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Nelson Institute for Environmental Studies
UNIVERSITY OF WISCONSIN–MADISON

THE COMMONS

For alumni and friends of the Nelson Institute for Environmental Studies at the University of Wisconsin–Madison

The Ho-Chunk Nation and the Village of Waunakee partner through UniverCity Year to address diversity and inclusion

Students in Nelson Institute's Environmental Studies 600 capstone course are providing support on this initiative

Village Park, Waunakee. Photo by Waunakee.com

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Photo by Waunakee Communications

By Bekah McBride

Located just north of Madison, Wis. within the Ho-Chunk ancestral territory of Dejope, the Village of Waunakee is unique in many ways, but perhaps most notably it is the only Waunakee in the world. A new partnership between the University of Wisconsin-Madison UniverCity Year (UCY) program, the Ho-Chunk Nation, and the Village of Waunakee is focusing on the village's unique history and helping to create a "tangible shift" in the way the community recognizes and celebrates its past.

The partnership was forged thanks to the UniverCity Year program, which brings faculty, students, and members of Wisconsin communities together to address local challenges through engagement, university research, and state-of-the-art problem-solving approaches. In this case, UniverCity Year partnered with the Village of Waunakee to work on a variety of projects related to diversity, equity, inclusion, and civility; several of which focus on the relationship with the Ho-Chunk Nation.

"We've been talking for years about doing this and I just thought it was important for us to recognize those who had been here before us and for our community to understand the heritage here and what the Ho-Chunk Nation means to this area," said Chris Zellner, the Waunakee Village President. "We are at a starting point where there's so much more we can learn and do with each other."

For several of the projects, particularly those that will work to recognize the Indigenous history of the area, UniverCity Year has partnered Waunakee leaders with Nelson Institute faculty associate, Jessie Conaway and students in her spring 2021 Environmental Studies 600: Senior Capstone. Since 2016, Conaway has been collaborating with First Nations

During the 2016-2017 academic year, students in Environmental Studies 600 worked with the Ho-Chunk Nation and City of Monona through the UniverCity Year program to preserve Ho-Chunk history and culture in parks. Photo by Jessie Conaway

in Wisconsin through a variety of programs including Native Nations_UW and Earth Partnership. She also previously worked with UniverCity Year and the Ho-Chunk Nation on a project in Monona. Together, Conaway, her students, Ho-Chunk Nation and Waunakee leaders, and UniverCity Year staff have been working together to develop educational programming, land acknowledgement, community installations, and more.

"This is a Tribal, municipal partnership that's starting and we are the third leg of the stool," Conaway said of the university's role in these efforts. "We focused on the building blocks of how we would build relationships and how we would promote cultural education within the Waunakee community and schools. What we did together with the students created a tangible shift."

Conaway and her class worked on five projects with Waunakee including:

- offering educational and training opportunities on Ho-Chunk Culture for the Waunakee community
- developing educational programming in Waunakee Schools about Ho-Chunk culture
- drafting a land acknowledgment statement for Waunakee
- developing parks and greenspace management protocols and a cultural resources management plan for Waunakee
- designing community-based installations of Ho-Chunk culture in Waunakee

> *"One of the greatest things about the Nation is that we want to create a symbiotic relationship with our neighbors and our greater community."*
>
> —Ryan Greendeer,
> Public Relations Officer, Ho-Chunk Nation

While developing each project, the students worked closely with the Ho-Chunk Nation to ensure that the land acknowledgement statement, educational programming, and installations were accurate and respectful of Ho-Chunk culture.

"The Ho-Chunk Nation has been a joy to work with throughout the project. Waunakee knew it had a lot to learn about its past, and the Nation was very willing to come to the table to help them grapple with it and find ways to educate the public," said UniverCity Year and UniverCity Alliance managing director, Gavin Luter. "It was very important early in the project to ensure that the leadership of Waunakee and the Nation were willing to

Ripp Park is one location within Waunakee being considered for community-based installations of Ho-Chunk culture. Photo by Waunakee Communications

commit the time necessary to do meaningful work. After that happened, it was a productive relationship that continues to spur new connections."

For the students, these connections were an opportunity to learn Ho-Chunk history, community collaboration, environmental priorities, and more.

"I enrolled in Dr. Conaway's course hoping to gain community collaboration experience with the Ho-Chunk Nation," said Megan Binkley, who was enrolled in the Capstone course and will soon go on to an Archaeology PhD program at the University of Wisconsin-Madison in the fall. "Throughout the semester, I was simultaneously and consistently struck by Dr. Conaway's dedication to her students and her work, and the generosity of our community partners from the Ho-Chunk Nation. Dr. Conaway went above and beyond to support her students by providing them with access to her expertise, years of experience-based learning, and extensive network of community contacts. Our community partners from the Ho-Chunk Nation were also extremely generous with their time, and with their willingness to share their expertise, knowledge, stories, and histories with the capstone students. Overall, these factors created a once-in-a-lifetime learning environment."

Ryan Greendeer, public relations officer for the Ho-Chunk Nation, shared that they are honored to be a part of these learning opportunities.

"The Ho-Chunk people are the original inhabitants of the area and, of course, celebrating the history of Waunakee we wanted to be involved in that," said Ryan Greendeer, the public relations officer for the Ho-Chunk Nation. "One of the greatest things about the Nation is that we want to create a symbiotic relationship with our neighbors and our greater community."

Greendeer shared that he and the Ho-Chunk Nation were proud to share more about their culture and traditions through a series of cultural trainings with Waunakee leadership. He was also particularly excited to be a part of the signage installation project as it allowed for great collaboration between the Ho-Chunk Nation, Waunakee, and the UW-Madison students.

"If we take a look at signage project for example, as Ho-Chunk was never a written language, but we are getting to a point where if we aren't able to talk with people and share how we came to be in the area, then we can't convey that to a larger audience," Greendeer said. "It's a medium that we aren't used to historically, but it's something that can be used to educate. Helping out with these different training events and talking to people helps us to get our story out. And the more we do it, the more we see people who have a knowledge base of the Nation. That for me is inspiring as it shows that what we are doing in the community is working. People are becoming educated and I think that's extremely important, especially as it is helping to build the relationships that we've always wanted."

In May, the students presented their projects to the Village of Waunakee and representatives from the Ho-Chunk

Nation. Now, UniverCity Year staff will be working with Waunakee leaders and the Ho-Chunk Nation to implement the projects.

"What's really impressive about the UCY partnership is the way in which the UCY staff work with their clients, in this case Waunakee, to scope the work. I think that was extremely productive and resulted in something better than we expected," said Todd Schmidt, the Village administrator. "The connections of UCY and the Nelson Institute were a critical ingredient in helping to receive support from the Ho-Chunk Nation. We had the right people from the Nation at the table and I thank UCY and the Nelson Institute for helping to make that happen."

Schmidt and Zellner are also thankful for the support and assistance provided by the Ho-Chunk Nation. Throughout the project, and particularly the community trainings, Schmidt and Zellner said the community has learned some important lessons and built significant relationships.

"The Ho-Chunk have been very gracious in affording us this opportunity to learn. What I noticed was that as the Ho-Chunk Nation leaders at the very top level leaned into Waunakee, Waunakee leaned right back into them. I felt there was this eagerness from both sides of the table and that helped to produce some products, or hopeful products, that will be very meaningful," Schmidt said. "I've learned that we are walking today on the same soil that a Ho-Chunk village sat on. We're looking at the product of what the Ho-Chunk Nation cultivated as a land. In learning about that and the culture during the training they provided us, I've come to appreciate that in a way I didn't before. It's created a sense of responsibility for me, but my sense is that others have also come to gain that sense of responsibility as well."

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>
> —Todd Schmidt,
> Village Administrator,
> Village of Waunakee

Likewise, UCY staff are honored to have played a part in supporting this relationship building and these learning opportunities.

"I've been so inspired by how gracious the Ho-Chunk Nation has been with their time and the openness Waunakee has to learn about what, at times, can be an uncomfortable history," Luter said. "We hope to inspire others to do similar work to connect local governments with tribal nations. Finally, this would never have worked if Jessie Conaway would not have agreed to take this on as a class project. We hope Jessie's experience inspires others to do these kinds of community-based learning experiences. It helps us achieve the most authentic version of the Wisconsin Idea."

Feature

A Wisconsin Idea **win-win**

By Dennis Chaptman

At a sweeping bend of the Mississippi River, where the waterway widens and flows through shimmering Lake Pepin, tourists come to snarf slabs of homemade pie, stroll through artisan shops, and enjoy water sports.

This is northwest Wisconsin's Pepin County, whose zigzag boundaries enclose 249 square miles, making it the state's smallest county by land area. Home to only 7,265 people, it's also one of the smallest by population. But every year, Pepin County draws gobs of tourists with its remarkable views of valleys and bluffs and the sweet, crusty allure served up at the renowned Stockholm Pie and General Store. Downriver, in the village of Pepin, fans of literature make pilgrimages to the birthplace of Laura Ingalls Wilder, whose Little House on the Prairie and other children's books have entertained generations.

From Devil's Corner to Durand, Porcupine to Stockholm, Pepin County is one of Wisconsin's jewels, picturesque and charming. But no community is perfect. Underlying all those beguiling snippets of rural Dairyland life are perplexing problems and concerns.

Similar issues exist all around the state, but they aren't going unnoticed or unaddressed. A UW-Madison program called the UniverCity Year is partnering with communities across Wisconsin to find solutions to knotty problems and bolster the quality of life for the state's citizens. And students, faculty, and staff from College of Agriculture and Life Sciences are helping to tackle those challenges by bringing research to bear on Main Street issues – in Pepin County and beyond.

"We make the Wisconsin Idea very practical and tangible," says Gavin Luter, managing director for the UniverCity Year program. "We get people from the university working hand in hand with people at the local level to build their capacity to do good self-governance."

Learn more about the work in Pepin County.

To restore biodiversity, embrace biotech's 'Intended Consequences'

Elizabeth Ann the black-footed ferret, the first cloned member of an endangered species. Photo credit: USFWS National Black-footed Ferret Conservation Center Flickr

By Paul Robbins and Ryan Phelan

In December of 2020, when scientists managed the incredible feat of cloning the endangered black-footed ferret, they took a leap toward the renewed global priority to combat climate change and biodiversity loss. The cloning success both fulfilled the founding vision of Earth Day and frightened its strongest proponents. By using biotechnology to achieve one of conservation's most critical goals—to restore genetic diversity to a species faced with a limited gene pool—conservationists made a step forward in saving a beloved species. But they did so by "tinkering" with the core mechanisms of life itself. This effort realized the vision of Earth-Day founder and Nelson Institute namesake Gaylord Nelson, to foster "an environment of decency, quality and mutual respect for all other human beings and all other living creatures." Would Nelson have recognized and valued this advance? We believe so. To restore biodiversity, we will have to innovate.

While none of this obviates the need for traditional conservation measures, like habitat protection and land management, we can and we should address the looming extinction crisis with the same bold and rapid approach used to fight COVID-19. A creative ethos and an open mind can release the power of new technologies.

SCIENTIFIC AMERICAN

Together, we have years of conservation experience. One of us is an environmental researcher and the other the co-founder and executive director of Revive & Restore. We understand the importance of supporting and restoring biodiversity, and we are teaming up with the world's leading molecular biologists, technologists, conservation biologists, conservation organizations, ethicists and thought leaders to call for "Intended Consequences" to help us safely use all of the available tools that can provide the advantage we need to turn the tide on species loss.

Intended Consequences is a new, inclusive, ethical and rational framework that will help us envision bold conservation interventions and safely leverage biotechnology to win the race against extinction.

Some individuals worry about the *unintended* consequences of intervening with nature, including the use of genetic technology as well as traditional conservation restoration. However, alarming biodiversity loss tells us we must be more focused on the game-changing positive impacts that will result from a focus on Intended Consequences. If we fret endlessly about unintended consequences and wallow in uncertainty, we will inevitably witness the chilling result as a mass extinction plays out. Our current pivot point asks of us boldness and action as we consider biotechnology solutions and weigh the consequences of doing nothing.

The American chestnut, for example, will not survive without intervention. Prior to the industrial revolution, these trees formed endless stands in the Eastern forests of North America. By the 1940s a nonnative fungal blight killed an estimated four billion trees nationwide. As Eastern forests lost the American chestnuts, smaller trees established denser stands. This shift resulted in a new ecological state characterized by impoverished habitats, shrunken wildlife populations, inferior forest products and reduced biodiversity.

Towards the end of the 20th century, a team of innovative scientists began experimenting in the lab. They added a gene from wheat to the otherwise unaltered American chestnut genome. The resulting transgenic tree is no freak of nature. It is a 100 percent American chestnut that now produces an enzyme that degrades the blight's toxin. Because of this single additional gene, it can coexist on landscapes where the invasive fungus also thrives.

This seemingly radical solution is an elegant example of the potential for biotechnology to enable species-saving interventions. American chestnut fans want seedlings to plant in their yards, and the Eastern Band of Cherokee Indians in North Carolina has signed onto plant blight-resistant chestnut trees on tribal land.But this early enthusiasm is only part of the process.

