MSU Fisheries & Wildlife

SPOTLIGHT

2015

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

The Science of Using Volunteers

A Bird's-Eye View: Burke Lake Banding Station

Go Wild! A Photo Essay

Leave a Buck, Take a Doe: Hunter Motivations

ALSO INSIDE: Pattullo Award Winner - Asian Carp: Your Stomach as a Conservation Tool, Do You Know our Polar Bear?, Lab Profile: Quantitative Fisheries Center, & MORE!

MSU Fisheries & Wildlife
SPOTLIGHT

2015
Issue 11

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
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Contents:

Interested in being a part of SPOTLIGHT?
Contact Lisa Peterson (*peter710@msu.edu*)

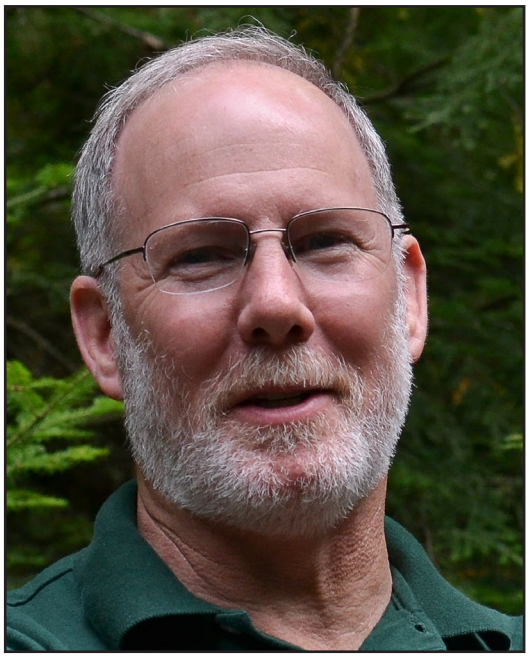
(photo: *A. De Palma-Dow*)

Amber Goguen's cover photo of a curious raccoon at summer camp. Voted the best outreach photo by the FW Department.

Letter from Dr. Scott Winterstein

This past summer witnessed a changing of the administrative guard in the department. Mike Jones decided to step down as chair, but worry not, he is not retiring. As Mike stated in his 2014 SPOTLIGHT letter, he is "...returning to the regular faculty ranks in FW." Mike did a masterful job leading the department and I know I can speak for the entire FW family when I say that we greatly appreciate all he did for us.

With the help of the academic support staff, able assistance of Dan Hayes (who graciously agreed to serve as the associate chair), and patience of the faculty and students, I am adjusting to my new role. One of the enjoyable tasks I inherited from Mike is that I get to introduce the 11th issue of SPOTLIGHT. Starting with the very first issue, SPOTLIGHT has been a top-notch publication of the highest quality, and this issue is no exception. Everyone involved in putting it together, take a well-deserved bow. Particular recognition goes out to Lisa Peterson (Coordinator), Emi Fergus (Copy Editor), and Amber Goguen (Design Director).



The multidisciplinary nature of the FW research program and multifaceted talents of the FW graduate students are on display in this issue. Angela De Palma-Dow and Sarah Schaffer discuss using volunteers in scientific research from the opposite perspectives of the project leader (Angela) and the volunteer (Sarah). Have you ever wondered what you can do about stopping Asian carp? How about eating them? Before you say no, check out Yang Li's award winning article. Zuri Kelley reports on her Masters research on a deer management "experiment" being conducted in Pennsylvania. "Go Wild!" with Amber Goguen and Lucas Gabbard as they relate their experience working with teens at the 4-H Great Lakes and Natural Resources camp through a photo essay.

Speaking of photos, you can find the FW Photo Contest Winners on the back two pages. But I encourage you to save that as a special treat for having read the entire SPOTLIGHT from front to back. That way you won't miss Callie Gesmundo's profile of the BULA, the Burke Lake Banding Station. In this issue you will also find a brief overview of the awards won and papers published by FW graduate students and a profile of the departmental fellowship awardees. Congratulations to all the award and fellowship recipients.

In the alumni corner, you will find an interview with Jessica Caton (M.S. 2013). Jessica reflects on her post-MSU life and how her time at MSU prepared her for a position with the Livingston Ripley Waterfowl Conservancy. This issue's Lab Profile looks at the Quantitative Fisheries Center and the impressive array of students currently working on graduate degrees through the Center. The article also sports some "new" calculus – no numbers, but it makes perfect sense (which cannot always be said of "old" calculus).

Finally, do you remember the Natural Resources Building polar bear? Well, he's been dutifully guarding the lobby without a day off since 1966. Now he needs our help. Darrin McCullough provides a bit of the bear's history and tells you how you can help save our building's polar bear.

Enjoy this issue of SPOTLIGHT. After you have read it and reread it, pass it on to a friend or a stranger. It is so well written and the photographs are fantastic! Unabashedly bragging about the FW graduate students and SPOTLIGHT is something all of us in FW do, but now I get to do it in writing. Enjoy!

- Dr. Scott Winterstein

Spotlight on Student Awards & Research

Brandon Armstrong received a Disciplinary Leadership award from the MSU Council of Graduate Students (COGS) and the Graduate School, Graduate Fellowship from the Center for Integrative Toxicology's Environmental and Integrative Toxicological Sciences Graduate Program, a Graduate Fellowship from the FW Department, and a conference grant from MSU COGS.

Julia Novak Colwell was awarded a Fulbright-Nehru Research Fellowship for 9 months of research in India.

Angela De Palma-Dow received a Graduate Student Organization travel grant, MSU COGS conference grant, College of Agriculture and Natural Resources summer support fellowship, Ecology, Evolutionary Biology, and Behavior travel fellowship, and a Research Enhancement Award from MSU's graduate school.

Jillian Deines received a NASA Earth and Space Science Fellowship for her proposed dissertation research, "Groundwater and economic sustainability in agricultural systems under climate change: A coupled human-natural systems approach."

Elle Gulotty received a scholarship from Schrems West Michigan Trout Unlimited and a grant from the Kalamazoo Valley Chapter of Trout Unlimited.

Yang Li received a Bailey Scholars graduate fellowship from the MSU Bailey Scholars Program for 2014-2015.

Remington Moll received a University Distinguished Fellowship from MSU and a National Science Foundation Graduate Research Fellowship.

Lisa Peterson received the Midwest Fish and Wildlife Student Travel Grant from the MI Chapter of the American Fisheries Society, the Joan Duffy Student Travel Award from the North Central Division, and the FW Symposium Best Fisheries Related Presentation Award.

Pablo Reeb received the best student poster award at the International Year of Statistics - Statistics in Applications Forum.

Brandon Armstrong published "Determining the effects of a mixture of an endocrine disrupting compound, 17α-ethinylestradiol, and ammonia on fathead minnow (*Pimephales promelas*) reproduction" with Jim Lazorchak, Cheryl Murphy, Herman Haring, Kathleen Jensen, and Mark Smith in Chemosphere. This study addressed an important and timely issue concerning the joint action of multiple stressors on fish. We investigated mixture effects of two routinely detected contaminants in wastewater treatment effluent, ethinylestradiol and ammonia, on fathead minnows. Our results showed that a mixture of these two compounds at their environmentally relevant concentrations caused significantly increased mortality when compared to the control and the individual compounds.

Yang Li published "An evaluation of alternative assessment approaches for intermixing fish populations: a case study with Great Lakes lake whitefish" with Jim Bence and Travis Brenden in International Council for the Exploration of the Sea (ICES) Journal of Marine Science. This paper is important because it's the first simulation study comparing separate, overlap, and pooled assessment approaches for overlap mixing using statistical catch-at-age assessment modeling.

Trevor Meckley published "Coastal movements of migrating sea lamprey (*Petromyzon marinus*) in response to a partial pheromone added to river water: implications for management of invasive populations" in the Canadian Journal of Fisheries and Aquatic Science (CJFAS) with C. Michael Wagner and Eliezer Gurarie. These findings suggest that partial pheromones facilitate sea lamprey search for river entrances, but does not influence river entry. Management tactics that rely on luring migrants into rivers with larval odor may prove ineffective without a complete blend of pheromone components.

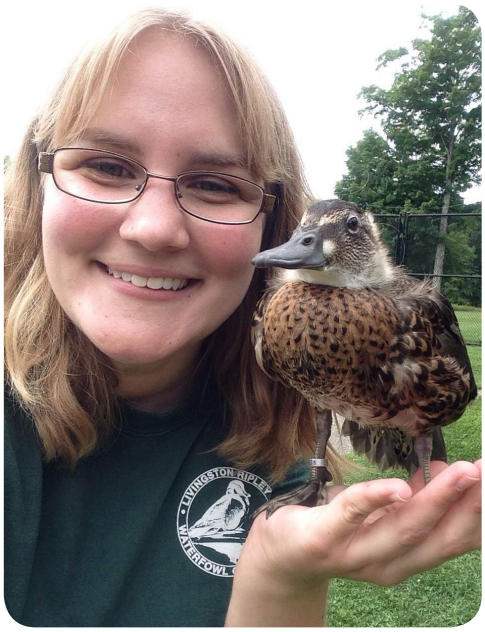
Trevor Meckley also published "An approach for filtering hyperbolically positioned underwater acoustic telemetry data with position precision estimates" in Animal Biotelemetry with Christopher Holbrook, Michael Wagner, and Thomas Binder. We propose a generalizable four-step process for filtering spatial data provided by a new underwater telemetry system using a position precision estimate (analogous to PDOP in GPS) that accommodates the specific data quality objectives of each specific analysis.

Joe Nohner and coauthors from the National Marine Fisheries Service published "A national assessment of stressors to estuarine fish habitats in the contiguous USA" in Estuaries and Coasts. The research identified major anthropogenic drivers of fish habitat degradation at a landscape scale, is the largest assessment of estuarine fish habitat to-date, and is being used to inform estuarine habitat management.

