Nelson Institute for Environmental Studies
UNIVERSITY OF WISCONSIN–MADISON

November 2024

THE COMMONS

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

Love Is …

Native November on campus celebrates love for family, community, and culture.

Where climate meets health.
Page 4

Sustainability Symposium centers on AI.
Page 6

The magic of insects.
Page 12

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We're reducing our carbon footprint! We hope you enjoy our digitally published magazine, sent monthly to Nelson alumni, students, and friends.

Jingle dresses at the Bad River Powwow. © Richard Schultz 2022. Courtesy of 50 Eggs Films

INSIDE

FEATURES

FACULTY/STAFF IMPACT

FRONT AND CENTER

STUDENT SNAPSHOT

ALUMNI SPOTLIGHT

From the Dean

Greetings, Nelson Institute community,

I've looked at the evidence, and the arc of history bends towards *just sustainability*. This is especially true on the local and regional scale, where water quality innovations are making huge strides and the double benefits of human health and renewable energy are being realized, from things like cleaner air, bikeable and walkable cities, and the climate-smart food revolution. The key is to build community, which is among the most important of Nelson's roles. So, I hope you're holding some space to check in with yourself, your friends, your community.

Speaking of community, it was wonderful to see so many of you back on campus during last month's Homecoming Week festivities. Between hosting our board of visitors, diving into the intersections of sustainability and AI at the Sustainability Symposium, and seeing donations fly in during Fill the Hill, Nelson covered a lot of ground. We also wrapped up a comprehensive alumni employment survey, which many of you surely participated in. we're still analyzing the results, but the initial message is clear: our grads get jobs, and they love what they do. Thank you for your continued participation and investment in our community!

When reflecting on community, we acknowledge the vibrant communities that were here long before Science Hall — and remain an integral part of the state now known as Wisconsin even today. Our Indigenous partners remain hard at work on water quality efforts, food sovereignty, and land stewardship.

If you're in town next week, I hope you'll consider joining us the Nelson Institute's contribution to this year's Native November programming: a free screening of Bad River, a new documentary that follows the Wisconsin-based Bad River Band on their continuous fight for sovereignty. This event is part of UW–Madison's Native November programming, the theme of which is "Love Is …", a celebration of the various ways Indigenous people show love for each other, their community, and their culture. I hope you'll visit their website and find other ways to engage this month.

And all of that is just the beginning. Read on to learn about the other great work happening across the Institute, in areas ranging from the nexus between human health and the green energy transition to customizable nematodes to corporate sustainability. What kind of stories do you want to see? Our editorial team would love to hear from you. Action is the best way to cure doubt with a restless spirit.

On, Wisconsin!

Paul Robbins
Dean, Nelson Institute

Grounds for Change

Four of the main green spaces on campus are on a three-year journey of self-discovery. Library Mall, Henry Mall, the Ogg Residence Hall lawn, and the Divine Nine Plaza are going back to their roots through an organic landscape management pilot project, which is being led by students in collaboration with the Office of Sustainability's Green Fund. Learn more about the project and how it supports UW–Madison's sustainability goals. Photo by Lauren Graves, Office of Sustainability

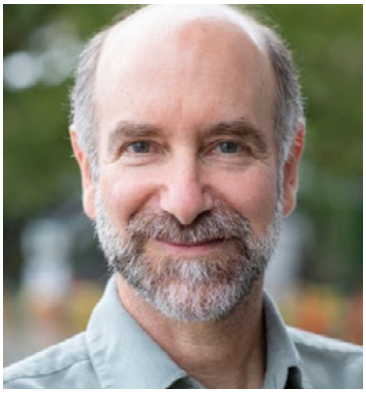
Feature

Where Climate Meets Health

New center launches to explore health equity and the energy transition.

By Chelsea Rademacher

As the nation and the world race to mitigate climate change, sweeping climate policies are emerging — and fast. But these policies often ignore short-term human health and equity considerations. A new center at the University of Wisconsin–Madison is addressing that gap by establishing a base of evidence to help guide policy decisions: one that both maximizes health benefits and reduces further warming of our planet.



Jonathan Patz

Maureen Durkin

The Health-First Climate Action Research Center, among the first climate change and health research center in the country, launched on September 20, 2024, with a $3.8 million grant from the National Institutes of Health.

Led by Jonathan Patz, a professor in UW–Madison's Nelson Institute for Environmental Studies and the School of Medicine and Public Health (SMPH), the center seeks "a community-based, health-first approach to climate action and the energy transition.

"Recognizing the threat of climate change, societies are now motivated to reduce their dependence on fossil fuels," says Patz. "Our new center will provide evidence to help guide this energy transition in order to maximize human health benefits alongside climate change mitigation goals."

Comprising experts in air quality, human health, clean energy, and artificial intelligence, the center brings together faculty, researchers, and practitioners from UW–Madison, UW–Milwaukee, and the Medical College of Wisconsin.

Their goal is to understand the health and equity impacts of various energy types, all in the context of the U.S.'s clean energy transition. Operating with a "community-based, health-first approach," the center will engage across communities, from local groups to scientists to policymakers. Their work, the proposal said, will "start and end with communities."

> *"Our new center will provide evidence to help guide [the] energy transition in order to maximize human health benefits."*
>
> — Jonathan Patz

"The idea that communities can reduce their reliance on fossil fuels for energy — and at the same time improve the health of their people and reduce health disparities — is both novel and very exciting," says Maureen Durkin, chair of SMPH's Department of Population Health Sciences.