Responsible intervention must be guided by the Intended Consequences framework, including a thorough risk assessment and detailed studies to test how the proposed intervention could affect the ecosystem. We now know that when transgenic chestnut leaves fall into forest pools, they are safe for wood frog tadpoles to eat. The Federal regulatory system is reviewing the American chestnut project now; if it passes muster, it will be the first to demonstrate how carefully considered genetic interventions can enable coexistence in the wild.

With both the American chestnut and the black-footed ferret, 21st-century conservation solutions began in the lab. Responsible genetic interventions resulted from pairing new biotechnologies with decades of natural history knowledge

Paul Robbins

Ryan Phelan

and careful research. Despite the wariness cultivated by fictional horror stories, biotechnology is simply one more tool in this earnest race against extinction. The American chestnut is a critical proof of concept, and the black-footed ferret project is underway now, but we need these positive outcomes for all endangered species. We want to see resilient wild populations flourishing in nature.

Perhaps, in the not-too-distant future, we will see biotechnology applied to help save coral reefs. Scientists are already exploring how genetic interventions could be used to adjust coral temperature tolerance. And with Intended Consequences in mind, Revive & Restore is designing the Advanced Coral Toolkit to develop new tools, including stem cells, probiotics and rapid diagnostics, that will increase our options for reef restoration. If we do not intervene, we could lose coral reefs forever.

Conservation is finally ready to embrace the innovative spirit that drives problem-solving in other fields. An interdisciplinary group of scientists and conservationists from around the world agreed, and together they recently authored the Intended Consequences Statement to provide an initial framework for responsible conservation intervention that follows in the footsteps of the black-footed ferret and the American chestnut tree.

The Intended Consequences framework incorporates the lessons learned from decades of successful conservation work and redirects us away from despair and toward an optimistic future, encouraging us to imagine solutions to seemingly intractable conservation problems and inspiring us to act. It's something we can all agree on.

About the authors:
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Sustainability during a pandemic

Andrea Hicks

By Andrea Hicks, interim director, Sustainability Education and Research, assistant professor, Department of Civil and Environmental Engineering.

A global pandemic is certainly not the ideal time to assume the role of Interim Director of Sustainability Education and Research at our Office of Sustainability (OS) here at UW-Madison. Nonetheless, even in this time of upheaval and uncertainty, the OS has been hard at work facilitating innovative research, supporting our campus in becoming more sustainable, and educating our students. I have received an incredibly warm welcome in this role across the campus, and I would like to take this opportunity to highlight some of what the office has been up to during the pandemic.

> *"We are excited to welcome everyone back to campus this summer and in the upcoming fall semester, as we work continuously to increase the sustainability of our campus."*
>
> —Andrea Hicks

The OS hosts a thriving student intern program, which just welcomed its newest cohort. The internship is open to undergraduate students from any major or background who have a passion for sustainability. Interns work on a range of teams, from Green Labs to Green Athletics to the Social Sustainability Coalition. One hundred eight students have served as interns since 2012. Although the internship was forced to adapt to a virtual setting during the 2020/2021 academic year, the interns did many excellent projects, including launching a new sustainability podcast and hosting a speaker series called Amplifying BIPOC Voices in Sustainability.

The Green Fund supports student-initiated projects that address the environmental footprint, social impact, and operating costs of campus facilities, and is open to both undergraduate and graduate students. The Green Fund has offered money and staff support to 26 student projects since its inception during the Spring 2016 semester. You may see some of your favorite places on the list of projects.

The undergraduate sustainability certificate program, hosted by the Nelson Institute for Environmental Studies, currently has over 100 students enrolled, an all-time-high number. This program allows students to obtain a sustainability credential during their studies here at UW-Madison.

This spring, we premiered our first Campus Sustainability Map on the OS website, which highlights different sustainability-related features of our campus. The map should serve as a great resource for classes as well as individuals exploring campus with sustainability in mind.

UW-Madison Arboretum designated a National Historic Landmark

Curtis Prairie, seen from the Wisconsin Native Plant Garden, is regarded as the oldest restored prairie in the world. Photo credit: UW-Madison Arboretum

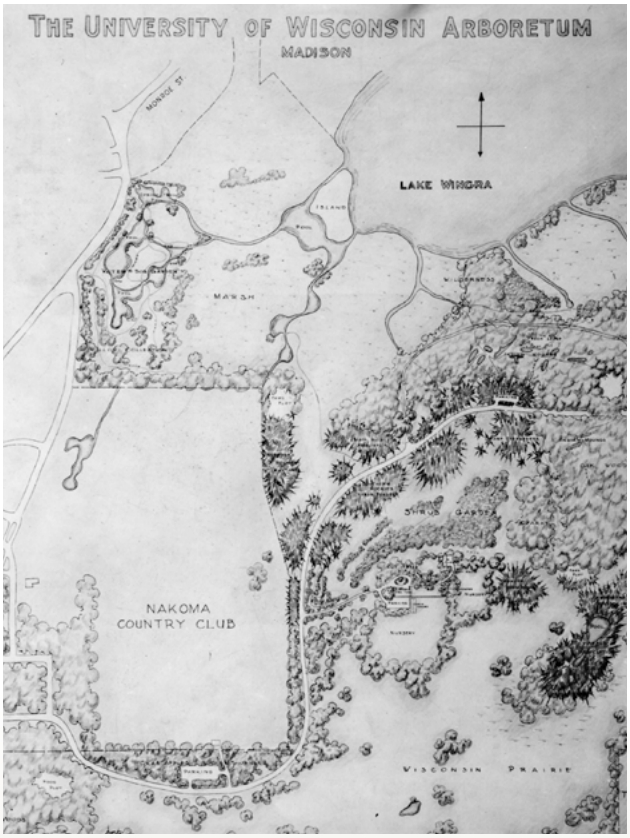
By Susan Day

The University of Wisconsin-Madison Arboretum has been designated as a National Historic Landmark by the National Park Service. The designation is based on the Arboretum's pioneering work in restoration ecology, its place in the history of conservation, and its commitment to Aldo Leopold's land ethic.

The UW-Madison Arboretum was established in the 1930s as an outdoor laboratory to study how to repair damaged and degraded landscapes. Its function, according to Leopold in his 1934 dedication speech, was to be "a reconstructed sample of old Wisconsin, to serve as a benchmark, a starting point, in the long and laborious job of building a permanent and mutually beneficial relationship" between people and the landscape.

Early experiments and research generated a better understanding of local ecosystems, contributed to the development of effective restoration and management practices, and helped define the field of ecological restoration.

The National Historic Landmark program designates places that represent an outstanding aspect of American history and culture. To be recognized as a National Landmark, a site must go through a rigorous nomination process. Then it must be evaluated by the National Park Service's National Historic Landmark Survey, reviewed by the National Park System Advisory Board, and recommended to the secretary of the interior, who makes the final decision. The Arboretum was listed in January 2021.



A map of the early Arboretum by G. William Longenecker, March 6, 1935. Photo credit: UW-Madison Arboretum

The Arboretum's landmark designation is based on a "period of national significance" that begins in 1933 with the first forest plantings. Notable experiments sought to understand and restore prairie, savanna and marsh communities; study fire ecology and test the use of prescribed fire; and implement an adaptive approach to land management, incorporating built-in experiments designed to inform practice. This period ended in 1966 with the retirement of G. William Longenecker, executive director from 1933-66, and the death of Henry Greene, instructor in the UW-Madison botany department and collection curator in what is now the Wisconsin State Herbarium.

Four UW–Madison buildings are also designated National Historic Landmarks: the Red Gym, North Hall, Science Hall and the Dairy Barn.

Civilian Conservation Corps workers planting a prairie at the Arboretum, Nov. 2, 1936. Photo credit: UW-Madison Arboretum

"The Arboretum is truly deserving of this honor for its significant role in decades of research into relationships between people and the land through science, stewardship and education," says UW–Madison Chancellor Rebecca Blank. "While historic, the Arboretum is not frozen in time. It is widely regarded as a renowned living laboratory for studies into sustainable ecological restoration. The Arboretum has exceptional value as a place cherished by scientists and recreationalists alike."

Today the Arboretum manages some of the nation's oldest restored ecological communities, including two prairies that are widely respected prairie restorations. Curtis Prairie, begun as experimental plots in 1935, is regarded as the oldest restored prairie in the world. Greene Prairie, hand planted by Henry Greene over two decades starting in 1943, is considered one of the finest examples of a restored prairie in the U.S.

Arboretum Director Karen Oberhauser says that this designation provides important recognition of the need for restoration ecology to consider the past, present and future, since protecting ecosystems against invasive species, habitat loss, climate change and environmental pollutants requires ongoing vigilance.

"This designation hopefully highlights the Arboretum in a long line of land stewards: the Indigenous peoples who began living in the region 12,000 years ago, the Ho-Chunk people who have cared for the land long before Euro-American colonization, the Arboretum's founders, whose vision and hard work led to our establishment in the 1930s, and the next generation of land caretakers we are helping to train," says Oberhauser.

Knowledge gained at the Arboretum has been disseminated through scientific publications, trainings, conferences, and the careers of UW–Madison graduates in ecological, conservation and restoration fields. Principles and practices explored at the Arboretum are taught, adopted and implemented on natural lands throughout the world. While restoration research and land care have continued uninterrupted, ecological threats unforeseen by early conservationists pose new challenges and restoration practices continually adapt to address them.

"The designation of the Arboretum as a National Historic Landmark is truly an honor, and it's the

Aldo Leopold with a group in the Arboretum, performing a controlled prairie burn, ca. 1940-45. Photo credit: UW-Madison Arboretum

44th property in Wisconsin to achieve this recognition of its exceptional importance to American history and culture," said Daina Penkiunas, state historic preservation officer for the Wisconsin Historical Society. "Wisconsin's National Historic Landmarks include our State Capitol, Frank Lloyd Wright's home Taliesin, and Milwaukee's Soldier's Home complex. The University of Wisconsin Arboretum adds another chapter to the national story."

Working with the Wisconsin State Historic Preservation Office at the Wisconsin Historical Society, the Arboretum was listed on the National Register of Historic Places in 2019. The National Register is the official list of historic properties worthy of preservation. The listing recognizes the significance of the Arboretum within local, statewide and national history.

"The Arboretum is not only a historic landmark. It is a great example of the Wisconsin Idea in action, as a place where research and education are far reaching and impactful," says Steve Ackerman, vice chancellor for research and graduate education. "The knowledge gained at the Arboretum helps lead to healthier lifestyles and a healthier environment."

This story was originally published on news.wisc.edu.

Greene Prairie, hand planted by Henry Greene over two decades starting in 1943, is considered one of the finest examples of a restored prairie in the U.S. Photo credit: UW-Madison Arboretum

Wisconsin Humanities grant awarded to CHE

Exciting news for *Edge Effects* and the Center for Culture, History, and Environment (CHE). The Wisconsin Humanities Council has awarded CHE a grant to fund a new *Edge Effects* series (tentatively) entitled, "Land Cast: Stories from Wisconsin's Frontlines of Environmental Action." This project will be led by graduate associates Caroline Griffith and Clare Sullivan – with support from *Edge Effects*' editorial board, *Edge Effects* managing editor Richelle Wilson, *Edge Effects* faculty advisor Mario Ortiz-Robles, and CHE leadership.

This podcast series, representing a new direction for *Edge Effects*, will offer insights from those on the frontlines of environmental action in Wisconsin – bringing to the fore critical issues that might otherwise not be made apparent. At CHE, we gather together scholars and students interested in working across disciplines to untangle the complex factors that have contributed to past environmental problems out of the belief that such understanding is critical to advancing just solutions in the future. This podcast series grows out of that premise.

This project is funded in part by a grant from Wisconsin Humanities, with funds from the National Endowment for the Humanities.

UW-Madison partners with Beloit community to increase diversity within STEM

By Bekah McBride

Increasing diversity in geosciences and fostering hands-on STEM (Science, Technology, Engineering, and Math) education within Wisconsin communities is at the heart of a new, National Science Foundation (NSF) GEOPAths-funded project that will bring together educational and environmental leaders throughout Beloit with faculty/staff from the University of Wisconsin- Madison Nelson Institute. Through trainings, mentorships, hands-on experiences, and more, the partnership is set to increase student interest in STEM, improve achievement gaps, and increase diversity within STEM degrees and careers.

Nelson Institute Center for Climatic Research (CCR) associate director, Michael Notaro and CCR Outreach Director, Rose Pertzborn will partner with leaders from the School District of Beloit, Beloit College, Welty Environmental Center, and Achieving Collaborative Treatment to create STEM opportunities for students through a program they are calling, Wisconsin Educational Leadership for Community Outreach and Mentoring for the Environment (WELCOME).