So-Jung Youn had a publication accepted in Global Food Security. The title was "Inland capture fishery contributions to global food security and threats to their future" and co-authors were William W. Taylor, Abigail J. Lynch, Ian G. Cowx, T. Douglas Beard Jr., Devin Bartley, and Felicia Wu.

An Interview with Jessica Caton

Fisheries & Wildlife, M.S. 2013



1. Tell me a bit about what you did when you were at MSU.

I was at MSU for three years completing my Master's Degree in the Avian Health & Disease Ecology Lab. My main advisor was Dr. Jen Owen. My Master's research focused on the migratory behavior and restlessness of captive Blue-winged Teals.

2. Where are you now? What is your position?

As of March 2014, I am living in Litchfield, Connecticut. I am the Director of Environmental Education and Assistant Aviculturist at the Livingston Ripley Waterfowl Conservancy (LRWC). LRWC is a non-profit facility that breeds and raises endangered and threatened waterfowl from around the world. The mission of the LRWC is to conserve waterfowl and wetlands through research, education, and conservation action. I applied for the position because I felt it was a perfect combination of my interests of working with birds and education.

3. What is a typical day for you?

In the morning, I am responsible for feeding, cleaning pens, and caring for the hundreds of captive birds at the LRWC. In the afternoon, I work on education tasks. My list of responsibilities includes the supervision and mentoring of our post-college interns as well as the training of the imprinted education birds that are used in our education programs. As the Director of Environmental Education, I am in charge of all education programs at the LRWC. This means I am responsible for curriculum and program development and scheduling programs both on and off-site. I have had the chance to present programs to all ages; from preschool to adult. It has been very rewarding to educate the public about waterfowl and wetlands! Most people I speak with might never be able to see these bird species in the wild, so I really love seeing their reactions as they interact with and watch the birds. Every day at the LRWC is different and unique and I would not have it any other way!

4. Do you have any advice for FW students?

My advice would be to pursue your dreams, no matter what. If you see a job posting where you might not have enough experience, go for it and apply. You have nothing to lose! Also, strengthen your professional network. It really is all about who you know, especially if the field is small. I landed so many unique experiences from e-mailing professionals prior to conferences and introducing myself to professionals with shared interests. Be bold and really exert yourself! One last piece of advice – never be discouraged if your future career changes throughout your graduate program. It did for me, but it all worked out for the best.

5. What at MSU best prepared you for your position now?

My M.S. project really helped me gain experience and knowledge with bird husbandry and care. I am extremely grateful for my advisor's mentorship; she really aided in my professional development. In addition to this, I supervised quite a few volunteers during my M.S. project and realized that I loved mentoring these students. Many of my experiences at MSU helped me develop a love for teaching and education. Examples of this include co-developing a massive open online course with fellow graduate students and faculty members on introductory science, working for the DNR Wildlife Division on wetland and waterfowl education to the public, and being a teaching assistant explaining science to non-science major college students.

6. Anything that you'd recommend as a MUST to students new to East Lansing?

Walk around campus at least once during every season. MSU is such a beautiful campus and everyone should take time to enjoy all of the lovely gardens around campus. Other musts would be to go to at least one MSU football game, eat at the Dairy Store whenever possible, visit the MSU Beaumont Tower during a carillon performance, and enjoy all the unique foods in and around East Lansing! I sure do miss MSU!

The Science of Using Volunteers: Two Perspectives on How Volunteers and Volunteering Can Work for You!

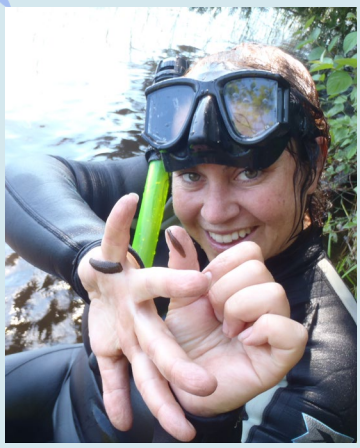
When budgets are limited and researchers need help, volunteer labor can be a valuable resource that is, unfortunately, underestimated and undervalued. If you've thought about using volunteers, but didn't know how to initiate hiring or training, this article can provide you with some helpful hints and lessons that we have learned as a successful project leader-volunteer team.

If you are a professor using students to collect data or an educator working for or with an outreach program and are thinking about starting or improving your citizen science program, you may face the same obstacles and issues that we address in this article.

If you are someone who is looking for volunteer opportunities, either as an undergraduate or active citizen hoping to learn and help with science, this article can help you plan and prepare to give and get the most out of the experience.

Over the next few pages we will provide you with two perspectives, divided into two parts. In part one, Angela, who has served as a successful project leader, will write about her experience and lessons learned on how to recruit and train volunteers. In part two, Sarah, a successful and experienced volunteer, will write about how to search for and decide on the right project, and how to make the most out of your volunteer experiences.

Meet your Authors!



Who? Angela De Palma-Dow, M.S. Fisheries & Wildlife
Where she is from? Sacramento, CA
What does she do? Field staff for the Michigan Cooperative Lakes Monitoring Program
What is her experience in research and mentoring? Five years sampling lakes and aquatic plants in the Midwest, two years leading undergraduate volunteer research teams to sample lakes on Isle Royale, and two summers visiting citizen volunteers to help them monitor and sample exotic aquatic and wetland plants. She also mentored two undergraduates enrolled in the Honors College professorial assistant program and spent three years as a Graduate Teaching Assistant for Organismal Biology.

Who? Sarah Schaffer, B.S. Fisheries & Wildlife
Where is she from? Flint, MI
What does she do? Lab technician at Koppert Biological Systems researching bumblebees as agricultural pollinators.
What is her experience in research and volunteering? Two seasons as a volunteer field technician at Isle Royale National Park for Angela De Palma-Dow, one year volunteering at Wildside Rehabilitation & Education Center, two years volunteering as a teacher's aide in a botany class, and one year working on an urban deer research project evaluating population size and dispersal within Meridian Township, MI.

Angela – The Project Leader

Keep in mind that as you lead a team of undergraduate volunteers (or even paid technicians), you will step beyond the role of a simple project leader and become a supervisor, a principal investigator, a team manager, a coach, a teacher, a boss, and at all times, a mentor. While you may not have wanted to take on these roles, you should embrace this wonderful opportunity to help shape, influence, and inspire the lives and futures of these new scientists.

So Angela, how do I know when to recruit volunteers versus paid help?

Budget constraints can determine whether you can afford to hire technicians or need to recruit volunteers. You should communicate with your advisor or boss to learn about other opportunities that might be available to provide you with funding or sources of paid field workers. Besides the added incentive of being paid, when money is changing hands this process symbolizes a legal and binding contract. Under this contract, paid workers agree to complete assigned tasks at the quality you stipulate in the job description or they risk being Fired. This F-word you should NOT be afraid to say out loud, at least once, to all members of your team to establish yourself as the authority figure. Science is serious business, and getting paid to be a part of a research project needs to be treated as such.

While using paid technicians seems like the most desirable strategy, you can get the same quality of work from non-paid volunteers but with mutual benefits that include incentives other than money. A different kind of contract can be used, but instead of money changing hands, the exchange might consist of mentoring (for research or resume advice), training (for specific skills to become more marketable), or serving as a network node (for future contacts, collaborations, and connections). You are responsible for showing these volunteers how complex but fun research can be. You can either turn them on or off to your branch of science. For example, my volunteer Sarah had such a wonderful time working with me on Isle Royale during the first field season that not only did she return for a second season, but she recruited one of her friends to also volunteer on the project. This meant that not only was the benefit of volunteering sufficient enough to deserve a return appointment, but that the experience was also wonderful enough that Sarah wanted to share it with someone else.

Sarah Schaffer measuring water clarity using a Secchi disk from her inflatable kayak in Lake Mason. (photo: *H. Meiklejohn*)

Whether you are dealing with volunteers or paid workers, as the project leader you need to be clear, concise, and unambiguous about what you expect from your workers. At the same time, you need to show your workers that you hold yourself to the same demands. However, there is a line between hiring paid help and "hiring" volunteers, and this should be clear. Don't abuse the trust and support of those willing to work for free by holding them to the same strict, regimented, hourly-working, and tax-paying standards as those who are getting paid. It's important to estimate in advance how long it will take to complete the tasks you'd like to assign to your volunteers so that you can delegate duties more efficiently and effectively, and make realistic schedules for your team. Even with paid help, it's important to understand that no one is going to care for or work as hard on your project AS YOU. Do not forget this. You cannot expect the same effort from your volunteers or paid minions as you, yourself, the project leader and master, will be putting into your project. You can, however, give your volunteers the expectations, knowledge, training, and respect for them to be successful members of your team, and in return they will provide you with the help you require. Just like most things in research, initial investment of time and energy in volunteers is the key; the more you put into them, the more you will get out of them.

Hey Angela! How do you select, train, and create successful volunteers?

1. Plan ahead. Know how many volunteers you need and the times you will need them. Know when and where volunteers have to work. Decide how much and what kind of notice they have to provide if they will be late or absent for work. If possible, figure out your project details ahead of volunteer recruiting. Writing all this out will help you get a better idea of the scope and true cost of your project, as well as provide the vital logistics for your volunteers.

2. Create an official job description before interviewing and recognize potential workers. When you actually interview volunteers, give them some background on the project, describe what they will physically be doing, and say what is expected of them. Make sure they understand their roles in the project and give them an opportunity to ask questions. Tell volunteers what they can expect to get out of this whole thing up front, or what you foresee to be the potential benefit for them to work on your project. But don't lie about this if you're trying to lure people into working for you. Just having this conversation will give you a strong indication of who would be the best fit for your project, who is not, and hopefully, who is actually excited about working with you! The first day I met and interviewed Sarah for a volunteer position she was all smiles and enthusiasm, and I could immediately picture myself working with her for multiple weeks on a remote island. She had good questions that showed she had researched the study site beforehand, and she also brought her calendar to check dates, which told me she was organized and responsible and would be a great research team member.

