



## Learning About the Meat Eaters of Michigan

By Jill Riddell

In 2015 Dr. Nyeema Harris launched a project that combined her long-term interests in carnivores and citizen science. An assistant professor in the Ecology and Evolutionary Biology at the University of Michigan, Harris directs the Applied Wildlife Ecology (AWE) Lab. One of the lab's ongoing projects studies Michigan's mesocarnivores, the medium-sized predators whose diet includes both meat and plants. A group that includes foxes, coyotes, and weasels, mesocarnivores are both more abundant than large carnivores such as bears, and include a greater diversity of species.

With support from the Huron Mountain Wildlife Foundation and University of Michigan, Harris is now in the third year of developing a much fuller picture of carnivore diversity throughout Michigan. In addition to working in the Huron Mountains, the lab is conducting extensive surveys in three locations in the lower peninsula.


### *How And Where—Surveying Mammals*

"Everything we are doing is non-invasive," Harris says. "We are not trapping or handling animals." Instead she and her team

rely on remotely triggered cameras, the type that takes a photo only when the sensor detects movement. Cameras have been placed in remote niches, far off-trail, in the Huron Mountains and the other locations.

"When I was preparing for the study, I spent quite a bit of time just scouting around Michigan for potential locations. When I learned about the Huron Mountain Club—a colleague put it on my radar—I was immediately intrigued and interested in the opportunity," Harris said. "When I saw the property, I was actually blown away by it—first of all, it's just breathtaking! There are very few places where you have such a natural landscape with so little logging and so little human activity to do wildlife research."

Her four study sites are on a gradient from north to south, and from most natural to most disturbed. The Huron Mountains site is on the far end of that spectrum, with the least human disturbance, and accordingly, its diversity of carnivores is greatest. So far, it's the only site of the four where wolves are present. The next most natural site is the University of Michigan Biological Station near the top of Michigan's Lower Peninsula (about twenty miles south



"Watching someone get jazzed about science in the field is part of why I am doing what I'm doing. I love to facilitate those immersive experiences for students." Dr. Nyeema Harris, an assistant professor in the Ecology and Evolutionary Biology department at the University of Michigan who runs the Applied Wildlife Ecology (AWE) lab. She will be the speaker at this year's annual meeting of the Foundation.





Sofia Kruszka and Michael Lyons, two undergraduates from the University of Michigan, are two of the students working on the project. They check cameras and replace the memory cards. “People are curious about the cameras,” says Dr. Nyeema Harris, the project’s principal investigator. “We have a tag on each camera that has the project name. At the Huron Mountains, we haven’t had any theft. It’s the first time in any project, internationally or nationally, that we haven’t had a camera stolen.” *Photo by Nyeema Harris*

of Mackinaw); the third is the Shiawassee National Wildlife Refuge near Saginaw; and the fourth is the parks of Detroit. One species found at the other three sites that’s absent in Detroit is bobcats; on the other hand, in Detroit domestic dogs and cats are present, and when loose, they play the role of mesocarnivores.

“The cross-site comparison allows us to determine how an animal’s ecology varies depending on where it is living,” says Harris. “Is what we think we know about raccoons or coyotes or bears consistent across each location? Probably not.”

The date, time, and temperature recorded by the cameras allows the Harris and the team from the AWE lab to determine when species are most active and in which weather conditions. The team also examines scat samples found on-site. “Feces is actually very illuminating in helping us understand ecology and the relative health of individual animals,” said Harris. “We study the diversity of parasites and the animal’s microbial community. And, of course, scat tells us a lot about consumption, what the animal eats.”

## Starting Out As City Girl

“In Philadelphia where I grew up, I didn’t go hiking or fishing with my family. But a lot of kids like animals, so that’s not rare, and I was one of those kids. I was always catching fireflies, trying to find the frog in my backyard, and digging up earthworms and bringing them inside,” Harris said.

Her mother was a high school biology teacher, and when Harris was thirteen, she got her first job at the Philadelphia zoo. The most transformative experience of her program was travelling to Kenya. “I can literally attribute my entire career to that experience,” she said. “Seeing lions hunting in their natural environment—I knew I wanted to be in that, somehow.”

“My personal experience does shape my perspective,” Harris

says. “All along, I knew that I wanted to do public science. I didn’t want to do science isolated. Being able to create an experience for others, especially people of color—there is a power in that. An experience of citizen science can bring that. Not everyone becomes an “ologist” but everyone votes and has an environmental footprint.”



Two carnivores caught on camera, a black bear and a gray wolf. So far, the Huron Mountain region is the only site in the study that has wolves.