As work begins, the center is focusing on:

- **Engaging citizen scientists** with web-based mapping, crowd-sourcing and artificial intelligence, and community use of low-cost air pollution monitors
- **Creating decision-making models** that balance policymaker and community needs
- **Assessing the link between climate change and asthma** in students of Milwaukee Public Schools

"Health action is climate action, energy action, transportation action," explains Paul Robbins, dean of the Nelson Institute. "UW–Madison is a core for all this; an NIH center leverages the whole campus to make something new happen for people, cities, and infrastructure. This research team is second to none."

Meet the Team

Jonathan Patz, Director
Vilas Distinguished Achievement Professor and John P. Holton Chair of Health and the Environment, UW–Madison Nelson Institute for Environmental Studies and School of Medicine and Public Health (SMPH)

Bruce Barrett, Deputy Director
Professor, Department of Family Medicine and Community Health and Department of Population Health Sciences, SMPH

Tracey Holloway, Research Lead
Jeff Rudd and Jeanne Bissell Professor of Energy Analysis and Policy, Nelson Institute

Kirsten Beyer, Colead
Medical College of Wisconsin, UW–Milwaukee

Langston Verdin, Colead
MKE FreshAir Collective

Jomol Mathew, Data Science Core
UW Institute for Clinical and Translational Research; Director, Clinical and Health Informatics Institute

Alicia Lopez, an intern with the Office of Sustainability, presents a poster outlining the work of the office's new educationa and outreach intern team. Photos by Lauren Graves (3)

The Bright Side of AI

Third-annual Sustainability Symposium highlights the AI in sustainability.

By Miquéla Thornton, Office of Sustainability

When Paul Robbins, dean of the Nelson Institute for Environmental Studies, arrived at UW–Madison 12 years ago, "the idea that we would've had a sustainability symposium, net-zero goals, a zero-waste commitment, graduates working at major sustainability firms around the United States," was "hard to imagine."

"I was bombarded my first day on the job, with mail from alumni saying, 'Where the hell are you people on sustainability?'" Robbins said, opening the third annual UW–Madison Sustainability Symposium last week. "And I am very pleased to say that is not how things look now."

In addition to launching a major environmental sustainability initiative in February 2024, Chancellor Mnookin also announced the RISE Initiative, a hiring effort focused on several research areas. So far, three have been announced: RISE-EARTH, which focuses on sustainability; RISE-AI, which focuses on artificial intelligence; and RISE-THRIVE, which focuses on health.

The RISE Initiative, according to the Sustainability Symposium's coordinator, Will Erikson, inspired this year's theme: AI and sustainability. "We wanted to highlight RISE-AI and RISE-EARTH, and talk about the nexus of those two," Erikson said, adding that the theme lent itself naturally to collaborating with other institutes and departments on campus.

The Symposium was hosted in partnership with the Data Science Institute, Facilities Planning & Management, the Nelson Institute for Environmental Studies, University Lectures, and the UW Environmental Awareness Fund.

Dr. Sara Beery of the Massachusetts Institute of Technology, whose work focuses on computer vision research for the environment, biodiversity, conservation, and sus-

tainability, delivered the keynote address. Working at the intersection of conservation and AI, Beery discussed the potential of AI to streamline the work of conservation biologists by turning the data gathered by community scientists, through apps like iNaturalist, into information necessary for scientists to measure biodiversity and understand ecosystems.

According to Beery, iNaturalist houses over 200 million species observations globally, across more than 450,000 species. This makes iNaturalist one of the largest mechanisms for collecting scientific data about species on Earth, surpassing almost all scientific data collection historically, except for data on birds, because of the massive popularity of birdwatching.

However, while there are challenges to harnessing data provided by community scientists — such as capturing images of rare species, or balancing the scales of conservation between the global north and south — Beery explained that AI is a worthwhile endeavor for conservation research. She said it can provide insights into animal behavior, habitat conditions, and interactions between species.

"I wanted to be one small cog in a big machine: a big, global, interdisciplinary, complicated machine that's going to try to figure out how we could ... do better for the planet."

— Sara Beery

The project is particularly urgent, she emphasized, because since 1970 the world has lost 73 percent of all wildlife. Additionally, researchers have identified a butterfly effect of species loss, with impacts on public health, food security, the ability of soils

From left, Drs. Paul Robbins, dean of the Nelson Institute; Andrea Hicks, director of sustainability education and research; Kyle Cranmer, director of the Data Science Institute; and keynote speaker Sara Beery pose for a photo. Photo by Kate Scroggins

to sequester carbon, and ecosystem services like flood mitigation and run-off management.

"We have to save everything or as much as we can," said Beery, who shifted from a career in professional ballet to computer science out of that desire to "save" as much as possible.

"Biodiversity is important. And this was really a strong motivator for me when I decided to retire quite young from my professional ballet career and go back [to school] and try to work on some big, difficult problems," she said to the symposium audience.

"I wanted to be one small cog in a big machine: a big, global, interdisciplinary, complicated machine that's going to try to figure out how we could address these challenges and how we could try to do better for the planet," Beery said, adding, that she's not the only person who "thinks like this."

Lightning talks ranged across a variety of topics, including UW–Madison's Bee Campus Initiative, research on mapping ecosystem services at the Lakeshore Nature Preserve, communicating PFAS risk, climate considerations in agriculture and shipping fuel, the circular economy, and the need for diverse energy storage solutions.