***From left to right*: Rachel Mistak, Angela D. Dow, and Jennifer Hollen suited up for backwoods hiking after sampling Patterson Lake. (photo: *K. Schoch*)**

3. Learn and teach how to deal with conflict. Uncomfortable situations will arise when working in the field or lab. As part of the interview process, make transparency a priority and actually encourage tattling and whistle-blowing. Seriously, we are not on the playground or in the mob; if someone is collecting data incorrectly or contaminating samples due to improper protocol, your volunteers need to know that they are required to tell you everything that is going on in your project, even at the risk of causing rifts. Remember, funding agencies do not allow "drama" as an excuse for fabricating or incorrectly collecting data. You, as the project leader, are being held responsible for the integrity of the data and that includes how it is collected, stored, and analyzed.

4. Make training go beyond simply responsible conduct. Many research projects funded by federal agencies now require proof of responsible conduct in research training by those who are involved in at least two weeks of data collection or handling. This is a great policy but can hardly teach anyone HOW to physically collect high-quality data by the specific method required for your study. Field training is a great way to both make sure volunteers can accurately collect your data and vet your volunteers. Isn't it better to find out if your volunteer hates your study organism or can't count during a practice training session rather than on the first day in a remote field site? In addition, a practice field training session is a great way to make sure that you have everything you need to complete your field data collection.

5. Foster a friendly working relationship, nurture potential networks, and culture future collaborations. Supervisor-volunteer relationships can last longer than the duration of your research project or sample season, and it would be wise not to abuse or burn bridges with your volunteers. If you are depending on these volunteers to collect your data, you shouldn't motivate them by being mean, unfair, rude, or acting like a slave-driver. It's a guaranteed way to get bad attitudes and bad data.

Sarah – The Volunteer

Volunteering is a great resource for students to gain work experience and help project leaders at the same time. Although you are working for free, it's important to stay focused so you can take away new skills and learn from your project leader. Always remember that you will be able learn something new as long as you allow others to teach you!

***From front to back*: Kaitlin Clark, Haley Sisson, and Angela D. Dow obviously in the middle of some hard field sampling in Lake Desor. (photo: *K. Clark*)**

Angela D. Dow (*left*) and Kimberly Schoch (*right*) organize plant samples and filter water samples at their campsite near McCargo Cove. (photo: *C. Lee*)

So Sarah, with all these choices, how do you decide on who and what project to volunteer for?

There are so many volunteer options out there and sometimes all the choices can become a bit overwhelming. Before contacting a project leader, be sure that the described project is an experience you're legitimately interested in and gets you excited. Whether you're interested in the specific research topic or perhaps just the location, it's important to be honest with yourself and be sure you won't dread every second (but expect that you might dread a few seconds —if it was 100% fun all the time, it wouldn't be called work, right?). After all, you will be working for a potentially stressed-out project leader in a possibly uncomfortable environment for free. Always be sure that you're comfortable with the commitment level and working environment. If you can't stand lab work, don't volunteer at a microbiology lab; if you can't handle hot climates, don't volunteer in Texas. You'd think this would be common sense, but too many times I've seen students hating their volunteering tasks when they could have easily made a different —and better—choice.

Carefully weigh what the project leader needs compared to what you have to offer. Personally, I always worried about not having enough fisheries and wildlife field experience after college, so I made sure to be involved in projects that could boost my resume in a unique way. With Angela's research at Isle Royale, I combined the two things I was looking for: field research experience and traveling within Michigan. Isle Royale has always been one of my favorite vacation spots, so I figured why not sight-see and get a resume booster at the same time! Right from the start, she was honest with the daily tasks, the level of difficulty involving hiking and sampling, as well as the project duration and time frame. It really helped me confirm my ability to not only "survive" the experience but in the end provide her with accurate data.

The next task after finding the right experience for you is to make sure you know who you're going to be working with. This doesn't include just the other volunteers; mostly, I'm talking about the project leader who's hiring you. If you can't work well with the project leader or respect the effort they are putting into the project, then you won't be able to work efficiently and learn from your experience. It might be awkward, but it's much better to decline the opportunity beforehand as opposed to reaching a breaking point in the middle.

Hey Sarah! How do I stay enthusiastic while still being serious about research?

1. Observe your project leader. So you're with an awesome project leader, at an amazing location, and learning about a cool research topic. With extended periods of volunteer time, how do you keep up the enthusiasm without losing efficiency? My first answer is to look up to your project leader. So many times their excitement and motivation is enough to inspire the rest of the team. Angela was so passionate about the ecosystem of Isle Royale that it made me even more interested in the management and biology of the species living there. Excitement can be contagious for both ends in a volunteer partnership and should always be expressed and promoted.

2. Mutual R-E-S-P-E-C-T. As a volunteer, we need to remember that each project leader chose us specifically and is depending on us for accurate data collection. Even though we work for free, we are not easy to recruit, train, and employ. If the project leader didn't need each and every one of us, we wouldn't be there aiding in their research. By knowing this, I have always felt a sense of responsibility and have always wanted to do my best at the job.

3. Always look for opportunities to learn something new. If you were able to find a position relating to your interests or goals, then it's motivating to work hard so you feel more confident in your skills during future opportunities. The best way to improve any skill is to practice and get pointers from peers and teachers. Volunteering is a great way to accomplish this.

4. Remember: (good) communication is the key! One issue I've stumbled across more than once is being exhausted from the task at hand and feeling like I'm not doing my best for my project leader. After talking to them about it, I've come to realize that leaders can get tired too! Having that open line of communication has made the world of difference and made me realize that everyone has their limits. By being honest and realizing how much you can accomplish in a day, you save yourself (and your project leader) from frustration and disappointment when your goals aren't reached. If you are a volunteer and feel like you're reaching your limit, speak up (especially if it is affecting the quality of your work)! Always establish a line of communication; everyone has their bad or tired days, and it's important to be honest with your project leader and your team. Sometimes they can really surprise you and help you get through the slump.

Overall, work quality and team building thrive on open communication, respect for each other, and respect for your work. If you are able to achieve this with your project leader, you'll not only be more efficient in your work, but you can have a lot of fun out in the field. Always remember to continue communication with your project leader and co-volunteers after the project is over. They can be great resources for other opportunities or help in future projects. I have been able to take these lessons back with me into the job world and have been so thankful for every moment!

A Bird's-Eye View

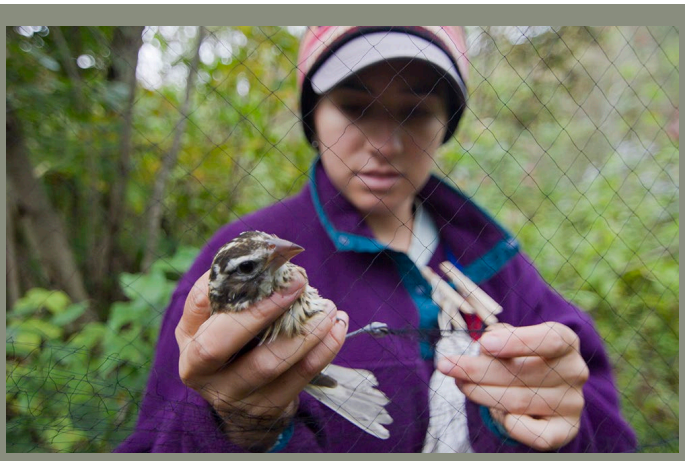
Burke Lake Banding Station and its transition from research to a non-profit, public outreach station

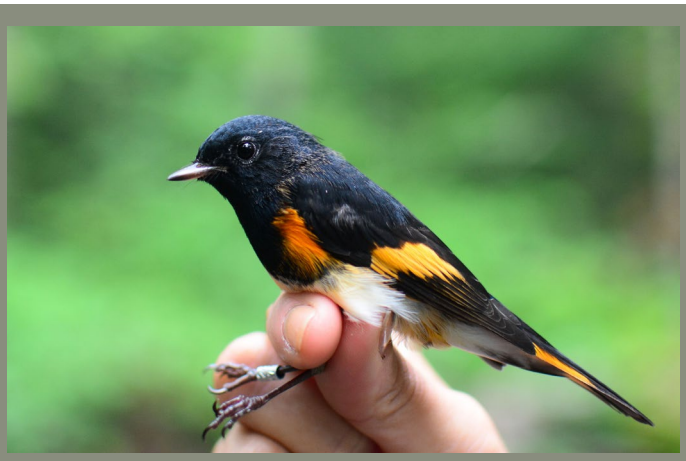
By Callie Gesmundo

There's an old superstition that says if a bird poops on you then good things are coming your way. If this is true, then the Burke Lake Banding Station crew is in for *years* of good luck.

Burke Lake Banding Station (BULA) is a bird banding station located within the Rose Lake State Wildlife Research Area in Bath, MI. Dr. Jen Owen, Associate Professor in the Department of Fisheries & Wildlife at MSU, started banding birds at Burke Lake in 2010. The station started as a field site for her and her graduate students to research the health of songbirds during migratory stopover.

Migratory stopover is an important time during the annual cycle of a migratory bird. Migratory birds travel north to their breeding grounds in the spring and south to their wintering grounds in the fall. During those migratory periods, birds often stop along the way to rest and eat to replace depleted fat stores. Suitable stopover locations are essential to birds on their arduous migratory journey. Mid-Michigan's largely agricultural-urban landscape does not provide adequate food sources for migratory landbirds (the majority of what birds forage in our netting area); hence, forested areas such as Rose Lake State Wildlife Research Area, where BULA is located, are essential stopover sites, particularly during fall when there is an abundance of fruit.