"The motivation behind this project is to address a number of challenges, including the lack of diversity in the geosciences," Notaro said. "We will also address the fact that science teaching continues to be lecture-based, and we want to push for the more recommended nature-based, active learning. We also want to address the fact that K-12 teachers have indicated that they largely feel underprepared for teaching on climate change. And, we want to address the needs of the autistic youth. Often, there is interest in STEM among autistic youth, but there are challenges that they face and we want to help them to find a path for pursuing STEM degrees and careers." By establishing summer STEM camps at the Welty Environmental Center for autistic middle and high school students, Notaro aims to support neurodivergence in a safe, inclusive learning environment.

Notaro shared that the community partnerships will be key in addressing these challenges as the Beloit community comes together to support this project. While each partner will play their own unique role, Brenda Plakans, the executive director of the Welty Environmental Center, was instrumental in helping to bring new partners onto this project; offering a connection to the School District of Beloit, which is one of Welty's primary program partners, and a strong relationship with Beloit College's Education and Youth Studies department.

"The genesis of this project can actually be traced back to the Nelson Institute," Plakans said. "I met Rose Pertzborn at a Research and Environmental Education Partnership (REEP) speed-networking forum—an event sponsored by Nature Net, the Center for Climatic Research, and the UW- Arboretum, with funding from a Baldwin Seed Grant. It was an opportunity for southern Wisconsin nature

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> Nelson Institute Center for Climatic Research

educators to meet with UW researchers and see what kind of collaborations might be possible. Rose was interested in extending CCR's partnerships with south-central Wisconsin school districts to provide training for a NASA-designed science curriculum, GLOBE."

The Global Learning and Observations to Benefit the Environment (GLOBE) program is a NASA/NSF/NOAA-supported citizen science and education program that encourages local science investigation by K-12 students. Notaro and Pertzborn are Wisconsin GLOBE partners/trainers. Through this program, students and teachers are provided with the tools and training they need to gather data on the atmosphere, hydrosphere, biosphere, and pedosphere (soil). As a part of the WELCOME project, the School District of Beloit, Beloit College pre-service teachers and in-service teachers, and Welty leaders will receive GLOBE training so that they can incorporate active, nature-based climate science learning in their curriculum and lead future training efforts.

"This collaboration is a game-changer for Welty. We will be the physical 'home base' for the grant and will help coordinate most training activities," Plakans said. "Big Hill Park (Welty's location) can serve as a site for GLOBE research, and our organization will host student internships and poster sessions. Our program staff will participate in the GLOBE training the first year, so they can lead these workshops going forward. This funding also helps us build our capacity to serve the (Wisconsin, Illinois) Stateline area and supports our mission to provide leadership in environmental education for the region. It will be exciting to work with area science teachers, to help them develop their skills and deepen their ability to engage their students with meaningful geoscience activities. I imagine we will learn a lot from Rose and Michael Notaro about hosting these kinds of workshops and trainings."

Kelley Grorud, the Director of Instructional Leadership and STEAM for the School District of Beloit, is equally excited to begin the project, having worked with Notaro and Pertzborn to apply for the grant. Grorud, along with district leadership, supports the goals of the grant and hopes that this project will provide staff and students with the resources and opportunities they need to narrow the STEM achievement gap that is currently seen within the district. Grorud also shared that she is excited to begin this three-year partnership as she hopes the partnership will provide the district with the additional tools it needs to extend this program far into the future.

"We are extremely grateful for the opportunity to work with the University of Wisconsin and Michael on this project," Grorud said. "To have a powerhouse in science like UW partner with us to build on what we have and really help us meet the needs of our students is meaningful. We have approximately 6,000 kids in our district that can benefit from this partnership."

Through the WELCOME project, the School District of Beloit will be provided with the scientific equipment they need to conduct climate-related citizen science through the GLOBE program. Students within the district will also have access to presentations by scientists, mentorship on science projects, internship opportunities at the Welty Center, and scholarship opportunities. Likewise, the partnership with Achieving Collaborative Treatment will provide autistic students with additional opportunities to engage with STEM through youth summer camps. Overall, the program will aim to increase enthusiasm and perception of STEM while confronting barriers related to race, ethnicity, and neurodivergence.

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–Kelley Grorud,
Director of Instructional Leadership and STEAM,
School District of Beloit

"We hope to train community leaders so that they can maintain these systems beyond the grant," said Notaro. "We hope that by participating in active, nature-based STEM learning, meeting scientists, and discovering more about STEM careers, students will become interested in science and want to pursue those careers and diversify our field, which is a real need all across the geosciences."

UW researchers investigate mining-related deforestation in the Amazon

By Mary Magnuson

If you're wearing gold jewelry right now, there's a good chance it came from an illegal mining operation in the tropics and surfaced only after some rainforest was sacrificed, according to a team of University of Wisconsin–Madison researchers and Nelson Institute alumni who studied regulatory efforts to curb some of these environmentally damaging activities in the Amazon.

The researchers, including UW–Madison geography professor and Nelson Institute affiliate Lisa Naughton, investigated mining-related deforestation in a biodiverse and ecologically sensitive area of the Peruvian Amazon to see whether formalizing and legalizing these mining operations might curb some of their negative effects.

Their study, published June 2 in the journal Environmental Research Letters, was co-authored by a group including UW–Madison alumnae Nora Álvarez-Berríos, now studying land-use and climate impacts at the International Institute of Tropical Forestry, and Jessica L'Roe, now a geography professor at Middlebury College.

The team focused on an area around the Tambopata National Reserve in Peru from 2001 to 2014. During this time period, Naughton says, demand for gold rose, roads penetrated the region and mining surged. In turn, mining-related deforestation rose by almost 100,000 acres over their study period.

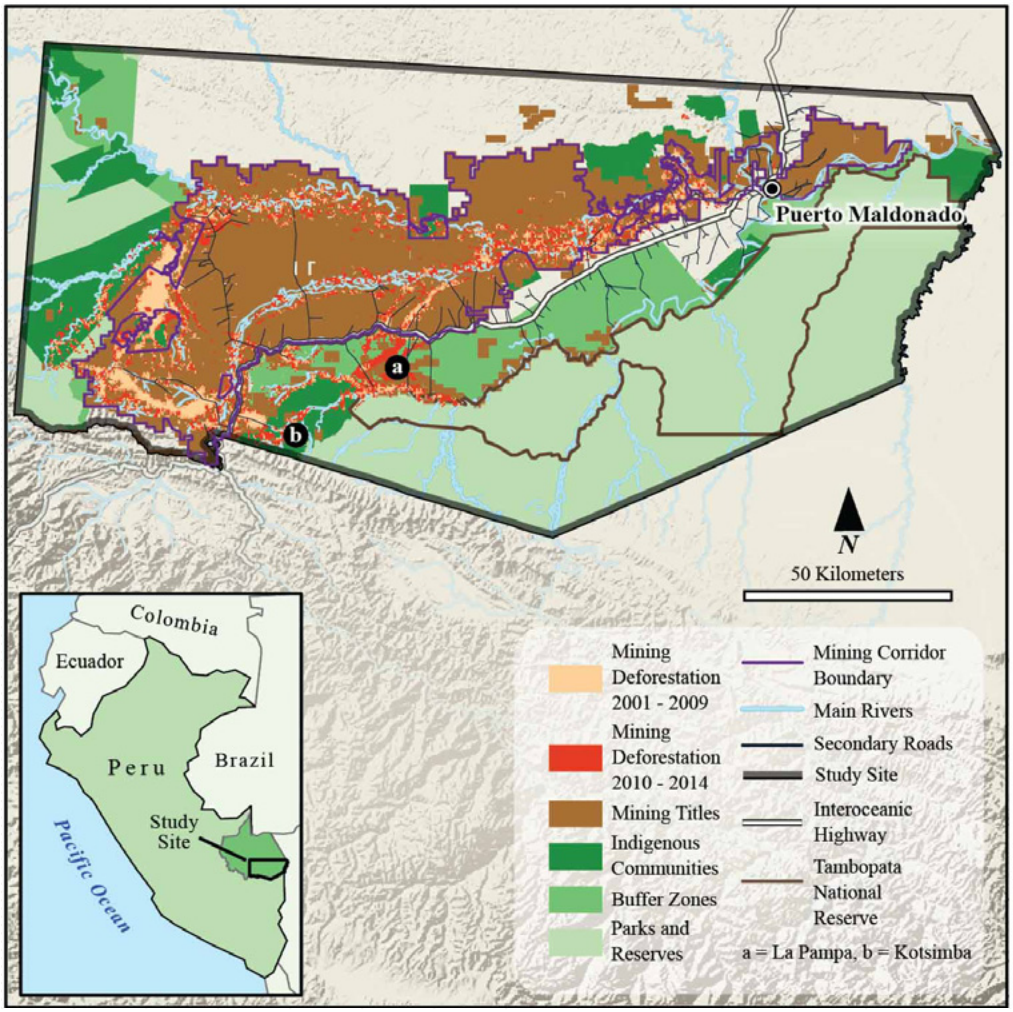
Lisa Naughton

"Because the gold is in the sediment scattered under the forest floor, to extract the gold, you have to remove the forest and dig," Álvarez-Berríos says. "You have to cut a lot of the forest and excavate sensitive waterways."

While these mining operations are often called "artisanal" or "small-scale," in aggregate they are very destructive. In many countries they operate outside the law, and millions of people are involved across the tropics. Álvarez-Berríos says the typical first step to reducing the environmental impact of artisanal mining is bringing it under governmental oversight, formalizing the activity. That way, local agencies can manage the impacts and protect both ecologically sensitive areas and the economic well-being of poor mine workers.

"Peruvian authorities, like authorities in other gold-rush sites, have given up on trying to stop gold mining. They're trying to confine it and contain it," L'Roe says. "Most of the studies about formalization are mainly about trying to help the poor, or make it more fair for the poor. Seldom, almost never, as far as we can tell, have these formalization projects been assessed for their environmental impact. So that's what we were looking at."

During their study period, local agencies issued provisional titles to miners to conduct their operations safely. After receiving a provisional title, miners would, in theory, undergo a series of environmental impact and compliance assessments be-



Map of study area, Madre de Dios, Peru highlighting the distribution of provisional mining titles, the mining corridor, and mining-related deforestation between 2001 and 2014. Graphic: K. McNair & T. Andersen/UW Cartography Lab.

fore they started work.

But, as L'Roe says they found, the regulation process took a long time. Many miners simply took their provisional title as a green light to start mining, and never went through with the environmental impact assessments. Over their study period, no mining operations made it through the full compliance process, and as such they found little evidence for improved environmental outcomes in formalized mining areas.

To assess environmental outcomes, the team used satellite imagery analysis to see how much of the forest had been cut down, as compared to areas without formalized mining regulations.

Naughton says while formalizing mining has the potential to decrease environmental damage, it needs enforcement and regulations that match the local context. Formalization without environmental impact assessment or enforcement could just encourage more damaging and dangerous mining, or the expansion of these operations under the pretense that what they're doing is legal.

But gold rushes are exactly what they sound like, Naughton says: rushed. They're fast, and slow formalization processes with many steps and provisions and impact assessments often cannot keep up with the pace of extraction.

"To sort out in a fair way who owns what land, with what rights, that is a slow process," Naughton says. "This gold rush is explosive. By the time you have well-regulated and transparent public land and property rights, the forest will be gone."

The team plans to go back to Tambopata to present its results to local stakeholders. Many members of the community are already aware of the problems with mining formalization but have not had a chance to systematically study the environmental consequences. The three co-authors hope their study will set a precedent for monitoring formalization interventions in Tambopata and other tropical sites losing forest to mining. They are already sharing results and methods with colleagues concerned about gold mining impacts in Colombia, Brazil and Bolivia.

"We'll go back to our study site and share the results — but in a humble way because folks there know that it hasn't worked well, and they know the problems," says Álvarez-Berríos. "So, yes, it's important to share it with that group of stakeholders and experts, but maybe even more important is to share the results and our methods and design for studying this problem with folks working in the many, many other areas where there's uncontrolled small-scale gold mining and where formalization efforts are being launched with best intentions."

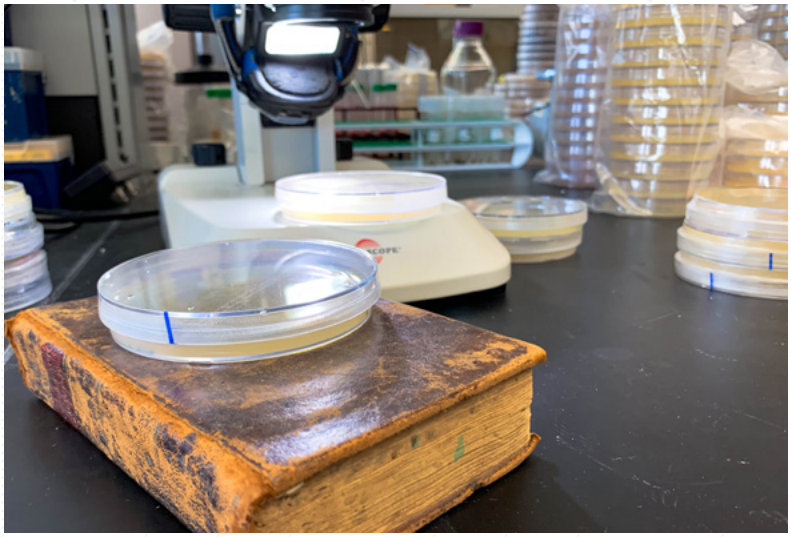
This story was originally published on news.wisc.edu.