Arthur Sacks, the second director of the Nelson Institute for Environmental Studies and current member of the Nelson Institute Board of Visitors, was most impressed by the locality of many of the lightning talks and how they brought sustainability home. A presentation by Gavin Luter, the managing director of the UniverCity Alliance, stood out to Sacks for its intersection of local government importance with community-focused sustainability initiatives in Wisconsin.

"[Their] approach to … serving community is really the basis of the Wisconsin Idea," Sacks remarked.

PhD student Victoria Salerno presents Linking Society and Science: UW–Madison's Bee Campus Initiative.

Highlighting Sustainability Research at UW–Madison

With approximately 300 attendees at the Sustainability Symposium and 15 lightning talks on different aspects of the field, Beery's words ring true.

In addition to the lightning talks, attendees enjoyed poster presentations and networking sessions where students, researchers, professors and interested Madison community members discussed how to solve big problems over small plates of refreshments (any waste from which was later audited by Office of Sustainability students to assist with certifying the event).

Caroline Arciszewski, a sophomore majoring in environmental science and pursuing a certificate in sustainability, talked about the variety of connections she made. As an intern at the Office of Sustainability, she's part of a new academic writing team that is currently researching how other universities like UW–Madison communicate Scope 3 emissions, which are activities from assets not owned or controlled by the university, such as those within its supply chain.

International students participating in the Scan Design Fellowship Program share their research with Michael Gay from the Center for Dairy Research.

"We're really open to collaborations and ideas, since we are such a new team," Arciszewski said, adding that presenting at the Symposium helped toward that goal. "I've made connections with people who I wouldn't maybe connect with in my day-to-day life," she said.

One poster presentation described a study by Affiliated Engineers (AEI) and Facilities Planning & Management that will inform decarbonization plans for the campus's district energy system. Willa Kuh, of AEI, said she has enjoyed the opportunity to discuss their work with UW–Madison experts in energy thermal storage, copper, aluminum, and more. "In our process, we engaged faculty a lot … they have an inside view on technology and information—more than we could gather on our own," Kuh said.

As the university embarks on its sustainability initiative, an effort that will require concerted collaboration across institutes and departments, reaching net-zero emissions by 2048 is among its most ambitious components. "It's a big task, right?" said Kevin Krause, also of AEI. "This isn't going to be solved in a day, so I've appreciated hearing from folks that they recognize what a challenge it is."

And what of the increasing role of AI on campus and around the world?

According to Erikson, "We're at a very interesting inflection point, with AI technology and all the implications it has … [for] energy use, but also with real life, applicable uses of the tech [such as] data querying of images for biodiversity and conservation."

Ultimately, Erickson hopes that attendees were "inspired by the presentations and got to really see all the different ways great work is being done in sustainability across our campus."

This story was originally published by the Office of Sustainability.

Climate Impacts on Tribal Nations

Nelson Institute alum Dylan Bizhikiins Jennings discusses the cultural, economic, and recreational changes that will result from climate change in Wisconsin.

By Dea Larsen Converse,
Wisconsin Initiative on Climate Change Impacts

Dylan Jennings, a member of the Bad River Tribe located in northern Wisconsin, shared information on how climate change is impacting Tribal Nations in Wisconsin for the 2021 Wisconsin Initiative on Climate Change Impacts (WICCI) Assessment Report. Jennings is a HEAL Earth Partnership doctoral fellow in the Department of Planning and Landscape Architecture at the University of Wisconsin–Madison. WICCI is a statewide collaboration of scientists and stakeholders formed as a partnership between UW–Madison's Nelson Institute for Environmental Studies and the Wisconsin Department of Natural Resources. WICCI's goals are to evaluate climate change impacts on Wisconsin and foster solutions.

How is climate change impacting the Anishinaabe people?
When thinking about climate impacts to tribes, remember that their boundaries are set. If the population of beings is reduced or extirpated in the ceded territories, or they migrate northward, the Anishinaabe people will no longer be able to rely on them for cultural and ceremonial purposes and subsistence.

Wild rice is very important to the Anishinaabe and is very vulnerable to many variables, including things like high water levels. A lot of data that WICCI has produced correlates with increasing water levels, especially in our area, that create catastrophic conditions for wild rice. That's something that our communities are looking to monitor over time and figure out ways to address that. Another aspect is warmer temperatures and increased water levels and other conditions that other species, non-native species, can thrive in. Tribal nations have taken actions to either eradicate or manage those non-native species, or prevent them from coming in the first place.

Tribes have been looking at climate impacts for a long time. How do you take thousands of years of cultural knowledge and systems and conform to what is happening with the current environment? They are trying to figure out which species are thriving and doing well in the current conditions and what we can do with them.

Most important is that tribes have been vocal about not looking at climate change through just a Wisconsin perspective. Tribes have treaty rights that extend beyond Wisconsin into Michigan and Minnesota. It is valuable to look at things through a holistic regional perspective to address climate change.

How is climate change impacting tribal health?
Climate change is creating bigger economic gaps and disparities between tribal health and other communities. For example, drastic heat ups and cool downs impact harvesting from sugar bushes by reducing flow of sap in sugar bushes. Ultimately, that type of healthy sugar harvested from sugar bushes will be in shorter supply and get more expensive. It will be less available and create greater health gaps for tribal communities and other historically marginalized communities.

Read an extended version of this story.

Illustration courtesy of iStock / J.J. Granville

A Kaleidoscope of Beings

In her new book, Heather Swan explores creative solutions that help protect insects, ecosystems, and our environment.