Left: Extracting a Rose-breasted Grosbeak from a mist net (photo: *Z. Pohlen*); Right: American Redstart with its uniquely numbered aluminum band (photo: *J. Owen*); Opposite: Group of young visitors walk the trails with the field crew at Burke Lake Banding Station to check mist nets for birds (photo: *J. Owen*)

The "Whats" of Bird Banding

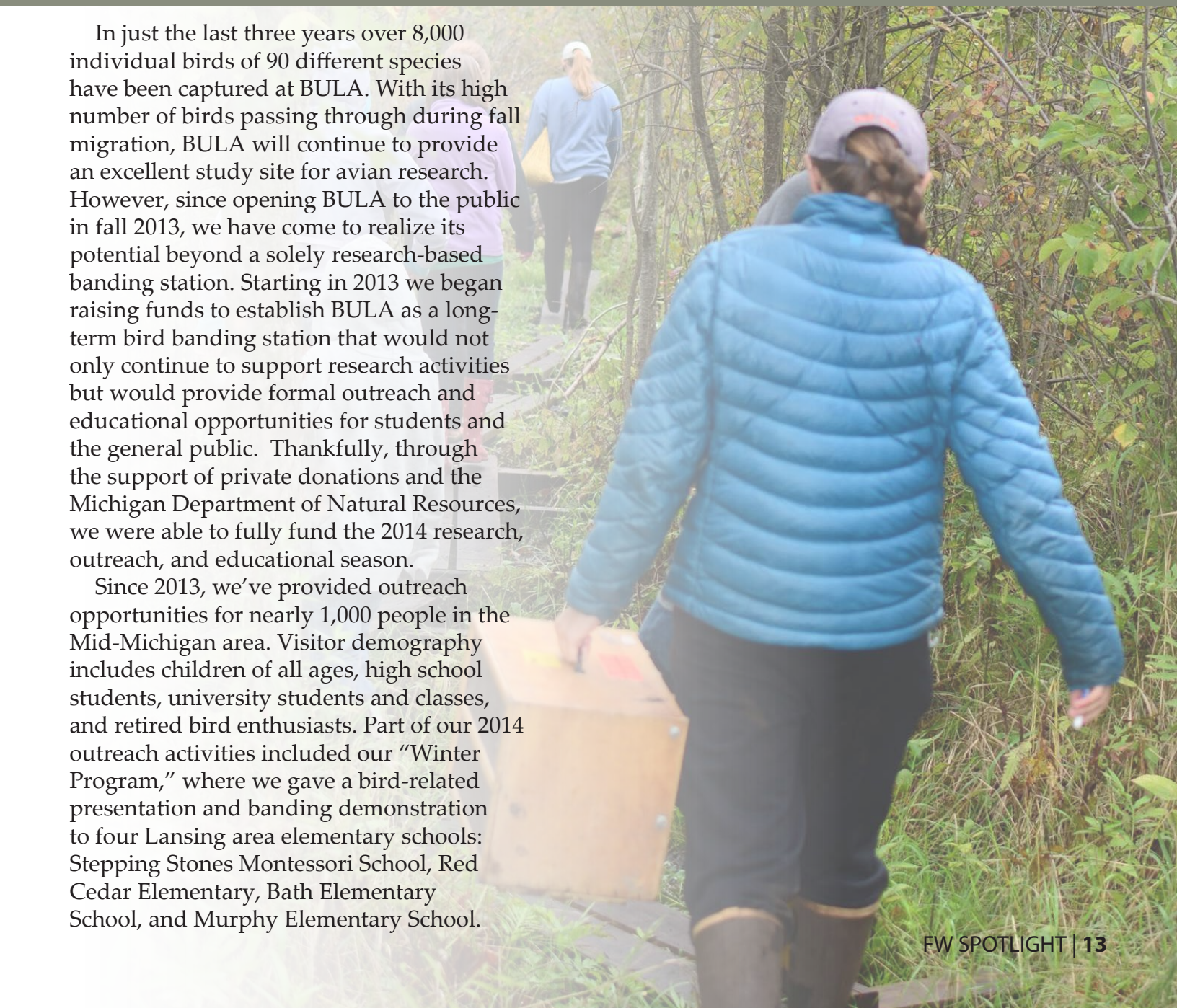
Although bird banding gets its name from the band attached to a bird's leg, a more accurate name might be bird identifying-aging-measuring-assessing-sexing. In other words, banding serves multiple roles in bird ecology by providing a way to mark and record individual birds over time and across space. The process of banding a bird requires special equipment and well-trained individuals. Here we outline key steps taken at Burke Lake Banding Station and banding stations across North America.

1) Catching birds Banding stations catch birds in devices called "mist nets." Mist nets are finely woven mesh nets strung between two poles. The net catches birds passively as they fly through the vegetation.

2) Extraction The nets are checked every 30-45 minutes and any bird caught is removed and taken to a central location where it is banded and processed.

3) Data Collection/Processing Each bird is identified to species and then fitted with a uniquely numbered aluminum band. Once a bird is banded additional information is recorded, including sex, age, body condition, and mass.

4) Data Storage The collected data are submitted to the Bird Banding Laboratory, a joint program managed by the United States Geological Survey and the Canadian Wildlife Service. The Bird Banding Lab keeps a database of all birds banded and captured in the United States and Canada. For more information on these long-term data sets you can visit the Bird Banding Laboratory website: http://www.pwrc.usgs.gov/bbl/.



In just the last three years over 8,000 individual birds of 90 different species have been captured at BULA. With its high number of birds passing through during fall migration, BULA will continue to provide an excellent study site for avian research. However, since opening BULA to the public in fall 2013, we have come to realize its potential beyond a solely research-based banding station. Starting in 2013 we began raising funds to establish BULA as a long-term bird banding station that would not only continue to support research activities but would provide formal outreach and educational opportunities for students and the general public. Thankfully, through the support of private donations and the Michigan Department of Natural Resources, we were able to fully fund the 2014 research, outreach, and educational season.

Since 2013, we've provided outreach opportunities for nearly 1,000 people in the Mid-Michigan area. Visitor demography includes children of all ages, high school students, university students and classes, and retired bird enthusiasts. Part of our 2014 outreach activities included our "Winter Program," where we gave a bird-related presentation and banding demonstration to four Lansing area elementary schools: Stepping Stones Montessori School, Red Cedar Elementary, Bath Elementary School, and Murphy Elementary School.

Research at Burke Lake Banding Station

Yushi Oguchi, a master's student in the Avian Health and Disease Ecology Lab, and Zak Pohlen, research technician and former Fisheries & Wildlife undergraduate, conducted research at Burke Lake Banding Station in 2012-2013. Using a combination of banding, blood collection, and radio-telemetry they investigated whether there were negative consequences for landbirds using exotic vegetation during migratory stopover. Fruits are an important food source for landbirds during fall migration. However, the nutrients within fruit vary between different plant species, which may influence the perceived habitat quality for a bird during migratory stopover.

Their results show that birds were using native-dominated shrublands more than exotic dominated shrublands. Moreover, the radio-telemetry data supports that birds spent more time in the native area, regardless of where they were initially captured. Additionally, Yushi found that some species captured in the native shrublands were healthier than the same species captured in exotic shrublands.

With the increased prevalence of exotic species on our landscape, it is important and of interest to understand how these species affect wildlife. We expect land managers will be able to use these findings to better manage forested lands for migrating landbirds.

Yushi using radio telemetry to determine a bird's location and movement within and between habitat types (photo: *Z. Pohlen*)

The students were very enthusiastic, loved sharing their knowledge and stories about birds, and already had an impressive grasp on bird identification.

With sufficient financial support, we plan to continue these programs as well as continue to participate in other community outreach events. By incorporating education and outreach opportunities into our mission, we hope to further establish BULA as an integral part of the mid-Michigan community.

There is still a long road ahead in establishing BULA as a permanent public banding station, but we are optimistic, excited, and will keep working hard to provide a unique learning environment for the community. Burke Lake Banding Station is a non-profit 501(c)(3) organization that depends on support from private donations.

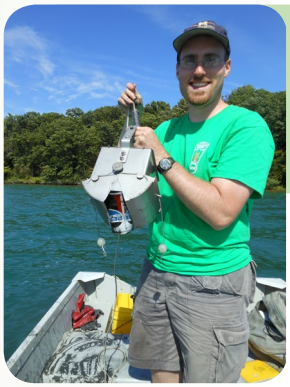
To find out more about how you can support our mission visit our website at:

www.bula.fw.msu.edu

Left: Callie showing off a Dark-eyed Junco caught during a banding demonstration at Murphy Elementary School in Haslett, MI; Right: Two young visitors enjoy the company of an American Tree Sparrow during a banding demonstration at the Michigan State University Science Festival (photos: *Z. Pohlen*).

Callie Gesmundo is an MSU alum with a B.S. in Fisheries & Wildlife. She began working with birds as an undergraduate and continues to today as a contract biologist.

Department Fellowship Awards



Jeffrey White

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.

Graduate Program: Fisheries and Wildlife, Ph.D. **Advisor:** Dr. Orlando Sarnelle

Graduate Research: I am a student in the limnology lab researching harmful (bloom-forming and potentially toxic) freshwater algae. I am especially interested in how biological variation in critical traits of my focal species, *Microcystis aeruginosa,* enables it to inhabit a broad range of niches (lakes) and also influences its population and community ecology.

Motivation to Apply: I sought this opportunity because my research is closely aligned with the mission of the fellowship, namely limnology and water quality research.

Benefits of the Fellowship: As a result of this fellowship opportunity, I will be able to greatly diversify my research through collaboration with a microbial geneticist to characterize at the molecular level different strains of *Microcystis* isolated from numerous lakes across southern Michigan.

Yushi Oguchi

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

Graduate Program: Fisheries and Wildlife, M.S. **Advisor:** Dr. Jen C. Owen

Graduate Research: Health status of migrating landbirds using exotic shrubland as stopover habitat (*see the previous page for information on my involvement with the Burke Lake Banding Station!*).