CHE sponsors six multi-disciplinary working groups

CHE is the proud sponsor of six multidisciplinary environmental research working groups for the 2021-2022 academic year. Consistent with its mission, CHE's research initiative encourages multidisciplinary collaborations in environmental research at the University of Wisconsin-Madison and beyond. These groups show promise in advancing innovations in interdisciplinary (methodological) approaches to environmental research; making novel contributions to scholarly knowledge of human dimensions of an environmental issue; promoting environmental justice; increasing public access to academic works; and supporting meaningful and measurable graduate student career development. As these research projects conclude, each group will present its work to the CHE community.

Turbulent Futures: A Working Group on Atmospheres

This working group posits the atmosphere as a key site for Environmental Humanities interventions. Cross-disciplinary attention to atmospheric mediations allows scholars to think anew the relay between visible and invisible phenomena, between everyday experiences of weather and statistical descriptions of climate, between old and new materialisms, and between scientific investigations of fluid dynamics, social-scientific attention to intersecting earth and social systems, and humanistic explorations of the seemingly ethereal histories that lend places their distinguishing feelings. Group Lead: Monique Allewaert, associate professor, English, CHE faculty associate



Nineteenth Century Book, petri dish (on which selections from the book have been plated with a selective agar medium for culturing microorganisms), and dissecting microscope. Photo by Caitlin Carlson.

Microbes, Old Media, & Marginalized Archives

How does climate change threaten to erase the histories of marginalized peoples? This group explores the histories we find on--but also in--the pages of archival media. Relying on the group members' varied expertise in archives and labs and building on the methodology of biocodicology (the study of biological information stored in old books), we seek to characterize and understand a sample of the largely unidentified microbial communities that thrive on archival media. Drawing on our preliminary data and the research database we create, we will write and submit two major grant proposals. Group Lead: Joshua Calhoun, associate professor, English, CHE faculty associate

Navigating Justice: Environmental Guides for the Upper Midwest and Northern Great Plains

Navigating Justice brings together CHE scholars and community partners working on numerous environmental justice issues across the Upper Midwest/Northern Great Plains. The issues we will explore in-

A pumpjack pulls oil to the earth's surface in the Dakota Prairie Grasslands. A nearby wildfire has burned 5,400 acres of land in this oil-rich region.

clude metallic mining in Wisconsin, coal mining remediation in North Dakota, oil development across the region, and PFAS contamination. This group grows out of existing academic-community collaborations to produce guides that distill the interwoven cultural, historical, legal, and scientific aspects of complex EJ issues for non-academic, non-specialized audiences. Group Lead: Caroline Griffith, graduate associate

Uncertain Agroecologies: Wisconsin Farmer Responses to Environmental and Social Change

In the face of growing uncertainty due to environmental (e.g. climate, land use) and social (e.g. COVID, farm consolidation) change, farmers must adapt both on their farms and in their broader social and economic networks in order to remain viable. This project will compare how different agricultural communities of practice in Wisconsin (conventional dairy/row crop farmers, small-scale organic fruit & vegetable growers, and Indigenous farmers) perceive and respond to uncertainty, and how this manifests in the ecology of their farms. Group Lead: Ben Iuliano, graduate associate

Alien Earth: Mapping Planetary Humanities

Recurring colonial regimes of racialized violence and capitalist extraction and neo-colonial efforts to privatize and militarize outer space unsettle the terrestrial and extra-terrestrial boundaries of planet Earth. To account for this tension, Alien Earth articulates the notion of "planetarity" as an ontological practice and scholarly technology. The project draws on a transdisciplinary perspective from the sciences, humanities, and art to disentangle the local, global and cosmic forces that shape contemporary imaginaries of planetary world-making. Group Lead: Frederic Neyrat, associate professor, English, Mellon-Morgridge professor of Planetary Humanities, CHE faculty associate

Psychedelic Humanities, Amphibian Conservation, Indigenous Water Rights, Mental Health, Intertribal Alliances, Neoshamanism, and Conspirituality

This working group's research focus is to sustain our group member's existing efforts to 1) advocate for the preservation of the Sonoran Desert Toad via species research and monitoring; 2) develop and implement an integrative mental health program in collaboration with specialist researchers and traditional doctors from diverse cultures related to the Yaqui culture; and to specifically 3) extend these projects via inquiries into the human dimensions (social, cultural, and historical factors) at play in each case. Group Lead: Amanda Pratt, graduate associate

Potential site of intercultural medicine clinic in Sonora, Mexico. Photo by Secretaría de Salud México

A black ash stand, located on the Stockbridge-Munsee Reservation in Shawano County in June 2020. Angela Waupochick monitors the site as part of her bioacoustics study. Photo by Angela Waupochick

Listen to the forest – and learn

By Karie Cherwin

In the forest, life is often heard before it's seen. Hikers and hunters are familiar with the creature chorus: cicada trills and tree frog chirps, wood thrush rhythms and whip-poor-will chants. This unique blend of animal noises is what scientists call the forest soundscape. And listening carefully to the soundscape is sometimes the best way to determine whether a forest is healthy.

Deep inside the forest-wetlands of northern Wisconsin, Angela Waupochick is listening.

A PhD student in forest and wildlife ecology, Waupochick is among a growing number of scientists using a simple technique called bioacoustic monitoring to record forest soundscapes. The equipment they employ is relatively inexpensive and unobtrusive, but it can capture the sound signatures of all animals that are present — even the most elusive ones.

"Bioacoustic monitoring can show us even minute details about wildlife that might be harder to see, for example, nocturnal birds or bats, without having to disturb the animals," says Zuzana Burivalova, an assistant professor in the Department of Forest and Wildlife Ecology and the Nelson Institute for Environmental Studies. She's also one of Waupochick's dissertation advisors.

With bioacoustic monitoring, researchers place small recorders in the forest. They then use computer software to parse out the captured sound signatures of different species. This information can reveal a lot about the biodiversity and overall health of the forest ecosystem. For instance, knowing which species are present — and at what times — can help land managers determine the most effective ways to protect their natural resources.

Waupochick is using bioacoustic monitoring in a forest-wetland research project in the Menominee and Stockbridge-Munsee Tribal Lands near Keshena, in northern Wisconsin. Her goal is to find the best conservation strategies for these black ash–dominated ecosystems because they are widespread in the area and a culturally significant tribal land resource.

"The Menominee word for wetland or swamp is maskīk (pronounced ma-skeek), which is also our word for medicine," explains Ben Grignon, a traditional arts teacher at the Menominee Indian High School and member of the Menominee Language and Culture Commission. "When we understand the Menominee worldview through our language, we gain a deeper understanding and appreciation of our tra-

Waupochick stands near a solar panel, which powers the sap flow heat sensors she uses to monitor this forest-wetlands site in Shawano County. Photo by Zuzana Burivalova

ditional ecological knowledge."

Waupochick is concerned that, even though these areas are ecologically and culturally important, they are not a priority for management.

"The forested wetlands that have survived through [past] disregard for these systems will now be even more reduced by the emerald ash borer," she says. "Since tribes have a significant amount of land holdings and forested wetlands, we need to acknowledge the importance of wetlands, and I am hoping, through this research, we are able to implement some degree of successful mitigation. Perhaps we can maintain some of the functionality for habitat, for the integrity of tribal forests. I am building my base to manage these systems in the long-term."

By recording the forest soundscape, Waupochick is analyzing which species are present. She plans to combine this information with tree physiology data to evaluate existing management practices and provide conservation recommendations to address future disturbances. To complete this work, she has partnered with two indigenous communities in northeastern Wisconsin and researchers from the United States Forest Service.

At the start of 2020, Waupochick was planning to launch her first field season in late spring. Then came the global COVID-19 pandemic. Due to travel restrictions, the team of assistants she had assembled could no longer help her install and maintain her experiment.

"I had no choice but to recruit my 16-year-old son to help tackle the fieldwork," Waupochick says.

Waupochick's son, Saswaen, never planned to spend his summer plodding through wetlands with recorders, 12-volt batteries, solar panels, and tree sap flow meters strapped to his back. But mother and son made a wonderful team. Saswaen came to truly enjoy participating in the research, and he learned a lot.

"Mostly, I like being out in the woods," he says, "I wouldn't want to work at a restaurant or store now that I am being paid to be outside. Both of my parents work in forestry, so I knew they plan how the forest is cut, and they worry about plants that are not supposed to be here and insects that kill trees. Now I think I can identify all of the trees in the forest by bark, not leaf, and know where to expect certain trees to be growing."

Waupochick also recruited students in a trade class at the Menominee Indian High School to help build heat sensors for measuring characteristics of tree physiology. The sensors will detect sap flux density, which will help her understand the movement of water through the trees, a process known as transpiration. Then she'll be able to compare relationships between a forest's water budget and the presence of biodiversity at various sites that are exposed to different management techniques.

For example, Waupochick's study aims to assess whether selective cutting — a management practice used to mitigate the devastation that would be caused by an emerald ash borer invasion — is the most effective way to protect forested wetlands. Waupochick's study can also help determine whether changes in biodiversity are tied to alterations in the forest's water budget that stem from climate change.

This story originally appeared in the summer 2021 edition of Grow.

The race to the animal vault

Zebrafish eggs are seen through a microscope after being treated with a chemical and UV light to break down their nuclei in Francisco Pelegrí's lab at the UW Genetics-Biotechnology Center. Photo by Michael P. King; Swimming zebrafish (Danio rerio). Photo by istockphoto.com/Dan Olsen

By Cassandra Willyard

Nelson Institute faculty, Elizabeth Hennessy, assistant professor of history and Paul Robbins, dean, Nelson Institute for Environmental Studies are co-principal investigators on this project along with William Murphy, associate professor of biomedical engineering.

The last known Pyrenean ibex, a wild goat named Celia, died more than two decades ago, the victim of a falling branch. But before she died, scientists managed to biopsy her skin and stash the sample in a freezer. They were already envisioning a future in which cloning might enable geneticists to bring species back to life.

In 2003, they thawed those cells and made a first attempt to clone Celia. Since they didn't have any living Pyrenean ibex, they had to get creative. They removed genetic material from goat eggs and replaced it with DNA from Celia's skin cells. After a mild electric shock, the eggs began to divide. The scientists then implanted these embryos into surrogate moms — goats or goat hybrids. This process — known as interspecies cloning — is tricky. One kid made it to term, but he died a few minutes after he was born.

Francisco Pelegrí first learned about the ibex cloning effort when one of his students brought a news article describing the feat to class. Pelegrí, a geneticist, was stunned. "From a technical perspective, it didn't make sense," he says. "By the time you only have 100 individuals, you're pretty close to extinction." The researchers had cells from a single animal, and they were trying to bring an entire species back. "It struck me that we really are not prepared for this at all," Pelegrí says.

The Earth is in the midst of a sixth mass extinction event, and most scientists point to human activity as the primary cause. Each day, the planet loses an average of five to 30 species. While efforts are under way to preserve their habitat, these efforts may not be enough to save them. Extinct species, by definition, no longer exist. But their genetic material can live on in biobanks, offering the possibility of resurrection. Think of it as an extinction loophole.

Pelegrí thinks this loophole will become an increasingly crucial part of conservation. But to successfully leverage it, scientists need a smarter way to proactively biobank samples — not just one or two, but hundreds, from each species. They also need to understand the rules that govern interspecies cloning. For example, how close do two species need to be on the tree of life for cloning to succeed? With a grant from UW2020, a campus-based initiative that rewards high-risk, high-impact research, Pelegrí and his collaborators aim to find out.

"Everybody agrees we need seed banks for plants, but when we talk about seed banks for animals, people start to think it's crazy," Pelegrí says. But to him, it seems like an obvious and necessary solution to curb the catastrophic loss of biodiversity. "Everything revolves around climate change and population control. We're doing our best to provide all the tools that we're going to have at our disposal to help with the problem."

Francisco Pelegrí, at his home near Brooklyn, Wis., with two of his Dartmoor ponies, the only remaining derivative species of now-extinct wild European horses. Pelegri breeds them to contribute to conservation efforts. Photo by Michael P. King

ANIMAL LOVER

Pelegrí has always had a passion for nature. As a child growing up in Venezuela, he watched nature shows hosted by the Spanish naturalist Félix Rodríguez de la Fuente and developed a deep love of animals. He memorized their scientific names and collected trading cards with their pictures.

When Pelegrí bought a small farm near Madison in 2006, he began thinking about what kind of animal he should raise to support conservation. He landed on a breed of endangered ponies. "They're essentially the only derivatives we have of the European wild horses, which became extinct," he says.

