

**MSU Fisheries and Wildlife**

**SP**  **TLIGHT**

Written and Produced by MSU Graduate Students

**2023**

**Featuring...**

**Cambodian Floating Fishing Villages**

**Equality vs Equity in Malawi**

**Lessons From a Graduate Student**

**Gray Wolf Connectivity and Recolonization**



# SPOTLIGHT



Spring 2023  
Issue 19

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

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**Cover Photo:** Antarctic Sunset by Dr. Daniel Hayes

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# LETTER FROM THE CHAIR

## Dr. Gary J. Roloff

Welcome to the 2023 issue of Spotlight magazine! This magazine is written and produced by graduate students in the Department of Fisheries and Wildlife, and the product they produce each year represents their commitment to research, education, and engaging our stakeholders and the broader public. This issue contains four entertaining and interesting feature articles:



- Trish Brockman (advised by Dr. Gary Roloff) shares some of her mishaps from her field seasons,
- Emma Rice (advised by Dr. Abigail Bennett) provides an article on equality and equity among fishers in Malawi,
- Snehalata Sainjoo (advised by Dr. Dan Kramer) writes about her experiences in Cambodia living with fishers in floating and relocating villages, and
- Merjin van den Bosch (advised by Dr. Jerry Belant) describes some work that he and colleagues conducted on the potential for gray wolf expansion in the eastern USA.

In addition to these feature articles, this issue also includes special sections highlighting the lab of Dr. Jerry Belant, checking in with Fisheries and Wildlife alumni (Drs. Sonja Christensen and Chris Hoving), a recap of the Graduate Student Organization Symposium, and more. This issue of Spotlight reflects a portion of the breadth and creativity of the Fisheries and Wildlife department. I am consistently proud of our graduate students and their roles in making our department better and advancing our mission.

Lastly but surely not least, I write this message with a heavy heart. Many of us are still recovering from the violence we experienced on campus in February 2023. The tragic shooting impacted our Spartan community globally; I was surprised and gracious for the notes I received from alumni, friends, and colleagues from around the world. Please keep the students that were killed or injured, and their families, in your thoughts.

# SYMPOSIUM SPOTLIGHT



Best Prospective Talk: **Max Majinska**

Best Retrospective Talk: **Molly Engelman**

## A LETTER FROM THE CO-CHAIRS...

The 18th Annual GSO Research Symposium was a success, boasting 21 presenters, over 100 in-person attendees, and over 60 online attendees from four countries! The 2023 GSO Symposium consisted of presentations from both undergraduate and graduate students, a wonderful plenary address delivered by Dr. Martin Smith from Duke University, and great conversation, company, and food. This year, in particular, there was a warm feeling of community, as we all came together after the tragedy on campus two weeks before the event. Thank you again to the incredible committee members, moderators, donors, venue and audiovisual staff, and presenters for making this year's symposium one to remember.

**FW GSO Symposium Co-Chairs, Nick Manning & Emma Rice**

## COMMITTEE MEMBERS

**Faculty Advisor:** Dr. Jen Owen

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**Budget:** Kyle Brumm

**Fundraising:** Michele Remer & Simran Singh

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**Food / Venue:** Nick Alioto & Carly Andrews

**Judging:** Olivia Ruppert

**Name Tags:** Trish Brockman & Katie King

**Registration & Webmaster:**

Alejandra Zubria Perez

**Photography:** Alex Benitez

# ALUMNI CORNER



## Dr. Christopher Hoving

Adaptation Specialist with the Michigan DNR,  
Wildlife Division

### What did you work on as an MSU student?

I worked on Modeling Environmental and Social Systems (MESS; you might say that from start to finish my graduate work was a MESS) in the Boone and Crockett Quantitative Wildlife center led by Bill Porter. In more common terms I work on modeling coupled human and natural systems (CHANS) or social ecological systems (SES). I worked to build a social ecological model of habitat management in a state agency, focusing on prescribed fire and climate change. From my colleagues I learned coding and quantitative biology culture, and from my advisor I learned about leadership, self-care, and being strategic with my time.

### What motivated you to apply for your current position?

In a previous position within the MIDNR, I sent a memo to our leadership making a case for more proactive climate adaptation on the part of the agency. Agency leadership gave me duties related to climate adaptation. Though not officially part of my duties as a field biologist, I started fielding media requests and attending in-state and out-of-state climate meetings on behalf of the agency, until the decision was made to create a new position was made for me within the agency.

### What experiences at MSU best prepared you for your current position?

My advisor put thought and effort into making weekly lab meetings a valuable use of our time, mentoring his students on practical lessons in leadership. In my current position, I attend and lead a lot of meetings. The lessons in facilitating a group of people to reach a shared goal while communicating complex ideas to diverse audiences have served me well.

### Do you have any advice for current FW students?

Be kind, to yourself and be kind to others. Graduate school is emotionally and mentally grueling, but it should not be damaging or harmful. Find a self-care routine that you enjoy and make self-care a high priority. The people you meet in graduate school will become colleagues, mentors, funders, or employers in the future. Be kind to them now. Being kind also has the added benefit that it is good self-care.

### Where are you now and what do you do?

I am the statewide program lead for climate adaptation and climate expert for the Wildlife Division within the Michigan Department of Natural Resources, a position I've held since I started my graduate studies in 2015. I review and sometimes write plans, provide interviews, help set policy, and develop decision support tools for land managers.

### Is it what you thought you'd be doing when you began your time at MSU?

Yes, I had expected to be in the same position, but now I have a wider academic network and greater ability to use and create modeling tools in the wildlife and climate space.

### What's your favorite thing about your current position?

My second favorite thing is the opportunity to work every day on something that will positively change wildlife conservation in Michigan. My actual favorite is working with teams of good people on a common cause. People attracted to the conservation field tend to be fun, interesting, competent, and dedicated. I came for the wildlife and have stayed for the community.

# Dr. Sonja Christensen

Assistant Professor,  
Michigan State University

## What did you work on as an MSU student?

Epizootic hemorrhagic disease epidemiology and impacts on white tailed deer.

## Where are you now and what do you do?

I am an assistant professor in the Fisheries and Wildlife Department at MSU!

## Is it what you thought you'd be doing when you began your time at MSU?

Yes, I had the goal of becoming an assistant professor at MSU or at another university.

## What motivated you to apply for your current position?

My passion for our profession and our amazing department!



## What experiences at MSU best prepared you for your current position?

Working closely with state agency partners and in a collaborative setting was crucial to how I tackle research questions with a team approach.

## Do you have any advice for current FW students?

Be willing to pursue opportunities even if they are out of state...you can always come back to Pure Michigan!



# A Life in a Floating Village Around Tonle Sap, Cambodia

By Snehalata Sainjoo

*Land people have permanent life. They can cultivate and eat. If they face drought, they might lose crops for a year but next year they can grow again. But for people living in water, if we lose fish then it won't come. Our lives are suspended...." said an elderly man in his late 60s. I sense multiple emotions in his voice and eyes--anger, fear, and despair. Similar stories echoed from other fishers as I walked through floating communities around the lake.*

As a part of my dissertation and Mekong Culture WELL (Water, Ecology, Land and Livelihoods) project work, I spent my summer in Cambodia. I had the opportunity to visit floating/flooded and irrigated communities in the Tonle Sap. Most of my time I was with fishers living in floating and relocated fishing villages, and field researchers. We were engaged in household surveys, photovoice, and participatory mapping exercises. In this writing piece, I will share my field experiences and learning through sharing pictures and telling local stories.

Tonle Sap is the largest freshwater lake in Southeast Asia and known for its most diverse and rich inland fishery. It produces around 18 percent of the world's freshwater fish supply, providing most of the nation's protein and supporting the economy, including neighboring countries. However, it is important to remember that Tonle Sap is a home and source of livelihood for millions of people who have lived in and around the Lake for centuries. Fishing is the principal source of subsistence for fishermen, particularly those living in floating villages with limited resources and livelihood options.