Motivation to Apply: I am evaluating the little-known impact of consuming exotic fruits on the physiology and immunology of migrating landbirds. It takes a lot of work to understand this system holistically - from indexing the habitat and habitat use in the field to looking at measures of refueling success and various immune parameters in the blood of birds. The project became very large, and I was in need of more time and funds to finish the study. I am very grateful to the Glassen Foundation for the fellowship and for the recognition that ecoimmunology can be a valuable new approach in evaluating habitats.

Benefits of the Fellowship: The greatest benefit of the fellowship is that it supports me for the last semester of my program and allows me to focus on research. It also granted me the opportunity to present my work to the board of the Glassen Foundation and share our passion for conserving healthy wildlife populations.

Yang Li

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.

Graduate Program: Fisheries and Wildlife, Ph.D. **Advisors:** Dr. Jim Bence and Dr. Travis Brenden
Graduate Research: Innovative management solutions for intermixing fish populations
Motivation to Apply: I wanted to share some interesting facts about Asian carp with a larger audience by writing a non-scientific paper and further explore the effect of human prejudices on Asian carp management by using a systems thinking approach. I greatly appreciate the FW Department's support and their emphasis on environmental communication though this fellowship.
Name of Literary Piece: "Asian Carp: Your stomach as a conservation tool" *See pages 22-24.*

Marissa Hammond

Dr. Howard A. Tanner Fisheries Excellence Fellowship

Dr. Howard Tanner is an alumnus of the FW Department. He has served as the Fisheries Division Chief and Director of the Michigan Department of Natural Resources and the Director of Natural Resources for MSU's College of Agriculture and Natural Resources. Dr. Tanner has been a longtime supporter of Great Lakes water issues and this fellowship recognizes students who are committed to fisheries research related to the Great Lakes, connecting waterways, or tributary stream research.

Graduate Program: Fisheries and Wildlife, M.S. **Advisor:** Dr. William Taylor
Graduate Research: My thesis research focuses on the changes in lake whitefish age and length at maturity over time and its impact on fish production and yield in the Upper Great Lakes.
Motivation to Apply: When I came to MSU I learned about Dr. Tanner's passion for water related issues, along with what he'd done to support Michigan's natural resources. The intent of my thesis research is to provide fishery managers in the Great Lakes Region important information regarding the potential future production and recruitment of lake whitefish. This knowledge will assist managers in their decision-making related to allocation of catch in future years. I am passionate about water related issues, as Dr. Tanner has been, and I feel that my research will help support and advance the knowledge pertaining to one of Michigan's highly valued natural resources. When I heard about this fellowship, I was highly motivated to apply.
Benefits of the Fellowship: I am honored to have received this fellowship and am thrilled that it will help support my research efforts and continued involvement in natural resource meetings focused on the management of lake whitefish within the Great Lakes Basin.

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 Department of Natural Resources Fisheries Division. It is designed to facilitate interactions of 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.

Fenske Mentor: Dave Caroffino, Fisheries Biologist, and Randy Claramunt, Fisheries Research Biologist Specialist; both are from the Department of Natural Resources (DNR) at the Charlevoix Field Station.
Motivation to Apply: Jan Fenske was committed to the sustainability of aquatic resources, as am I. When I learned about the Fenske Fellowship I felt that I could make an impact on the sustainability of one of Michigan's highly valued aquatic resources and was excited about the opportunity to work with a state agency to enhance my knowledge of fisheries management.
Fenske Project: For my project, I studied lake whitefish recruitment and year-class strength to determine if year-class strength could be used as a pre-recruit index for informing catch quotas. I also distributed a survey to managers to gather information on sampling protocols used for monitoring lake whitefish to assist in the future development of a standardized commercial sampling protocol for state and tribal agencies within the Upper Great Lakes.
Lessons Learned: I learned how the Michigan DNR functions as a research and management agency by performing field work with the DNR, spending time in the Charlevoix Field Station lab, and by attending management meetings with members of the DNR, tribal, and other state agencies. Through attendance at various management meetings I learned how different stakeholders work together to manage a resource and how the research that each of these entities performs is used and applied to make management recommendations.
Application beyond Fellowship: The experiences that this fellowship provided me with have better prepared me for working within a state management agency, and the lessons learned have taught me about what it takes to be an effective fisheries manager.

Go Wild!

A Photo Essay of Teens Exploring Michigan's Wildlife

By Amber Goguen with additional images from Lucas Gabbard

To many of us, it is hardly news that today's youth are becoming increasingly disconnected from the natural world. Youth are spending less time outdoors due in part to large societal changes resulting from urbanization, such as new technologies that lead to a more "indoor" lifestyle and lack of access and opportunity to get outside. The effects of this detachment have both social and environmental ramifications. Spending time in nature is not only beneficial for our mental, physical, and spiritual health but also helps nurture and grow environmentally-responsible behavior. Research suggests that environmental concern is developed through childhood experiences with nature. A child who has early life experiences in nature is more likely to have positive environmental attitudes and engage in pro-environmental behaviors. This situation raises the question; If children continue to spend decreasing amounts of time outdoors, will there be a next generation of conservationists? This fear has led conservationists and educators to develop initiatives aimed at rekindling connections between youth and the environment. One such program is the Michigan State University Extension 4-H Great Lakes and Natural Resources (GLNR) Camp. Here, Michigan teens from across the state spend a week exploring Michigan's vast and unique natural resources through outdoor hands-on learning experiences. In the summer of 2014, Lucas and I had the privilege of planning the camp's Morning Wildlife Session. Through the use of trail cameras, track pads, and live traps we sought to provide campers with the experience of being a wildlife biologist for the day in hopes of exciting interest in Michigan's wildlife and their habitats. Rather than tell you about our week we would like to show you - through the use of photography - how these Michigan teens engaged with local wildlife and built connections to nature through their experiences.

What is a photo essay?

A photo essay is a series of images intended to tell a story or portray an event. A photo essay not only captures experiences but also conveys emotions and concepts. Here, there are short comments below each image to aid in interpretation. The comments can be read from left to right, however, there is no correct order.

Checking the trail cameras in the morning to see who was roaming around in the night...

What happens when you put a trap full of tasty fruit next to a dumpster?

Here are just a few examples of what we saw: two raccoons, an opossum, and a gray fox.

You catch a skunk! Using a tarp and bacon we got the skunk out without being sprayed.

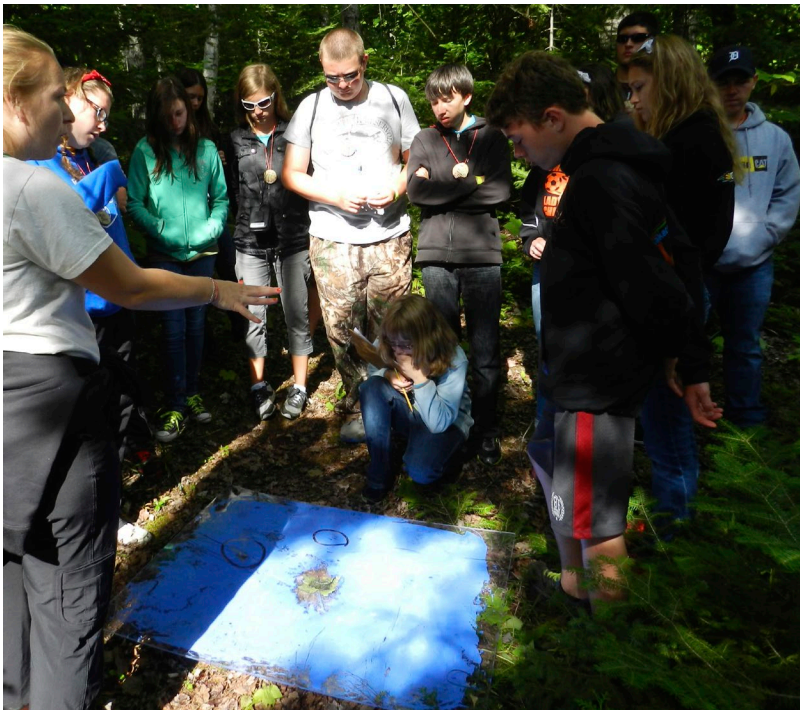
What is an ecosystem? Are humans part of an ecosystem? How do humans affect nature?

Out into the field we go to check traps for live animals and track pads for their prints.

Sherman traps are triggered when an animal steps inside, closing the door behind them. We baited them with peanut butter and jelly. Yum!

One of the most exciting parts about catching a chipmunk is their energy.

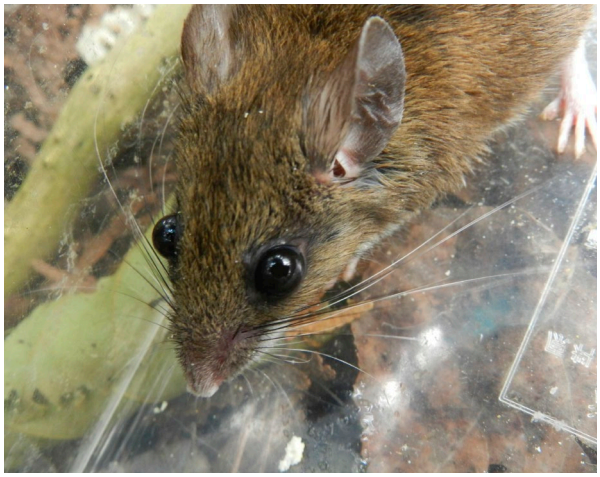
Chipmunks are curious creatures. Often their curiosity gets the best of them. When a trap is chirping you can tell a chipmunk is inside.



We made track pads out of plexiglass, painters chalk, and rubbing alcohol. Mix 3 parts painters chalk with one part alcohol. Spread the mixture evenly over the plexiglass and let it dry. When the alcohol evaporates it leaves a layer of chalk dust behind that gets lifted off when an animal walks across it. And don't forget to add a snack in the middle to help attract an animal.

That's not just a mouse! It's a deer mouse. Learning to identify wildlife using an identification book is an important skill for a future wildlife biologist.