At the time, conservation was a hobby. In the lab, Pelegrí focused on developmental genetics, trying to work out how an egg becomes an embryo. "My passion for nature has always been there, but it was not a part of my profession," he says.

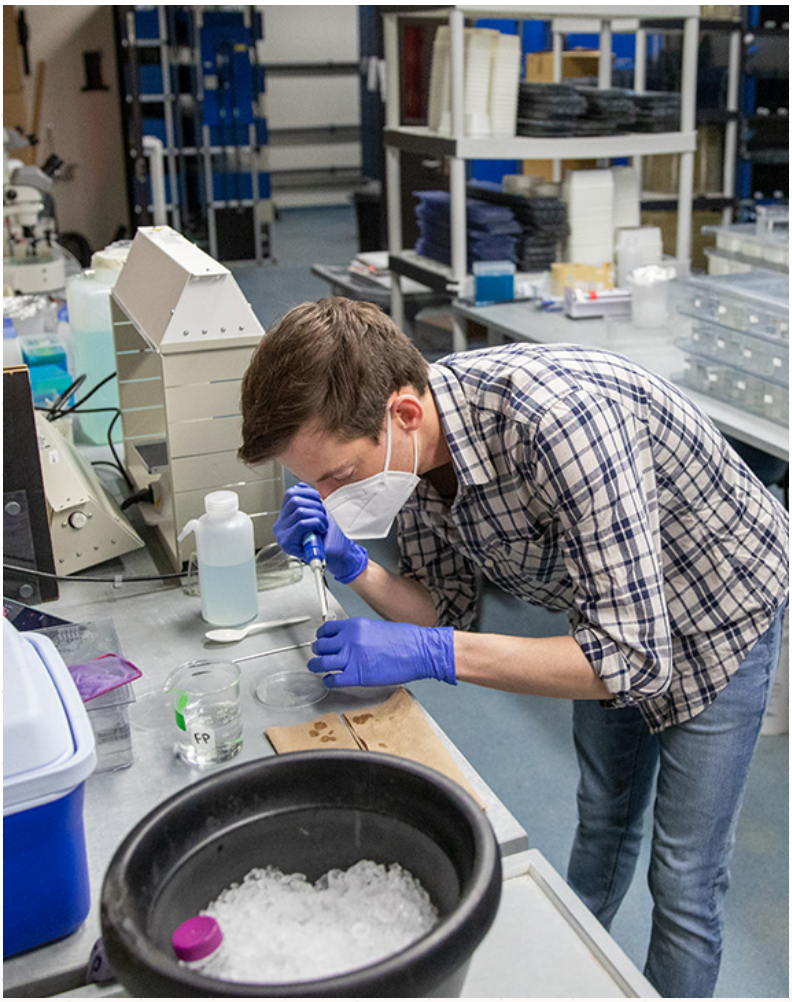
After Pelegrí read the story about the ibex, however, he started learning more about the role of genetics in conservation. But, as he read more about the field, he grew increasingly bewildered. Scientists seemed to be jamming genetic material from one animal into another willy-nilly — whale into pig egg or panda into rabbit egg. These mash-ups — called cybrids — didn't have a chance at succeeding. "The organisms were so far apart," he says.

Pelegrí realized he could use his two decades of expertise in developmental genetics and his own zebrafish lab to work out which pairings could be successful and which could not. "I can literally apply what I've learned in all these decades to something that I've always cared about," he says.

FISH FAMILY

In the basement of the UW Biotechnology Center, Pelegrí pushes open a gray steel door to reveal row after row of shelves stacked with glass and plastic tanks. Each tank houses dozens of zebrafish — Danio rerio. The main room and a smaller back room currently hold some 50,000 fish. Pelegrí, in bright green Crocs and a navy "Badger State" hoodie, points out some that glow pink and babies no bigger than the tip of a pencil.

Zebrafish aren't endangered, of course. They're readily available in pet stores and labs all around the globe. But some of their distant cousins are under threat. Pelegrí believes that he and his colleagues can use this family of fish to work out the limits of interspecies cloning.

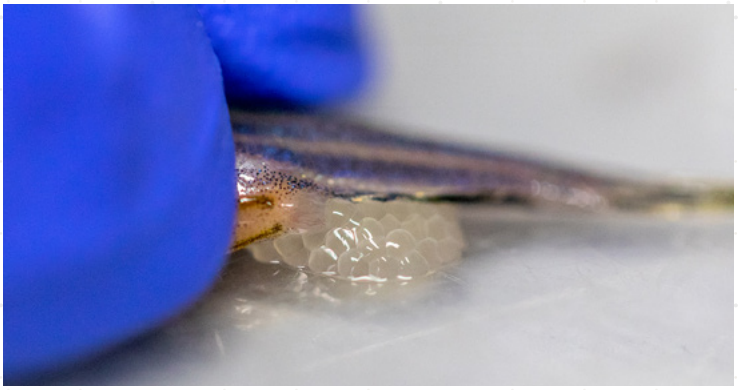


Research assistant Ryan Trevena treats zebrafish eggs with a chemical before exposing them to UV light to break down their nuclei in Francisco Pelegrí's lab at the Genetics-Biotechnology Center. Photo by Michael P. King

At the front of the fish room, Ryan Trevena, a graduate student in Pelegrí's lab, is busy matchmaking, pairing males and females and placing them in small tanks. The females' bellies are swollen with eggs. As soon as one of these fish begins to lay, Trevena scoops her out and places her in a beaker of anesthetic to knock her out. He carefully dries her with a paper towel and then gently presses on her belly with a gloved finger until a drop of milky liquid appears on her abdomen. This single droplet carries dozens of microscopic eggs. He treats the eggs with a chemical that, with help from a UV light, breaks down their nuclei.

Upstairs, in a much smaller room, dozens of tanks hold other members of the Danionin family. Some have Dalmatian-like spots. Others are almost translucent. Trevena mixes the zebrafish eggs he just collected with sperm from Danio albolineatus, the pearl danio. Over the next several hours, the eggs will start dividing. Three days later, they will hatch.

These fish won't survive — they have only half the genetic material of a normal fish and typically die in the first few hours after birth. But it's enough time for Pelegrí and his colleagues to examine whether cloning the pearl danio using a zebrafish egg might work. Performing nuclear transplants is finicky work that takes time, "and the success rate is fairly low," says genetics Ph.D. student Trevor Chamberlain MS'19, who is working on the project with Pelegrí and Trevena. In vitro fertilization — the process they're using — is a quick and easy way to screen for combinations that might work. "We're doing it for the through-put," Chamberlain says.



Trevena expresses eggs from a zebrafish. Photo by Michael P. King

For cloning to work, a transplanted nucleus must communicate with the rest of the egg cell. If the nucleus and egg are from two different species — especially distantly related ones — that communication can break down. For example, "the mitochondria only code for a small handful of genes, but they're core genes," Chamberlain says. They are key to respiration. If the mitochondrial DNA and the nuclear DNA aren't compatible, the embryo may never develop correctly. In primates, humans can mix with chimpanzees, Pelegrí says. "But when you get as far as orangutans, then it breaks down."

Knowing these limits will be essential if biologists want to boost endangered populations or revive extinct animals through cloning. Using eggs from the animal's closest living relative might produce the best success, but it won't always be feasible.

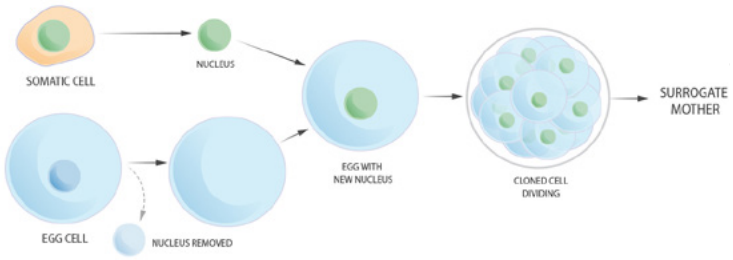
One model system, of course, won't be enough. The limits that exist in the Danionin lineage may not apply to other families. "We need to look at other lineages precisely for that reason," Pelegrí says. That's why he has recruited collaborators working with other model organisms: frogs and bees.

Brilliantly colored mantella frogs, from Madagascar, are tiny and poisonous. Eleven species are either at risk, endangered, or vulnerable. The golden mantella, which now exists only in one small patch of forest, is critically endangered. And many other amphibians are under threat too from a fungal outbreak that has decimated populations around the globe. According to a 2019 study, fungi contributed to the decline of some 500 species between 1965 and 2015. Of those, 90 are presumed extinct.

Pollinator populations have also been on the decline. "These insects are critically important, so their declines are pretty troubling," says Sean Schoville, a molecular ecologist, associate professor of entomology, and Pelegrí's collaborator. "We are focusing on bees — mostly bumblebees — as a good model because they're declining across the world, but especially in the United States," he says. "There are more direct measures of conservation that are still possible with insects. But we might find ourselves needing these kinds of techniques because we haven't actually found the cause of the decline."

The factors that create a mismatch between nucleus and egg won't be the same for every family. The boundaries might be different for bees than they are for fish or frogs. But by studying all three groups, Pelegrí says, the team might be able to "get a ballpark idea of what those parameters might be."

Cloning is one way to revive endangered populations or re-create extinct ones, but there are other ways that might work better. One method being considered for mammals relies on the plasticity of the mammalian embryo. In the earliest stages, scientists can fuse cells from



Interspecies cloning can be achieved through a process called somatic cell nuclear transfer. In simple terms, the nucleus of a somatic (body) cell of one species and the nucleus of the egg cell of a closely related species are both removed. The somatic cell nucleus is then placed in the egg cell to create a cloned embryo, which begins dividing before, if needed, it is placed in a surrogate mother for further development. Illustration by Jacki Whisenant

an endangered species onto the embryo. That organism then becomes a chimera — part engendered, part not. And some of its germ cells might be wholly composed of endangered species DNA.

"You could get sperm that is pure sperm from an endangered species or pure eggs from endangered species," Pelegrí says. Those cells could then be mixed to create an embryo that is wholly the endangered species.

TAKE IT TO THE BANK

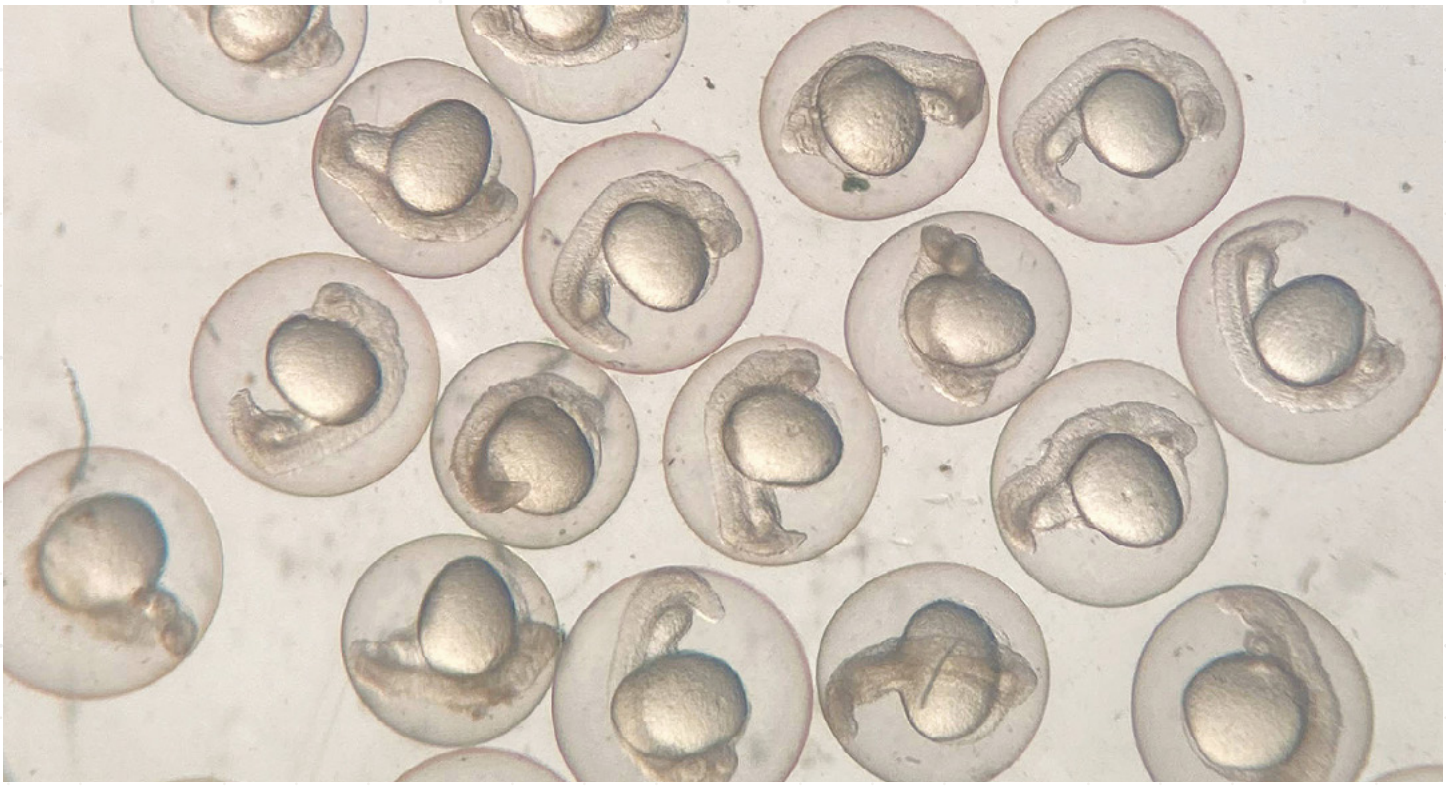
The success of cloning as a conservation strategy depends, in large part, on having well-stocked, long-lasting biobanks. Pelegrí envisions a network of biobanks that would house samples from thousands — or even tens of thousands — of species. To maintain genetic diversity, they would store samples from 500 individuals for each one. The first conundrum is how to obtain samples from species that are already under threat. "You cannot go somewhere and be invasive and affect the species you want to save," Pelegrí says.