**Michael Lyons (left), an undergraduate from the University of Michigan and Moses Muhumuza (right), a visiting researcher from Uganda participated in the survey in fall, 2017.**

*Photo by Rumaan Malhotra, a PhD student in the AWE lab*

### ***“Help Us Investigate Wildlife in Michigan!”***

That’s the tagline for Harris’s citizen science project on Zooniverse, a website where Harris solicits public assistance in identifying the animals in the images the cameras capture. Zooniverse offers volunteers the chance to participate in many projects, like helping to identify types of galaxies, understand chimp behavior, transcribe the handwriting of Shakespeare’s contemporaries—and to find out which carnivores live in the state of Michigan.

For Harris’s mesocarnivore project, a citizen scientist can either set up an account or participate anonymously. If you volunteer, you can spend a lot of time or only a couple of minutes because even short stints are useful. When you go to the website, a photo pops up, and if there’s an animal in the image, you record what type. You are also asked what the weather appears to have been.

“Because I knew we’d literally get millions of images across seasons and our lab is pretty small and have other research projects, crowdsourcing ended up being the solution,” Harris said. “Three thousand six-hundred sixty-eight individuals have helped identify the animals in those pictures so far and we are so grateful.”

The obvious question is how on earth can Harris rely on the word of some anonymous person somewhere who may or may not know a thing about animals? When asked, Harris laughs. “I know! Asking a second grader to tell the difference between a marten and a fisher sounds crazy. Sometimes even I can’t do it! But fifteen different people look at each photo before it gets retired, meaning it’s taken off the rotation. If fifteen people declare it’s a deer, I’m confident in their identification; I don’t have to look at that picture. But when we don’t have congruency, then we do a little bit more work on our end to determine what the animal actually is.”

### ***Lure of the Huron Mountains***

About the Huron Mountains and the field station, Harris says, “We feel so fortunate to have access to the property to do the research. It’s a place I enjoy working. In my lab, we go through these discussions about who is going to get to go where, and even though when we’re up at the Huron Mountain Club our days are really long and sometimes the mosquitoes are awful and the mountains we have to climb are difficult—everyone wants to go.”

## **BEST VOLUNTEER JOB EVER**

Imagine making an important contribution to science while at home, in your pajamas, eating chocolate chip cookies, and looking at photos of Huron Mountain. Oh, and how about if you could do it in five minutes or less—even better, right?

Thanks to Dr. Nyeema Harris, now you can. The images up on the Zooniverse site this summer (2018) are from the Huron Mountain Club and the Shiawassee National Wildlife Refuge. At the time of publication, these vast numbers of images in what is called Season Two were only thirty-two percent complete, so there’s plenty of work still to be done. Once Season Two of images is finished, there will always be Season Three that consists of more HMC images from summer Winter 2018, Summer 2018, and Detroit Fall 2017. And after that, Season Four.

Identifying the animals is an activity that’s both restful and rather addictive. It’s hard not to hope for a wolf or a moose, but sometimes a simple photo of doe and fawn will move you.

Name of project: Michigan ZoomIN

**URL:** <https://www.zooniverse.org/projects/michiganzoomin/michigan-zoomin>

Ninety-second video on the work of Nyeema Harris and the AWE lab.

(It’s very good, definitely worth checking out.)

**URL:** [https://www.youtube.com/watch?time\\_continue=13&v=WJpTQ7Q05FM](https://www.youtube.com/watch?time_continue=13&v=WJpTQ7Q05FM)



In the Huron Mountains, bears, wolves, and martens have all been photographed by Harris’s cameras. The two carnivores caught most frequently by the researchers’ cameras are bears and raccoons. Though herbivores aren’t a target for the study, moose, porcupines, sandhill cranes and wild turkey have also all been photographed. By a wide margin, though, the most common animal to be caught on camera is the white-tailed deer.

# Research Projects for the 2018 Field Season

By Kerry Woods

One of the Foundation's explicit and urgent priorities is *biodiversity inventory*. While this sort of research gets a good deal of lip service – everyone acknowledges that “knowing what’s out there” is essential to functional understanding of how ecosystems work – not many large agencies are willing to commit significant funds to basic, site-based descriptive studies.

HMWF fills several niches in the ecology of research support, and we bring attention to areas relatively neglected in the scope of larger research opportunity and funding. Another example is the priority we give and advertise in our annual call for research proposals: *long-term monitoring* of natural populations and systems. Again, the scientific community is in consensus that such systematic monitoring is critical to assessing and predicting response to changing environments and movement and introduction of new species – but few funders offer sustained support for efforts designed to be ongoing and long-term.