By Laila Smith

Heather Swan didn't have the most conventional upbringing. As a girl, she lived with her mother, an artist, and traveled between artist communities across the country. "My mom was a potter, and she always solved problems in creative ways," says Swan. "Like when we didn't have a couch, she built one out of milk crates and plywood!" Constantly moving made it difficult for her to make friends, so Swan spent a lot of time in nature with her dog, appreciating the ecosystems and landscapes around her. "I've always felt that all beings — even the smallest ones, like insects — have very complicated lives. I didn't think of myself as superior to them, but rather part of the whole kaleidoscope of beings," she says.

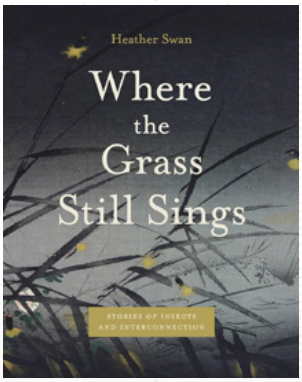
"This book isn't about me, it's about all the amazing people I met. It's like being the host of a really great party."
— Heather Swan

In addition to having an affinity for insects, Swan was also drawn to literature. She holds a PhD in literary studies and an MFA in poetry from the University of Wisconsin–Madison, and is currently a senior lecturer with UW–Madison's English department. She also holds a minor in environmental studies through the Nelson Institute's Center for Culture, History, and the Environment. The intersection of her interests has led her to publish two books about the relationship between insects, humanity, and the environment. Her most recent book, *Where the Grass Still Sings: Stories of Insects and Interconnection*, is a companion to the award-winning *Where the Honeybees Thrive: Stories from the Field*, published in 2017.

Your first book explored your relationship with honeybees and the threats they're facing. What made you branch out to other insects as well?
I realized I hadn't focused enough on all the insects that weren't very glamorous — such as beetles, which I've included in my new book. When you really start noticing insects, you'll see that they're truly extraordinary. Every day, miracles are happening but we don't notice because they're so small. Just think of metamorphosis; a little caterpillar forms a chrysalis and wakes up as a butterfly — that's marvelous, isn't it? Insects are so beautiful.

Do you have a favorite insect?
Ask me any day of the week, and I'll probably have something different to say! Right now I'm fascinated by bumblebees because I feel like they're quite strange and wonderful little beings. They're cute, too — they're like the panda bear of insects!

Why should people pay more attention to insects?
Insects are a foundation of entire ecosystems; If you don't have a healthy insect population, an ecosystem will fall apart. That means if you love birds, you have to love insects. If you love mammals, you also have to love insects. If you love to eat, you have to love insects because they pollinate so many things.



Heather Swan's new book, *Where the Grass Still Sings*.

Heather Swan doing research in Ecuador. Photo by Drew Szabo

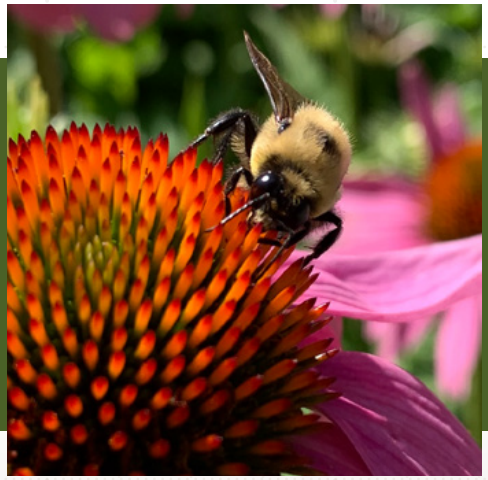
If you stop and slow down to look at what's surrounding us every single day, you'll see that there's so much magic and beauty out there. It's such a complex, incredible world, and if we slow down and notice it, we'll realize that it needs care. Attention lends to intention, and intention leads to action.

What can readers expect from your new book, *Where the Grass Still Sings*?
My book shows several strategies for change from entomologists, conservation biologists, farmers, museum curators, botanists, and more. It's a collection of people I've met who are innovatively and creatively coming up with solutions to protect insects and our world. After spending time with these experts, I braided my own experiences with their knowledge to create a mosaic of different ways to approach a problem. But this book isn't about me, it's about all the amazing people I met — it's like being the host of a really great party.

Can you tell me about your decision to include artists' galleries in your book?
After every chapter, there's a gallery featuring an artist whose work plays off of a theme from the chapter. For example, after the chapter where I meet with an entomologist at the Berkeley Essig Museum, I feature a gallery from Jenny Angus, who creates patterns with insects that she's collected herself over 30 years.

I believe art affects us differently than other forms of communication. When I was in Columbia and saw some incredible murals of animal-human hybrids, I remember thinking that I could write about these murals — but it was an entirely different thing to see them. Through art, we can envision things beyond what we see right now and visualize how interconnected things are.

What do you want to accomplish through your book?
I hope to inspire people to think outside the box, and also to feel hope. I want to offer younger generations a path for change, and my book shows that change can happen, and it is happening. It's easy to feel like what you're doing isn't important; that you're just one person. But in a lot of these stories, it's just one wonderful person causing so much change — your impact is so much bigger than you realize.



Left: Swan holding a Cedar Waxwing. Middle: Swan inspecting a Stag Beetle. Right: Honeybees on a feeding after a rainstorm. Photos by Heather Swan (3)

Don't Go Changing Watersheds

Anita Thompson's lab finds insights in climate change's impacts on water resources.

By Kally Arnzen

Photo by iStock / John Brueske

This article, by Kally Arnzen, is part of a series highlighting members of the Office of Sustainability's Experts Database. In a collaboration with instructor Hannah Monroe's course, LSC 561: Writing Science for the Public, students interviewed campus sustainability experts and produced short feature stories.

