Nelson Institute for Environmental Studies
UNIVERSITY OF WISCONSIN–MADISON

July 2023

THE COMMONS

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

Delight versus Displacement

An artistic look at the complex histories of Tewakącąk/Devil's Lake.

The Nelson Institute's impact goes global. Page 4

Reflections from a Wisconsin train journey. Page 22

Meet two of 2023's alumni award winners. Page 30

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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.

Cover image by Dani Burke

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From the Dean

Greetings, Nelson alumni and friends,

This month marks an exciting milestone for the University of Wisconsin–Madison: our 175th birthday! The university was officially incorporated on July 26, 1848, just two months after the state was admitted to the union. Partners from across campus are coming together to celebrate this milestone, starting with the 175th anniversary launch day celebration coming up on (you guessed it) July 26.

Events and stories to honor the 175th will be rolling out for the next calendar year; at the Nelson Institute, we're incorporating our own 175th celebration into our annual Rendezvous on the Terrace event coming up on September 28–29. (This year's Rendezvous is also celebrating a Nelson-specific milestone, which you can read more about.). This year promises to have a big turnout of alumni, faculty, students and friends from around the world. I hope to see you all there!

As the event is strongly tied to the state's founding, it is important to place this 175th milestone in the larger context of the land that the university occupies, and that of the state now known as Wisconsin. This campus, set amidst the spectacular lakes region known as Dejope to Ho Chunk people who were dispossessed of this land in the 1830s, is one with a cultural history that far predates that founding event, after all. Our colleagues and keepers of memory for the Ho Chunk tell us that has been a place of gathering of diverse people for more than 10,000 years. Our celebrations, therefore, should best be seen as a commemoration of the way Dejope, the City of Madison, and UW–Madison continue to be places where people assemble, learn from one another, and listen to the land. We look forward to the next 175 years being ones of solidarity with the people who were here first.

This month's issue also celebrates the 175th anniversary by taking a look at the history of Science Hall: the building that the Nelson Institute has called home since our founding. Did you know that, across the university's history, nearly every scientific department was originally based out of Science Hall? They've all since moved out and into their own buildings, but we and the Department of Geography are proud to be keepers of the research and education legacy of this wonderful historic building.

In honoring the 175th, I'm reminded of the importance of the Wisconsin Idea — the philosophy that the university's work should extend beyond the boundaries of campus to serve the global good. Members of the Nelson Institute community have a rich tradition of not only upholding the Wisconsin Idea, but propelling it forward. On page four, you can see just how far our institute's reach extends: to every continent on the globe.

Once again, I've reached my word limit before having the chance to properly rhapsodize about the great work by our students, faculty, and alumni that are featured in the following pages.

Read on!

Paul Robbins
Dean, Nelson Institute

Delight versus Displacement

During the spring semester, Dani Burke — PhD candidate in design studies and certificate student in the Center for Culture, History and Environment — found inspiration on a class trip to Tewakącąk/Devil's Lake. "In these collages," writes Burke, "I want to celebrate the women's joy while also recognizing the layered contexts which situate Tewakącąk/Devil's Lake as a site of many experiences, facilitated by a myriad of social, cultural, political, and material means." Read more about Burke's work.


VIL'S LAKE, No 31.
BARABOO, WIS.
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SOLIET

Around the World with Nelson

The Nelson Institute may be housed at Science Hall, but its impact spans the globe.

By Laila Smith

Although the Nelson Institute is housed within Science Hall at 550 North Park Street, our faculty, students, and alumni are sharing our mission and conducting research internationally. From partnering with world-renowned organizations to helping small tribal communities, the institute makes an impact all across the globe.

NORTH AMERICA

Utqiaġvik, Canada, United States

What's better than taking Environmental Studies 126 at the Nelson Institute? Taking a transposed version of the same course in Utqiaġvik, Alaska! For several years, Nelson affiliates **Cathy Middlecamp** and **Tim Lindstrom** have taught at a pre-college summer STEM camp at Iḷisaġvik College in Utqiaġvik. The two educate students in a "place-based" manner, using the Alaskan environment to teach the same concepts being taught in Environmental Studies 126.

Sonora, Mexico

The Nelson Institute's Center for Culture, History and Environment has sponsored several research projects over the years, including a 2022 venture to Sonora, Mexico. The research team, including Nelson affiliate **Alberto Vargas**, aim to help preserve the Sonoran Desert Toad and "implement an integrative mental health program" that incorporates cultural aspects from the Yaqui, the people native to Sonora.

SOUTH AMERICA

Guyana

In Guyana, the nonprofit environmental organization Conservation International is working on assessing the country's tropical forest maintenance. Last summer, two newly minted Nelson Institute environmental observation and informatics (EOI) alumni, **Timothy Babb** and **Gwen Murphy**, were funded by NASA to work with Conservation International on this project. Further research is still being conducted, but the former students have wrapped up their field work where they conducted interviews and surveys in Guyanese villages. Keep an eye out for more updates from this project.

Pará, Brazil

Holly Gibbs and **Lisa Rausch**, two Nelson-affiliated researchers, found that many slaughterhouses are buying cattle from ranchers who allow their herds to feed on lands of Indigenous tribes and protected areas of the Amazon. Even though purchasing these cattle creates a bad reputation for slaughterhouses, the lack of available recordkeeping in Brazil makes it difficult for them to determine the previous whereabouts of herds, and easier for ranchers to sweep their herds' whereabouts under the rug.

ANTARCTICA

Arctic and Antarctic Oceans

Did you know that the ice sheets surrounding Antarctica and Greenland are so large, they attract water with their own gravitational force? We sure did, thanks to **Hannah Zanowski**, a self-titled "polar oceanographer," whose current research focuses on how Arctic glaciers and melting ice sheets from the past 10,000 years have shaped the hydrography of the northern areas of Canada's Baffin Bay. This past spring, Zanowski also piloted teaching an undergraduate atmospheric and oceanic sciences course to assess interest in adding an oceanography elective class to the atmospheric and oceanic sciences major.

EUROPE

Laxenburg, Austria

After spending four decades collaborating with Laxenburg's International Institute for Applied Systems Analysis (IIASA), the Nelson Institute's energy analysis and policy (EAP) program has partnered with the Austrian research institute. **Greg Nemet**, **Tracey Holloway**, and **Rob Anex** are among a few Nelson faculty and affiliates who are leading this new partnership with IIASA which will focus on "policy-relevant projects related to energy, climate, air quality, and more."

ASIA

Karnataka, India

In 2020, Nelson Institute Dean **Paul Robbins** and Nelson graduate student **Vaishnavi Tripuraneni** partnered with researchers in India to publish a study detailing the relationship between biodiversity and coffee farming in Karnataka, an Indian state. The team found that because the Arabica coffee variant has to be grown under thick tree canopies, several avian and mammalian species are drawn to the shaded areas, promoting biodiversity.

AFRICA

Botswana

The Nelson Institute has worked with leaders and wildlife organizations in Botswana in 2017, but over the past few years, **Nathan Schulfer** and Dean **Paul Robbins** have increased the collaboration efforts to help preserve Botswana's environment and biodiversity — especially since more elephants call this country home than anyplace else in the world! This month, Schulfer, Robbins, and other UW delegates are headed back to Botswana to share conservation knowledge and explore further collaboration opportunities.

AUSTRALIA

The Nelson Institute's Center for Climatic Research director **Michael Notaro** has done extensive research on Australia's monsoon season, contributing to six papers from 2011–20. His most recent research on monsoons focuses on how both terrestrial (vegetation and soil moisture) and oceanic forces during monsoon season impact the climate in regions of Australia. Notaro and his team have also used regional climate modeling technologies to identify and analyze land surface feedbacks on the Australian monsoon system.

Read more about these projects in an extended online version.

Science Hall: A History

As UW–Madison celebrates a major milestone, we look back at the history of the building we call home.

By Chelsea Rademacher

Science Hall is a building that bares its soul, says Daniel Einstein, historic and cultural resources manager at UW–Madison and graduate of the Nelson Institute. "If one assumes a metaphor of the human body, we can see the skeletal structure, we can see the circulatory system, we can see the respiration occurring," he elaborates. Science Hall's innards aren't hidden by drop ceilings or modern paneling; looking up, one can see its steel skeleton and patchworked piping, updated and repaired bit-by-bit over the years.

If Science Hall bares its soul, so, too, does it bare its history. On a historic tour of the building, Einstein is ripe with metaphors. From floor scratches to mismatched paint, the building is, as Einstein explains, a palimpsest. A palimpsest is an early form of writing material — say an animal hide or a tablet — that would be used and reused, often resulting in old writings appearing faintly behind new ones. In other words, something where both the past and present are visible in the same space. If you pay attention, you can glimpse into Science Hall's history everywhere you look.

