips for Electrofishing

1. Regardless of the environment, safety must come first when electrofishing. Rubber gloves and waders are a necessity in order to insulate the crew from the electric field.
2. Brush the electrodes on backpack and barge shockers with Scotch Brite® pads to remove oxidized deposits, which limit electrical conductance.
3. When backpack electrofishing, concentrate the electric field by placing the cathode ("rattail") in front or to the side of the electrofisher. Even better control can be gained by using a wand-style cathode similar to the anode wand.
4. Increase the size of the cathode ("rattail") to minimize the number of fish shocked behind a backpack.
5. Large anodes create large electrical fields, but small anodes provide more concentrated fields and greater maneuverability. Select the anode that suits your sampling needs.
6. Use power-based electrofishing to standardize your electrofishing effort as environmental conditions or electrofishing equipment vary. (Check out the references for more details)

Electrofishing provides a useful alternative to other fish sampling techniques, but also has its own challenges. Varying environmental conditions, fish size, and fish location all affect the method's efficiency and effectiveness. Additionally, certain fish species are more sensitive to electrofishing than others. These factors complicate the interpretation of results when trying to directly measure abundance or density.

The references below provide an excellent starting point to learn more about electrofishing as a fisheries sampling technique. As with most collection techniques, the best way to learn the art of electrofishing is to go out and try it with an experienced biologist. The experience may offer you an effective new sampling technique, and it will definitely provide you with an exciting day on the water!

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Joe Nohner
jnohner@msu.edu
Taylor Lab

One Fish, Two Fish, Where Fish for Whitefish?

By Abby Lynch

Imagine you are playing a game of Monopoly and are investing wisely for the future. You have numerous hotels on “Boardwalk” and are raking in the dough any time another player lands on your valuable property. Then, the rules of the game unexpectedly change. “Baltic Place” is the hot commodity and all of your painstaking investments in “Boardwalk” are for naught. Now, imagine this is not a game and your actual livelihood and family depend on your success.

Currently, the Great Lakes lake whitefish fishery is the most economically valuable commercial fishery in the upper Great Lakes. But, like the modified Monopoly, this fishery could face new “rules of the game” from climate change. My dissertation research developed a decision-support tool to ensure that the fish, the fishery, and the livelihoods dependent upon them remain sustainable in the face of climate change.

“A better fish cannot be eaten!”

Lake whitefish, a member of the salmon family, are found in coldwater lakes throughout much of northern North America. Like many salmon species, they are highly valued as food fish: fresh fillets, smoked fillets, frozen fillets, fish cakes, spread, and sausage. Lake whitefish have been a staple of native communities in the Great Lakes for thousands of years and were a particular favorite of early French explorers—one even wrote that “a better fish cannot be eaten!” They are a favorite still today; over 15 million pounds of lake whitefish are consumed each year in the Great Lakes region alone.

Aiming for 20/20 vision of lake whitefish recruitment

To reach someone’s dinner plate, a lake whitefish must survive a treacherous journey from an egg to a larvae to a juvenile and, finally, recruit to the fishery. Ultimately, we want to know how many lake whitefish enter the fishery so that we can determine how many can be harvested without negatively impacting future populations and harvest. But, it is next to impossible to know how many lake whitefish are actually out there. So, we estimate the population size using mathematical modeling.

You can think of mathematical modeling of fish populations like a visit to the eye doctor. For many of us, perfect 20/20 vision is as unobtainable as knowing true population abundance is for fishery managers. But, with corrective lenses and modeling approaches, we can get pretty close to estimating (or seeing) those realities. Like adjusting the lenses in an eye exam, including biologically relevant variables in the model can often improve our ability to predict fish populations.

My dissertation research did just that. I examined climate factors, specifically temperature, wind, and ice cover, which have been shown to influence recruitment of lake whitefish to the commercial fishery. Because lake whitefish spawn in the fall and





Designing a Climate Change Decision-Support Tool for Great Lakes Lake Whitefish

hatch as larvae in the spring, these time periods are particularly critical to the survival of lake whitefish. I used historical data to model how changes in these climate variables affected recruitment.