When I first heard of floating villages, I pictured wooden boats with polythene-sheet roofs. I had this image from my visit to Thailand's floating market in 2018. To my surprise, I found thriving settlements spatially distributed around Tonle Sap, which is vast enough to be mistaken for the ocean (I almost did).





When I reached Kampong Prak, I noticed a cluster of floating houses with timber floors and metal walls and roofs. While passing, I saw a family moving their floating house, which prompted me to wonder why. When I spoke to the fishers, they explained their dynamic relationship with the lake. Throughout the year, the water level of Tonle Sap changes dramatically, and they adjust their living by moving from one location to another. They are not confined to one place. Furthermore, their mobility is affected by disturbances such as storms. They move closer to the flooded forest to escape the storm.



**Kampong Prak, Southwest of Tonle Sap.**  
It took around 1 hour to reach via boat from shore.  
The weather was scorching hot (92 F).

I'd never spent so much time in water before. For a moment, I had the thought of stepping on shore. Thanks to our Cambodia research team, they took us to the Peam Bang village. I was happy to land and spend the day with the locals. Surprisingly, the settlement was built on the land, and each house on tall wooden pillars with a ladder to protect from floods during the wet season. Hmm, I also noticed cornfields. I couldn't help but walk into the farmland to talk with a few women gathering veggies. It turns out that during the three months when Tonle Sap feeds the Mekong River, the flood level is low, and the land is exposed. During that time, communities like Peam Bang in the floodplain had some ground for cultivation. However, only a limited number of families cultivate.



**Floating houses in the floodplain zone of Tonle Sap.** The height of the pillar and ladder varies. I remember climbing the ladder to reach first floor of a house at height of 20 feet in Chong Kneas village.

### **Water is livelihood.**

The majority of fishers I interacted with practice inland fishing. Besides, they collected clams, crabs, shrimps, snails, and other aquatic species for food or to sell in the market. Some ran small-scale business, like running floating markets --boats stocked with veggies and fruits, food ("mobile restaurant"), and groceries ("mobile retail store"). Others were part of commercial enterprises, which involved paid labor work with private companies. During the off-season, they worked as wage workers in Phnom Penh (Cambodia's capital) or Thailand.

### **What do daily chores look like?**

These fishers are dealing with ecological changes such as shifting floodplains and water levels, as well as fish population losses. These changes, along with government controls on fishing and the use of other resources (such as land and forest), have serious consequences for their food security and livelihood.



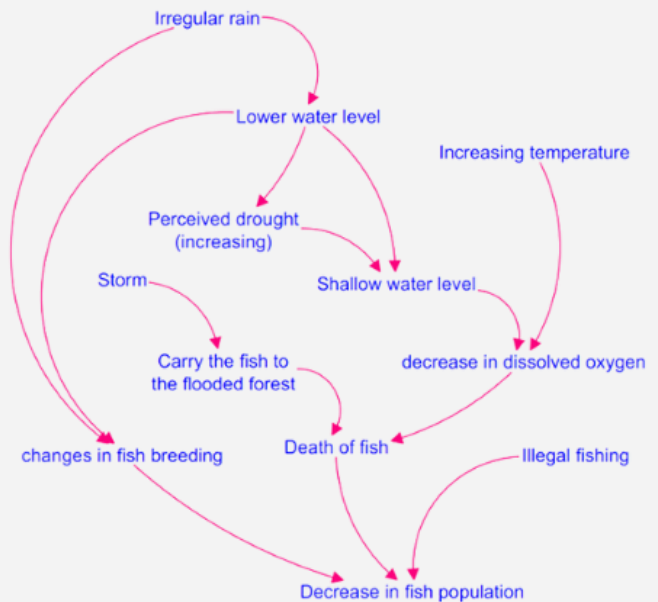
**Depletion of fisheries -- diversity and abundance -- is the major livelihood challenge for fishers.**

Talk to any fishers in these villages, whether they are Khmer, Cham, or Vietnamese, and you will hear similar stories that once there was abundant fish to feed their family.

*"When I threw fishing net three times back then, I could catch fish of roughly 100 kg, now they can only catch that many fish after 100 tries," said a woman in her late 50s from the Cham group in Phnom Kroam village. Similarly, a Vietnamese man who has lived in Chong Kneas since 1981 recalls days when he could catch plenty of fish within a 100-meter radius, but now he has to drive 100 kilometers to fish. All of these talks lead to my query, "Why are there less fish now?"*

To a conservationist, the interaction of numerous stressors—climate change (drought, erratic rainfall, high temperature, storm), hydrological change (lower water level), and human activities (illegal fishing)—influence fish breeding patterns and population growth (Figure 1).

For fishers, the main reason is “illegal fishing” by government authority in cooperation with big companies and some fishers. However, the government blames fishers for fisheries degradation and so justify limiting their access to fish by defining conservation zones or relocating them away from the lake. Illegal fishing refers to any fishing activity that involves overfishing, fishing during the incorrect season, or utilizing illegal methods such as small size fishing nets and electric shocks. If we use the state definition of illegal fishing, then every fisherman may be held responsible. But I heard them clearly. They said that they had no other choice.



**Figure 1. Interrelated factors impacting fish population based on a talk with a conservation officer in Kampong Prak village.**

Fishing is all they ever known to do for living. Because of the loss in fish population size and variety, they have no other option but to fish during the rainy season (restricted period) using tiny size nets. Some may even consider other options, such as gathering and selling forest products or seasonal farming (if they have the skill). However, the government's changing policies and rules—where they may and may not fish in the lake, which resources (land and forest) they can utilize and when—have hindered their activities, leaving them confused and frustrated.



**A house numbered 044 in Phnom Kroam village, Northeast of Tonle Sap. This number refers to the order of removal. It means house and people will be relocated after the house numbered 043.**

### **Relocation from lake to land space.**

There is ambiguity in government decisions to relocate fishers from the lake to the land. I heard several reasons, such as stopping illicit fishing and environmental destruction and fixing their position and livelihood (having "permanent life" like land people do). However, the reality on the ground suggests that they want control over their activities and resources (called "management" in state language). When I spoke with locals in relocated villages such as Seh Slab, they voiced dissatisfaction with current living conditions compared to their previous life on the lake. They can't cultivate despite moving to land (because of lack of land ownership and farming skill). They still rely on the lake for fishing. As a result, they travel to the lake by boat, which takes hours and adds to their costs and debt. Some fishermen still have floating houses where they dwell for months during the fishing season.

**When I reflect on these stories, it makes sense to a statement of an old fisherman**  
*"Our life is suspended....".*

To conclude, I had an incredible experience living among fishers. I learned about their way of life and their struggles, which may sound minor and usual when we read discourses, but I found them intense and emotional when I heard their stories of hardship, depletion, and desperation. It makes me anxious and even keeps me awake all night.



**Snehalata Sainjoo (she/her/hers)** is a Ph.D. candidate pursuing a dual major in Fisheries and Wildlife and Environmental Science and Policy Program. She is advised by Dr. Daniel Boyd Kramer. Her research focuses on the intersection of climate risk, rural livelihood, and adaptation governance. She will use a mixed research method to explore the adaptive behaviors of farming communities in Cambodia in response to shifts in natural resources due to dams, perception of drought risk, and resource accessibility. Her contact info is: [sainjoos@msu.edu](mailto:sainjoos@msu.edu).

# SPOTLIGHT ON

The Janice Lee Fenske Excellence in Fisheries Management Fellowship honors the first female fisheries biologist with the Michigan DNR. It is designed to facilitate interactions of a graduate student with professionals from an agency through the implementation of a fisheries project.