Above is the print of a raccoon's hind foot captured on a track pad.



We were quite surprised to find this guy in our trap! But don't worry, no one ended up looking like a pin cushion. Porcupines don't shoot their quills. They release them when something touches them.

Here is a snowshoe hare in its summer coat. In winter they turn white to blend in with the snow and better hide from their predators, such as bobcats.

"All I wanted was a juicy red strawberry!"

Virginia opossums are the only marsupial species north of Mexico. They have opposable thumbs on their hind feet.

To learn more about the GLNR 4H Camp visit http://4h.msue.msu.edu/events/glnrc

Amber Goguen is a graduate student studying the human dimensions of wildlife management with Dr. Shawn Riley. Her research focuses on the role of natural resource consumption in coupling human and natural systems, with a particular focus on wild harvested meat.

Asian Carp

Your stomach as a conservation tool

By Yang Li

Dislike. Fear. Hate. Big threat to native species and ecosystems.

What are your first impressions of Asian carp? Have you heard the stories about Asian carp launching out of the water and hurting people? Have you ever thought about what you can do to help the government fight these fish invaders? Maybe you could just buy them and eat them. Never underestimate the power of the consumer.

Asian carp have been blacklisted by many people without a second thought. Actually, "Asian carp" refers to a group of fish species. The Asian carp group, originally from eastern Russia and China, includes the bighead, silver, black, and grass carp (a grass carp is pictured below). The Michigan Department of Natural Resources describes Asian carp as "a series of highly invasive fish species capable of causing economic, ecological, and human health harm." Is this true? Yes and no.

They are highly invasive fish species.

An "invasive species" generally has two features: 1) it is non-native to an ecosystem, and 2) its introduction is likely to cause economic, human health, or environmental damage in that ecosystem. Except for black carp, all other Asian carp species were purposely introduced by farmers from the state of Arkansas in the 1970s for aquaculture and research. Although black carp was initially smuggled into the U.S. with a grass carp shipment, later it was also purposely introduced to control snails in catfish ponds. However, no one expected that Asian carp would be so good at escaping. By 1976, Asian carp were already being sighted in the wild in Arkansas. Then the flooding of the Mississippi River in the 1990s facilitated the escape of even more bighead, silver, and black carp into the wild. Now these species are widely spread throughout the Mississippi River basin. Due to the diet overlap between Asian carp and native U.S. fish species, the Asian carp compete directly with native fish for food. Scientists believe that Asian carp could out-compete native yellow perch and walleye, and result in the decline of their numbers. Although juvenile Asian carp would be eaten by predatory fishes, such as bass and pike, they grow quickly and soon become too large for any North American native fish to feed on. The electric barrier in the Chicago Sanitary and Ship Canal has been used for years to prevent the Asian carp from getting into Lake Michigan. So, it's true that they are highly invasive fish species.

But they could provide economic profit if people would eat them.

Like Asian carp, Pacific salmon are also a group of introduced fish species in the Great Lakes region, yet they have a much better "reputation." Salmon contribute greatly to commercial and sport fisheries. State agencies on Lake Michigan annually stock 3.3 million Chinook salmon spring fingerlings. Why the difference?

One of the most important reasons for the success and popularity of introducing Pacific salmon is that they are valuable to other predators: you and me. Commercial and recreational harvest annually maintains the population of Pacific salmon at a manageable level. Yet, for Asian carp we have prejudices against them, paying no interest in them as a food source.

"This fish is so good, I'd take it over tilapia"
— Chef Philippe Parola

Why don't people eat Asian carp?

Prejudice 1: "They are 'trash fish.' Eating them is disgusting."

Many people are prejudiced just because of the name "Asian carp," which can be confused with the common carp. The common carp is a bottom feeder and has a "muddy" flavor according to many people. But Asian carp, such as silver carp, are clean fish living in the upper waters of rivers feeding on plankton and algae. Several restaurants in Louisiana have been serving silver carp dishes for years. "This fish is so good, I'd take it over tilapia," said Louisiana Chef Philippe Parola. According to a cross-culture blind taste test at the University of Missouri last year, the silver carp clobbered catfish. In fact, Asian carp are healthy and nutritious, high in protein, low in fat, and lower in accumulated toxins than other fish, mostly because they don't feed on other fish.

Prejudice 2: "They are hard to eat. They have bones in 'strange' places."

It is true that they have a complex bone structure. Yet,"When the fish is cooked, it's easy to remove the bones," Parola said. "There's no secret. Fillet the fish, cook it, take out the bones. One fish can feed an entire family." Clint Carter, the co-owner of Carter's Fish Market in Springfield, Illinois, prefers to cut out the rib bones and some of the pin bones before cooking. You can cook Asian carp like any other fish. Bread it, fry it, or bake it, whatever you want. If you search online, there are tutorials available about deboning and cooking Asian carp.

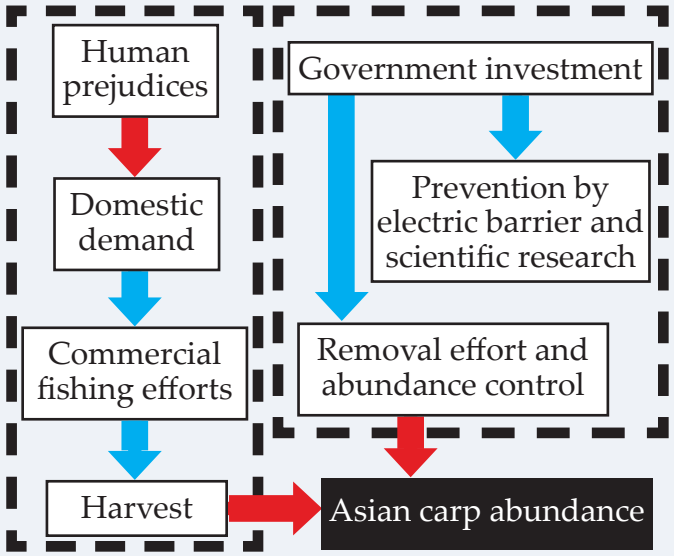
Asian carp management solutions.

Two possible solutions for decreasing Asian carp abundance are commercial harvest (market-based) and government removal, as indicated by the two dotted boxes in the diagram on the next page. Current management for Asian carp is based on a government-oriented system (right dotted box), which is also the expensive one. The Obama administration has invested more than $200 million to prevent Asian carp from getting into the Great Lakes and created the Asian Carp Regional Coordinating Committee in 2009. You may begin to wonder, why not simply switch to the market-based solution? The challenge is human prejudice.

How does human prejudice impact the abundance of Asian carp?

Human prejudice against Asian carp could result in reduced purchasing behavior (left side of the diagram at right). Without local demand for such fish species, the only other solution for Asian carp harvest is the export business. The only problem is the earnings margin, given it's not easy or cheap to ship millions of pounds of anything across the globe. The main reason why commercial harvest has not been previously considered as an effective method for controlling Asian carp is because there is no market. Low demand results in less fishing effort, and subsequently leads to less commercial harvest.

You could imagine the opposite scenario after correcting human prejudices. If fishermen could earn enough money by selling Asian carp to local people, there would be more commercial fishing effort. With enough commercial fishing, the electric barrier in the Chicago Sanitary and Ship Canal could be closed, and there would be less concern about Asian carp getting into the Great Lakes. Less government investment on prevention and removal would be needed, and taxpayer money could be saved. This is the so-called market-based system.



The relationship between human prejudice and the overall abundance of Asian carp. Blue arrows represent a positive relationship; red arrows represent a negative relationship. The two dotted boxes separately represent two potential approaches of controlling Asian carp abundance.

The limitations of the market-based system.

No system is perfect. Unlike the current government-oriented system whose goal is to eliminate invasive Asian carp, the market-based system, at best, may eventually lead to a sustainable level of Asian carp. Businessmen are not fools. They do not want to build a business aimed at destroying all raw materials, especially for the Asian carp business, which will require high investment in establishing new processing plants and introducing specific processing machines. Secondly, commercial harvest is unlikely to eliminate all Asian carp, even if desired, because the market would likely demand big Asian carp, generally larger than 10 pounds. Without harvesting small Asian carp at the same time, Asian carp can hardly be eliminated. Thirdly, the mesh size of fishing gear determines the size of Asian carp harvested. Even if the mesh size is reduced to capture smaller Asian carp, higher by-catch of native fish species can also be expected.

In all likelihood, eliminating invasive species with prolific breeding behaviors that can get so abundant, like Asian carp, is unrealistic based on our previous experience with species like sea lamprey. A more realistic goal for controlling Asian carp invasion is to keep the abundance of Asian carp at a manageable level in the region where they have become abundant, such as the Mississippi River basin, and decreasing the risk of their spread into the Great Lakes region by increasing commercial fishing effort in the waters close to the electric barriers in the Chicago channels. Of course, developing an industry for Asian carp requires more scientific risk assessment, and cooperation among the government, fishermen, and fisheries businessmen.

The current critical tasks for managing Asian carp, such as bighead carp and silver carp in the Mississippi River, are to correct some general prejudices against Asian carp, make the policymakers aware of the importance of making Asian carp a marketable fishery, and encourage more commercial fishermen to make money off of Asian carp. If one day the balance between commercial fishing and government control of Asian carp is found, we may view it as a success for introduced fish species management, just like Pacific salmon. For the Asian carp, if we cannot beat them, at least we can eat them.

Leave a Buck, Take a Doe

Motivations for Antlerless Deer Hunting

By Zuri Kelley

Deer management on trial

Hunting is a deeply rooted tradition in Pennsylvania. It's so strong that in many parts of the state the first day of rifle season is a school holiday, since students just won't come to school anyway. However, despite the rich hunting culture, deer densities remain high and are resulting in negative economic and ecological impacts throughout the state. Since the early 20th century, white-tailed deer management actions have been debated as deer densities increased while farmers and foresters experienced less return on their crops. Higher deer densities can cause crop damage and can alter the ecological state of forests by deer preferentially browsing on certain plant species. At times, management attempts to reduce white-tailed deer densities gave politicians leverage to contest and draw votes from hunters who opposed reductions in deer densities, so reduction attempts were largely unsuccessful. Through the years, hunters have been resistant to accept any changes in white-tailed deer management.