Could warmer temperatures be good for a coldwater fish?

Earlier research has observed a positive relationship between recruitment and spring temperatures and ice cover and a negative relationship between recruitment and fall temperatures and wind speed. My research confirmed these same patterns. Warmer spring temperatures may improve survival of larval lake whitefish, if food resources are available, and increase lake whitefish production in the Great Lakes. However, warmer fall temperatures, more wind, and less ice cover may inhibit egg survival and, consequently, lake whitefish production.


The relationship between climate variables and lake whitefish recruitment has significant implications for the fishery in the context of climate change. By the end of this century, the Great Lakes will be a warmer, windier, and less ice covered region. Surface temperatures for the Great Lakes, for example, are expected to increase by as much as 7°F. So, is this just another “doom and gloom” climate change story where a species will be ousted by habitat changes? Or, perhaps could warmer temperatures be good for this coldwater fish?

I was able to project anticipated impacts on lake whitefish recruitment using my climate-recruitment model and a downscaled climate model developed for the Great Lakes for the 1836 Treaty Waters of Lakes Huron, Michigan, and Superior. The 1836 Treaty Waters sustain a highly productive lake whitefish fishery, approximately 25% of the whole fishery in the upper Great Lakes. Recruitment

projections varied between management units; some had up to a 50% decline and others had as much as a 220% increase. Overall, my research suggests that there is potential for increased lake whitefish recruitment in the Great Lakes with climate change and some shift in the distribution of the fishery.

Predicting the Monopoly board

These potential changes in lake whitefish populations have significant repercussions for fishermen and the communities dependent upon this fishery. Returning to the Monopoly analogy, if you could predict changes to the game, you would change your strategy and invest differently. Likewise, my research aims to help the lake whitefish fishery adapt to anticipated climate change. I hope my climate-recruitment model and projections will serve as a decision-support tool to assist fishermen and fishery managers. This tool, which is housed on the Michigan Sea Grant website, will tell fishermen if it's better to give up on the “Boardwalk” fishery locations and focus their investments on “Baltic Place” for a more sustainable and prosperous fishery. *Because, ultimately, who doesn't want to win Monopoly?*



Abby Lynch recently graduated with a Ph.D. Her advisor was Dr. William Taylor. She now works as a Research Fisheries Biologist for the United States Geological Survey. Contact Abby at ajlynch@usgs.gov. (photos: A. Lynch)

This article received the Best Student Paper Award from the American Fisheries Society.



Contact Dr. Weiming Li at: liweim@msu.edu

Dr. Weiming Li, professor and Frederick E.J. Fry Chair of Environmental Physiology, is jointly appointed in the Department of Fisheries & Wildlife and the Department of Physiology. He is also a faculty member for the Neuroscience Program and the Ecology, Evolutionary Biology, and Behavior Program (EEBB). His primary research interests are to develop a better understanding of fish and lamprey biology and to develop additional sea lamprey control strategies. Research in his laboratory is currently focused on pheromone communication, comparative physiology, neurobiology and medicine, as well as on lamprey genomics.

In addition to advising graduate students, Dr. Li supports research by Dr. Yu-Wen Chung-Davidson (Assistant Professor) on lamprey neurobiology and development, Dr. Ke Li (Senior Research Associate) on lamprey natural products, and Dr. Mar Huertas (Senior Research Associate) on lamprey neurophysiology and endocrinology. Dr. Li also hosts numerous international visiting scholars and students.

Li Lab



Cory Brant is a Ph.D. student using behavioral stream bioassays to identify the functions of the different components of the sea lamprey pheromone. Cory received a B.S. in Fisheries and Water Resources and a B.S. in Biology from the University of Wisconsin-Stevens Point, and his M.S. in Fisheries and Wildlife from MSU.