**Kyle Brumm**

**Advisor:** Dr. Dana Infante

**Graduate Program:** Ph.D., FW: Aquatic Landscape Ecology Laboratory

**Motivation to Apply:** The Fenske Fellowship provides exceptional opportunities for students to engage and collaborate with resource managers on a high-priority project of local relevance, while at the same time gaining insights into how a specific management agency operates.

**Fenske Mentor:** Gary Whelan, MDNR Program Manager

**Fenske Project:** Climate change is a complex issue expected to exacerbate the effects of various stressors on freshwater ecosystems. Although climate adaptation efforts at the federal level are relatively well documented, we lack a comprehensive understanding of how state fisheries management agencies are incorporating considerations of climate change into their

decision-making processes. Therefore, the main objective of my Fenske project is to assess barriers to climate adaptation that may limit the ability of agency staff to incorporate climate change into management and operations decisions. I have developed a survey to (1) document climate adaptation measures being planned and/or implemented by state fisheries management agencies across the United States, (2) identify barriers to climate adaptation, and (3) produce a ranking of strategies thought to be effective for overcoming those barriers.

**Lessons Learned:** My fellowship experience is ongoing, and I am learning a lot about the structure and organization of MDNR Fisheries Division.

**Applications Beyond Fellowship:** The products generated by this project will serve as valuable resources to help guide climate adaptation efforts in Michigan and beyond. My experiences and networking opportunities will have far-reaching benefits throughout my career as a fisheries professional.

**Further Recognition of Scholarship:** Kyle was additionally awarded The Vera M. Wallach, & Theodore Roosevelt Conservation and Environmental Leadership Fellowships which have further contributed to his pursuit of building his leadership skills and engagement in networking across the globe.

The Dr. Howard A. Tanner Fisheries Excellence Fellowship recognizes students who are committed to fisheries research related to the Great Lakes or connecting waterways.



**Carrie Meier**

**Advisors:** Drs. Daniel Hayes & Jo Latimore

**Graduate Program:** M.Sc., Human Dimensions of Fisheries & Wildlife

**Graduate Research:** I am researching impediments boaters and wading anglers face for cleaning recreational equipment. I will develop strategies to combat these impediments to improve frequency of performing recommended cleaning actions, thus reducing aquatic invasive species spread.

**Motivation to Apply:** Dr. Tanner was committed to the health of our fisheries and waterways. This motivated me to apply for the fellowship because I hope to make positive contributions to conservation, as Dr. Tanner did, by helping reduce AIS spread to improve waterways and habitats.

**Benefits of the Fellowship:** The fellowship provided me with extra funding, which allowed me to focus more deeply on tasks with the stresses of finances lifted from my shoulders a bit. I am so very grateful for the generosity of the donors.

# FELLOWSHIPS

The Robert C. & Betty A. Ball Fisheries and Wildlife Fellowship provides graduate students with the opportunity to study fisheries, limnology, or water research.



Emma Rice

**Advisor:** Dr. Abigail Benett

**Graduate Program:** M.Sc., Human Dimensions of Fisheries & Wildlife

**Graduate Research:** My thesis research focuses on the social-ecological fisheries system of Lake Malawi and explores the drivers of variation in livelihood outcomes for small-scale fish traders. I use a mixed methods interdisciplinary approach drawing from development economics, geography, and gender studies to investigate my research questions. Specifically, I evaluate differences in marketing margins between women and men, explore the barriers to market access for different fish traders, and investigate trader's resilience to price volatility.

**Motivation to Apply:** The Ball Fellowship was a great fit for me because its goal is to support students researching fisheries.

**Benefits of the Fellowship:** This Fellowship enabled me to participate in an internship with the Fisheries and Aquaculture Division of the Food and Agriculture Organization of the United Nations in Rome, Italy. I worked on a project in Malawi connecting small-scale fisheries organizations with Home Grown School Feeding Programs and have designed capacity building training programs to improve marketing skills for women's fisheries organizations in Malawi.

**Advisor:** Dr. Jim Bence

**Graduate Program:** Ph.D., Fisheries & Wildlife

**Graduate Research:** I build and study computer models used to assess fisheries stocks. Essentially my models read in information about when, where, and how many fish were caught and uses that to estimate difficult to measure quantities like abundance, fishing rate, or birth rate.

**Motivation to Apply:** The department does such a great job of recognize excellence in students, faculty, and staff for their work and efforts. Graduate fellowships are one such way to acknowledge the accomplishments and careers of the student body. I see so many familiar names on the list of past recipients, folks who I admire personally as well as their work, and I wanted my work to be a part of this ongoing legacy of excited funded research.

**Benefits of the Fellowship:** The Robert C. Ball and Betty A. Ball Fisheries and Wildlife Fellowship has afforded me the ability to finish out my graduate career on a high note. I've been able to devote full focus to sharpening up some of my more complicated models, submitting work for publication, and writing my dissertation.



Emily Liljestrand

# SPOTLIGHT ON

The Hal & Jean Glassen Conservation Medicine Fellowship recognizes a student committed to the study of fish and wildlife disease ecology and conservation medicine.



**Samantha  
Courtney**

**Advisor:** Dr. Gary Roloff

**Graduate Program:** M.Sc. in Wildlife Biology & Management specializing in Disease Ecology

**Graduate Research:** My thesis research focuses on impacts of supplemental feed on the spread of chronic wasting disease in white-tailed deer. I am also investigating landscape features influencing deer congregation in the winter & what this might mean for disease spread.

**Motivation to Apply:** I was inclined to apply for this Fellowship so I could continue to develop my interests and skills in wildlife disease. This fellowship is designed specifically for students working in the area of wildlife disease, so I felt it was a perfect opportunity to help me find my place within wildlife conservation and management.

**Benefits of the Fellowship:** This fellowship allowed me to expand my professional network & develop leadership skills. The financial support enabled me to present at the International Wildlife Disease Association conference which was a great opportunity to connect with other professionals in the disease field, explore my interests, & learn about new ideas & methods.

**Further Recognition of Scholarship:** Samantha was additionally awarded the Theodore Roosevelt Conservation Fellowship which has further contributed to her professional networking and leadership skills.

**Advisor:** Dr. Jean Tsao

**Graduate Program:** Ph.D., Fisheries & Wildlife & Ecology, Evolution, & Behavior

**Graduate Research:** *Borrelia burgdorferi* population genetics in endemic and emergent areas in Michigan

**Motivation to Apply:** To have the funds to support upcoming lab work and field work

**Benefits of the Fellowship:** Having the resources to continue my research, particularly with the help of paid undergraduate field technicians.



**Michelle Volk**

# FELLOWSHIPS

The Joseph Laurence Maison Fellowship recognizes students who are committed to pursuing a career in wildlife conservation.



**Ben Luukkonen**

**Advisor:** Dr. Scott Winterstein & Daniel Hayes

**Graduate Program:** Ph.D., Wildlife Ecology

**Graduate Research :** My research focuses on movements and population dynamics of Great Lakes mallards. I am working with GPS transmitter, banding, aerial survey, and habitat data to build an integrated population model. The primary application of the model will be identification of limiting factors contributing to a declining Great Lakes mallard population.

**Motivation to Apply :** The ideals on which this fellowship was established align closely with my choice to pursue a career in wildlife conservation. My upbringing as a hunter and angler inspired me to become a wildlife research biologist.

**Benefits of the Fellowship:** Strong support from a regional group of partners substantially increased the number of GPS transmitters available for this research, but a deficit remained to fund biological sample processing for all GPS-marked mallards. This fellowship greatly assisted in meeting this funding shortage and supported travel to conferences.