Both of these priorities are obvious “targets of opportunity” for the Foundation for at least two reasons. One, the research area accessible through Foundation sponsorship offers unique value to researchers interested in such undertakings. Two, the Huron Mountain region is well documented and is “hyperdiverse” in groups that have been particularly well studied, like vascular plants, mayflies, and macromoths. The “reference ecosystem” properties of the Huron Mountain Club lands and their exceptional level of security and protection (a rare attribute and one of particular concern to researchers) make them an attractive venue for long-term studies. More practically, biodiversity inventory and monitoring projects are often doable with modest financial outlay, especially when facilities like the Ives Lake Field Station are available.

Our annual call to researchers to submit proposals also encourages projects with potential for attracting funding from agencies with deeper pockets. If a researcher can couch a project as something where seed money

from HMWF will enable proof-of-concept work or development of a critical baseline data-set that will support a strong proposal to the National Science Foundation or a similar agency, that carries a lot of weight. It’s particularly gratifying to have seen a couple of such seeds germinate over the last year, and to have some new projects appear to have the potential to follow a similar trajectory.

Here, then, is a brief listing and description of the projects active for 2018 – about two dozen, with a diverse mix of topics and a combination of brand new projects and continuing work.

## Monitoring

We have a core collection of ongoing, long-term studies, monitoring ecosystem and population status and, and developing data-sets that will, themselves, fertilize and support future studies and analyses. **Don Waller** (Univ. of Wisconsin), with **Sarah Johnson** (Northland College) and others are into the second half of their planned ten-year study of the effects of elevated deer browsing, built around the large deer “exclosure” near Fisher Creek. Initial surveys this year suggest that substantial differences between exclosure and control areas are beginning to emerge. **Walter Carson** (Pittsburgh Univ.) and **Rose-Marie Muzika** (Univ. of Missouri) are in the third year of their decade-long study of whether small natural refuges from deer browse (like tops of large boulders or cliff-tops) can serve as a source for recolonization by wildflowers, sedges, etc. in forest understory habitats if deer-browsing is reduced (in very small experimental exclosures).

Continuing studies build around long-term monitoring in stream habitats include: assessment of invertebrate communities in a number of local streams by **Donna Kashian** (Wayne State Univ.); studies of the activity of microbial “detritivore” communities by **Scott Tiegs** (Oakland Univ.), and monitoring of spawning migrations of suckers in Pine River and the Salmon Trout River by **Karen Murchie** (Shedd Aquarium). One of our longest-standing studies – of microclimatic variation across the Huron Mt. landscape – enters its 14th year under the direction of **Fritz Nelson** (Northern Michigan Univ.) and **Ken Hinkel** (Michigan Tech. University), and has provided valuable supporting data for several other studies. **Dennis Riege** (Univ. of Maryland) is nearing the decade mark in his studies of pine and hemlock regeneration in Huron Mt. forests near Fisher Creek. This study has provided important “control” data for the Waller project, above, and has spawned sub-studies opportunistically addressing things like the effects of beaver activity. **Evelyn Williams** (Chicago Botanical Garden) continues monitoring of grape-fern populations, begun during her dissertation research a decade ago.

## Diversity

**Thomas Werner** (Michigan Tech. University), whose studies of the remarkable diversity of moths (along with Jim Bess) and fruit flies in the Hurons were written up in this newsletter last year, will return after a brief hiatus; this year’s work may lift total documented moth diversity above the 500-species mark. **Nyeema Harris** (University of Michigan), as documented in this newsletter, is in the third year of her studies of mammalian predator diversity patterns across Michigan.

Increasingly, studies of biodiversity have begun to focus directly on the genetic level as well as classical documentation of species diversity. For example, **Cody Thompson** (Univ. of Michigan) uses genetic analyses to understand the interactions and diversity of flying squirrels in the Huron Mountains. He is following up on earlier study by Phil Myers, suggesting shifting species mixtures. And interestingly, Phil Myers was the colleague of Nyeema Harris’s who suggested she consider a proposal here. **Patrick Gorrington** (Harvard Univ.) will be complementing previous studies of beetle

## ALL ARE WELCOME

Meet Dr. Nyeema Harris, the star of our cover story, and hear her keynote address at the

### Annual Meeting

**Date: Tuesday, July 31**

**Time: 4:00 p.m.**

**Location: The Playhouse**

**Keynote Address: “Who’s there? Variation in carnivore communities across space and time”**

Bring along the animal lovers in your family! This is a chance to ask an expert about animals you’ve seen in the Huron Mountains, and where to find ones you would like to see.

### Walk With A Pro

A researcher from the Huron Mountain Wildlife Foundation will lead a walk on Wednesday, the day after the annual meeting. Look for posters with the specifics.



Caption here. Photo by XYZ

diversity with “proof-of-concept” genetic analyses targeting wood-boring beetles. **Oliver Gailing** (Michigan Tech. Univ.) will be winding up studies using genetic analyses to understand oak diversity at the Huron Mountains. **Stephen Techtmann** (Michigan Tech. Univ.) is entering the third year of studies of microbial diversity, focusing on the spread of “biocide” resistance in microbial gene pools.