"[In the] wintertime, the soil conditions and the amount of ice that's in the soil and how nutrients are responding to that are changing."

— Anita Thompson

Growing up in the midwest, Anita Thompson recalls that her childhood winters in Minnesota followed a reliable pattern of the ground freezing and thawing at roughly the same times every winter and spring. Over the years, these weather patterns have changed rapidly and become far less consistent.

"What that means in the wintertime is that the soil conditions and the amount of ice that's in the soil and how nutrients are responding to that are changing," Thompson explained.

Thompson's lab at the University of Wisconsin–Madison's Nelson Institute for Environmental Studies aims to understand how changes in these processes impact the quantity and quality of water resources. The lab also seeks ways to reduce the impact of inconsistent weather patterns on groundwater and surface water systems.

Both agricultural and urban environments benefit from this approach, called predictive watershed modeling, because it helps inform decisions on land management practices that preserve water resources, water quantity, and water quality in a way that provides for the needs of society today without sacrificing the needs of future generations.

Specifically, Thompson's lab investigates how wintertime hydrological processes influence the moisture content, physical properties, and nutrient migration of soil in agricultural settings. These water processes include snow cover and freeze-thaw cycling, which is the pattern of groundwater freezing solid and re-thawing to liquid water within the soil. In turn, these processes affect how nutrients contained within the soil migrate to both underground and surface water systems and affect the quantity and quality of the water found in them. In urban environments, Thompson's lab is interested in how stormwater management and urban water management practices can further affect water quality.

Wintertime hydrological processes are far less studied than the typical agricultural growing season, creating a knowledge gap that leads to less physical representation within watershed models and, as Thompson notes, "that leads to errors in predication and that can lead to misunderstanding in what conservation or best management practices might be most effective throughout a watershed."

Thompson hopes to bridge the research gap and help inform land management decisions that enable practices which reduce runoff, soil erosion, and nutrient loss.

There is "not a one-size-fits-all in terms of what's good and will work throughout the whole annual cycle," she said. Rather, both winter and growing seasons must be considered, depending on when the landscape is most vulnerable to losses in soil and water quality.

Progressions of changing weather patterns also play an important role in watershed models' predicative capabilities, as they can be used to compare, contrast, and predict weather between regions. Often, the current climate in one region is a perfect example of what the climate in a nearby region may look like in coming years as climate trends change.

To physically address these questions, soil samples are taken from across different scales — from small, temperature-controlled laboratory soil samples to larger in-field samples from working farms. The soil samples are then used to model wintertime processes in various physical watershed models, which represent a system of water for a given area. With these samples, the Thompson lab can test the effects of the various conditions mentioned from agricultural and urban perspectives, different climates, and different water management strategies.

Water resources management (WRM) students conducting a water sample in Beaver Creek in 2017. Photo courtesy of WRM

Thompson's lab collaborates with researchers far and wide, from Midwestern neighbors of Minnesota and Ohio to vastly different climates and landscapes in Alaska and Texas, to create a larger frame of reference and enhance predictability for effective water and soil management. In time, Thompson hopes to connect with researchers to create a global network dedicated to improving soil and land management practices.

Understanding these processes and forming a basis for physical predictions can help policy makers and producers prepare for what future changes to the landscape will mean for the water quality in that region. Thompson hopes that by implementing better conversation and management practices, agriculture can become more sustainable and a part of the solution to climate change, thinking of the future, while still providing for the needs of people today.

From the Office of Sustainability

A monthly update from faculty, staff, and students in the Office of Sustainability - Education and Research.

On September 11, 2024, the Sustainability Research Hub convened the inaugural Sustainability Research Visioning Event for campus. The purpose of the event was to connect UW–Madison researchers, facilitate discussions around the RISE-EARTH Initiative, and explore the breadth and depth of sustainability research on campus. With 120 people in attendance representing more than 40 departments and 12 schools and colleges, the event highlighted the broad interest in sustainability from all corners of the university.

One series of breakout sessions was organized around the four areas of RISE–EARTH: Adaptation, Resilience, Technology, and Humanity. Several recurring themes emerged, including the link between technology and human behavior; the importance of community engagement and the Wisconsin Idea; and the concept of resilience as a cross-cutting topic. Participants also concurred on the importance of connecting local issues to the global context as well as building partnerships beyond the university.

The remaining breakout sessions focused on the current sustainability landscape UW–Madison, with topics including identifying research strengths, using campus as a living lab, defining sustainability, and promoting interdisciplinary research. These sessions provided an opportunity to connect research with real-world applications, review existing models of collaboration, and create a shared sense of purpose.

The Sustainability Research Visioning Event also included discussion on how UW–Madison departments can best engage with the RISE–EARTH initiative. Still in its early stages, the success of the initiative will be determined by its ability to not just hire new faculty, but to provide incentives and mechanisms for interdisciplinary connections that create a cohesive community. There were many good ideas on how to make this happen, and the Hub looks forward to creating services to support early-stage collaborations, increasing its work in research development, exploring innovative incentives for collaboration, and creating events and structures to encourage interaction among researchers.

At the event, participants emphasized the importance of building on what already exists. To that end, the Hub team will be working to connect with existing efforts across campus and leverage all the good work that is already happening, while also identifying where gaps may still exist. As plans develop around the implementation of the RISE initiatives, the Hub aims to serve as a connector, resource provider, convener, and collaborator.

The visioning event provided valuable insight into a path towards a vibrant, broad-based, sustainability community that can help address some of the world's most urgent issues. We look forward to walking that path together.