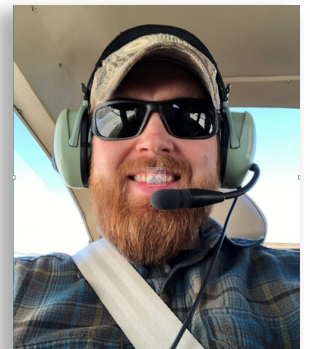
**Advisor:** Dr. Sonja Christensen

**Graduate Program:** M.Sc., Fisheries & Wildlife

**Graduate research:** My research includes a methods assessment of an abundance estimator for abundance and composition of deer populations following a harvest regulation change, and modeling CWD dynamics under different harvest scenarios.

**Motivation to apply:** As a non-traditional student, my finances have always been a little tight, and my experience as a graduate student has been no exception. Fellowships and scholarships have always been an integral part to my success story.

**Benefits of the scholarship:** This fellowship has lessened the financial burden that comes with pursuing an advanced degree, providing a sense of security which enables me to focus more on meaningful experiences, thus making my professional goals more feasible to obtain. The recognition for my efforts gives me a great sense of accomplishment, in turn fostering personal growth & an energizing boost of confidence to pursue my goals.



**Steven Gurney**

# SPOTLIGHT ON FELLOWSHIPS

The Vera M. Wallach Fellowship is awarded to students studying wildlife management, ecology, or natural resource management or conducting Arctic/Antarctic research with emphasis on the protection and preservation of wildlife.



**Veronica Frans**

**Advisors:** Dr. Jianguo 'Jack' Liu

**Graduate Program:** Ph.D., in Fisheries & Wildlife & Ecology, Evolution, & Behavior

**Graduate Research:** I study human influence on species distributions and how this relates to ecological theory, methods, and sustainable development.

**Motivation to Apply:** I applied for this fellowship during a semester when I realized I needed more time to finish my PhD. While my PhD work focuses on theory and methods, it has broad management applications, which made me eligible for this award, and I was happy to have received it last year.

**Benefits of the Fellowship:** In addition to financial support, the Vera Wallach Fellowship was a great opportunity to be recognized among other fellows over the past years who have also received this award. It is nice to be part of a legacy of fellows with promising work in wildlife and natural resource management.

**Advisors:** Drs. Gary Roloff & Henry (Rique) Campa III

**Graduate Program:** M.Sc., Fisheries & Wildlife

**Graduate Research:** My research aims to understand eastern massasauga rattlesnake (EMR) space use around maintained roads in Michigan, and identify factors influencing EMR visibility during surveys to improve visual detection survey methodology.

**Motivation to Apply:** I applied to the Fellowship to support my participation in conferences, workshops, and other opportunities to further my personal and professional development.

**Benefits of the Fellowship:** This fellowship has been invaluable in supporting my travel for conferences (National and Midwest Chapter meetings of The Wildlife Society). I participated in workshops to develop my knowledge of field research techniques, become a better project manager, and better support diversity, equity, and inclusion.



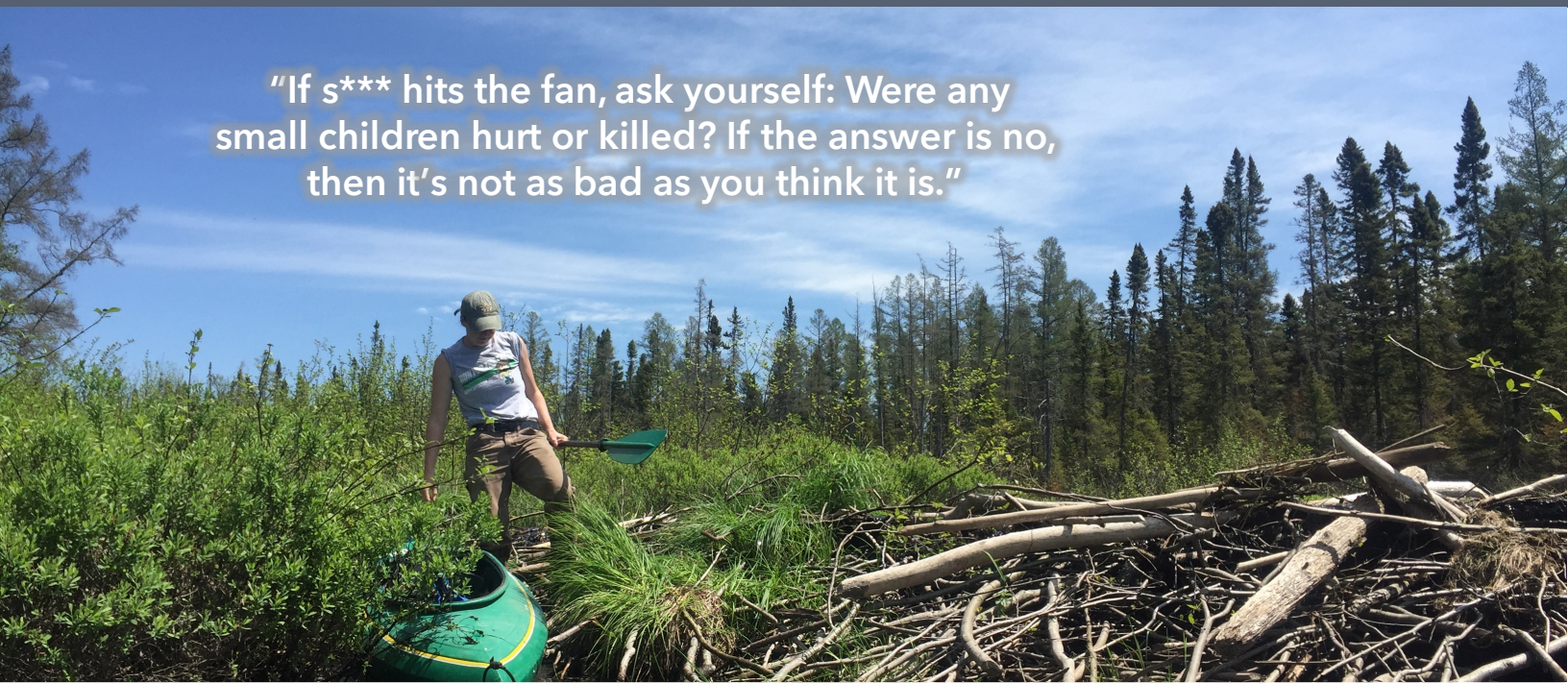
**Jillian Sterman**

SPOTLIGHT would like to recognize **Jared Gregorini** as a recipient of The Ambrose Battullo Fund for Environmental Issues Graduate Fellowship for Literary Work, for students interested in current environmental issues and have written about them for possible literary publication.



# S\*\*\* Happens

"If s\*\*\* hits the fan, ask yourself: Were any small children hurt or killed? If the answer is no, then it's not as bad as you think it is."



## By Trish Brockman

This piece of advice, given to me at the beginning of my master's journey, has been the credo that I have lived by these past three years. And s\*\*\* has hit the fan A LOT, but that's part of being a grad student, right? They say failure is the greatest teacher. If failure has taught me anything, it's to get back up, dust off your butt, and keep moving forward. However, it's not something you have to do alone. There is help out there if you seek it, and sometimes it's there even if you don't.

Before I dive into the real meat of this story let me introduce myself. My name is Trish and I study turtles, wood turtles (*Glyptemys insculpta*) to be exact. My field research took place in the remote woodlands of the UP. That's Michigan's Upper Peninsula, for folks who may not be familiar. No cell service, few roads, fewer people, and lots of wilderness and wildlife. Basically paradise. A lot can go wrong up there, and it did. Lost compasses, drowned electronics, hornets, beavers, and more mosquitoes than should be allowed on this earth. Every time an obstacle reared its ugly head, I'd ask myself, "Were any small children hurt or killed?" Since this was never the case, I counted my losses and tried not to repeat the experience. One time, though, it was almost as bad as I thought it was. Here is that story.

It was the summer of 2020, not a very auspicious year to say the least, and my first field season. Things had been tough from the get-go: delays due to Covid, burnout from working long hours, a vehicle lost to a deer, and very few turtles found. Like 3 turtles all summer. At the time of "The Incident" it was July 31<sup>st</sup>, just a few weeks away from the end of the field season and I was ready to go home.