This month, the University of Wisconsin–Madison is kicking off a yearlong celebration of its 175th birthday. The Nelson Institute is proud to have been a part of that history for 53 years (and counting!), so to participate in the celebration, we decided to pay homage to Science Hall, the building that's been our home since day one — and that's been an icon on the UW campus since it was built. Come along for the journey as we examine Science Hall's history by looking at its present.

Oh, Oh, Oh, I'm on Fire

The Science Hall that all living alumni know is actually Science Hall 2.0. The original building opened in 1877 — 29 years after the university was established, 28 years after the first classes met, and 26 years after the first campus building, North Hall, opened. But the original Science Hall was only around for seven years. "Then what happened? It burned, and in that fire, a lot of important research material and libraries were lost," Einstein explains. Since Science Hall housed nearly every scientific department on campus, university leadership was eager to replace it … but with a less flammable option. In 1887, the new Science Hall opened in the footprint of the original. To this day, Science Hall remains the only university building to have been completely lost to a fire.

Photos courtesy of UW Archives S10785 (top), S10790 (bottom)

Frames of Steel

When the new Science Hall opened, it made history. In their quest for a fireproof structure, the building's engineers opted for a relatively new technology: structural steel. In fact, Science Hall is the oldest, still-standing building to have used steel as its primary structural material. So when Einstein talks about seeing the building's skeletal structure, he's talking about one that's almost entirely made of steel (plus a little bit of iron for good measure). In the building's attic, some of these joints are on full display. Because steel was so new, the tools to properly cut and shape it didn't exist yet. "They would get these large steel beams to the work site, and if they needed to shorten it," Einstein says, "they would drill through the steel and then bend it until it broke."

Photo by Chelsea Rademacher

Hit a Wall

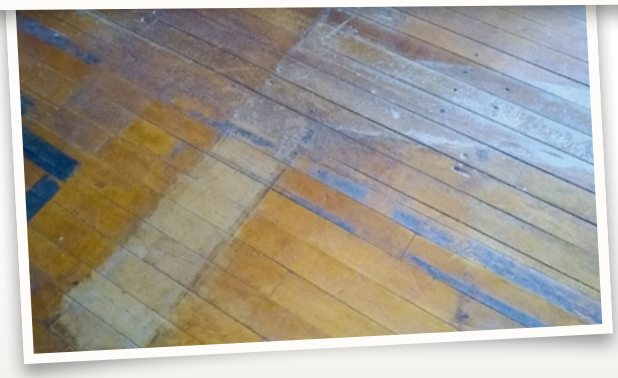
Like its iconic neighbor, the Red Gym, Science Hall was built in a Romanesque revival style. The two buildings share a castle-like exterior, high ceilings and arched doorways, and an extensive use of terracotta brick throughout. Many UW alumni are familiar with the brick walls of Science Hall's upper floors, as they've long been used by graduating seniors to leave their mark — literally — on the university. As you climb the stairs from the first floor to the fourth floor, you'll notice a switch from brightly painted brick to raw, exposed brick walls. This is one of Einstein's palimpsests: "When the building was first constructed, there was no paint on the walls," Einstein says. "It was all clay tile terracotta in natural form, which is to say, dark."

Photo by Brian Huynh, University Communications

Photo by Bryce Richter, University Communications. Below: Photo courtesy of UW Archives S10792

Walking on Broken Glass

"I think one of the most delightful features of the building is something that a lot of people don't necessarily notice," Einstein says, pointing to the original stained-glass window above the main entrance. "Unfortunately, it's falling apart. If you look at it closely, you can see that it's bowing." For more than a decade, Einstein has been leading the charge to get a conservation effort going for the window, but so far, the only solution has been to case the window in plexiglass so that if (or "when," Einstein warns) the original glass breaks, it'll be caught in the plexiglass and won't shatter to the ground.



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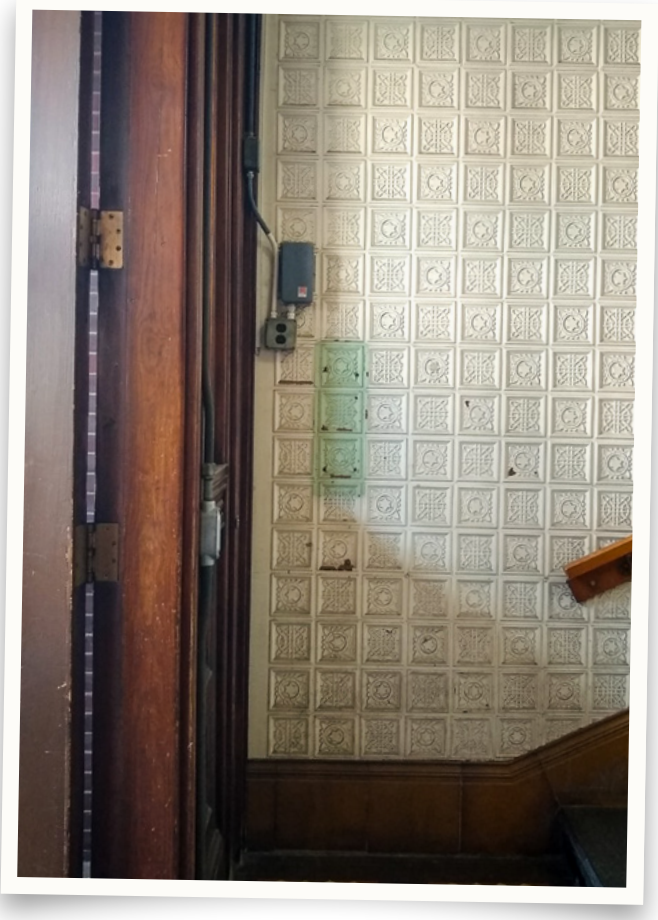
If you've walked through the front doors of Science Hall, you've likely walked right past a palimpsest. Just inside, to the left of the front doors at the bottom of the stairs, is a mint green rectangle that stands out from the rest of the cream-colored wall. "It's about two feet tall, about 12 inches wide," Einstein points out. "Can anybody think of what may have caused that layering of paint?" It was a payphone. At some pre-payphone point, the entryway walls must have all been painted mint green. But when it came time to repaint, rather than remove the payphone to paint behind it, the new color was painted around it, leaving the ghost of an old technology when the payphone was ultimately removed.



Floor Fossils

One of Science Hall's original tenants was what we know today as the University of Wisconsin Geology Museum. Home of impressive collections, including a Boaz mastodon skeleton, the museum resided on the third floor of the south wing until it moved into Weeks Hall in 1981. The former museum space is now a student lounge and offices for the Nelson Institute's Center for Culture, History, and Environment, but look down at the hardwood floor and you'll see the faded, scratched-up outlines of where the museum's collections once stood.

Men work in a College of Engineering drafting room in Science Hall. Photo courtesy of UW Archives S08263.

The fourth floor – or attic – of Science Hall housed the anatomy department for many years. Photo courtesy of UW Archives S10795.

We Who Remain

"This is where it all started," says Einstein. When then-president John Bascom and the Board of Regents requested funding for the first Science Hall, they did so to accommodate the rapidly growing student population. "A Hall of natural science," the 1874 report stated. "This, as it seems to us, is just now the one great desideratum of the University." Once it was built (and then rebuilt), Science Hall became home to almost every science-based department. "Many, many departments had their beginnings in this building," Einstein explains. "As they expanded, they got their own buildings" — and many of those buildings were each larger than the whole of Science Hall. Engineering moved out in 1901, followed by botany in 1910 (to Birge Hall), physics in 1917 (to Sterling Hall), and the medical school in 1928. The next exodus started a few decades later: meteorology went to the Atmospheric, Oceanic, and Space Sciences Building in 1968; geology moved into Weeks Hall in 1974 (followed by the Geology Museum in 1981), and lastly, the Department of Chican@ and Latin@ Studies left for Ingraham Hall in 1995. So, who's left? The Nelson Institute and the Department of Geography (and the UW Cartography Lab) are the only two who remain, surely leaving their own palimpsests on the building for future generations to come.

Women work in a Science Hall biology laboratory, the space that is now occupied by the cartography library. Photo courtesy of UW Archives S11729

Art for All

UniverCity Year projects propel Wisconsin Rapids toward a public arts culture.

By Abigail Becker, UniverCity Alliance

Demitz Park. Photos by City of Wisconsin Rapids (2)

Walking around Wisconsin Rapids, residents might notice music notes lining a fence, a bike rack shaped like a guitar, or a colorful mural on the side of a building. These public art installations, which are now all documented in a digital public art inventory, create a sense of place, foster vibrancy, and inspire the community. Carrie Edmondson, associate planner for Wisconsin Rapids, hopes the online inventory will pave the way for more public art projects in the city.

"The inventory reminds everybody that public art has really been a priority for a long time, and there's some really good public art that is already here," Edmondson said. "It brings that to the forefront. Public art has historically been something that we've prioritized in different ways."