## Seed-money Success Stories

I want to particularly applaud two studies that have built on HMWF support to successfully apply for and receive major funding from the National Science Foundation. Collaborative biogeochemical studies at Canyon Lake, begun by **Chad Wittkop** (Minnesota State Univ. – Mankato) in 2014 and now conducted jointly with **Elizabeth Swanner** (Iowa State Univ.) and **Sergei Katsev** (Univ. of Minnesota – Duluth), are now fully supported by a three-year NSF grant that recognizes the potential for Canyon Lake to provide critical new insights into ecosystem processes and, potentially, the earliest environments of life on Earth. **Jalene LaMontagne’s** (DuPaul Univ.) work documenting seed production in white spruce – a northern species at the southern edge of its range and likely particularly vulnerable to climate change – began in 2012 under HMWF support, and has also now gained multi-year funding from the National Science Foundation. (Both of these projects were described in depth in previous newsletters).

## Explorations

We have a collection of projects in their first or second years that are exploring new questions and experiments. Some build on previous research conducted in the Huron Mountains. At the outset, it’s hard to predict which of these will be the next to stimulate expanded or long-term projects or which might attract support from major funders. Stay tuned for future newsletters and blog posts.

**Brad Wells** and **Casey Huckins** (Michigan Tech. Univ.) Building on Casey’s long-term studies of fish communities and trout populations in

the Salmon Trout River, the two researchers are in the second year of an innovative attempt to study competitive interactions among native and introduced salmonids in habitat. In a follow-up on 2017 work, **Steven Voelker** (Utah State Univ.) and **Louise Chavarie** (Michigan State Univ.) continue to follow up on their fortuitous observations of synchronous, potentially climate-linked, growth patterns in hemlock and lake trout – a fine example of the surprising cross-fertilizations and insights that arise from the interaction of two researchers studying very different organisms from one another. **Diane Lafferty** (Northern Michigan Univ.) and **Erin McKenney** (North Carolina State Univ.) are initiating a “proof-of-concept” study focused on using analysis of gut microbiomes (from scat samples) to understand ecological relationships and habitat influences for American marten populations.

**Susan Knight** (Univ. of Wisconsin) is undertaking initial studies of “fairy-ring” growth patterns of water lilies in Howe Lake (a project springing, like many, from a fortuitous observation by another researcher). **Erika Hersch-Green** (Michigan Tech. Univ.), studies root interactions between parasitic plants and their hosts, and will initiate exploratory studies of the hemiparasitic *Melampyrum lineare* (cow-wheat). **Scott Warner** and **Frank Telewski** (Michigan State Univ.) are beginning a tree-ring based study – building on a number of previous studies and data-sets from the Huron Mts. – of the interacting influences of climate change and latitude on growth rates in key tree species.

## Summary

It’s easily put: stay tuned. HMWF sponsors a wide variety of projects in all stages of development. It’s in the nature of research that outcomes are unpredictable. I am confident that the diversity and fertility of the Foundation’s program will continue to generate exciting products and fascinating new projects. That’s possible only through the continuing generosity of the Foundation’s many supporters; I thank you all for past and future support.

# Foundation Research Contributes to Global Knowledge of Climate



The changing climate is now a part of the context for virtually all field biology research. This is particularly the case in the North Country. Climate projections have long suggested change will be greatest at more northern latitudes, and measurements of the last couple of decades bear that out. From 1962-2014, Marquette, Michigan saw the frost-free season increase by 24 days and the average annual temperature increase by 2.7°F. Winter here is warming much

more than summer, much as was predicted by the models.

Climate change is becoming a core theme in most research sponsored by the Foundation. The Foundation's decades-deep archive of baseline studies coupled with the "reference ecosystem" status of a largely unmanaged landscape are powerful draws for researchers. For some current projects, assessing responses of ecological systems to climate change is the focus: researchers are studying shifts in growth rates of trees and fish (Warner & Telewski, Voelker & Chavarie), seed production response in white spruce (LaMontagne), changes in breeding time for suckers (Murchie), and the interactions between related northern and southern species of flying squirrels (Thompson).

The international scientific community is unanimous in the expectation that climate change will drive dramatic reorganizations of natural systems. Researchers are attempting to anticipate the specifics of these changes. This increasingly pressing need amplifies the value inherent in the Huron Mountains.

## About the Huron Mountain Wildlife Foundation:

Since 1955, the Huron Mountain Wildlife Foundation has supported original research in a wide variety of scientific fields. The research takes place in the Upper Peninsula of Michigan. More information on the Foundation can be found at: [www.hmwf.org](http://www.hmwf.org)

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