Director's Cut

A quarterly update from Ben Zuckerberg, director of the Center for Ecology and the Environment.

The mission of the CEE is to provide a nexus for faculty and students to share ideas, enhance scholarship, and promote ecology on campus and beyond. This past semester was an exciting one for CEE! Here are some of the highlights:

- We just wrapped up our two-day CEE Fall Symposium! We hosted four great assistant professors from our campus community to give talks on topics ranging from sea turtle herbivory to the lore of Paul Bunyon. Our keynote speaker, Dr. Shane Campbell-Staton from Princeton University, gave an amazing set of talks on the evolutionary consequences of human disturbance and a deep time perspective of African American history in the United States. We had a great turnout with 217 attendees from 15 departments across campus.
- We are also excited to offer another set of Aldo Leopold Graduate Research Awards this coming spring semester. This research award, made possible by the generous support of Steven Lawry, will support graduate students whose research focuses on the intersection of ecological and societal systems challenges.
- Our undergraduate student chapter of WILD SEEDS (Strategies for Ecology, Education, Diversity, and Sustainability) continues to impress us with their passion and have been active with native planting initiatives on campus, visiting research sites, and organizing camping trips.
- The Queer Ecology reading group, cosponsored with the Center for Culture, History, and Environment, has started its second year and plans to continue their efforts. This reading group explores the intersection of queer and feminist theory, posthumanism, ecology, and evolutionary science.

None of this would have been possible without the generous support from the College of Agricultural and Life Science, the College of Letters & Science, and the Nelson Institute for Environmental Studies. As I begin my second year as director, I remain inspired by our exceptional group of students, postdocs, and faculty members who make our center excel. I extend a heartfelt acknowledgment to our tireless executive committee for their support: Kyle Webert, James Crall, Zac Feedman, Sara Hotchkiss, Sean Schoville, Jessica Hua, Jesse Weber, Min Chen, Alyson Fleming, Nicole DesJardins, Stephanie McFarlane, Emily Adler, Pairsa Belamaric, Zach Farrand, Timon Keller, Amy Munes, Brooke Propson, and Robin Higgins. Thank you all for a great start to our year, and I look forward to many more exciting accomplishments together!

Ben Zuckerberg

Raise Your Own Nematodes

Scientists are providing growers with a DIY process to fight insect pests.

By Tami Terella-Faram, Agricultural Research Service (USDA)

Microscopic view of a Nematode. Image by iStock / Videologia

As scientific sleuths, Agricultural Research Service (ARS) researchers continually seek new natural methods to help farmers grow and maintain healthy crops.

ARS entomologists David Shapiro-Ilan (Iowa State University) and Shawn Steffan (an affiliate with the Nelson Institute's Center for Ecology and the Environment) have developed a unique process that enables farmers to raise their own nematodes, a type of worm that can serve as an environmentally friendly biopesticide and offer a natural solution for insect pests.

"In Byron, Georgia (at the Southeastern Fruit and Tree Nut Research Station), we do a lot of work on entomopathogenic, or beneficial nematodes, which are small round worms," said Shapiro-Ilan. Entomopathogenic nematodes are used to control a wide array of economically important insect pests such as fungus gnats, white grubs, thrips, citrus weevils, peachtree borer, and pecan weevils, etc. Opposed to some nematodes that are harmful to plants or mammals, these only kill insects, that's why they are used as natural biopesticides."

According to Steffan, when applied to crops, the nematodes can act as a broad-spectrum biopesticide.

"We have yet to find an insect pest the nematodes won't kill and eat, and so for cranberry and blueberry growers, or for any U.S. crop where the nematode is placed in contact with the insect host, there is the potential to kill that host," he said.

Nematodes are effective biocontrol agents because they use their built-in partner, symbiotic bacteria, to assist in killing insect pests. As a nematode invades an insect host, it releases the bacteria, filled with toxins. While researching the nematode's basic biology and ecology, Shapiro-Ilan said he discovered some unique characteristics.

> *"Ultimately our goal is to have growers mass-propagate nematodes on their own."*
>
> — Shawn Steffan

Because nematodes are sensitive to UV radiation, the ARS team created nanoparticle and gel formulations to protect the nematodes when they're applied above ground.

"The nanotechnology provides each nematode a 'suit of armor,' shielding it from the sun," said Shapiro-Ilan. "Nematodes move in the soil like a pack of wolves, trying to find their prey. They also communicate with each other through pheromones, so we are applying specific pheromones to enhance their efficacy. We expose nematodes to the pheromones to tell them it's time to find another insect to kill. We are finding they do better with these pheromones than without."

Together with Steffan, who is based at the Vegetable Crops Research Unit in Madison, Shapiro-Ilan is also generating a more robust and cost-effective way for farmers to activate their own environmental pest control for a variety of crops. It involves formulating and mass-producing nematodes through a 'do-it-yourself' process.

"In addition to the gels, we have developed a new methodology with which farmers can grow their own nematodes inside insects," Shapiro-Ilan said. "This will allow a farmer to inoculate mass numbers of insects, and then harvest the nematodes before applying them to the field or pasture. Shawn [Steffan] has been successful in assisting cranberry farmers in Wisconsin in producing the nematodes on their own. Now we are developing this in Byron, Georgia, for peach and pecan farmers.

"What's great about nematodes is that they will attack native pests of a native North American crop, such as cranberries," added Steffan. "We've discovered the nematodes are highly virulent against cranberry pests, such as the flea beetle and three species of invasive moths."