The digital inventory and a strategic plan that guides the development and installation of creative public art projects throughout Wisconsin Rapids are new initiatives that grew out of the city's partnership with UniverCity Year (UCY) from 2019–22.

Wisconsin Rapids staff were able to build off of the groundwork laid by University of Wisconsin–Madison and Ripon College students, which included stakeholder engagement, a community survey, and a final Policy Support for Public Art document.

"The UniverCity Year students conducted a survey and did an inventory of our arts and recommended that a strategic plan be created," community development director Kyle Kearns said during a city council meeting on February 21, 2023. "We took it to the next step."

> *"Our biggest goal is to make our community more welcoming and inclusive, and one of those ways is placemaking and public art."*
>
> — Emily Kent

In 2022, the city began the strategic planning process with arts and cultural stakeholders, held a public workshop, and launched a survey before finalizing the plan early this year. Now, the Public Art and Creative Placemaking Plan and digital inventory are housed on the Creative Placemaking page on the city's website. "The UniverCity work helped us to better identify goals and

next steps," Edmondson said. "It has been great to be a part of continuing the momentum."

This is UniverCity Year's goal, says Gavin Luter, managing director of UCY's umbrella program, UniverCity Alliance: "Get cities to identify goals that advance community prosperity, gather community stakeholders, work on projects that could advance those goals, and have these projects assisted by students with faculty oversight," he said. "We also showed that UniverCity Year could effectively partner with other higher education institutions," Luter added. "Mark this down as a major win!"

Create Wisconsin, the state's cultural development organization, also supported the partnership. "It's impressive that Wisconsin Rapids has put energy and resources toward developing its creative economy, workforce, and sense of place," said Create Wisconsin director Anne Katz. "As the post-pandemic world comes into view and every community must reimagine and revitalize itself, Wisconsin Rapids is a model for public-private cooperation and partnership united for a common goal — to make the community a great place to live, work, and play — for all."

Nash Block Park includes these pagoda bells, which are interactive musical instruments.

Emily Kent, chair of the South Wood County Cultural Coalition, said the city held additional focus groups after receiving the report to engage with underrepresented community groups. This effort led to the South Wood County Cultural Coalition, which now has 32 coalition members from 19 local organizations.

Screenshot of public art and creative placemaking map in Wisconsin Rapids.

The city held a cultural leadership roundtable and invited organizational leaders and elected officials. The coalition will then hold a large public meeting about its work. "We're here to create networks, provide research, find out what is needed and make suggestions, and help people along the way," Kent said.

"Launching-off Point"

As Wisconsin Rapids moves forward, Edmondson hopes to assemble a smaller stakeholder group to lead priorities identified in the placemaking plan. For example, this group could create a downtown walking tour organized around public art.

In addition to these public art initiatives moving forward, Wisconsin Rapids has implemented a cultural initiative that was developed in partnership with Bolz Center for Arts Administration students.

This work intersects with public art and placemaking. "Our biggest goal is to make our community more welcoming and inclusive, and one of those ways is placemaking and public art," Kent said. "If you don't see yourself represented here, you ask, 'Where's my place here?' " She added, "We see a lot about the paper mills and the white men who opened those paper mills, which is an important part of our story, but it's not the only part of our story."

Working with UCY provided a "launching-off point" for

Angela Richardson

Mollie Oblinger

the city to start the work that led to the South Wood County Cultural Coalition. "This was something that a lot of people were interested in for a long time. Working with the student group was just what we needed to get us rolling," Kent said.

"Learning Exchange"

Though the students' recommendations have been adapted, Kent said the city gained useful information, new ideas, and a different perspective. She described the experience as a "learning exchange," with students and community members learning from each other.

Angela Richardson, project coordinator for the Bolz Center for Arts Administration, said the students gained real-world experience and insights into their professional capabilities and prospective careers. "It's wonderful to watch students take what they're learning in the classroom, apply it to the challenges presented, and contribute in meaningful ways to communities' futures," Richardson said. "The UniverCity Year program makes that kind of impact possible."

"We make the Wisconsin Idea come to life and make it a two-way street."

— Gavin Luter

Mollie Oblinger, professor of art at Ripon College, echoed Richardson and said "taking [students] out of the classroom and the textbook" allowed her arts management class to better understand public art and its roles in communities. Her course focused on creating a public arts inventory for Wisconsin Rapids. "The students really felt like they were doing work that was valuable and that would be realized," Oblinger said.

As an instructor, Oblinger said the UCY experience motivated her to explore how to further include communities in her art courses. This year, she is doing a community project in Ripon with students and the Ripon Senior Activity Center.

WISCONSIN RAPIDS

Ripon College President Victoria Folse said the work conducted by UCY, Oblinger, and Ripon College students is a "perfect pairing of academic theory and practical application."

"This project serves as a model for productive and collaborative work between the College and the greater Wisconsin community," Folse said. "As a fine arts enthusiast, I'm also eager to increase accessible art to the larger Wisconsin community and proud of the role Ripon College played within achieving that goal."

During the UCY partnership, Oblinger's students connected with the Bolz Center graduate students, demonstrating another layer of learning across academic institutions and with community members. The partnership between these courses and Wisconsin Rapids through UCY "honors the Wisconsin Idea by connecting UW students with community leaders throughout the state to work together on civic initiatives," Richardson said.

Luter underscored that both the UW–Madison campus and Wisconsin communities benefit by learning from each other. UW–Madison faculty, staff, and students benefit from on-the-ground learning, and communities access new ideas, research, and other information that help them move toward their goals. "We make the Wisconsin Idea come to life and make it a two-way street," Luter said.

Top: For decades, Wisconsin Rapids was known for its paper-mill industry. That history is honored through this mural at Legion Park. Center: The city's medical history is depicted on a mural outside of the post office. At right: On Grand Avenue, passersby will see an artist's rendition of the town's history. Photos courtesy of Wisconsin Rapids (3)

Moving Forward on Climate Action

After its initial assessment report, the Wisconsin Initiative on Climate Change Impacts looks to the future.

By Dea Larsen Converse,
Wisconsin Initiative on Climate Change Impacts

Photo by Finn Ryan

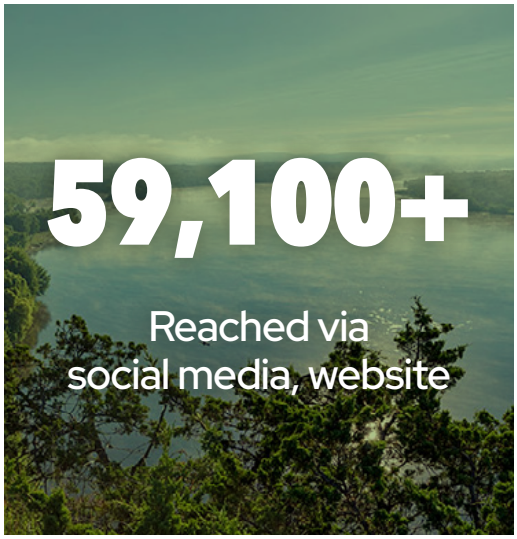
Nearly 20 years ago, a group of scientists in Wisconsin knew all too well from their research that climate change was impacting natural resources, communities, and the built environment throughout the state. Yet, they saw little urgency among decision-makers to make Wisconsin more climate resilient.

In 2007, a very promising thing happened. The Wisconsin Initiative on Climate Change Impacts (WICCI) formed as a partnership between UW–Madison's Nelson Institute for Environmental Studies and the Wisconsin Department of Natural Resources and created working groups to evaluate Wisconsin's changing climate. WICCI published its first climate assessment report in 2011.

Fast forward to 2020. After a period of transition, the group was revived with new leadership and expanded its working groups. While continuing to be a voluntary effort, a donation to the Natural Resources Foundation of Wisconsin allowed the group to contribute ideas to the Governor's Task Force on Climate Change and publish an updated *2021 Assessment Report: Wisconsin's Changing Climate*, targeting decision-makers and featuring stories of climate impacts.

In the 10 years since the 2011 report, new data show continued warming, increases in rain and snow, and more frequent extreme events. The last two decades have been the warmest on record, and the past decade has been the wettest. By mid-century, the report projects Wisconsin will be about four to six degrees warmer on average compared to our baseline climate conditions at the end of the 20th century (our recent past). Each additional degree of warming will intensify the climate impacts experienced in Wisconsin, detailed in a series available on the WICCI website. An education grant from the Wisconsin Coastal Management Program enabled WICCI to expand outreach about the report, leading to new collaborations and climate information distributed to venues reaching over 430,000 stakeholders.