Amelia, my field technician, and I had just wrapped up a grueling week of field work and were heading to Escanaba to drop off some gate keys. We were driving down County Road 426, a long and lonesome road, and passed a western painted turtle (*Chrysemys picta bellii*) making her way across. Being the I-brake-for-turtles kind of person that I am, I went to make a u-turn with the intent of helping it along. Man, was that a mistake!



To my credit, the grass in the ditch was pretty high and the truck had a ridiculous turn radius. Suddenly, the world turned green and we were teetering on the edge of the void. Amelia, who always has her priorities straight, finished the ice cream she was eating before clambering over me to exit on the not-so-dangerous side. I quickly followed.

What greeted us on the outside was a truck that looked like it was trying out for Cirque du Soleil, two tires on the ground, one in the ditch and the other in the air. Remember that we are in the middle of nowhere with no cell service for at least 20 miles in any direction. What are you going to do now, Trish? WHAT ARE YOU GOING TO DO NOW?

Our first glimmer of hope arrived in the form of a nurse returning home from work. She pulled over and asked us if we were hurt and if we needed any help. While I was trying to form a reply, more vehicles began to show up. These were pickups full of men, Yooper men. Now, let me tell you a little something about Yoopers. Yoopers are the folks that live in the UP and they are some of the friendliest people you will ever meet. It comes from living in a remote and harsh environment, I think.

"Looks like you need a hand, there!" they offered.

"I think we'll see if we can get a hold of a tow truck, but thanks." I replied, trying to maintain authority.

"I bet we can get you out," they insisted.





As they swarmed my poor truck, my heart sank. I'd totally lost control of the situation. They were going to pull my truck out of the ditch come hell or high water. It was now A PROJECT. Men love projects. First, they tried jumping on the rear bumper to bring it down, which didn't work. Next, one of them produced a ball hitch, another a tow strap. You aren't a true Yooper unless you have at least one tow strap in your truck. Apparently, they were going to drag me out. As they were working, a few more trucks slowed down with offers of assistance and extra tow straps. This was turning into a real spectacle.

Amelia and I decided that the best course of action would be to stay out of the way and pray that these guys knew what they were doing. The nurse stood by in case someone got hurt, which was highly possible. Slowly, and with much squealing of tires and revving of engines, our truck emerged like some great red beast from the abyss.

After an inspection, it was determined that there wasn't a scratch on the thing. Once they were sure it would run, backs were patted, hands were shaken, and tow straps stowed. They left as suddenly as they had arrived, like moose into the mist.

As we resumed our trip to Escanaba, Amelia and I laughed at our predicament and its outcome. We weren't injured, the truck was running well, and those Yoopers had a good story to tell at Gary's Knotty Pine over Friday's fish fry. S\*\*\* had majorly hit the fan, but no one was hurt or killed. Throughout that whole ordeal I had repeated this to myself like a mantra and it rang true. It wasn't as bad as I had initially thought it would be. Everything turned out okay.

Oh yeah, and that turtle? She made it across the road just fine on her own.



**Trish Brockman (she/her)** is a third year M.S. student in Dr. Gary Roloff's Applied Forest and Wildlife Ecology Lab at MSU. Her thesis project is focused on exploring the effects of private forest management on the North American wood turtle in the western Upper Peninsula of Michigan. Collaborating with private landowners and participating in public outreach to increase awareness and a sense of stewardship is one of her main passions. In her free time she enjoys hiking, herping, illustrating wildlife, and spending time with her partner and nieces. Her contact info is: [brockm16@msu.edu](mailto:brockm16@msu.edu).

# A Rising Tide Lifts All Boats: From Equality to Equity

By Emma Rice



**Fish traders at an auction in Senga Bay, Salima.**

However, it is well known that women in Malawi generally have less access to capital than men, making it difficult for women to purchase fish in such large quantities. As a result, women must often purchase smaller quantities of fish from other men fish traders at a much higher cost. Unfortunately, this is often the best-case scenario for women fish traders purchasing fish at the beach site.

In some cases, men who control access to fish resources will demand sex from women in exchange for fish. This form of gender-based violence is inherently exploitative and further disempowers women. Yet, when my research team asked both men and women fish traders in separate focus groups what the biggest challenges in the fish trade in Malawi were for them, women were the only ones who discussed gender-based violence as being a problem. In addition to concerns about gender-based violence, women fish traders discussed their inability to access formal financial services (e.g., credit, loans) as being a key challenge.

The shores of Lake Malawi can be one of the most beautiful and peaceful places on Earth. Imagine the warm African sun beating down through a cloudless blue sky, heating the sand beneath your toes as you are mesmerized by the sound of crashing waves. Then, all of the sudden, this serenity transforms into chaos as swarms of men and women fish traders overrun the beach. As a boat approaches the shoreline, fish traders push and shove one another, each hoping for a glimpse at the catch of fish about to be landed. Just seconds after the boat is pulled ashore, fish traders begin shouting loudly over one another during the frenzied bidding process that follows. Typically, within mere minutes of landing, these fish will have changed hands upwards of three times - each subsequent transaction decreasing in volume.

In the pandemonium that ensues as fishers auction off their catch to fish traders, highly capitalized traders that can buy the entire boatload of fish are often prioritized by fishers as it makes the transaction easiest for them.



**Fish traders in Nkhotakota market, the central region of Malawi.**

Further, women who are particularly capital constrained and live in remote fishing communities tend to have low levels of education and no access to arable land for agriculture. Despite these challenges, women continue to work as fish traders because they lack alternative livelihood opportunities.

After hearing about the challenges women in fisheries face in Malawi, I wanted to support their stories in the way that scientists do best - with numbers. Using market data, I found that women fish traders earn 56% less money per unit than men in Malawi. That's a BIG difference, especially because women typically trade smaller volumes than men. Interestingly, I also found that participation in fish trade is nearly equal between men (55%) and women (45%). This reveals that although the sector employs nearly equal numbers of men and women, the costs and benefits are not yet close to equal between genders.

This reality highlights the difference between gender equality and gender equity. Gender equality in fish trade has, in fact, been increasing in recent years as there are now nearly equal portions of men and women working as fish traders in Malawi. Gender equality, however, only means that women are being given equal opportunities as men. While this is a crucial first step, equality alone is not enough. The next step is gender equity, which recognizes that each person has different circumstances and provides the resources necessary to help everyone reach more equal outcomes. It is essential to understand the barriers that lie in between equality and equity to design interventions that can effectively increase equity. Moving toward gender equity in the Malawian fish trade context means acknowledging the unique challenges that women fish traders face to understand why women are not achieving equal economic outcomes as men. This is where women's lived experiences come in and their stories can play an important role in explaining differences in those outcomes. In Malawi, women's stories tell us that differences in access to capital between women and men and gender-based violence are key examples of current barriers to gender equity. These factors emphasize why we cannot stop at gender equality and must continue working towards gender equity.

Understanding the difference between equality and equity is important beyond gender as it pertains to issues of diversity, equity, inclusion and justice across all identities (e.g., gender, race, religion, ethnicity, sexual orientation) and the unique intersections of these various identities. These two key concepts - equality and equity - can be applied in any context anywhere around the globe. Further, equitable outcomes benefit everyone everywhere, not just marginalized individuals. In the context of fish trade in Malawi, this means that efforts towards gender equity would not only benefit women fish traders, but also men fish traders, the families of both women and men fish traders, and the broader functioning of the entire Malawian economy.



So, why should we care about increasing equity for others?  
Because a rising tide lifts all boats.