Steffan's team is working with a handful of Wisconsin growers who are currently producing large numbers of nematodes in-house, in the hundreds of millions.

"That in itself is a success, but we're also trying to scale up," Steffan said. He added that it typically takes 25 to 26 million nematodes-per-acre to protect a specific crop. Commercially, the recommended number of nematodes is 1.5 billion-per-acre.

Many companies currently producing beneficial nematodes use artificial media to grow the nematodes in fermentation tanks. But Shapiro and Steffan say that approach is out-of-reach to farmers as start-up costs are high. Also, a certain level of expertise is required for fermentation technology.

"The grower-based methods we've developed allow the farmers to produce high quality nematodes with ease," said Steffan. "Ultimately our goal is to have growers mass-propagate nematodes on their own. That way they will have a biopesticide readily available to treat hot spots [of invasive pests] around their cranberry marshes, or on their farms." (In Wisconsin, cranberry farms are called marshes, not bogs).

Initially, Shapiro-Ilan and Steffan's research was published in the *Journal of Insect Science* in September 2023. They are now working to create a step-by-step instructional video for farmers to self-produce beneficial nematodes to protect their crops.

This story was originally published by Tellus, a digital experience that features stories about the cutting-edge work of the Agricultural Research Service (ARS), the U.S. Department of Agriculture's chief in-house scientific research agency.

Early field trials with beneficial nematodes. Photos by Shaw Steffan, ARS (3)

Stephanie Rink, Natalie Eisner and Shane Foye, from the University of Wisconsin, are part of the Bioinsecticide Team assisting with field work for ARS Vegetable Crops Research in Madison.

Cranberry canopy from a Wisconsin cranberry marsh.

Shaping Waterscapes

Sophie Van Alsburg's connection to water goes beyond just a hobby.

By Anica Graney

Van Alsburg, knee-deep in the Fancy Creek watershed, as she measures the embankment. Photos courtesy of Sophie Van Alsburg (3)

Sophie Van Alsburg has always felt a deep connection to water in all its forms. Whether she's carving through snowy slopes in winter or diving into lakes in summer, her favorite pastimes are tied to H_2O. It was only natural, then, that her academic path would follow suit, leading her to pursue a degree in civil engineering with a focus in hydrology at the University of Washington.

Having spent much of her undergraduate experience online, Van Alsburg wanted to continue her education at a master's level and found the Nelson Institute's water resources management (WRM) program. "I really like the WRM program because I get to pick my own classes and make my own degree, which was my main reason for deciding to enroll," Van Alsburg said. "I also liked the idea of getting to do a project that gives me real world experience."

The WRM program is a 45-credit master of science degree that prepares students to face the complexities of managing water resources. Students choose an area specialty and follow a core curriculum that reflects the diversity of knowledge and interdisciplinary experience needed in water resources planning and management. To supplement the program and provide real-world experiences, students must take a summer practicum that focuses on a contemporary problem in water resources.

Van Alsburg values the interdisciplinary nature of her classes and the wide-ranging knowledge she's gaining. One of her favorites so far has been Agroecosystems and Global Change in the agronomy department. "I have no background in agriculture at all, so it was nice to learn about that different background and understand rural water resources," she said.

Another impactful course has been Indigenous Water and Infrastructure taught by Grace Bulltail, assistant professor of environmental studies. "I've really liked learning about policy and how water infrastructure has impacted indigenous communities," Van Alsburg said. "I want to pursue water infrastructure and design as a career, so it's great to learn about policies that I don't get in a normal engineering degree."

In addition to her coursework, Van Alsburg gains hands-on experience as a project assistant in the water resource engineering department, where she models future rain events in Madison to predict the impact on existing stormwater infrastructure. This real-world work allows her to apply classroom concepts directly, deepening her understanding of how changing weather patterns affect urban water systems.

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— Sophie Van Alsburg

This past summer, Van Alsburg had the opportunity to work in the Fancy Creek Watershed in Richland Center, Wisconsin, with the rest of her cohort as they study the groundwater and create hydrologic models for their summer project. She led her project team using the Stream Quantification Tool (SQT) which helps to quantify uplift of the creek after restoration. The Fancy Creek reconnection is one of the first projects to use the new Wisconsin SQT, and Van Alsburg's team had the opportunity to work closely with one of its authors while conducting their research. In addition to using the SQT, Van Alsburg worked with two other students to install groundwater well transects that will inform them of how the groundwater will move once the water is redirected out of the channelized ditch to the historic meander.

Van Alsburg's team installs a groundwater well.

As the project wraps up during the fall semester, Van Alsburg is now working on design parameters and metric estimates. Once that's complete, Trout Unlimited will take over the monitoring portion of the project post-restoration to see any improvements in the hydrology, hydraulics, geomorphology, and biology of the Fancy Creek Watershed.

"My favorite part of this project was getting to experience working on all different aspects of the project. I helped with all the physical science parts of the project for at least a day, so I got a lot of experience in different fields outside of engineering. I especially enjoyed electrofishing and seeing the different species of fish we found in Fancy Creek and its tributaries," she said, also noting her appreciation to the program area's landowner who generously allowed Van Alsburg and her team to work on her property.

Reflecting on her own graduate experience thus far, Van Alsburg advises current undergraduates to make sure they have a project in mind when applying to master's programs as they will be able to apply their experiences to their future careers. "Because of COVID-19, I never had the opportunity to do field work or any type of internship or research in my undergrad," she said. "Getting that real-world experience is so nice because you get exposure to different kinds of workplaces that you might want to be part of."