Next steps for WICCI are to publish an updated report in 2026. WICCI is also continuing to foster climate solutions by researching better geospatial data integration, assessing climate migration, identifying climate-sensitive agricultural practices, collaborating on standards



to help the built environment withstand a wetter environment, and promoting practices to help native plants, wildlife, and natural communities adapt to the rapidly changing climate. WICCI's efforts underscore calls for accelerating actions to reduce greenhouse gas emissions to reduce the worst consequences of climate change. There is hope for the future, but it's up to us.

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. Gifts to the WICCI Program Fund provide general, discretionary program support and enhance and expand WICCI's teaching, research, and public service roles. Gifts also support partnership-building activities, including faculty, staff, and student recruitment, retention, and morale.

This article ends a series highlighting the working groups as noted in the 2021 assessment report. Previous stories are available here.

Meet Chris Kucharik

How an interdisciplinary background has opened doors for this UW–Madison professor.

By Laila Smith

Chris Kucharik is an expert in atmospheric sciences, land management, and ecology. While studying at UW–Madison to earn his PhD in atmospheric and oceanic sciences, Kucharik worked with Professor John Norman on the Boreal Ecosystem-Atmosphere Study (BOREAS), which investigated how carbon, water, and energy were exchanged between forests and the atmosphere and developed remote sensing instrumentation to help observe and model these processes. Later in his post-doctoral research, Kucharik worked with John Foley, director emeritus of the Nelson Institute's Center for Sustainability and the Global Environment (SAGE), on representing soil biogeochemistry in a numerical ecosystem model, the Integrated Biosphere Simulator (IBIS), that Foley created. "I didn't do that kind of modeling and didn't have much knowledge of what it was," Kucharik admits, "but it sounded fascinating to me." After initiating carbon cycling field work to support the IBIS modeling, Kucharik continued working with Foley. Eventually, both scientists were in the original group that became SAGE.

Today, Kucharik maintains his appointment with the Nelson Institute. He currently works in the Department of Plant and Agroecosystem Sciences in the College of Agricultural and Life Sciences, where he's working on two projects that make good use of his interdisciplinary background.

How did you get involved in land management and ecosystem ecology?

When I started my work with Jon Foley, we were modeling vegetation on a global scale, but were only including trees, shrubs and grasses. I wondered why we weren't including managed agriculture in this model. At this time, dynamic ecosystem models were in their infancy, and crop models didn't necessarily represent coupled carbon, water, and energy cycling. After discussing ideas with Jon, I created an offshoot of his IBIS model called Agro-IBIS, which I still use today.

How do you benefit from having an interdisciplinary background?

I understand the complete picture of how carbon, water, energy, and nutrients cycle through ecosystems. My weather and climate expertise has served me well in my home department of agronomy because I understand forecast models and how climate changes may impact agriculture down to the nitty-gritty details. Overall, it seems like a very natural and comfortable fit having knowledge about both fields.

Tell me about your weather station project.

My team is creating [a mesonet, or] a dense network of weather stations that provide high temporal resolution weather data and observations. Currently, Wisconsin only has 14 mesonet stations in the state, but the goal is to increase the network to 90 stations over the next four years. We're aiming to have the stations provide observations about every five

Meteorological instrumentation in a potato field at Isherwood Family Farms. Photos by Elizabeth McNamee, UW–Madison Department of Agronomy (2)

Kucharik helping during installation of a lysimeter in the Wisconsin Central Sands at Isherwood Farms.

minutes, which will be made accessible on a website. The mesonets provide this information for anybody to use, so it would support farmers, crop consultants, K-12 education, and various other groups. Once the expanded stations start collecting more data, we'd like to develop decision-making support tools, particularly for agriculture. These will better help people manage planting, harvesting, fertilization, irrigation, and more.

"If you had told me 25 years ago that I'd eventually be working in an agronomy department, I would have replied, 'What's agronomy?' "

— Chris Kucharik

Are you working on any other projects right now?
Recently, a team that I'm part of was notified that our Research Forward proposal for agrivoltaics was funded, so we can study solar farms and the integration of solar panels on agricultural land. There's several questions around what kind of an impact large solar arrays might have on ecosystems and the landscape. Do they create heat islands or influence how water is making its way into the soil? Can we have grasses growing and animals grazing on this land? Will crop yields be impacted by having a physical structure interspersed with plant growth? Everybody's so interested in renewable energy, but at the same time wondering how it will affect our farms and landscapes, making it an attractive topic for a lot of folks to be drawn to.

What's the coolest part of your job?
Not only the coolest, but also the most rewarding part is mentoring and guiding students. When I step away from academia someday, I'll miss the excitement and satisfaction of seeing them reach their goals, helping them see different perspectives, and learning from them as they're doing their own research. I definitely don't take any of those things for granted.

What's one piece of advice you give to students?
Career paths can meander quite a bit. You can't predict what other things might interest you along the way. I went into college thinking I was going to be a meteorologist, and if you had told me 25 years ago that I'd eventually be working in an agronomy department, I would have replied, "What's agronomy?" I'm pretty thankful that I was interested in ecology, biology, and land management, because it's given me a pretty rewarding career. You never know where life will take you. I tell a lot of graduate students that what they initially study is just one thing, and it doesn't cast them in stone forever.

Christian Andresen (left) prepares a LIDAR-equipped drone for remote sensing. Photo courtesy of Christian Andersen (3)

Awarding Arctic Research

Christian Andresen will measure the impact of climate change on carbon emissions from Arctic wetlands.

By Elise Mahon

When Christian Andresen was just an undergraduate, he had the opportunity to travel to northern Alaska to conduct field research in the Arctic. The trip changed the trajectory of his academic career and he's continued conducting field research there for the past 15 years. Now, thanks to funding from an NSF Career award, he can help pass along this passion by training the next generation of scientists and geographers to study arctic processes and patterns.

"Getting involved in Arctic science as an undergrad — especially with field activities — it was a life-changing moment."

— Christian Andresen

Andresen, an assistant professor of Earth system geography in the College of Letters and Sciences and researcher in the Nelson Institute's Center for Climatic Research, is using cutting-edge technologies like drones, gas-monitoring systems, and virtual reality to measure and visualize the effects of climate change on carbon emissions from arctic wetland ponds and the potential feedbacks to global climate.

As the climate warms, the ice season in the Arctic shortens and more permafrost thaws, releasing more nutrients into the ecosystem than before. The combination of warmer temperatures, longer growing seasons and more nutrients allows for the increased growth of aquatic grasses along the edges of these arctic ponds.

Unfortunately, the grasses that are thriving in this warmer environment are also acting as what Andresen describes as "methane straws." The hollow inner structures of the aquatic grasses keep them afloat in the ponds, but it also allows

the grass to funnel methane, a potent greenhouse gas, from the soil below into the atmosphere.

"Even though these ponds and wetlands only cover about 10 percent of the landscape in the Arctic, they account for about two-thirds of the methane emissions," Andresen says. "So, you have this 10 percent of the landscape that acts as methane hotspots."

Christian Andersen

Since methane is 30 times stronger a greenhouse gas than carbon dioxide, it's important to understand just how much methane these plants and ponds are funneling into the atmosphere. Understanding these dynamics will allow them to eventually use the data to improve global climate models.

Over the next five years, Andresen will use the funds from the award to continue this research with students and develop several modes of education and outreach about Earth geography research in the Arctic. One of the main motivations behind the project is to diversify the field by providing pathways to research for undergraduates from minority communities through an initiative called Polar Badgers.

An aerial view of Arctic wetlands, captured by a drone.

"If we don't involve minorities at that stage, we're not letting this big part of the U.S. population make science questions," Andresen said. "We're talking about how society will confront and act on climate change and environmental justice; we're talking about inclusion. This program aims to pull those communities into Arctic research and train the future U.S. demographics to design and conduct science that will provide more diverse research."

Undergraduates in the Polar Badgers group will travel to Alaska, design their own experiments, collect and analyze their own data, and present their findings to local symposiums and national conferences. They'll also be trained to use novel technologies like drones, artificial intelligence, photogrammetry software, and remote sensing methods like LIDAR, which Andresen believes represent the future of science.

"For me, getting involved in Arctic science as an undergrad — especially with field activities — it was a life-changing moment that would dictate my path into arctic research," he says. "I wouldn't be here if it wasn't for those opportunities. So, I want to continue that and develop this research program of Polar Badgers to continue these opportunities for minorities."

Students in the geography department will also help design a photo book that highlights the Arctic landscape, Indigenous communities in the region and the threats of climate change they face. Another important aspect of the project will include outreach to Indigenous groups in Alaska through summer camp activities so students can share their research and get feedback from Native groups living with the realities of these climate changes every day.

This story was originally published by the College of Letters and Science.

From the Office of Sustainability

A monthly update from faculty, staff, and students in the Office of Sustainability – Education and Research. This month's column is from interim director Matthew Ginder-Vogel.