**Emma Rice** is pursuing a M.S. in Fisheries and Wildlife with a specialization in Gender, Justice, and Environmental Change (GJEC), working under the supervision of Dr. Abigail Bennett. Rice is generally interested in fisheries-based livelihoods and her thesis research specifically investigates drivers of variation in livelihood outcomes for fish traders in Malawi. Her contact info is: [riceemma@msu.edu](mailto:riceemma@msu.edu).



# LAB SPOTLIGHT



**Jerry Belant** is excited to be a new member of the FW community as the Boone and Crockett Chair of Wildlife Conservation. His research interests are diverse and include carnivore ecology, predator-prey relations, wildlife responses to human disturbances, human-wildlife conflicts and coexistence, wildlife harvest management, and integrating wildlife science with policy and practice. He works extensively with agencies throughout the US and internationally to develop and implement science-based conservation and management. He is on the editorial board of *BioScience* and was recently appointed by US Secretary of Agriculture, Thomas Vilsack, to serve on the National Wildlife Services Advisory Committee. He most enjoys working with the outstanding group of folks in his lab. A native of Wisconsin, Jerry is happy to be back in the Great Lakes region and pleased that the Merrill Bluejays continue to dominate the Wisconsin Valley Conference.



**Hailey Boone** is a PhD student working in collaboration with Isle Royale National Park to investigate the influence of introducing predators and park visitation on the mammal community's perception of risk and behaviors. She received her MS degree at North Carolina State University studying white-tailed deer fawn survival. In the future, she hopes to become an ungulate or furbearer biologist for a state or federal agency. Through the lab, Hailey has had the opportunity to work and interact with individuals with vast backgrounds and skill sets.



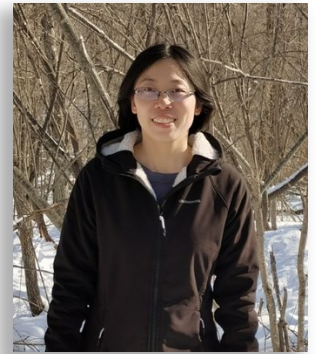
**Brandy Braman** is an Office Assistant III in FW. For the Boone and Crockett (B&C) Program, among other duties, she manages and reports on budgets, provides financial oversight on transactions, and maintains publications, grants, and students in support of B&C reporting. For FW she processes purchases and assists with student hire/onboarding processes. She received a bachelor's degree in Science and Organized Management and has over twenty years of experience in administration. She loves working with people and uses her outgoing personality to her advantage. She and her husband have three children. Brandy loves spring and summer while working in her yard and playing golf.

# DR. JERROLD BELANT



**Alejandra Zubiria Perez** is a PhD student working on the population ecology of gray wolves in the Great Lakes region. Her project aims to understand drivers of wolf mortality and how anthropogenic mortality affects pack dynamics, dispersal risk, and population viability. Ale's background includes animal welfare, wildlife conservation, and human-wildlife coexistence. After her PhD, she would love to work with non-invasive sampling methods to understand carnivore behavior and support human-wildlife coexistence.

**Dan Li** is a second-year PhD student. Her research includes analyzing the drivers of spatiotemporal variation in wolf-human conflicts in the western Great Lakes region of the USA, evaluating how wolf management affects conflicts, and developing a social-ecologically optimal management framework. She has previous experience with conservation of large carnivores and migratory birds in NGOs and a wildlife agency after she received her MS degree in Genetics and BS degree in Biology. She likes hiking, jogging, swimming, reading, and listening to books.



**Dr. Ken Kellner** is an assistant research professor whose research has covered a wide range of topics including forest management, population modeling, and avian and mammal conservation. He provides statistical support for the lab and has worked on a variety of projects involving white-tailed deer, black bears, moose, wolves, and other species. He also has developed or contributed to several software packages that are widely used by ecologists and featured in several books, including the R packages `jagsUI`, `unmarked`, and `ubms`. In addition, Ken is coauthor of a forthcoming book on statistical modeling for ecologists.

**Jamshid Parchizadeh** is a PhD student working on the ecology and management of brown bears on Kodiak Island, Alaska. Born and raised in Tehran, he moved to Mazandaran Province in northern Iran in 2003 to complete his BS degree in General Biology. In 2009, Jamshid traveled to Pune, India to obtain his MS degree in Zoology. He returned to Iran in 2012 and has conducted research on Iran's large carnivores (i.e., Asiatic cheetah, Persian leopard, and brown bear) before joining our lab for his PhD program.



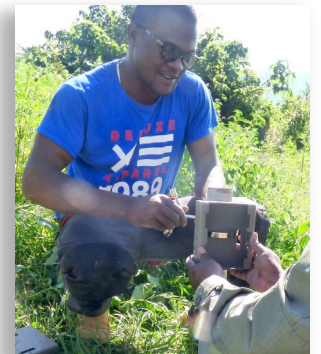


# LAB SPOTLIGHT



**Matt Nelson** was raised in South Carolina at the foothills of the Appalachian Mountains where he fostered a love for wildlife and the outdoors. He obtained a BS degree in wildlife and fisheries biology from Clemson University, then spent the next 3 years working with wildlife ranging from sea turtles to greater sage-grouse to wolves. Matt completed his MS degree at the University of Idaho, testing novel approaches to estimate black bear abundance in Idaho using remote cameras and comparisons to yearly huckleberry crops. Matt's dissertation research at MSU will explore gray wolf ecology and abundance estimation using remote cameras.

**Stanslaus Mwampeta** is a wildlife biologist and researcher with expertise in estimating lion abundance and ecology. He obtained his BS and MS degrees from University of Dar es Salaam, Tanzania. His MS thesis investigated the co-occurrence of caracals and servals in Serengeti National Park. Following each of his degrees, Stan worked as a field biologist monitoring lions in Serengeti National Park. He then earned a PhD on field techniques for estimating lion presence and abundance from the Norwegian University of Science and Technology. Stan's research interests include large carnivores, behavioral ecology, and game cameras.



**Adia Sovie** is a Research Associate quantifying ecological responses of the wolf introduction to Isle Royale National Park, a collaboration between the National Park Service and MSU. Adia earned her MS and PhD degrees in Wildlife Ecology and Conservation from the University of Florida and her BS degree in Environmental Science from the University of Massachusetts, Amherst. Her research focuses on understanding how wildlife communities respond to global change through experimental manipulations and non-invasive monitoring. Adia loves the global reach of the lab and the focus on solving on-the-ground conservation problems.

# DR. JERROLD BELANT



**Joe Goergen** is a MS student quantifying sustainability of socio-economic benefits from hunting and photo-tourism to communal conservancies in Namibia. His research seeks to understand environmental, market, and governance mechanisms driving rural wildlife economies in southern Africa. Joe is also Managing Editor for Conservation Frontlines, a news platform partnered with Michigan State University. Joe previously worked for an international conservation nonprofit and plans to return to the wildlife NGO space at a leadership level. He received a BA in Environmental Studies from Tulane University and is a member of the IUCN Sustainable Use and Livelihoods Specialist Group among other professional roles.


**Merijn van den Bosch** is a PhD candidate investigating the spatial ecology of gray wolves in the Great Lakes region. Before working for several conservation NGOs, such as BirdLife International, he completed a MS degree at Ghent University with a research project on the foraging behavior of herring gulls. He also obtained a Master's degree in Animal Behavior at the University of Edinburgh in Scotland, and Bachelor's and Master's degrees in Philosophy, with a thesis on Aldo Leopold's "Land Ethic". In his spare time, Merijn enjoys birdwatching, wildlife photography, hiking, and hanging out with his dog Tucker.



**Nate Wehr** is a PhD candidate in FW working in collaboration with the Grand Portage Band of Lake Superior Chippewa in northeastern Minnesota and Isle Royale National Park, Michigan. His dissertation research focuses on community ecology and management of gray wolves, moose, white-tailed deer, and black bears. Before joining MSU, Nate completed his MS at the University of Hawai'i at Mānoa studying the community ecology of feral pigs and his BA at Oberlin College studying wading bird habitat selection. In his free time, Nate enjoys hunting, sports, and home maintenance.