His work focuses on identifying the pheromone components that are specifically attractive to sea lamprey, with the hope of integrating the “cocktail of love” with the current Great Lakes sea lamprey control program to assist in removal of this species from its non-native waters.

Contact Cory Brant at: brant@msu.edu

Anne Scott is a Ph.D. student studying chemical communication and ligand interaction with vomeronasal and odorant receptors in sea lamprey. She received a B.S. at Northern Michigan University in Zoology and Chemistry.



Her current research focuses on blocking the female detection of the sex pheromone released by males that attracts females to spawning grounds. She aims to identify an antagonist with significant chemical, shape, and electrostatic similarity to the pheromone that will likely bind to the same receptor and interrupt the behavioral responses of female sea lamprey, thereby impeding the reproductive cycle.

Contact Anne Scott at: scottan7@msu.edu



Chu-Yin Yeh is a DO/Ph.D. dual degree student in Physiology. Her main research interests are to understand how sea lamprey cope with the loss of the biliary tree (the path from the liver to the small intestine that transports bile). This is caused by a

disease called biliary atresia that also affects humans. Her work hopes to shed light on the management of this disease through understanding the molecular mechanisms in sea lamprey that allow them to survive. Chu-Yin received her B.S. in Biochemistry & Molecular Biology as well as her M.S. in Physiology from MSU.

Contact Chu-Yin Yeh at:
yehchuyi@msu.edu

Erin Walaszczyk is a Ph.D. candidate studying circadian rhythms and the effects of environmental cues in sea lamprey in laboratory and field settings. Erin received B.S. degrees in Zoology and Fisheries & Wildlife from MSU. Her research focuses on the effects of pheromones on rhythmicity and behavior as well as the underlying clock genetics and physiology in the sea lamprey.



Contact Erin Walaszczyk at:
walaszcz@msu.edu

Steven Chang is a Ph. D. candidate studying large gene families in the sea lamprey genome. He received his M.S. in Biological Sciences from the University of Windsor. Steven's research centers on efforts to control sea lamprey populations in the Great Lakes. One part of his research concerns a novel pathway and associated genes in the nose that may be associated with mating. The other part examines expression of detoxification genes in response to lampricide treatment.



Scot Libants is a Ph.D. candidate studying the evolution of vertebrates, with particular interest on the diversification of populations and gene families. Scot received his B.S. and M.S. in Biology from Northern Michigan University. His work focuses on chemosensory receptor genes in sea lamprey, their composition, their evolution in the ancient vertebrate forebears, and the specific life history context in which they function.



Tyler Buchinger is a Ph.D. student interested in the ecological and evolutionary drivers of pheromone identities in fish. He received his B.S. in Biology from Lake Superior State University and his M.S. in Fisheries & Wildlife from MSU. His current research focuses on the pheromones used by native lampreys and lake trout.



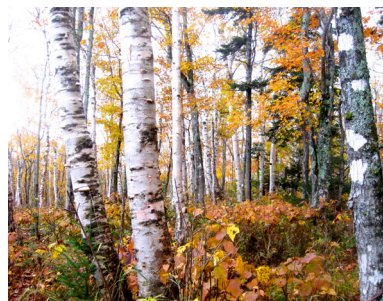
Contact Steven Chang at:
changst4@msu.edu

Contact Tyler Buchinger at:
buching6@msu.edu

Contact Scot Libants at:
libants@msu.edu

2013 GSO Photo Contest Winners

Scenery



1st: Iceberg by Dr. Jen Owen

2nd: Birch Trees by Amber Goguen

3rd: Duck Lake Fire by Brandon Armstrong

Flora and Fauna



1st: Leopard Seal by Emily Galassini

2nd: Rockhopper Penguins by Dr. Jen Owen

3rd: Underwater Lillies by Angela De Palma - Dow

Field Work



1st: Rhino and Helicopter by Joe Presgrove

2nd: Sockeye Salmon Weir by Dylan Tauzer

3rd: Sedated Rhino by Joe Presgrove

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