One idea is to outsource the collection to mosquitoes. Their guts hold blood from a wide variety of species, "a possum or a tiger or whatever," Pelegrí says. If researchers can catch the insects and identify which cells belong to which animal, this method could be an easy, noninvasive way to get cells from species whose populations are already dwindling. (Read about how students are engaging in sample collecting and learning about conservation genetics through a study abroad course in Costa Rica in Research Creates Teaching Opportunities.)

A second hurdle is the biobanking itself. Existing animal biobanks store cells in massive subzero freezers, "which, just from an energy standpoint, is pretty costly," says Caroline Barry BS'16, a graduate student who is working with Pelegrí. It also makes them vulnerable to power outages or political whims. So the team is working to develop less energy-intensive ways to preserve samples. The goal is to make the animal cells more like plant seeds.

Barry hopes to do that by taking some lessons from the adorable and nearly indestructible tardigrade (also known as the water bear or moss piglet). These animals can survive for years, or even decades, without water. They can withstand blasts of UV radiation, extreme temperatures, and the vacuum of space.

Research intern Gabby Voit works with zebrafish in the lab of Francisco Pelegrí at the Genetics-Biotechnology Center. Photo by Michael P. King



These zebrafish embryos were generated using eggs with nuclei that were inactivated by high-energy X-rays and then fertilized with intact sperm. This is a simple method researchers use to replace an egg nucleus with a nucleus from another organism and test models to improve nuclear transfer. Photo by Ryan Trevena

Barry is currently trying to grow tardigrades in the lab, and then she'll begin working to imbue fish eggs with some of the tardigrade's toughness by bathing them in tardigrade messenger RNA. That might allow for eggs to be stored at higher temperatures. And if the tardigrade doesn't work, there are plenty of other bio-inspired options to explore. Keratin — a protein found in hair, nails, feathers, and horns — might provide good protection from bacteria and help keep DNA stable. Or the team might be able to use cells called osteoblasts, which play a crucial role in bone formation, to encase the samples in a tough mineral shell. They are using new mRNA delivery methods, which allow them to test these different options efficiently.

Barry is also investigating methods for giving individual samples unique barcodes so that entire populations can be stored in a single vial. Vertebrates alone account for 66,000 species. So combining individuals would save much-needed space.

Conservation biologists tend to view cloning and other genetic manipulations as a last-ditch effort to save species. But Pelegrí says it's crucial to be proactive rather than reactive. Samples need to be collected and banked before populations begin to crash. "We don't have to wait until the species become extinct to do anything," he says. "In fact, we shouldn't." As a population shrinks, so does its genetic diversity. Cloning could be used to reinject diversity, essentially boosting a struggling species.

"These technologies are coming," Pelegrí says. In 50 years, they might be commonplace. "What we need to do now is prepare for that future."

A CROSS-CAMPUS COLLABORATION

The animal biodiversity biobanking project involves faculty, staff, and students from the College of Agricultural and Life Sciences, the College of Engineering, the College of Letters and Science, the Morgridge Institute for Research, the Nelson Institute for Environmental Studies, and the School of Medicine and Public Health. Here are some of the key collaborators.

Principal Investigator: Francisco Pelegrí, professor of genetics

Co-Investigators: Wesley Culberson, assistant professor of medical physics; Claudio Gratton, professor of entomology; Susan Paskewitz, professor and chair of entomology; Sean Schoville, assistant professor of entomology; James Thomson, director of regenerative biology, Morgridge Institute for Research

This story originally appeared in the summer 2021 edition of Grow.

SAGE post-doc researcher: A view from space can save the trees

By Eric Hamilton

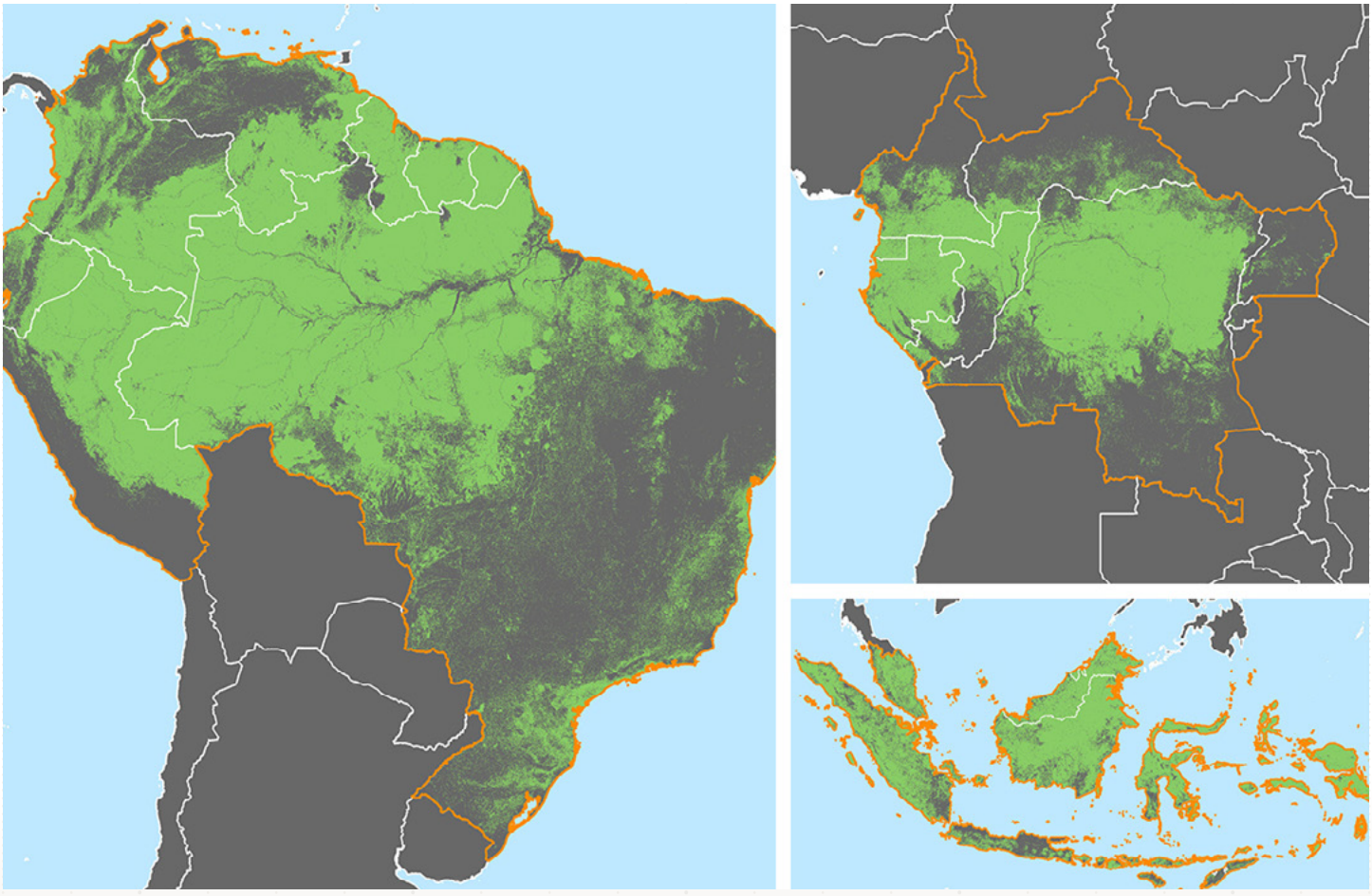
For government agencies and conservation groups, protecting forests can be a tall order. Their resources often don't allow them to cover the sheer amount of acreage they need to monitor, and there are a lot of places to conceal damaging and illegal activity.

But it's hard to hide destructive practices from eyes in space.

That's the idea behind GLAD, the Global Land Analysis and Discovery system. Launched in 2016, GLAD uses satellite-acquired data to provide frequent, high-resolution alerts when it detects a drop in forest cover. Governments and others interested in halting deforestation can subscribe to the alerts on the free and interactive interface called Global Forest Watch and then intervene to limit forest loss. And it seems to be working, at least in one part of the world.

According to research led by Fanny Moffette, a postdoctoral researcher in the Department of Agricultural and Applied Economics and the Nelson Institute for Environmental Studies Center for Sustainability and the Global Environment (SAGE) within Holly Gibbs' lab , deforestation dropped by 18 percent in two years in African countries where organizations subscribed to receive forest cover warnings from GLAD. And the carbon emissions avoided by reducing deforestation were worth between $149 million and $696 million, based on the ability of lower emissions to reduce the detrimental economic consequences of climate change.

The researchers — including Moffette's collaborators Jennifer Alix-Garcia at Oregon State University, Katherine Shea at the World Resources Institute, and Amy Pickens at the University of Maryland — studied deforestation in 22 trop-



Research into the ability of satellite alert subscriptions to help reduce deforestation covered 22 tropical countries (outlined in orange) across South America, Africa, and Asia. Forest cover in 2010 is indicated in green. Images courtesy of Fanny Moffette

The study was led by Fanny Moffette, a post- doctoral researcher in agricultural and applied economics and environmental studies.

ical countries across South America, Africa, and Asia from 2011 to 2018. They set out to understand whether these kinds of automated alerts could achieve their goal of reducing forest loss, which has global climate implications. Land-use changes such as deforestation account for 6–17 percent of global carbon emissions. And avoiding deforestation is several times more effective at reducing carbon emissions than regrowing forests.

"The first question was to look at whether there was any impact from having access to this free alert system," Moffette says. "Then we were looking at the effect of users subscribing to this data to receive alerts for a specific area."

Simply being covered by GLAD did not help a country combat deforestation. Only those African countries in which organizations had actually subscribed to receive alerts saw a decrease in deforestation. Intuitively, this finding makes sense, says Moffette. Having access to information is good. But what you need to change the course of deforestation are people committed to using that information and acting.

However, deforestation did not decrease in South American or Asian countries, even where organizations subscribed to receive warnings. There are multiple potential causes for this continental discrepancy.

"We think that we see an effect mainly in Africa due to two main reasons," Moffette says. "One is because GLAD added more to efforts in Africa than on other continents, in the sense that there was already some evidence of people using monitoring systems in countries like Indonesia and Peru. And Colombia and Venezuela, which are a large part of our sample, had significant political unrest during this period."

The GLAD program is still young, and as more governments and organizations sign on to receive warnings and decide how to intervene at sites of deforestation, the system's influence may grow.

Developed by a team at the University of Maryland, which includes Pickens, GLAD made several improvements over its predecessors. It has very high spatial resolution, roughly 900 square meters, which is orders of magnitude more precise than older tools. And it can provide alerts up to every eight days if the skies are cloud-free when satellites reimage a section of Earth. Users can define custom areas to monitor. They then receive weekly emails, available in six languages, that contain geographic coordinates of the alerts within the monitored areas.

Going forward, the team is looking to evaluate the effect of the monitoring platform's new features, such as data that can inform forest restoration, while supporting efforts of organizations that try to intervene to halt deforestation.

"Now that we know subscribers of alerts can have an effect on deforestation, there's potential ways in which our work can improve the training they receive and support their efforts," Moffette says.

Findings from this study were published in January in the journal Nature Climate Change.

This story originally appeared in the summer 2021 edition of Grow.

Student discovers passion for One Health approach in Environmental Conservation program

By Bekah McBride

When Nelson Institute Environmental Conservation (EC) graduate student, Siyeun Kim, was accepted to the program nearly two years ago, she wasn't yet sure where her career would take her. Having received an undergraduate degree in conservation biology and a certificate in both global health and environmental studies from the University of Wisconsin-Madison, Kim knew she wanted to focus on the environment, but she wasn't sure what aspect. Through the courses and the connections made within the EC program, Kim strengthened her knowledge and understanding of the One Health approach, which works to create positive outcomes for people, animals, plants, and their shared environment, a topic that turned out to be incredibly timely given the growing importance of wildlife interaction and pandemic prevention.