A different approach to management

In 2001, the Sand County Foundation and private foresters partnered with the Allegheny National Forest to form an alliance known as the Kinzua Quality Deer Cooperative (KQDC) with the goal of combating the ecological change and economic costs resulting from high deer densities in northwestern Pennsylvania. The purpose of the KQDC is to promote ecological diversity of forests for multiple uses, such as recreation, research, forestry, and wildlife, through the utilization of hunting as a primary tool to achieve these goals. In this way, the program aims to meet the needs of all stakeholder groups. The KQDC encourages hunters to harvest additional antlerless deer beyond the standard state allotment as part of the Deer Management Assistance Program (DMAP) developed by the Pennsylvania Game Commission in 2003. DMAP assists landowners in achieving land management goals by allocating additional opportunities to harvest antlerless deer through the distribution of DMAP coupons to prospective hunters. Coupons are assigned to designated parcels of land known as wildlife management units and can only be used in those units for the designated year. Since 2001, deer densities have decreased from 10.6 deer/km^2 to an average of 5.3 deer/km^2 with the DMAP program. As a result, the amount of available DMAP permits has decreased with decreasing deer densities. However, hunters are integral to the continued ability of the KQDC to maintain their objectives. As such, we're studying hunters who purchased DMAP's during different time periods to understand what compels them to hunt on the KQDC despite decreasing deer densities. We would like to know what kinds of hunters use the KQDC? What motivates hunters to hunt on the KQDC, and why do some hunters stop hunting? Additionally, how satisfied are these hunters with their hunting experience, and are they willing to hunt on the KQDC in the future? This is important because knowing what affects a hunter's willingness to hunt on the KQDC over time can inform management decisions of the landowners to keep engaging hunters and achieving their management objectives.

Identifying hunters for the study

To understand differences among hunters on the KQDC, we used a mail back survey of questions ranging from 'Completely disagree' to 'Completely agree' of hunters who purchased DMAP permits during three time periods. "Former hunters" purchased a DMAP in only 2007 or 2008. "Recent hunters" purchased a DMAP in only 2011 or 2012. Lastly, "Loyal hunters" purchased a DMAP during both of the aforementioned time periods. These time periods were chosen and categorized to reflect DMAP hunter's temporal participation in hunting on the KQDC. We identified former hunters who may no longer hunt on the KQDC from a 2004 KQDC hunter survey.

What kinds of hunters hunt the KQDC?

Of the 489 hunters who responded to the survey 97% were male. The average age of hunters was 56 years with an average of 40 years of hunting experience, which is 10 years more than the average age and experience of hunters in Pennsylvania as a whole. Of the KQDC hunters, 55% primarily hunted on private lands compared to 29% who hunted only on public lands. Most hunters lived within a two hour drive of the KQDC. During the 2013 hunting season, 65% of hunters who responded indicated that they had hunted on the KQDC. Of these however, only 9% of hunters were successful at harvesting an antlered deer, and 21% harvested an antlerless deer. Most of these harvests were obtained during the firearm season.

Differences between hunters

We found that the motivations and perceived contraints for hunting on the KQDC were very similar across the different time periods we studied. The three groups of hunters only differed in a few of their motivations, including: harvesting enough deer, being familiar with the KQDC, and/or having always hunted on the KQDC.

Compared to former hunters, both loyal and recent hunters were more likely to agree that they were motivated to hunt the KQDC because they had harvested enough deer. In addition, loyal and recent hunters were more likely to agree that they were motivated to hunt on the KQDC because of their familiarity with the landscape. Loyal hunters were most likely to be motivated to hunt the KQDC because they'd always hunted the KQDC, compared to former and recent hunters. Additionally, recent hunters were 1.32 times more likely than former hunters to say that they'd always hunted the KQDC. Satisfaction with hunting on the KQDC did not differ among the groups of hunters. Surprisingly, all hunters were relatively unsatisfied with hunting on the KQDC. The likelihood of future participation in hunting the KQDC differed among the three groups. Loyal hunters were 1.85 times more likely than former hunters to continue hunting on the KQDC, while recent hunters were 1.49 times more likely than former hunters. This means that loyal and recent hunters are likely to continue hunting on the KQDC in the future in pursuit of the opportunity to harvest an additional antlerless deer despite low deer densities.

What it means for the KQDC

From our analysis we can conclude recent and loyal hunters are similar in their motivations and constraints when contemplating hunting on the KQDC. While our results have shown that former hunters are not anticipating hunting on KQDC in the future, they have been supplemented by recent hunters in addition to loyal hunters who never stopped. Former hunters appear to be less familiar with hunting on the KQDC or to have not hunted there as long, which would affect their ability to harvest deer. Prior research on the KQDC predicted that there would be an exodus of DMAP hunters, and that only traditional hunters (local hunters who typically pursue antlered deer) would remain. However, we've shown that recent hunters have replaced former hunters, and that these antlerless deer hunters are indeed traditional hunters who will continue hunting on the KQDC in the future. Hunters are the primary tool utilized by state agencies to maintain wildlife populations at levels acceptable to the general public. It is useful to know that while the objectives of the KQDC have not been popular among many hunters, there are other hunters who are willing to hunt on the KQDC. Additionally, understanding the demographics of KQDC hunters will help habitat managers set objectives to better engage and inform hunters of what is occurring on the cooperative. In this manner, the intentions of the managers and expectations of hunters may intersect as they come to understand each other's objectives. Only then will hunters begin to accept the adaptive strategies involved in white-tailed deer management.

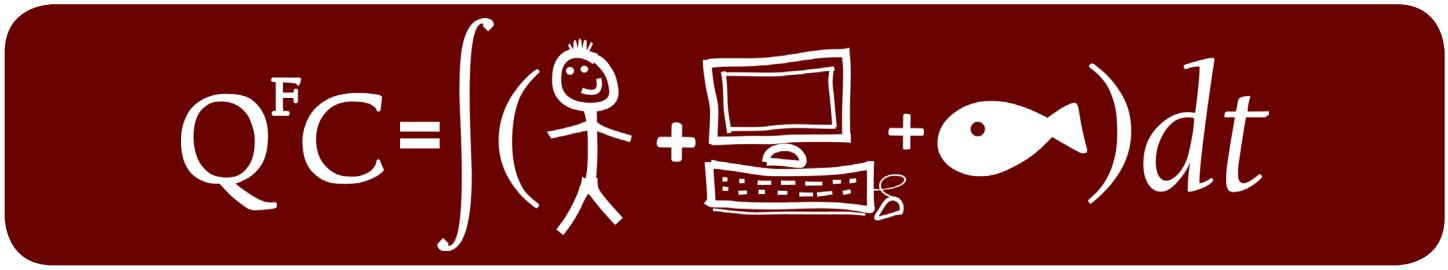
Zuri Kelley is a masters student working with Dr. Shawn Riley. Her research focuses on the effectiveness of deer hunter cooperatives as a mechanism for common-pool resource management.

Quantitative Fisheries Center

Drs. Mike Jones (top), **Jim Bence** (middle), and **Travis Brenden** (bottom) jointly direct the Quantitative Fisheries Center (QFC). The QFC was established in 2005 to provide scientific support for fishery management agencies in the Great Lakes region. The QFC conducts research, engages in extensive outreach and consultation with management agencies, and trains students, post-docs, and fishery management staff in many aspects of quantitative fisheries science including stock assessment, simulation modeling, risk and decision analysis, and statistical methods. The QFC currently hosts two online courses, an introduction to R and an overview of maximum likelihood estimation methods, both with a focus on addressing problems in fisheries and aquatic ecology, and is in the process of developing additional courses. The QFC also runs a number of in-person workshops on stock assessment methods and use of associated software. The QFC is guided by a Board of Advisors comprised of MSU and Great Lakes fishery agency representatives.

The QFC is composed of several professional staff in addition to graduate students. Dr. Iyob Tsehaye, Dr. Reneé Reilly, Dr. Sam Truesdell, and Dr. Lori Ivan are QFC post-doctoral associates. Dr. Norine Dobiesz and Dr. Rick Clark are research scientists. Ms. Angie Leslie is an academic specialist who supports the QFC's online courses and other outreach efforts. Dr. Rahman Patimar is a visiting scholar from Iran. *You can learn more about the QFC at http://qfc.fw.msu.edu.*

Contact Dr. Jones at: jonesm30@msu.edu
Contact Dr. Bence at: bence@msu.edu
Contact Dr. Brenden at: brenden@msu.edu



Dave Fielder is a Ph.D. student developing models to describe the status of the walleye population in Lake Huron. These models have been used to evaluate potential management directions for walleye in Lake Huron and especially Saginaw Bay. Walleye have recently recovered in Saginaw Bay with population levels achieving targets established by the DNR. New management opportunities and needs have emerged from the recovery, and this work is helping to address those.

Cleyo Harris, an M.S. student, works with Michigan DNR, Ohio DNR, and Central Michigan University on a project that focuses on grass carp in Lake Erie. They use acoustic telemetry tags and receivers to find out where this aquatic invasive species spends it's time throughout the year and if the fish are using tributaries to Lake Erie's western basin. This project will be used to inform managers and stakeholders about a potentially problematic invasive species in Lake Erie.

Chris Holbrook's Ph.D. work uses electronic fish tracking technology to study where and when sea lamprey, an invasive species in the Great Lakes, move through large rivers during their spawning migration. By tracking movements of individual lamprey during migration, we can evaluate the effectiveness of traps for counting and removing adult lampreys before they spawn. Understanding lamprey migration will also guide development of new capture methods.