As for Van Alsburg's future career, she hopes to prevent flooding and improve stormwater infrastructure that works better in a changing climate. Of course, that means ending up in a place that's rainy and surrounded by her favorite thing: water.

Turning Passion into Progress

Tiffany Clark serves up sustainable solutions and spikes down waste.

By Laila Smith

Clark playing volleyball for the University of Wisconsin–Madison. Photo by Greg Anderson / UW–Athletics

When Tiffany Clark first started as an undergraduate student, she didn't plan on majoring in environmental studies. She also didn't expect to be doing sustainability work for a multibillion-dollar company. Now, she's had the opportunity to help two major U.S. corporations — IKEA and ALDI — improve workplace sustainability.

It was during a freshman year biology course when environmental issues first caught Clark's attention. On the last day of class, her professor showed a slideshow on the dangers and impacts of climate change, which completely opened Clark's eyes. "As I sat there while everyone else around me packed up their bags to leave, I couldn't help but think 'Where have I been? How did I not know about this?' " says Clark.

Even after realizing this and graduating with a degree in environmental studies, it took a few years before Clark pursued sustainability as a career. As a former Badger volleyball player, she continued to play professional volleyball in Germany for several years — but knew that she would eventually circle back to solving environmental issues. "I had this passion for the environment, and I knew that was going to be my next step," she says.

"I had no idea what I was signing up for, but I stuck to one thing: I really cared about making a difference in the sustainability field."

— Tiffany Clark

After Clark's volleyball career wrapped up, she began searching for her next job while pursuing a master's degree in environmental sciences and policy. She soon realized, though, that finding a job working on environmental issues wasn't as easy as having a passion for solving them. To get a leg up in her job search, Clark

started asking people working in environment-related fields to join her for a "curiosity conversation."

"Every week, I would find someone on LinkedIn and ask them to chat in a 'curiosity conversation' where I could learn about their role, how they got there, what they do day-to-day, and any advice they had," Clark shares. Eventually, she connected with someone who was the sustainability developer for IKEA Joliet, an IKEA distribution center. Coincidentally enough, he was transitioning to another job — and thought that Clark would be a perfect fit to replace him. So, after officially applying for the position, Clark became IKEA Joliet's latest sustainability developer.

Clark at IKEA's Meet the Bees workshop where coworkers got a chance to get up close and personal with IKEA's biodiversity initiatives. Photo courtesy of Tiffany Clark

"I had no idea what I was signing up for, but I stuck to one thing: I really cared about making a difference in the sustainability field," Clark shares. "My advice to anyone starting out at a new job would be to actively seek out any opportunity to learn something new. Pick your colleagues' brains — and this doesn't have to just be people on your own team! Everyone you meet has something to teach you."

Every day Clark walked through the doors of IKEA, she was working on something new — which, as a former athlete, was the perfect environment for her. Some days, she would work on the factory floor of the 1.25 million square foot warehouse, operating a forklift and investigating how she can help improve sustainability culture in the workplace. Other days, she led initiatives to help her coworkers become more sustainable and efficient in their positions.

Some of the events Clark helped organize include paint nights with reused water bottles, a sampling event for IKEA's new plant-based hotdogs and meatballs, and a workshop to teach employees about different kinds of plastics. "Every single day I had the opportunity to be creative," says Clark.

After a year and a half at IKEA Joliet, Clark has recently accepted a new position as a sustainability specialist at ALDI, focusing on the company's zero-waste efforts. "There are roughly 2,400 ALDI stores across the United States today, and we are looking to expand and add hundreds of more stores in the next couple of years all while upholding our sustainability commitments," Clark says. "As you can imagine, this brings with it exciting new challenges that require creative solutions and cross-departmental collaboration."

While Clark's specific role is to focus on improving food waste sustainability, ALDI's sustainability team is working on many more initiatives in areas such as greenhouse gas emissions, deforestation, human rights, and animal welfare. "Being on such a robust team of passionate individuals, there is always something new and exciting developing in the office," she says. "It reminds me of the personal growth and connections I made during my volleyball career."

No matter where she is, Clark's work is fueled by her ambition to protect the environment. "One of my favorite aspects of my job is feeling like what I'm doing has a big impact — I entered this field because I want to make a difference," she says. "I believe passion will get you really far in this field. Having a zest for what you do is contagious."

FILL THE HILL

During this year's Fill the Hill campaign, we learned three things:

1. *Flamingos' beaks have adapted for upside-down eating.*
2. *Dean Paul Robbins makes a great David Attenborough.*
3. *When the Nelson Institute community comes together, we make a big impact.*

Thank you to everyone who showed their support during this year's Fill the Hill campaign!

Help us choose a design for a NEW Nelson Institute sticker!

Members of the Nelson Institute community submitted designs as part of our sticker design competition.
Now we need your help to decide which design to print!

Voting is open until 11:59 p.m. November 24, 2024.

SCREENING

Monday, Nov. 18, 2024 | 6–8 p.m.

Wisconsin Union Theater

800 Langdon Street

Join the Nelson Institute for a free screening of *Bad River*, a new documentary that follows the Wisconsin-based Bad River Band on their continuous fight for sovereignty. Following the screening, hear from some of the voices featured in the film through a moderated Q & A.

tales from planet earth

NATIVE NOVEMBER

University of Wisconsin–Madison

This screening is proud to be a part of UW–Madison's Native November programming. Learn more about this year's events – including a keynote by Jana Schmieding.

More information to register:

nelson.wisc.edu/bad-river

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