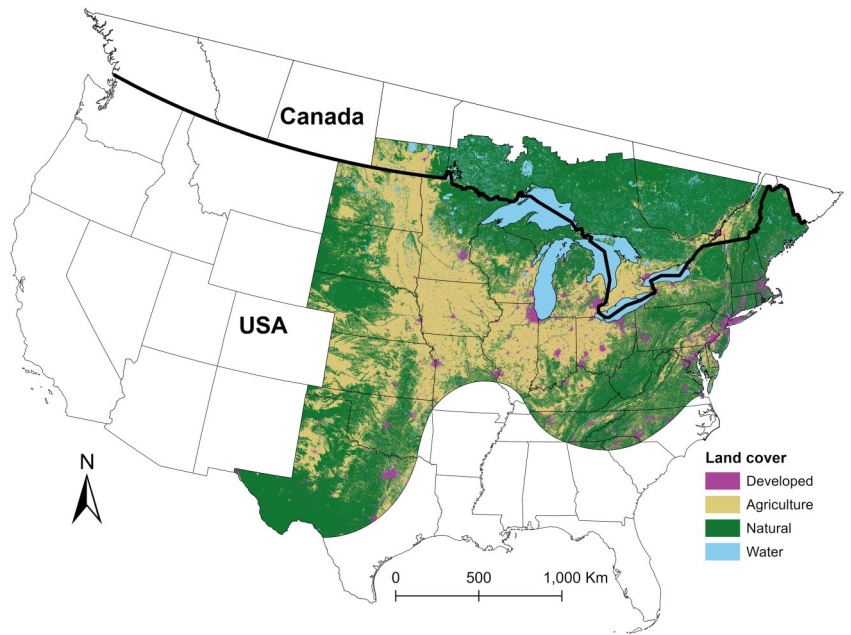
# Identifying Potential Gray Wolf Habitat & Connectivity in the Eastern USA

By Merijn van den Bosch, Kenneth F. Kellner, Dean E. Beyer, John D. Erb, David M. MacFarland, Cody D. Norton, Jennifer L. Price Tack, Brian J. Roell, Jerrold. L. Belant

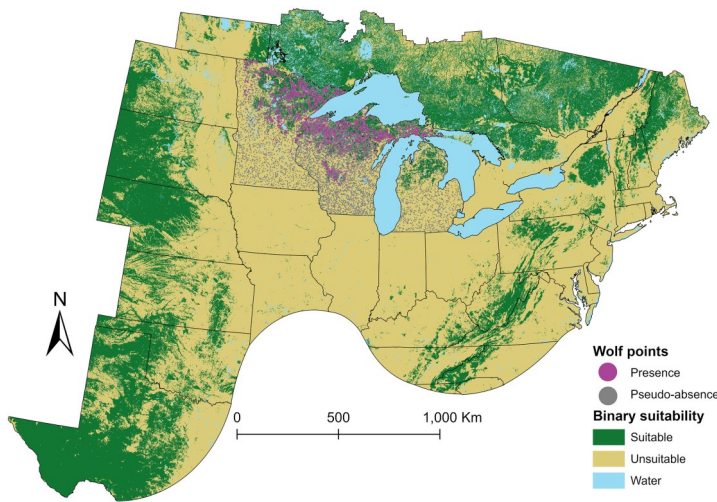
A photograph of three gray wolves standing in a snowy, hilly landscape. The wolves are positioned in a line, moving from left to right across the frame. The background is a bright, overcast sky, and the ground is covered in deep snow with some sparse, dry vegetation visible. The overall scene is serene and captures the natural habitat of these animals.

Worldwide, large carnivore ranges have contracted since the 1700s due to persecution, and habitat and connectivity loss linked to increases in human populations and land use change. Not only does encroachment upon their habitat directly affect large carnivore numbers, it can also exacerbate human-wildlife conflicts. We now have an increased recognition of the ecological role of large carnivores, and there have been improvements in how the public perceives them, so there is now increased legal protection of large carnivores and more willingness to co-exist with them. Therefore, several species such as gray wolves, black bears, and mountain lions have partially recolonized their historical range in the United States. After receiving federal protection through the Endangered Species Act in 1974, gray wolves recolonized former range in the western USA and the Midwest. The wolf population in the Great Lakes region spans across portions of Minnesota, Wisconsin, and the Michigan Upper Peninsula, and with over 4,000 wolves it is the largest in the contiguous USA. An important research gap is that it is unknown how much wolf habitat remains in other states in the eastern half of the USA, thus it is unknown where further recolonization of historical range is plausible. We therefore developed a species distribution model to estimate wolf habitat in the Great Lakes region and used it to predict habitat availability throughout the area in the eastern USA where wolves once roamed (Figure 1). We also estimated habitat connectivity between remaining wolf habitat, including habitat in southern Canada, to identify potential linkages between currently occupied and unoccupied wolf habitat.

**Figure 1.** Land cover throughout our study area, consisting of all historical gray wolf range in the eastern USA, and parts of current wolf range in southern Canada



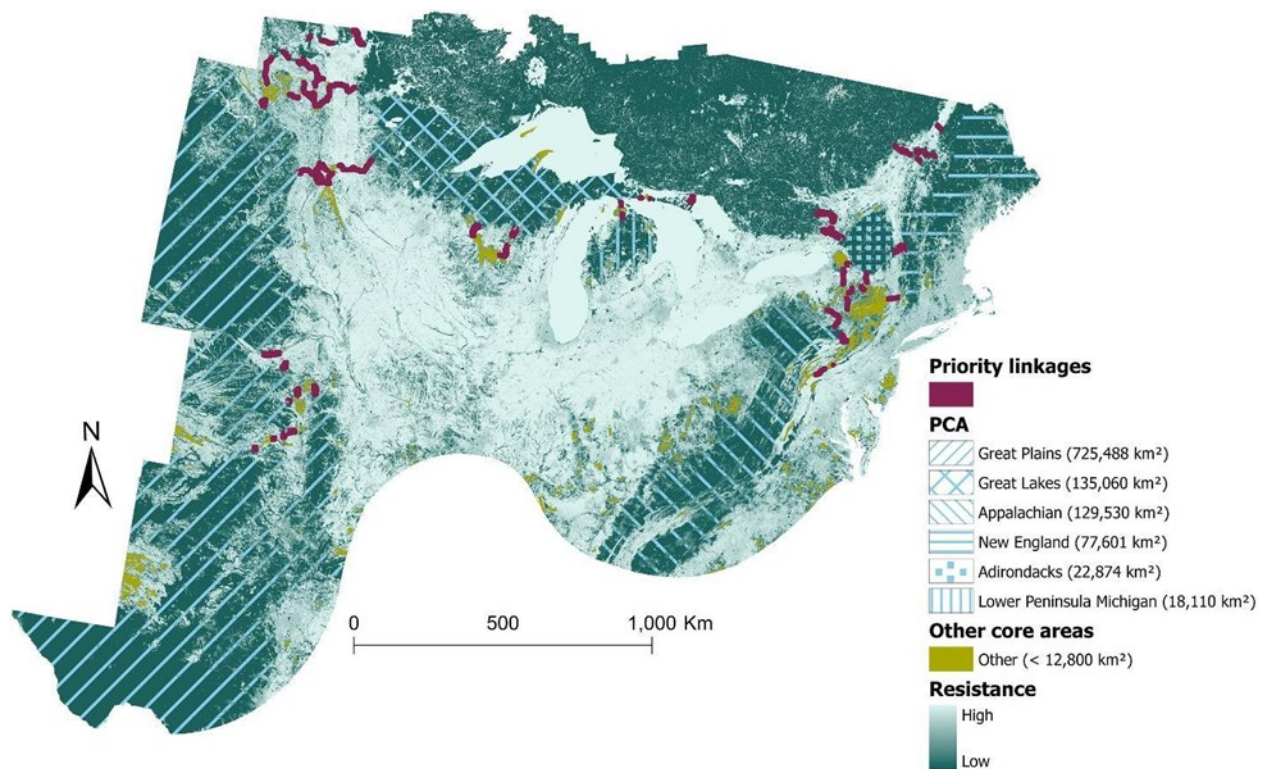
We used snow tracking data collected by the DNRs of Minnesota, Wisconsin, and Michigan and many trained volunteers. To complement our presence points, we assigned twice as many ‘pseudo-absence’ points throughout the states of Minnesota, Wisconsin, and Michigan, which are randomly located points where wolves may have been present but are assumed absent (Figure 2).