Groundwater is a critical source of drinking water worldwide, with an estimated 2.5 billion people relying solely on groundwater for daily water needs. More than two thirds of Wisconsin's population relies on groundwater at home for drinking water, food preparation, and bathing. Pure, clean groundwater is also vital to Wisconsin's most important industries, including brewing, dairy, and agriculture. Groundwater sustainability is vital to public health, the environment, and the economy. As defined by the United States Geological Survey, groundwater's development and use must meet both current and future beneficial uses, without causing unacceptable environmental or socioeconomic consequences. A deep understanding of the factors impacting groundwater quality and quantity is essential to sustainably manage groundwater supplies now and into the future. That understanding has been a central focus of my research at UW–Madison.

Recently, groundwater contamination by per- and polyfluorinated substances (PFAS) has dominated the news. PFAS are hazardous to human health and are often referred to as "forever chemicals" because they do not readily break down in the environment. These chemicals are used to make a wide variety of products resistant to water, grease, oil, and stains, including clothing, furniture, food packaging, and nonstick cooking surfaces. They are also found in firefighting foam, which is a major source of environmental PFAS contamination.

PFAS and other anthropogenic groundwater contaminants (e.g., nitrate and bacteria) have led municipalities to obtain groundwater from deep geological formations, where ancient groundwater has been largely isolated from human activities. However, due to the length of time that this water has interacted with aquifer rocks, contamination by geogenic (naturally occuring) contaminants is common. Common geogenic contaminants of concern include arsenic, strontium, uranium, and radium. Recent research by my group revealed increasing levels of radium in untreated groundwater throughout the state.

Although groundwater may be hidden, the secret to its sustainability is not. There are individual and collective actions that we can take to ensure the availability of high quality groundwater in the future. The cost of groundwater pollution prevention is negligible when compared to having to rebuild a single public water source or remediate groundwater. At home, you can help prevent groundwater contamination by properly storing and disposing of chemicals and fuels and minimizing your use of chemicals. If you have an on-site septic system, ensure that it is routinely pumped and inspected, and have on-site wells routinely tested and inspected. As a society, we can protect this vital resource by improving groundwater monitoring, preventing groundwater pollution, and implementing legally binding groundwater protection measures as part of planning and land use controls. I encourage everyone to become educated about your water source and potential threats to its sustainability, including overuse and contamination.

Director's Cut

A quarterly update from Will Brockliss, director of the Center for Culture, History, and Environment

It's been an exciting year for CHE, the Center for Culture, History, and Environment! In my first year as director, I've been struck in particular by the dynamism and diversity of the CHE community and by its vibrant interactions with others, both at the UW and elsewhere.

This past year, we've welcomed new associates from multiple departments and units across campus, including Jagravi Dave (English), Nicolás Rueda Rey (history), Tania Kolarik (art history), Sahil Sasidharan (geography), Nguyen Vuong (agricultural and applied economics), and Marino Miranda Noriega (curriculum and instruction).

The strength of the CHE community was very much in evidence on our annual place-based workshop (May 19-21), which this year focused on the "rail and trail ecologies of Wisconsin." Eric Carson offered geological notes on fossils at the port of Milwaukee and on the rock strata of the Elroy-Sparta bike trail. Reba Luiken, director of Allen Centennial Garden, shared her botanical knowledge with those curious about the plants we encountered on our trails. Our place-based media team, James Spartz and Sarli Mercado, guided our verbal and visual responses to the sites that we visited. Justin Hougham's expertise in the wild spaces of Wisconsin and how to negotiate them was indispensable.

Along the way, we also heard from experts from other institutions. At the intersection of West Washington Avenue and Regent Street, Scott Lothes, president and executive director of Madison's Center for Railroad Photography and Art, brought to life the original bustling, multi-track rail intersection. He also presented on railroad history at Union South, where we were joined via zoom by Miriam Thaggert of SUNY Buffalo and Gordon Chang of Stanford University. Thaggert introduced us to the work of women of color in and around the railroad stations of the southern US. Chang discussed human and environmental factors in the work of Chinese laborers on the transcontinental railroad. In Milwaukee and La Crosse, we heard from local experts Bobby Tanzilo, managing editor at OnMilwaukee.com; Drake Hokanson, emeritus professor at Winona State University; and former railroad employee Ron Copher.

In the spring semester, my students and I learned a tremendous amount from visitors to the CHE methods course (Envir St 922), which surveys key methodologies in the environmental humanities. A series of experts enriched our consideration of topics as diverse as environmental justice, autoethnography, oral history, counter-cartography, and ecocriticism. The course culminated with visits to Tewakącąk ("Devil's Lake"), the focus of the students' place-based projects. On the first such visit, we were joined by the environmental photographer Tomiko Jones, who guided us in creating cyanotypes of the rocks and flora of Tewakącąk. During our last excursion, Bill Quackenbush, tribal historic preservation officer for the Ho-Chunk Nation introduced us to the deep human history of the site.

CHE thrives as a result of its members and community partners. Join us!

Will Brockliss
Director, Center for Culture, History, and Environment

A New Perspective

The Center for Culture, History, and Environment's annual place-based workshop took to the rails and trails of Wisconsin.

"It gave a sense of being fully immersed in the late afternoon countryside, generating a feeling of nearness to the fields, bluffs, and the Wisconsin River."

— Tessa Archambault

It's 61 degrees — a warm 61 — with mostly sunny skies save for a haze brought down by the Canadian wildfires. Trees are in full bloom, dandelions have turned to fuzz, and the soundtrack of construction sets the mood as a group of Nelson Institute graduate students and staff convene in front of the Motorless Motion bike shop on Madison's West Washington Avenue. They're here for the Center for Culture, History, and Environment (CHE)'s place-based workshop: "The Rail and Trail Ecologies of Wisconsin."

The place-based workshop is an annual event, held since 2007, that takes graduate students and faculty associates out of the classroom and into the field to explore the complex relationships between culture and nature. The started their three-day tour of Wisconsin's rail tracks and bike trails on West Washington Avenue because the space, now occupied by shops and upscale restaurants, used to be the old Milwaukee Road Depot — Madison's main hub for train activity from 1903–71. At the historic intersection, Scott Lothes and Heather Sonntag from the Center for Railroad Photography and Art started the workshop with an in-depth look at the history of not only the space, but the Milwaukee Road line, which in its heyday, spanned 11,252 miles across the Midwest and West.

The group then walked the Southwest Commuter Path, which runs alongside the tracks, to Union South, for an afternoon of guest lectures that covered everything

At left: A retired train lies permanently stationed at Madison's historic train depot, which now houses a bike shop, cafe, and high-end restaurant. Above: Participants of the place-based workshop start their experience with a talk by Scott Lothes (second from right). Photos by Chelsea Rademacher (2)

from Madison's rail history to the role of Black women in the American railroad. Day one concluded with a five-mile walk around Madison's Dudgeon-Monroe neighborhood, mapped out by UW PhD candidate John Canfield.

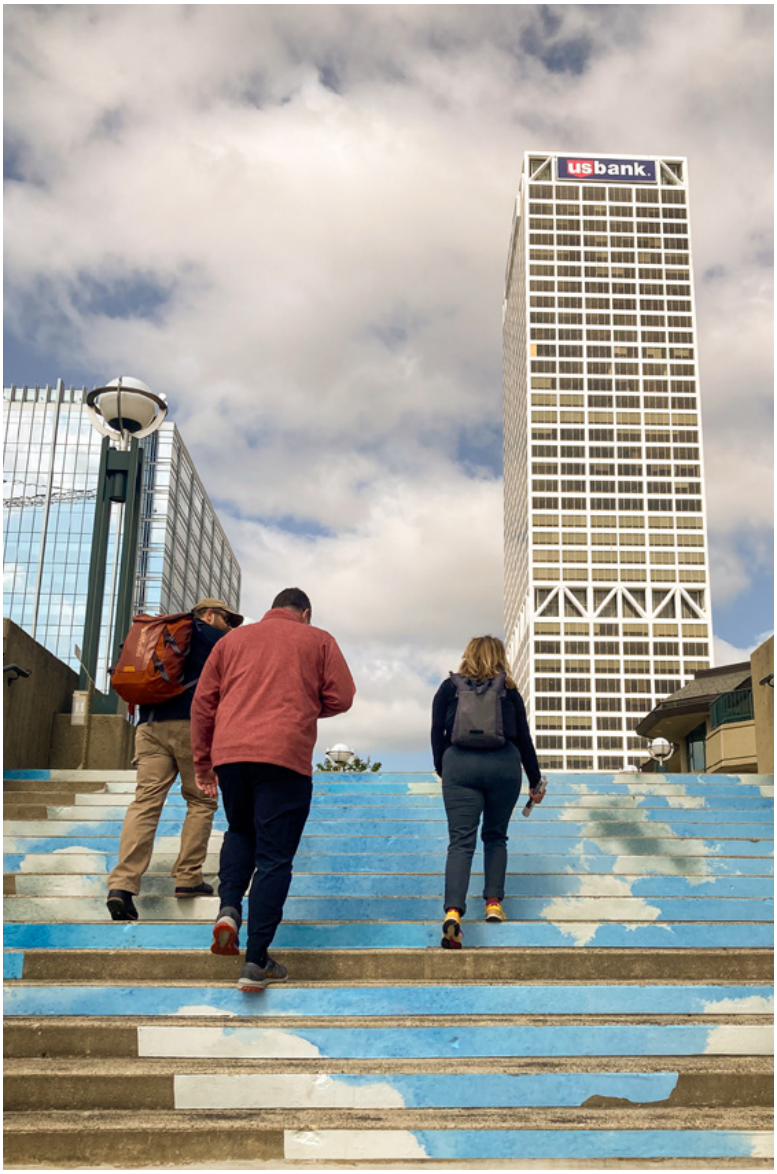
The following day, the group bused from Memorial Union to downtown Milwaukee for a walking tour of historic train sites before boarding the Empire Builder train at the Milwaukee Intermodal Station, which they rode to La Crosse, Wisconsin. The final day of the workshop started with a tour of La Crosse-area railroad sites and culminated in a bike ride along the Elroy-Sparta Trail — a popular biking and walking trail that was converted from a railroad line in 1967.