Yang Li is a Ph.D. candidate studying management approaches for intermixed fish populations through a case study of lake whitefish populations in Lake Huron. Specifically, her research will estimate mixing rates from tag-recovery results to improve current fisheries stock assessment models and determine the spatial scale of management. Yang received her B.S. degree in Marine Science from Shanghai Ocean University and M.S. in Fisheries & Wildlife from MSU.

Jared Myer's Ph.D. research focuses on understanding how dynamic processes and the environment may influence larval cisco survival in Lake Superior. Cisco, a salmonid species, were once the most prolific fish species in each of the Great Lakes. A better understanding of the factors that drive cisco recruitment could help us better predict population numbers; benefiting their management in Lake Superior and informing restoration efforts in the lower Great Lakes.

Bryan Stevens is a Ph.D. candidate studying population dynamics and harvest management of wild turkeys. He received a M.S. in statistics, and M.S. and B.S. degrees in wildlife resources from the University of Idaho. Bryan's doctoral research evaluates how uncertainty influences our ability to determine sustainable harvest rates for wild turkeys, develops statistical models to assess harvested populations, and uses decision-analytic tools to evaluate turkey harvest regulations.

Alex Jensen's M.S. research will model the response of sea lamprey populations to dam removals on rivers that feed into Lake Michigan. Although dams block favorable habitat for sea lampreys, the demand for their removal is increasing; Alex plans to use stream data to estimate the amount of lamprey habitat above dams and then use this information to update population predictions. These predictions can inform dam removal and lamprey control policy in Lake Michigan.

Sarah Mayhew's Ph.D. research applies statistical catch-at-age analysis, a population assessment technique common in fisheries, to bear harvest data from the Michigan DNR. The models she develops will estimate the annual bear population size, composition, and mortality rates and will allow the DNR to predict potential effects of future management decisions. This approach is a low-cost and more detailed means of monitoring the bear population than what the DNR has used in the past.

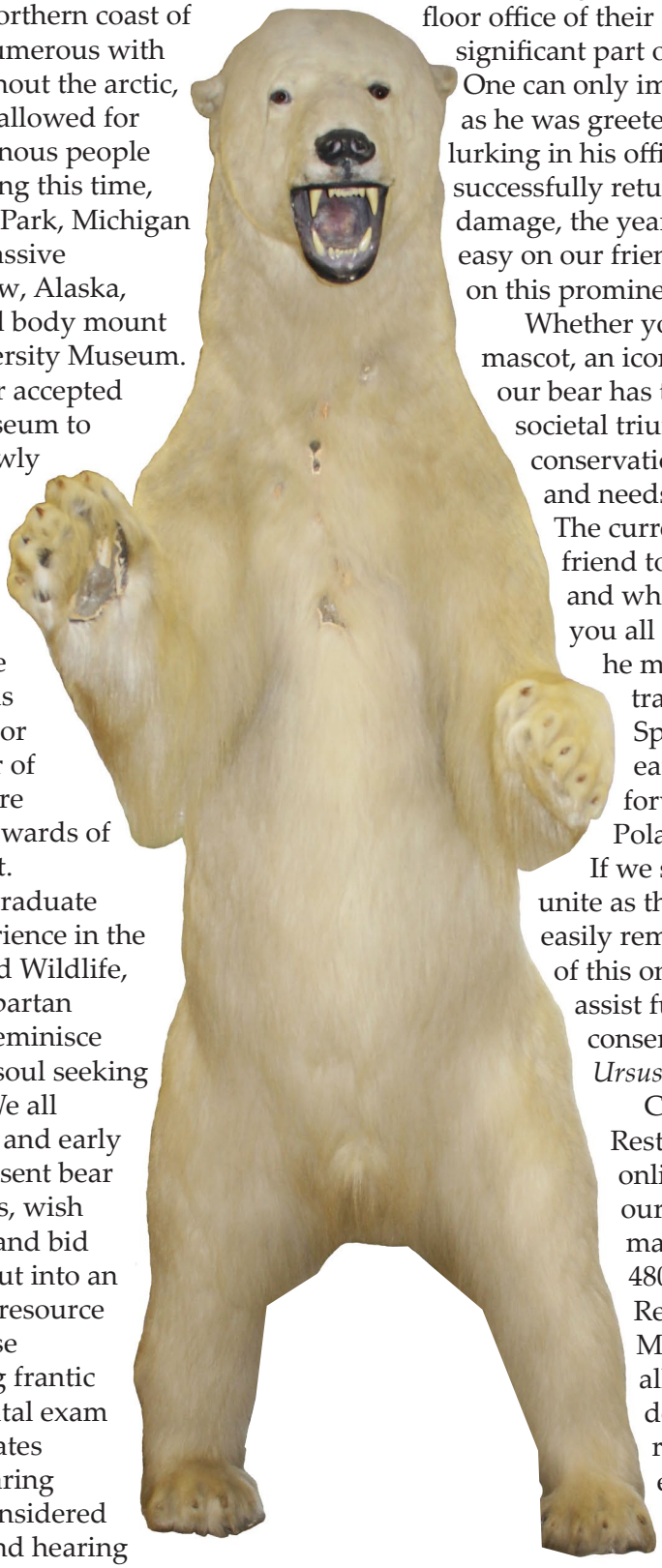
Lisa Peterson is a Ph.D. student using acoustic telemetry data to estimate mortality components for walleye populations in Lake Erie and Lake Huron. There has been a multi-year project deploying acoustic tags and receivers and this research will help put this data to use. Finding a suitable approach has the potential to improve our understanding of walleye population dynamics and inform the current stock assessment models that are used to set total allowable catches in the lakes.

Matt Vincent, a Ph.D. student, is comparing the accuracy and precision of estimated population sizes, mortality rates, and movement rates for intermixing stocks of fish from two assessment models that use tagging and catch data. This involves simulating data, fitting the two different models, and then comparing the model estimates to known values. Ultimately, the population dynamics of Lake Erie walleye will be estimated using one of these models.

Do you know our polar bear?

By Darrin McCullough

In the 1950's, the pursuit and harvest of polar bear (*Ursus maritimas*) was a legal and prized hunting opportunity on the frigid northern coast of Alaska. Polar bears were numerous with sizable populations throughout the arctic, and Alaskan policymakers allowed for their harvest by non-indigenous people with proper licensing. During this time, Mr. Koepplinger from Oak Park, Michigan successfully harvested a massive polar bear near Point Barrow, Alaska, eventually donating the full body mount to the Michigan State University Museum. In 1966, Dr. Howard Tanner accepted this specimen from the museum to place in the lobby of the newly opened Natural Resources Building. Nearly half a century later, our polar bear continues to stand at his post and greet new students of natural resource management while acting as a notable landmark, an honor guard, and a stoic reminder of our past successes and future challenges we all face as stewards of our one global environment.



Throughout my undergraduate and graduate student experience in the Department of Fisheries and Wildlife, I continue to meet fellow Spartan professionals who fondly reminisce about their time under the soul seeking gaze of our polar mascot. We all remember those late nights and early mornings with the ever-present bear standing his post to greet us, wish us luck on that final exam, and bid us farewell as we venture out into an uncertain future as natural resource professionals. Through these shared memories, including frantic preparation for another brutal exam with equally frantic classmates in the Polar Bear Room, sharing amusing anecdotes of ill-considered undergraduate activities, and hearing legendary tales of mischievous graduate students assisting the bear in a migration to the third floor office of their advisor, the bear has become a significant part of who we are as FW students. One can only imagine the professor's surprise as he was greeted by the nine foot tall predator lurking in his office. Though our bear was successfully returned to his station without damage, the years since then have not been easy on our friend and time has taken its toll on this prominent icon.

Whether you wish to call it a symbol, a mascot, an icon, or a long standing tradition, our bear has tirelessly witnessed our societal triumphs and failures in the conservation of our natural resources and needs our help to be restored. The current estimate to refurbish our friend to pristine condition is $6000, and while this may seem like a lot, as you all know, Spartans will. So that he may continue this honorable tradition, I ask you, my fellow Spartans from across our one earth to come together, pay it forward, and contribute to the Polar Bear Restoration Fund. If we simply join our forces and unite as the one family we are, we can easily remove the uncertain future of this one polar bear and perhaps assist future generations of Spartan conservationists to know the great *Ursus maritimas*.

Contributions to the Polar Bear Restoration Fund may be made online at www.fw.msu.edu/save_our_polar_bear or checks can be mailed to Fisheries & Wildlife, 480 Wilson Road, 13 Natural Resources Bldg., East Lansing, MI 48824, please reference allocation code A111194. All donated funds will go to the restoration of our bear with excess funds used to support student organizations, teaching, and research within the department.

FW Photo Contest Winners
Runner-Up & Third Place

Scenery *(top):* Amber Goguen & Angela De Palma-Dow
Field Work *(middle):* Darrin McCullough & Linda Ortiz
Flora and Fauna *(bottom):* Stephanie Shaffer & Angela De Palma-Dow

FW SPOTLIGHT |

Department of Fisheries & Wildlife
Michigan State University
13 Natural Resources Building
East Lansing, MI 48824

www.fw.msu.edu

FW Photo Contest Winners

Scenery

by Darrin McCullough

This photo was captured in December of 2011 during my MSU study abroad experience, "Quest for the Antarctic Circle." It shows a large group of gentoo penguins enjoying a rather atypically warm (34 °F) and sunny summer day in Neko Harbor, Antarctica.

Field Work

by Andrew Dennhardt

Surveying populations of turtles in the Forest Preserve District of DuPage County, Illinois. This photo was taken during a summer field season where I was sampling populations of the federally endangered Blanding's turtle.

Flora and Fauna

by Dan Hayes

This is a photo of a belted kingfisher I took while duck hunting on Park Lake. The bird perched briefly on a small tree I was under, and then hovered right above me, which allowed me to get the shot. The hovering behavior is not unique to kingfishers (ospreys and hummingbirds do it also), but not common among birds in general.