**Figure 2.** Binary landscape suitability for gray wolves (*Canis lupus*) throughout former range in the eastern USA and southern Canada, a result acquired using the presence and pseudo-absence points in Minnesota, Wisconsin, and Michigan, USA.

Our species distribution model tested for differences between the landscape characteristics of wolf presence locations and pseudo-absence locations. The major landscape characteristics we used to characterize locations were the proportion of agricultural land cover, human population density, and the distance to agricultural land cover. We then projected the results of this analysis to all historical wolf range in the eastern USA. After estimating remaining wolf habitat, we defined patches > 100 square kilometers to be ‘core areas’ of habitat. Because we already quantified how landscape characteristics affect the suitability of an area for wolves, we were able to quantify the extent to which the landscape poses ‘movement resistance’ to wolves, an indicator of habitat connectivity. We calculated linkages between core areas, which are routes between core areas with the least resistance to wolves moving across them. We then assessed what linkages could be most important to further recolonization of habitat, based on various factors such as the size of the core areas connected by a linkage and the centrality of these core areas in the study area.

We found that the proportion of agricultural cover and human population density, followed by distance to agricultural land cover, are strong predictors of what is and is not wolf habitat. Proportions of agricultural cover and human population densities are both negatively related to habitat suitability for wolves. The predictions stemming from the model suggested that of all historical wolf habitat in the eastern USA, about 35% (or 1.2 million square kilometers) remains suitable for wolves, while the other 65% can no longer be considered wolf habitat. Only 12% of what we estimated as remaining wolf habitat is currently occupied, which translates to about 4% of their total historical range in the eastern USA. Apart from the already occupied Great Lakes region, we identified 5 unoccupied core areas potentially large enough to host wolf populations (PCAs, or Population-sized Core Areas). These are, from largest to smallest, located around the Great Plains of the Midwest, the Appalachian mountains, New England, the Adirondacks, and the Michigan Lower Peninsula (Figure 3). They range in size between about 23,000-725,000 square kilometers, and the largest three may be large enough to host wolf populations independent from connectivity with other core areas. However, linkages connecting these PCAs appear to have low connectivity, as these linkages often traverse landscapes dominated by agriculture and with high human population densities.



**Figure 3.** Landscape resistance to gray wolf movement throughout former range in the eastern USA and southern Canada, and linkages connecting wolf habitat. Resistance is overlaid with core areas of habitat in the USA, including six population-sized core areas (PCAs) that could host viable wolf populations.

Our analysis shows wolves occupy areas with high natural land cover, such as forests, and low human disturbance. While we found over a million square kilometers of unoccupied wolf habitat in the eastern USA, connectivity between current and potential wolf range is low due to extensive agriculture, high human populations, and the presence of the Great Lakes. We suggest recolonization of the three easternmost PCAs is more plausible via dispersal through current wolf range in southern Canada, than through states with extensive agriculture and low connectivity, such as Illinois, Indiana, or Ohio.

While human disturbance and associated land use limit habitat connectivity in many places, there appear to be a few linkages that wolves may be able to cross: one such linkage is the straits of Mackinac, which could connect the Great Lakes PCA and Lower Peninsula Michigan PCA. Wolves have crossed the straits before, but apparently too infrequently to establish in the Lower Peninsula. Secondly, wolves may be able to recolonize habitat in New England by crossing the St. Lawrence River in the northeastern part of our study area. Similarly, the Adirondacks in New York are most likely to be recolonized through wolves dispersing from southeastern Canada, but high human disturbance around the St. Lawrence River may limit connectivity, while population control in Quebec and Ontario may limit the number of wolves dispersing into the northeastern USA.

In conclusion, we estimate 65 % of former wolf range in the eastern USA is currently unsuitable, and limited connectivity between occupied and unoccupied habitat may limit further wolf recolonization. Moreover, linkages for large carnivores often cross jurisdictional borders, highlighting the need for interjurisdictional cooperation if recolonization or reintroduction is desired, for example between Canada and the USA. Our results suggest that while several parts of the eastern USA may not be recolonized naturally, there is sufficient remaining wolf habitat for reintroduction. Beyond the availability of habitat and linkages for wolves, their recolonization and persistence will require human willingness to share landscapes with them, which is something that holds true for all large carnivores. Knowing where and how large carnivore recolonization may occur can help to prioritize areas for conservation and for promoting successful co-existence with humans.



**Merijn van den Bosch** is a PhD candidate investigating the spatial ecology of gray wolves in the Great Lakes region. Before working for several conservation NGOs, such as BirdLife International, he completed a MS degree at Ghent University with a research project on the foraging behavior of herring gulls. He also obtained a Master's degree in Animal Behavior at the University of Edinburgh in Scotland, and Bachelor's and Master's degrees in Philosophy, with a thesis on Aldo Leopold's "Land Ethic". In his spare time, Merijn enjoys birdwatching, wildlife photography, hiking, and hanging out with his dog Tucker.

His contact information is: [merijnb@msu.edu](mailto:merijnb@msu.edu)

# PHOTO CONTEST WINNERS



## **Best Community Engagement**

Charity Event

by Simran Singh

## **Best Fieldwork**

Researchers release a bright green dye in the river to determine application site for experimental odorant to manipulate sea lamprey movement

by Kandace R. Griffin



# PHOTO CONTEST WINNERS



## **Best Flora**

Watershield

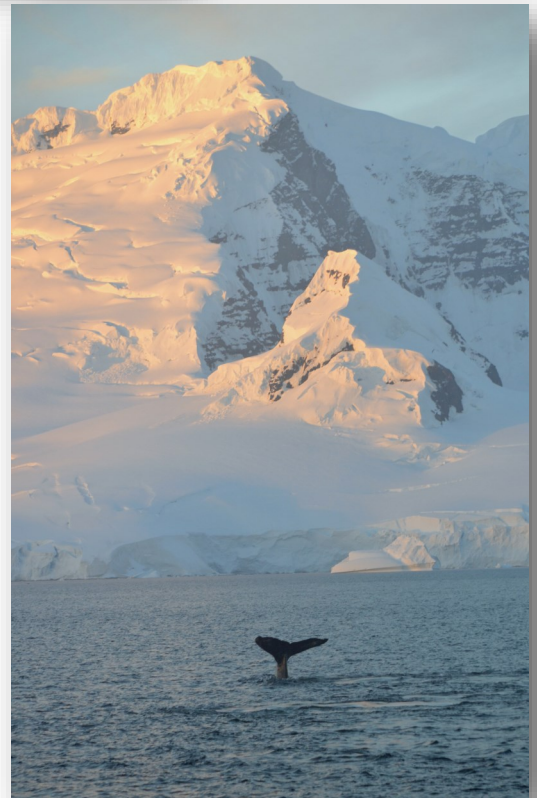
by Dr. Jeremy  
Hartsock

## **Best Fauna**

Deer and Mayflies

by Dr. Jeremy Hartsock

*(Contents image)*



## **Best Landscape**

Antarctic Sunset by

Dr. Daniel Hayes *(Cover image)*