Throughout the experience, students were asked to capture their experiences and reflections through a variety of media, including photos, videos, poems, and essays. Tessa Archambault, a PhD student who attended the workshop, wrote an essay documenting her experience of the train ride from Milwaukee to La Crosse.

Rail Reflections
By Tessa Archambault

It's not every day you get a fresh perspective on the state you call home. While I'm not sure what I expected to gain from this year's CHE place-based workshop on rail and trail ecologies, that is what I got: a new take on Wisconsin. A short visit to both Milwaukee and La Crosse via train offered the chance to take in the lush and green countryside of late May as well as some of the industrial structures that define some of those landscapes. These included train tracks and tunnels, a swinging rail bridge across the Mississippi, and the urban spaces of downtown Milwaukee, its historic Third Ward, and the stretches of city along the river and shores of Lake Michigan. The rich yet stark contrasts from one place to the next figured prominently throughout the weekend.

Starting out early on both days allowed us to make the most of a compact and full schedule, but it also created space to be present for different periods of the day: bright mornings, weightier afternoons, and one mellow evening sunset. The quality of spring light, shifting throughout the day, accentuated the colors of both the urban and rural scenery as we moved from Madison to Milwaukee to La Crosse and onto the Elroy-Sparta bike trail before venturing back to Madison again. But equally important were modes of transportation: train, bus, bike, streetcar (briefly!), and on foot. They provided opportu-



Day two of the place-based workshop started with a walking tour of Milwaukee. Photo by Tessa Archambault

nities to see and experience these places from unusual angles throughout the weekend. Particularly striking were some of the historic rail structures in Milwaukee as well as the beautiful views from the train ride across southern Wisconsin.

In Milwaukee, an informal walking tour was the ideal way to notice the shifts taking place between old and new, to get a feel for the history of rail transportation here, and to admire some of the city's unique buildings. The Public Service Building, for example, is beautiful to look at from the street. A large and imposing structure, it dates back to 1905 and is an example of Beaux-Arts neoclassical architecture. The unique ornamentation on its façade points to the transitions between different forms of transportation, from horse-drawn carriage to electric streetcar. Taking up a whole city block, the building originally served as the central terminal for the interurban rail system and the headquarters for the Milwaukee Electric Railway and Light Company. Its size and scale combined with the attention given to its architectural design and detail point to the past importance of public rail transportation, before automobiles became a commonplace feature of American life. Although the building was closed that Saturday, we were able to peer in at its famous marble lobby and staircase through the windows.

Thoughts of rail history and the prominence of the railroad carried over into the evening as we made our way from Milwaukee to La Crosse on the

Participants disembark Amtrak's Empire Builder train in La Crosse, Wisconsin. Photos by Will Brockliss (2)

La Crosse's historic rail bridge connects Wisconsin to La Crescent, Minnesota.

Milwaukee's Public Service Building was built to house the Milwaukee Electric Railway and Light Company's offices, as well as serve passengers as a downtown terminal. Photo by Tessa Archambault

On the workshop's third and final day, attendees pedaled along the Elroy-Sparta bike trail to explore how rail lines have been converted to leisure trails. Photo by Will Brockliss

Amtrak's Empire Builder, a line that extends from Chicago all the way to the Pacific Northwest. Having taken trains many times while traveling and living overseas, I found myself repeatedly surprised that this was my first time doing so in the U.S. While it all felt very familiar, this kind of travel is very out of the ordinary for us here, particularly in the Midwest. Even more surprising were the views from the train. The four-hour ride provided plenty of time to take in the long stretches of changing scenery along the way. The train's carriage car was designed specifically for that purpose. Large windows line both sides of the car, extending upwards to allow passengers to gaze out as much as possible, while the seats all face toward the windows rather than lined up in rows facing the exits in the other passenger cars. It gave a sense of being fully immersed in the late afternoon countryside, generating a feeling of nearness to the fields, bluffs, and the Wisconsin River as the train crossed through Wisconsin Dells. While it's perhaps faster to make the trip via car, taking the train, and especially riding in the carriage car, encouraged a sense of wonder about the state's natural beauty that isn't always obvious from I-94. It also generated a feeling of connection to the other passengers on the train, something that doesn't typically happen within the confines of a car.

Although I've lived in Wisconsin for the last five years, I have much more to discover in the state's various histories and landscapes. Doing so through the lens of the railroad offered a different vantage point from the typical things Wisconsin is known for, like long winters and numerous lakes, cheese and Wisconsin Dells waterparks. I look forward to revisiting some of the places we explored over that weekend, and to taking the train the next time I can.

STUDENT SNAPSHOT

Intersecting Interests

Undergraduate student follows her passions to create small scale change within a larger picture.

By Anica Graney

When the leaves would start to change color in the fall and begin to bud in the spring, you could find undergraduate student Savannah Lipinski taking in the views along a University of Wisconsin–Madison Arboretum trail. “I go at least once a week through the arboretum just to watch it all change,” Lipinski said. “It’s one of the coolest things about Madison.”

Lipinski came to UW–Madison from her home state of Colorado — leaving behind the towering mountains for endless bodies of natural water. “I love the lakes and the fact that I can be in a city and go to a big school, but also have places where I can get away and connect with nature,” Lipinski said.

Her connection with nature goes beyond how she spends her free time as she majors in geology and Jewish studies with certificates in environmental studies and physics. With four areas of study, it’s a wonder Lipinski is able to get outside at all. “It’s a lot,” Lipinski said. “But there’s also a lot of overlap.”

For Lipinski, her majors and certificates form an interdisciplinary education experience that combines everything she is passionate about. The geology and physics degrees offer her a deeper understanding of the scientific aspects of the environment — taking away some of that existential dread

Lipinski explores Tzfat, Israel while on a student leadership delegation with Hillel in summer of 2022. Photo by Samantha Angelina

she feels when learning about climate change — while her Jewish and environmental studies degrees provide a humanistic perspective that she can relate to her values as a Jewish person.

The environmental studies certificate is a 15-credit program that offers a unique opportunity for undergraduate students to learn about society's environmental challenges, study environmental science, policy, and humanities, and take part in environmental research, fieldwork, and case studies.

While taking a class with Professor Morgan Robertson, Lipinski learned how to tackle environmental issues on a small scale, which redefined the way she thought about global environmental issues. "It was eye opening for me to understand that it's okay to focus on a really small issue, because that's the only way to make change," Lipinski said. "The issues really boil down to community-based action."

This mindset drives Lipinski in all that she does. "One of the ways you can make change in the world is through whatever niches you're a part of and identify with," Lipinski said. "And the niche that I've chosen to go into is this Jewish perspective on the environment."

"It's okay to focus on a really small issue, because that's the only way to make change."

— Savannah Lipinski

For the past few years, Lipinski has worked as an intern with the UW Hillel Foundation, an organization that supports the local Jewish community. She also conducts geology research with the Wisconsin Geological and Natural History Survey and has been a Dean's Ambassador for the College of Letters and Science, where she joins a group of students who meet monthly with Dean Eric Wilcots and discuss how to make the school a better and more welcoming place for students.

With a full plate of classes and work, Lipinski is also part of the Community Environmental Scholars Program (CESP), an opportunity designed for students who want to link their passion for the environment with their commitment to community. The program partners undergraduate students with community-based environmental organizations where they can obtain hands-on practice while fostering some good in the world.

Lipinski harvests raspberries at a local orchard in southern Wisconsin.

Lipinski stumbled upon CESP as she was browsing the Wisconsin Scholarship Hub for environmental-related scholarships. With the deadline just around the corner, it was the perfect time to apply for CESP, and she went for it — which she's glad she did. CESP helped foster many connections with people who share her passions and taught her new skills like communicating science in a coherent and professional way.