"A lot of people go into graduate school knowing exactly what they want, but for me, it was the opposite," Kim said. "When I graduated with a bachelor's degree, I didn't have a clear vision of what I wanted to do. But with the EC program, I got to interact with people from different experiences and expertise. I also took various classes that helped me to gain new perspectives. The combination of those helped me learn the importance of understanding the relationships among humans, animals, and the environment. It motivated me to learn more about the One Health principles and environmental health."

> ***"I came into this program wanting to learn more about myself and what my passion is. I now know my interest and passion lies in environmental health. I want to be a One Health practitioner."***
>
> -Siyeun Kim

For Kim, the EC program offered the perfect combination of hands-on experiences, networking, and classes. The 15-month Nelson Institute Environmental Conservation Professional Master's program is designed to train conservation leaders in practical interdisciplinary skills and features in-person and online courses as well as a three-month professional leadership experience.

CCR and Geoscience students awarded post-doctoral positions


Cameron Batchelor


Brittany Hupp

The Nelson Institute Center for Climatic Research (CCR) is proud to announce that two students have been awarded postdoctoral positions. Cameron Batchelor, a PhD student in the Department of Geoscience, under the advisement of assistant professor Shaun Marcott and scientist Ian Orland, was awarded a National Science Foundation Division of Atmospheric and Geospace Sciences postdoctoral research fellowship position and will be heading to MIT next spring to work with to work with David McGee and Jeremy Shakun at Boston College. Brittany Hupp, a PhD student in the Department of Geoscience was awarded a National Oceanic and Atmospheric Administration (NOAA) postdoctoral position and will be heading to Oregon State University this fall.

"I really enjoyed the land use policy and planning course because I didn't have a lot of knowledge in policy. It was fascinating to learn about the stakeholders and process involved in land use planning procedures and how it works to incorporate social and environmental effects," said Kim. "Also, the GIS course was informative and practical as I learned to make useful maps and conduct spatial analysis, and the Conservation planning course was also rewarding because I got to learn more about the Conservation Standards and the Miradi software program."

Siyeun Kim

In addition to the courses, Kim participated in the Asiatic Black Bear reintroduction program in South Korea during her first fall with the EC program. Kim worked with the National Institute for Ecology, National Park Service, Center for Endangered Species on the reintroduction project. The Asiatic Black Bears are highly endangered species with a high risk of extinction in South Korea. In response to the dwindling population, the reintroduction project began to establish a self-sustaining wild population of Asiatic black bears, recover and establish suitable habitats, and foster coexistence between humans and bears.

"Even though I'm from South Korea, I was not familiar with the history or the policy regarding the endangered Asiatic Black Bear. Through this experience, I learned a lot about both conservation measures in Korea," Kim said. "It was also practical because I got to apply the skills and knowledge I learned directly from the EC Conservation Planning course. I also learned professionalism and communication skills throughout the project. This project was also valuable and meaningful to me because the project was based in South Korea, which is where I am from!"

In addition to the Asiatic Black Bear project, the EC program provided Kim with several networking opportunities. Through Nelson Institute contacts and the support of EC staff, Kim was able to connect with a variety of professionals and programs, including Nelson Institute professor and the director of the Global Health Institute, Jonathan Patz, who became Kim's academic advisor. Patz is a world-renowned global health expert who, among his many accomplishments, was a lead author for the United Nations Intergovernmental Panel on Climate Change (or IPCC)—the organization that shared the 2007 Nobel Peace Prize.

"A core value of our program is creating connections. We are able to incorporate introductions to local communities, Q&A panels with international practitioners, or world-renowned experts as faculty advisors," said EC program coordinator, Meghan Kautzer. "It's a pleasant surprise what networking connections seem to 'click' for our students, inspiring them on their personal journeys or bringing awareness of opportunities they never knew about. Initial conversations with our students often include the phrase 'you don't know what you don't know!' Students work closely with program staff to discover those very things, to see how they fit in. Siyeun discovered her path after connecting with Dr. Jonathan Patz through the EC program."

Patz helped to introduce Kim to a variety of organizations working on One Health initiatives, including EcoHealth Alliance, a nonprofit dedicated to protecting wildlife and public health from the emergence of disease. Kim became interested in the organization's work and received a prestigious internship with EcoHealth

Alliance where she is completing her professional project.

"I've been focusing on learning more about zoonotic diseases, which are especially pertinent today since we are in the middle of a pandemic most likely originating from animals," Kim said. "Right now, my research aim is to estimate and characterize the global consumption for wildlife and understand the relationships between these consumption behaviors and zoonotic disease emergence. We are trying to do a complete literature review by the end of the summer. The EcoHealth Alliance is also providing workshops that are relevant to the One Health approach and conservation. They are going to teach us technical and practical skills in scientific research and communication. I am so grateful Dr. Patz introduced this organization to me. I am excited to be a part of the internship."

Kim shared that it was through this unique combination of experiences that she felt she was able to find her passion for One Health.

"I came into this program wanting to learn more about myself and what my passion is," Kim said. "I now know my interest and passion lies in environmental health. I want to be a One Health practitioner."

Kim also says that she encourages anyone who isn't yet sure what they want to do to explore the Nelson Institute EC program and to reach out to other professionals to gain insight and experience.

"I encourage people who are unsure of what they want to do in the beginning to join and participate in different activities and talk to different people," Kim said. "At EcoHealth Alliance, I talk to lots of different scientists, and I have asked them about their paths which were very helpful. It turns out many people weren't sure what they wanted to do and talking to people helped me to build who I am today."

EOI alumna now working for NASA's DEVELOP program

Paxton LaJoie

By Anica Graney

From completing her master's in Environmental Observation and Informatics (EOI) to working for the Digital Earth Virtual Environment and Learning Outreach Project (DEVELOP) program at NASA, Paxton LaJoie made her dreams of working with remote sensing and solving ecological issues a reality.

After obtaining her undergraduate degree in Environmental Studies from the SUNY College of Environmental Science and Forestry, LaJoie spent a year teaching science at an underserved middle school in Syracuse, New York. Wanting to work more with research and data collection, she set out to find a graduate program that aligned with her educational goals.

"When I was first looking at grad programs, a lot of them initially felt the same," said LaJoie. "All the programs I looked at essentially wanted you to choose between focusing on modeling or spatial observations and I think EOI just presented itself as providing me a toe in every field so that I could sample everything."

The Nelson Institute's EOI program is a 15-month program that focuses on the disciplines of environmental conservation, remote sensing and geographic information system (GIS), and informatics. Learn more about the program and how to apply.

Before entering the EOI program, LaJoie had never worked with remote sensing before but was instantly intrigued by the process. "Just learning that we had all these incredible satellite images and all these great things

we could do with it was just really fun for me," said LaJoie.

Not only were the classes new and exciting, but LaJoie said that the people she met along the way also gave her a unique perspective as to what the program offers students. "I met a couple of people who had taken the remote sensing class just because they wanted to use satellite imagery for art which was absolutely not something I was using it for, but it really helped me get an idea of all the avenues for this field and I really liked it."

LaJoie said she owes some of her success at the EOI program to Sarah Graves. Graves is the coordinator for the EOI MS program where she advises, trains, and engages with students to become leaders in using observational data to address pressing environmental issues. "The biggest reason I came to EOI and my number one biggest help throughout the program was Sarah Graves," said LaJoie. "She's amazing and she deserves some credit because she was the person who convinced me to go and helped me with everything and has been so supportive since then."

Graves shared that she had the utmost confidence in LaJoie during their work together. "Paxton epitomizes values we have in the Environmental Professional Programs; having a genuine excitement to learn, being open to new opportunities, learning from and with your peers, and being resilient and creative when faced with challenges," said Graves. "I am confident she will go far professionally, not just because of the strong geospatial skills she developed in the EOI program, but also because she is fun to work with and has a passion for supporting communities and creating healthy environments."

After graduating the EOI program in August of 2020, LaJoie was hired at DEVELOP which is a part of NASA's Applied Sciences Program. There, she started as a team member and has since upgraded to a project lead position. LaJoie said that the transition from her graduate studies to working for DEVELOP was seamless. "It was the same type of work I was doing at EOI but as a job. So, I was very excited, applied right away and was lucky enough to be accepted and have the opportunity to work with DEVELOP."

"[DEVELOP's] goal is the same as EOI in that they are trying to promote capacity building, educate people on remote sensing, partner with different organizations on projects to try to build environmental knowledge in different sectors and solve ecological issues," said LaJoie. "So, it was a really incredible bridge from EOI to the professional world because it was a lot of the same goals and components, just in a different sector. It's been a really easy transition and I've enjoyed it."

LaJoie's said her tasks at DEVELOP are mostly researched based. "Every week is kind of different but it's basically a lot of collaboration between our team and partner organizations and doing remote sensing research all day, every day to try and support the research goals of each project."

> ***"Just learning that we had all these incredible satellite images and all these great things we could do with it was just really fun for me."***
>
> -Paxton LaJoie

Looking back, LaJoie said she found the right path for herself through the EOI program. "I've found that I really enjoy the remote sensing and GIS work and I definitely think that EOI was the right move for me."

Learn more about the Environmental Observation and Informatics MS and how you can support the program

Environmental Conservation student helps create a framework to guide environmental justice work

Alli Wenman

By Rachel Carrier

Lifelong Wisconsin resident Alli Wenman's educational path has led her to help promote environmental and climate justice in Madison, Wis.

Wenman began the Environmental Conservation MS program at the Nelson Institute in June 2020, and is now working on her final leadership project.

The Environmental Conservation MS Program prepares students to engage, interpret, and respond to critical environmental issues. The 15 month program refines a range of skills to prepare students for a career in conservation through both in-person and online courses, concluding with a final professional leadership project.

Wenman's final project is with the Wisconsin Initiative on Climate Change Impacts (WICCI). WICCI is a partnership between the Nelson Institute and the Wisconsin Department of Natural Resources that fosters relationships between scientists and other experts to address climate issues. Their work centers around recommendations and evaluation of climate change in Wisconsin.

Wenman's project focuses on helping update an environmental report titled "Impacts and Adaptation," originally published in 2011. The updated version is expected to be published in September 2021. The report details the current and projected impacts of climate change on the state of Wisconsin and offers recommendations for adaptation and mitigation plans for key decision makers in the state.

Her main role in the project is to design a framework of questions for scientists working with WICCI to think about how their work intersects with environmental and climate justice.

Wenman's favorite part of the project, though, has been working alongside a science writer conducting interviews with individuals who have been personally impacted by climate change and are trying to promote a cleaner earth. While this is not her typical work, she has gained resourceful insight on what specific groups want to see done about climate change.

> ***"I saw the Environmental Conservation program as a way to do project management for conservation, which is a great fit for me. The program has aspects of program development, management, implementation, evaluation, and a crash course in everything you need to run a program in conservation. I absolutely love it."***
>
> -Alli Wenman

"I love the interviews because we're talking to people who are doing absolutely amazing work." Wenman said. "It's really amazing to see these pockets of people who are dedicating their lives to educating people about climate change, mitigating the effects of it, and making sure we are taking climate action."

A field trip to Upham Woods to take stock of the landscape for a restoration ecology class project. Photo by Alli Wenman

One interview with a Wisconsin farmer revealed the massive issue of flooding many local residents are facing. She said that hearing personal stories like this one helps her understand what environmental issues are most pressing for Wisconsin residents.

Her work with WICCI combines her interest in project management with her love for the outdoors and passion for addressing climate change through adaptation and mitigation. This project is a way for her to work with the environment without directly participating in research or field work.

Wenman's love for the outdoors started at a young age, but came to fruition when she pursued a degree in Botany from UW-Madison. After graduating, Wenman worked a year with Americorps, a non-profit civil service organization. She was located in Alamosa, Colo. where she taught children gardening skills at a camp run by a local non-profit. The group also produced food for local food pantries in the area.

Her decision to return to school at Nelson came after three years of working as an auto insurance adjuster.

"It's a job that really made me want to go back to school." Wenman joked.

She wanted to guide her skills and interest in management in the direction of her passion for environmental justice.

"I saw the Environmental Conservation program as a way to do project management for conservation, which is a great fit for me. The program has aspects of program development, management, implementation, evaluation, and a crash course in everything you need to run a program in conservation." Wenman said. "I absolutely love it."

Supervising WICCI efforts with Wenman, Dominic Holt, Policy & Stakeholder Engagement Coordinator at Wisconsin Department of Natural Resources is increasingly impressed with her work so far, specifically her dedication to the project. "We are so fortunate to have her on our team. She's hands down one of the most impressive people I've supervised in my professional positions."

Holt notes that Wenman's ability to understand what it takes to collaborate with high level state agencies, researchers, and policymakers sets her up for success on her project.

Wenman continually expressed her gratitude towards what the Environmental Conservation program has offered her in terms of guidance and experience, and is in the process of looking for jobs that are more in line with her interests.

Learn more about the Environmental Conservation MS and how you can support the program.

Support Nelson

Interested in supporting the Nelson Institute? There are many ways to contribute to the Nelson Institute – participating in our events, mentoring our students, providing connections to your personal networks, and making financial gifts. All of these are necessary and important to us and we invite you to invest in our community in the way that makes the most sense to you. Learn more about all of the great academic programs, research centers, and public programs we offer.

Gifts in any amount are needed and appreciated!

Nelson alumna supports efforts to clean the bay

Julia Noordyk

By Bekah McBride

The walleye have returned and the shores of Green Bay, Wis. are cleaner, thanks in part to the work of Nelson Institute alumna, Julia Noordyk. As the water quality and coastal communities specialist for the University of Wisconsin Sea Grant Institute in Green Bay, Noordyk leads a variety of projects aimed at improving water quality and coastal resilience.

Noordyk's interest in the environment began when she was a child. And, while there wasn't an exact moment where she knew she would work on water quality, she can trace her general interest back to the third grade.

"I've always really cared about environmental issues, but I think it started with a third grade project to raise money to save the whales through recycling newspaper," Noordyk said. "Like many kids, I loved animals and I also watched a lot of documentaries. I thought I wanted to be a veterinarian, but later discovered that conservation is where I wanted to be."

In college, Noordyk followed her passion for the environment, attending Colorado State University and doing conservation fieldwork in places such as Tanzania. In fact, it was while she was in Tanzania that she learned about the Nelson Institute.

"I was studying abroad in Tanzania and the faculty person who was leading our group mentioned that the University of Wisconsin-Madison had a good environmental studies program," Noordyk said. "Several years passed and when I decided to go back to school, I looked it up. I started making connections and I visited the campus. I was fortunate enough to meet my advisor Nancy Matthews on that trip."

Once accepted to the Nelson Institute Conservation Biology and Sustainable Development (CBSD) program, Noordyk decided to participate in a graduate exchange program in the south of France.

"I loved it so much I decided to go back to do my thesis there. I developed a social-ecological model of the Camargue Delta wetlands," Noordyk said. "I came to understand that conserva-

tion is really all about people. If we want to work on these issues, we have to understand where people are coming from. I thought the Nelson Institute was a great program for this because of the interdisciplinary nature of it and getting those people-oriented skills."

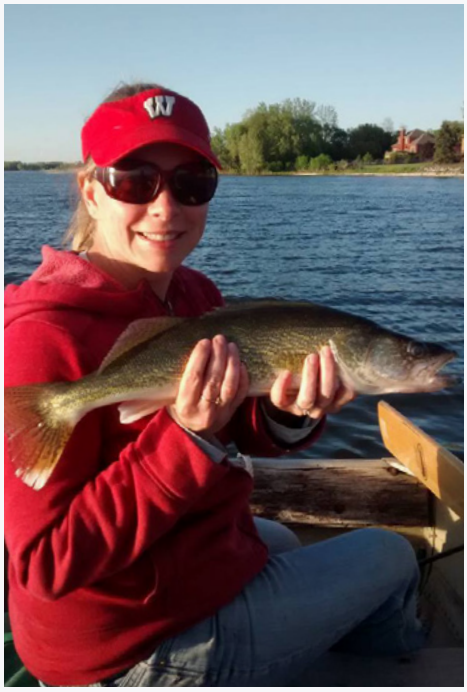
After graduating from the Nelson Institute, Noordyk was accepted to a National Oceanic Atmospheric Administration (NOAA) coastal management fellowship. The two-year program matches NOAA fellows with state coastal management programs.

"It was an amazing experience," Noordyk said. "I got matched with the Maine coastal program and worked on off-shore wind energy and nonpoint source pollution. But, my biggest project was building the Maine coastal public access guide, which was no small feat given the state has over 5,300 miles of coastline."

After completing the fellowship, Noordyk and her family were looking to return to Wisconsin. Fortunately, a position with Sea Grant was posted and Noordyk found it was a natural move to join the organization, which conducts "basic and applied research, education, and outreach and technology transfer" and is "dedicated to the stewardship and sustainable use of the nation's Great Lakes and ocean resources."

Through her role as the water quality and coastal communities specialist, Noordyk works with communities along Lakes Superior and Michigan on water quality and coastal resilience. She is the program manager for the Wisconsin Clean Marina program, a statewide certification program where marinas adopt best management processes to reduce water pollution. She is also involved in the Clean Bay Backers, a citizen-based group that has aided in the clean-up of the lower Fox River and the Green Bay Sustainability Commission, which just passed a water resolution for the city.

Additionally, Noordyk is involved with the East River Flood Resilience planning.



Julia Noordyk

"We have a really big project happening right now," Noordyk said. "It brings together the municipalities and the county in this watershed to addressflooding and water quality issues. Historically, the river has been treated more like a trash dump than a resource, there are even stories of folks putting perfume along the river to dampen the smells, so we are working with the communities on a resilience plan that uses nature- based solutions. Things like green stormwater infrastructure, floodplain restoration, and agricultural wetland treatment systems."

Noordyk is also working with municipalities across the area, and throughout the United States on green infrastructure, having developed a local ordinance workbook, which is a tool that can help municipalities to identify barriers to implementing green infrastructure.

She is also currently collaborating with the University of Wisconsin-Green Bay Center for Biodiversity and the First Nations studies program on a initiative that will put a focus on the ancestral homelands and the ecological knowledge held by the Ho-Chunk, Potawatomi, and Menominee nations.

While Noordyk is involved in a variety of projects, all of her outreach has the community at its heart. In fact, her focus on building relationships is something she attributes to her time at the Nelson Institute.

"The most valuable things that I took with me from my time at the Nelson Institute were professional skills—how to be adaptable and collaborate with people from various perspectives," Noordyk said. "Conservation work is all about building relationships and trust and you can't do that without being flexible and listening. The Nelson Institute gave me the chance to learn about these skills and develop them through my thesis project. There's no doubt in my mind that this has helped me be successful."

We invite you to learn more and support our current graduate degrees including the Environment and Resources and the Water Resources Management programs.

> *"The most valuable things that I took with me from my time at the Nelson Institute were professional skills–how to be adaptable and collaborate with people from various perspectives."*
>
> —Julia Noordyk

EC alumna is helping to address the human-wildlife conflict

Photo iStock | ginosphotos

By Bekah McBride

Each year, a few of the world's 808 whooping cranes are shot and killed. Considered critically endangered, these deaths generally occur in areas of the country where individuals are unfamiliar with the large, white and black bird. Whether the shooting is motivated by fear or novelty, the act is illegal and is just one example of the human–wildlife conflict that has become an area of study for Nelson Institute alumna, Sarah Weber.

Weber was a member of the first cohort accepted to the Nelson Institute Environmental Conservation Masters of Science (EC) program. A 15-month program designed to train conservation leaders in practical interdisciplinary skills, EC features in-person and online courses as well as a three-month professional leadership experience. While many students select their leadership experience within the first year of attending the program, Weber knew she would be working with the International Crane Foundation (ICF) on human-wildlife conflicts before she even started the EC program.

"I was a senior at American University in Washington D.C and had done a number of different internships with a number of different organizations, such as the Smithsonian's National Zoo and World Wildlife Fund (WWF), and I was looking for a way into that world," Weber said. "I was a journalism major and was looking for a bit more of a biology background to complement my communications background. I decided that a professional program that focused on building those skills would be the perfect fit. I began right after graduating from college, but I think it was unique in that I knew I would be working with the ICF. They had asked the program leaders if there was anyone in the cohort with communication experience and they put my name forward and it worked out."

With her background in communication and her interest in human-wildlife conflict, Weber got to work on a be-

Sarah Weber

havior change campaign related to whooping cranes. Working with the ICF, Weber used her communication skills and the new skills she was gaining through the EC program to develop a campaign that educated people on the importance and rarity of whooping cranes in an effort to discourage shootings.

"Unfortunately, there are a number of shootings of whooping cranes that are migrating south," Weber said. "They are supposed to be going to Florida, but because of climate change they were going to places like Alabama and Indiana where they haven't been to in a long time. People are shooting them because they don't know what they are and that really sparked my interest in human and wildlife conflict."

This project became the catalyst for Weber's career working on human-wildlife conflict. After she graduated from the EC program in 2015, she started a full-time communications job with the World Resources Institute and then went to The Nature Conservancy.

"I got a lot of great experience with those organizations," Weber said. "But, then, about seven years in, I realized that the communication skills are important, but I'm more interested in policy and research. I decided to make a career shift by going back to school for my PhD."

Weber decided to attend George Mason University, just outside Washington, D.C., where she is beginning her third year studying environmental policy and environmental science with a focus on human-wildlife conflict related to rewilding.

Rewilding is a conservation tactic that reintroduces native wildlife back into environments where they may have been removed due to human intervention in an effort to restore ecosystem processes that have been lost. An example of this includes the rewilding of red wolves in North Carolina and the Eurasian beaver in Great Britain.

"Because some of these animals have not been in these homes for sometimes hundreds of years, there is a lot of conflict," Weber said. "So, I'm trying to work on identifying the social and political barriers to rewilding success. This is based on what I was working on at Nelson and the great connections I made which have translated to my work."

In addition to her work with human-wildlife conflict, Weber has also been working with Conservation Measures Partnerships (CMP) to promote the success of their Conservation Standards program. The Conservation Standards are a set of principles and practices that conservation professionals use to design, manage, and

Conservation Measures Partnership

monitor projects. Weber was first introduced to Conservation Standards as a student within the Nelson Institute.

"I had no idea what the conservation standards were until I came to Nelson and took the class with Arlyne Johnson," Weber said.

Johnson, a senior program officer at Foundations of Success (FOS) teaches the Conservation Standards course as a part of the EC program. Although Conservation Standards is available to professionals around the world, this three-credit course is unique to the EC program. The Nelson Institute has also recently partnered with Foundations of Success (FOS), the CMP, and the Conservation Coaches Network (CCNet), to offer a course on "Step 3. Implement" of the Conservation Standards called, Conservation Essentials. This course is held virtually a few times a year and is available to professionals and graduate students in the conservation field. Scholarships are also available to those who qualify. While Weber isn't directly involved with this course, she has been helping CMP to share their success stories.

> *I was a journalism major and was looking for a bit more of a biology background to complement my communications background. I decided that a professional program that focused on building those skills would be the perfect fit.*
>
> —Sarah Weber

"I've been helping the partners with highlighting the successes of Conservation Standards and publicizing all the awesome projects they are working on," Weber said.

In the next year or two, Weber hopes to complete her degree and continue her work within the nonprofit world. She is also interested in exploring a policy fellowship or other policy related work. Regardless of the exact focus, she knows that she wants to do hands-on work that will directly and positively impact issues surrounding human-wildlife conflict.

"I will be in a practitioner role as I think that it's a good opportunity for me to get involved in the actual outcomes related to challenges like biodiversity decline," Weber said. "I think I can add to the world as a practitioner."

We invite you to learn more and support the Nelson Institute graduate professional programs.

We invite you to stay connected by updating your contact information by joining Badger Bridge or making simple updates here.

Additional Earth Day videos released

The 2021 Nelson Institute's virtual Earth Day learning event was a success. While the virtual sessions were available to participants during the event, the Nelson Institute will be releasing nearly a dozen videos to the public throughout the summer. We are pleased to share these additional videos this month:

- ***The Future of Work: How to Create a Just and Sustainable Workplace Culture***
- ***Justice in the Few Nexus***
- ***Resilience in the Great Lakes***

View the Nelson Earth Day program archives. Learn more about how you can support future Earth Day events.

Fall 2021 CHE Environmental Colloquia

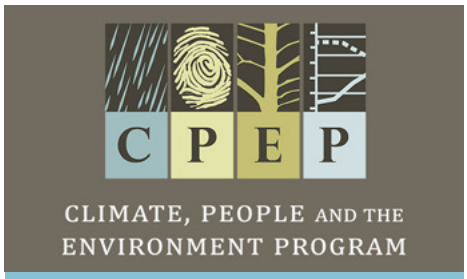
The Center for Culture, History, and Environment (CHE) invites you to attend the Fall 2021 CHE Environmental Colloquia series on Wednesdays from noon-1 p.m. (CDT). Mark your calendar for these events:

Place Writing - Narrative as Meaning, Relations, and Ecology
James T. Spartz
Wednesday, October 27, 2021
Register Today

Icy Matters: Race, Indigeneity, and Coloniality in Ice-Geographies
Jen Rose Smith
Wednesday, November 3, 2021
Register Today

Weston series

The Weston Roundtable Series is designed to promote a robust understanding of sustainability science, engineering, and policy through weekly lectures co-sponsored by the Center for Sustainability and the Global Environment (SAGE), the Department of Civil and Environmental Engineering, and the Office of Sustainability. Past lecture recordings are available for viewing.



CPEP seminars

Each semester the Climate, People, and the Environment Program (CPEP) hosts a weekly seminar featuring lectures by visiting speakers as well as presentations by CPEP faculty, scientists, and students. CPEP seminar presentations are held in conjunction with the Department of Atmospheric and Oceanic Sciences (AOS) and are open to the public. Past lecture recording are available for viewing.

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