Through her CESP volunteering project, Lipinski worked with Hillel to create a sustainability guide for Hillels across the world as well as implement environmentally focused programming. "Getting to marry those two things that I'm really passionate about to make meaningful change was a really cool experience I got to have," Lipinski said.

Having just graduated in May, Lipinski plans to go to rabbinical school where she hopes to eventually work for a Jewish environmental nonprofit. Like her experience with CESP, Lipinski aims to merge her environmental and Jewish interests together in her future career and advocates for other students to do the same with their passions. "I think if you desire to do something, then it's worth putting yourself out there and trying to make it happen," Lipinski said.

Learn more about the environmental studies certificate and how you can support the program.

Continuing a Legacy

EOI graduate student blazes his own path while sticking to his family's farming heritage.

By Anica Graney

A snapshot of Eddinger piloting his drone, from his drone's perspective. Photos by Jesse Eddinger (3)

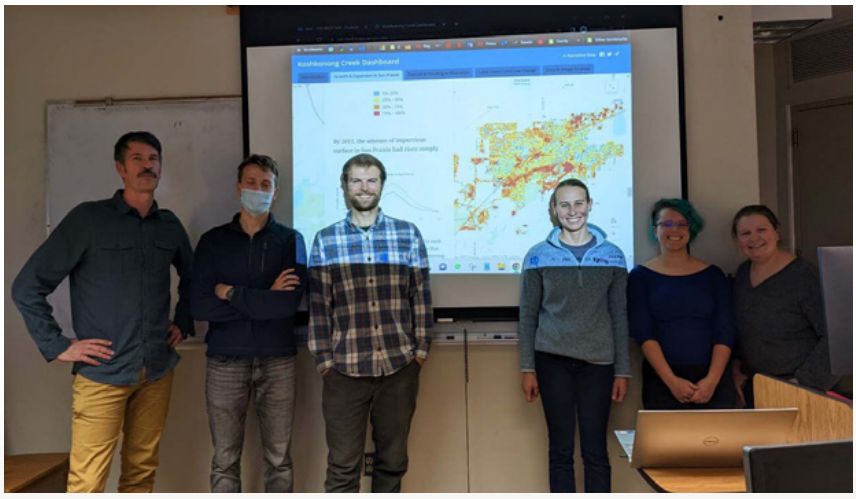
Being out in nature and working with the land is within graduate student Jesse Eddinger's genes. Both sides of his family come from farming backgrounds, and Eddinger was raised on the same land his family farmed for generations. Though he doesn't consider himself a farmer, Eddinger hopes to continue his family's legacy of working the land in his own way, through earning his master's degree in environmental observation and informatics (EOI) at the Nelson Institute.

From rural Pennsylvania, Eddinger discovered his passion for environmental science and agriculture in high school after taking AP environmental science. "And I knew that's what I wanted to do with the rest of my life," Eddinger said. He applied to Juniata College, a liberal arts college a few hours from his hometown, and earned a degree in environmental science. There, he spent his summers working as an agricultural consultant, gaining experience working with farmers, developing nutrient management plans, and flying drones.

Eddinger joined the Conservation Corps in Nevada after graduation, where he planned to spend his gap year between undergraduate and graduate programs. The gap year turned into a few years due to the COVID-19 pandemic, but Eddinger still knew he wanted to go back to school. He began researching graduate programs across the country and found the Nelson Institute.

The Nelson Institute's environmental observation and informatics (EOI) program is a 15-month MS degree that prepares students for a career at the intersection of the geospatial and environmental fields. Students learn digital image analysis and interpretation, geospatial data science, and programming, along with the policy and ethics of observational data.

After speaking with EOI program coordinator Sarah Graves, Eddinger applied for the EOI program and said that Graves' support was ultimately the deciding factor of where he would go. "It really aligned with my goals



Eddinger (third from left) presents on the Koshkonong Creek with his fellow EOI classmates.

in conservation and agriculture," Eddinger said. "Even though it's not an ag-focused program, everyone has been very good about helping me meet the goals I have for my conservation career."

Over the past year, Eddinger's classes have offered hands-on projects to help build his skillset. From analyzing satellite imagery to learning how to code, he was even able to get out into the field and map water blockages along the Koshkonong Creek. He specifically enjoyed his classes with associate professors Mutlu Ozdogan and Annemarie Schneider whose courses introduced him to various remote sensing techniques and professionals currently working in the field.

Eddinger will finish out the EOI program with the United States Department of Agriculture (USDA) as part of his leadership project, the distance-learning portion of the EOI program that connects students with organizations to set up and execute a plan based on the student's interests and experience. Eddinger will work in the Badgerlands, south of Baraboo, Wisconsin, where he will study how planting native prairie strips can help increase plant renewal — a project he is more than enthusiastic about starting. "As soon as I heard what the USDA was doing, I knew I wanted to be in on that," Eddinger said.

"The EOI program aligned with my goals in conservation and agriculture. Everyone has been very good about helping me meet the goals I have for my conservation career."

— Jesse Eddinger

Eddinger (left) while working in the Conservation Corps after graduating from his undergraduate studies.

Eddinger hopes to stay in the Madison area upon graduation and apply his knowledge of remote sensing and conservation to the agricultural field. He reflects back on his EOI experience with the assurance that his skillset will take him far. "This was a really good program to reinforce the necessary skills I need for the careers that I will want to pursue," Eddinger said.

Learn more about the environmental observation and informatics MS and how you can support the program.

Alpha Advocate

Francisco Santiago-Ávila combines advocacy, science, and faith to give a voice to the voiceless – predatory carnivores.

By Chelsea Rademacher

As a kid, Francisco Santiago-Ávila had a plan to become a priest. Growing up in Puerto Rico to a Catholic family, his faith was an important part of his upbringing — particularly the values of showing compassion to the less fortunate and being a voice for the voiceless. Just a few decades later, Santiago-Ávila lives those values in his daily work, though the job title is different than he'd planned: he's a conservation manager and carnivore coexistence advocate who helps humans learn compassion for coyotes, wolves, and other carnivores — and uses his own voice to advocate for animals.

Santiago-Ávila's role involves wearing many hats. For starters, he's operating within two independent organizations — Project Coyote and the Rewilding Institute — that have recently come together for the Heartland Rewilding Initiative. "It's an initiative that brings the focus and the programs of these organizations to the Midwest, which is often an area that gets neglected in wildlife protection and wildlife conservation initiatives," he says. The Midwest poses novel challenges to carnivores, including coyotes, wolves, and bears, so coexistence strategies require extra effort. Simply because predators have less space, coexistence with human communities is harder to achieve. "You even see it on a map when you look at the Midwest compared with the West and the East," Santiago-Ávila explains. "You see a scarcity of protected areas and national parks." Plus, much of the open land in the Midwest is dominated by agriculture, which raises the stakes for many of the humans whose cooperation the initiative needs.

As the initiative's conservation manager, Santiago-Ávila develops research programs, advocates policies to decision-makers, and translates science to the public. One scientific fact that guides much of his work is the research showing how, contrary to popular belief, lethal methods of control — trapping and killing— don't really work. "Actually, that type of lethal intervention often leads to more conflicts, so you aren't really resolving the issue," he says. "It's more of a Band-Aid™, but a Band-Aid™ that kills others. We don't want that to happen."

One might think — and hope — that these lethal methods of "control" only happen as a last resort, such as in immediate defense of your or your loved ones' lives. But Santiago-Ávila's demeanor changes when he talks about another lethal outcome: killing for sport. "Wildlife killing contests are pervasive in the Midwest, but people don't really know about them," he says. He works to inform communities about these activities and advocates for policies that would prohibit them. "When you let them know that there are over 40 that happen annually in Wisconsin, or over 20 that happen annually in Illinois, they are just floored ... even when we go and inform members of, for example, local or state wildlife advocacy organizations, they have no idea that this is happening."

In addition to his work with Project Coyote and the Rewilding Institute, Santiago-Ávila is a founding member, research fellow, and clerk of the board at PAN Works, a think tank focused on ethics and animal well-being. There, he leads an initiative on multispecies justice, which asks what we owe people, animals and nature as a matter of justice, and coleads a project called "Moral Panic over Cats," which explores the conservation ethics, science, and rhetoric surrounding outdoor cats.

To truly understand Santiago-Ávila's full portfolio of work, one must step back and look at the question behind it. Why *should* we coexist with carnivores? Why *would* we save predators who pose a threat to our livestock, our pets, and even ourselves? It's an ethical question that Santiago-Ávila started to grapple with first during his undergraduate work at the Universidad de Puerto Rico, where he studied political science and economics, then while earning masters' degrees in public policy and environmental management from Duke University. "I thought I wanted to be a lawyer, an advocate for social justice, maybe a politician, maybe

a legislator," he reflects. With his economics background, he explored the economic valuation of natural resources, or how disadvantaged communities are often also harmed when nature is under threat. "But then I came to the ethical realization that that's not the argument that I wanted to foreground," he says. "I wanted to foreground the argument of respect and wellbeing through intrinsic value and through recognizing that even though these individuals are non-human, that's not an argument to dismiss their claims, dismiss their wellbeing, and their concerns."

While completing his master's coursework at Duke, Santiago-Ávila started researching policies around wolf protections, which led him to the work of Adrian Treves, a faculty affiliate of the Nelson Institute for Environmental Studies and principal investigator of the Carnivore Coexistence Lab. "He was one of maybe two or three researchers — even today — that was foregrounding arguments combining the science of ecological interventions for mitigating conflicts with policy," Santiago-Ávila recalls. He kept up with Treves' publications and explored Nelson's environment and resources program where he taught — but he was hesitant to apply, simply because he didn't see himself as a "PhD person." But the wolves had imprinted on him, and he had more questions to answer.

In his free time, Santiago-Ávila works hard to stay present – whether it's exploring the wilderness or walking around the neighborhood. Photo courtesy of Francisco Santiago-Ávila

"They might have paws and walk on four legs and eat raw deer. But so much of what's fundamental [to them] is so much like us and what we want, that I just couldn't look away," he recalls, and soon he found himself in the Nelson Institute's environment and resources program, studying under Treves and focusing his PhD work on carnivore conservation and animal ethics. "Wolves led me to the animal ethics and animal studies literature, which is something that a lot of conservationists don't go into," he reflects. "Basically, [wolves] are the animals that gave me a slap in the face and were just like, 'Hey, we matter. Our wellbeing and relationships matter, too, and we don't want to be harmed.' "

Santiago-Ávila earned his PhD from the Nelson Institute's environment and resources program in 2019, and while he's moved into the professional sphere, he hasn't stopped researching and publishing. "As testament to his diligence and drive, he has maintained an active research program, publishing 12-plus peer-reviewed scientific papers or articles on ethics since leaving UW–Madison [and] working full-time," lauds Treves. While Santiago-Ávila is proud of his continued publishing efforts, he's perhaps most proud of finding a career that allows him to embrace his dual passion for science and advocacy. "I wanted to get a PhD to be an advocate," he says. "I didn't just want to be this 'objective' scientist that believes, "I can't advocate because if I'm a scientist, I can't have any values, because that's going to impact my science."

When it comes to values, Santiago-Ávila continuously returns to his faith-based principles of showing compassion and protecting others. In fact, it's what keeps him going. "I like to think the universe supports us. There's this feeling that's hard to describe, but it's almost like there's nothing else to be doing but advocating for this," he says. Santiago-Ávila may not have turned out to be a priest like he'd expected, but he certainly fills the role of compassionate thought-leader and advocate. When he's not working, publishing, or spending time with his wife, their three dogs, and their three chickens, he tacks on a side of philosophy of religion research for fun. "I dive into Taoism, and Buddhism, and Hinduism. There's a lot of love and kindness there; a lot of recognition of the value of life in general," he says. "So, when promoting that compassion and that empathy, that love for life in general and other beings, I don't know that it's going to turn out the way that I want it to, but that doesn't really faze me because I just have to do this. This *is* the work."

All Risk, All Reward

For Martha Goodell, the answer to the climate crisis lies in the finance sector. Fortunately, she speaks the languages of both worlds.

By Chelsea Rademacher

When Martha Goodell sat down in Science Hall for her first class as a Nelson Institute graduate student, she did as any new student would do — chatted with the person sitting next to her. "What do you do?" they asked. It was 2012, and Goodell was starting fresh. An amicable divorce reminded her to do what she loved, which had always been science. Plus, after earning her MBA and working in the business sector for nearly two decades, she had seen some critical gaps in how the business and environmental sectors talk to each other. She wanted to build that bridge.

"I'm in the investment field," Goodell responded.
"Oh, you're from the evil side," her neighbor retorted without missing a beat.

The evil side? Was that how *everyone* in the Nelson Institute would view her? "That was exactly [this student's] perspective: business destroyed the environment. We had chemical dumps because of business. We're in the climate disaster because of business," Goodell remembers. But where others might see an insult, Goodell saw an opportunity to do exactly what she came to Nelson to do: build bridges.

After earning her MBA in finance from the University of Illinois Urbana-Champaign, Goodell spent the first chapter of her professional career in finance and investments — from organizations like the Bank of America and Ernst & Young to angel investing and running her own consulting firm. In these roles, she started to see the siloed nature of the business sector, particularly when it came to how businesses interacted with the climate crisis and environmental issues. But Goodell rarely sees problems — only opportunities — and became curious about the disconnect.

It was at a cocktail party that Goodell realized her second chapter would be uniting these two spheres. A fellow finance and investments professional whom she was chatting with said she didn't believe in climate change. Goodell was shocked. She realized, in that moment, that if she went back to school and studied the environment, she could become a translator between finance and the environment.

Perhaps Goodell's classmate wouldn't have agreed with her statement: "The climate is only going to be repaired through finance." But as an expert with a foot in both worlds, Goodell can easily back up such an argument. A few years ago, she sat on a panel about divestments in Wisconsin. "You say you should divest out of oil and gas companies because they're contributing to the climate crisis," she explained. "You don't want to divest from a company like Exxon, you want to actually *convince* Exxon to use some of that money to invest in other early-stage technologies like climate, water tech, food scarcity, or agriculture You want to have a seat at the table. In addition, you want companies with strong balance sheets so they can diversity risk across their portfolio of projects," Goodell says.

So at age 45, she turned the page and started researching interdisciplinary environmental graduate programs. She wanted a program that would let her chart her own course, while also allowing for exploration into disciplines beyond straight environmental studies like technology and energy economics. "By the time I had done that research and understood what program I wanted, the only program I applied to was Nelson," she recalls. It was the energy analysis and policy (EAP) program that first piqued her interest, but she quickly became enamored with all that the Nelson Institute had to offer. In addition to earning her EAP certificate, she also completed the master's track in environment and resources.

After graduating from UW–Madison, Goodell worked in project finance for climate: "Tire recycling, biofuels, anything that really had a sustainability focus, even if it wasn't pure climate." Working in this space, she became interested in direct air capture — a technology that pulls excess carbon out of the air and safely stores it — as a long-term

solution to the climate crisis. "The technology required to extract atmosperic CO2 is complex," Goodell explains. "It's difficult, but the industry is making progress." She had found the next negative she could transform into a positive — and it was the perfect space for her finance/environmental bilingual skills.

Though Goodell moved frequently throughout her life, she called Chicago home for 25 years. Photo courtesy of Martha Goodell

Goodell knew that most of the work in direct air capture was based in California, and though she'd settled in the Midwest for about 25 years, she had no reservations about uprooting. As a child, Goodell's family moved — a lot. Her father was a brass and copper manufacturing executive, so Goodell and her three sisters got used to being the "new kids." Any former "new kid" knows how tough it can be, but like everything else in Goodell's life, trial became triumph as she became comfortable in just about any social situation. "You just go out to parties, events. You just don't think about the fact that it's awkward, or [wonder] what am I going to do to meet new friends? You just do it," she says. Goodell started networking with folks in the solar industry which has similar economic drivers to direct air capture, and in late 2022, she linked up with Matt Atwood, the founder and CEO of a company called Aircapture. Just a few months later, she moved to Emeryville, California, and started as Aircapture's director of strategic finance.

A start-up, Aircapture is entering its second round of financing — which is where Goodell comes in. Knowing the science of direct air capture and how it can make a difference, paired with understanding the landscape and language of finance, Goodell helps Aircapture tell its story to investors in a meaningful way. "My background is leveraged fairly directly at this stage in the company," she says. "Investing in any early-stage technology is risky, and direct air capture is complex. So, it takes a lot of science-based storytelling."

When speaking with investors, Goodell harkens back to the portfolio of initiatives. "Risk" is something that the investment world understands. Each company's portfolio "is all risk management," she explains. She translates that understanding of risk into reducing risk to the environment by investing in companies like Aircapture. "You have to look at all these new technologies as portfolios," Goodell explains. "It's totally true that one might not work, but finance shows us that if you invest across a diversified portfolio of initiatives, one of those is going to work."

This understanding of risk carries over into Goodell's personal life. For her, risk isn't defined by success or failure, but the loss of opportunity. So when it comes to defining her proudest moments, it's fitting that she feels the most pride from making decisions that others questioned — like enrolling in the Nelson Institute at age 45. "I'm not even sure where that stuff comes from, you know? Is it the nature versus nurture in life?" she asks herself. "I'm just a scrappy person though. I'm a Taurus, so we just get scrappy," she says with a smile. "I'm not going to let my past trajectory define my future trajectory."

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