Nelson Institute for Environmental Studies
UNIVERSITY OF WISCONSIN–MADISON

September 2023

THE COMMONS

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

Turning Ditches into Rain Gardens

An upcoming WRM report advises how to best convert lowlands into filtration rain gardens

Air-related research gets funding boost from Volkswagen Group settlement. page 4

EPP celebrates 10 years of living the Wisconsin Idea. page 6

Meet new professor Tim Portlock. page 16

EDITORIAL STAFF

Kevin Berger, Graphic Designer
Anica Graney, Assistant Editor
Eric Klister, Web Editor
Chelsea Rademacher, Editor
Laila Smith, Staff Writer
Diane Stojanovich, Managing Editor

CONTRIBUTORS

Abigail Becker
Dea Larsen Converse

DEAN'S OFFICE

Paul Robbins, Dean, Nelson Institute for Environmental Studies
Colleen Godfriaux, Interim Director of Budget and Financial Management
Anna Gade, Associate Dean for Research and Education
Diane Stojanovich, Distinguished Associate Dean for Communications
Shelly Strom, Assistant to Paul Robbins
Ann Swenson, Associate Dean for Advancement
Steph Tai, Associate Dean for Education and Faculty Affairs
Jenna Weidner, Associate Dean for Administration

CONTACT US

We'd love to hear from you! Send us feedback or questions about this issue, or share story ideas for future issues.

Nelson Institute for Environmental Studies
550 Science Hall
Madison, WI 53706
communications@nelson.wisc.edu

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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.

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From the Dean

Greetings, Nelson alumni and friends,

Heat indexes may have been over 100 mere weeks ago, a dismal atmospheric condition that can be really deflating, but in the academic world, it's officially autumn, and that cheers me enormously. We rang in the fall semester last Wednesday with our annual Welcome Back, Nelson event, where I got to say "hello" to some of our returning students and welcome new — and prospective! — undergrads. The start of a new academic year is always a time of refreshed energy and new beginnings: not only because of our new students, but also new research and new faculty.

Take, for example, some of the new clean-air research being done by Holly Gibbs and Tracey Holloway's labs — efforts that were bolstered by support from the Volkswagen Clean Air Act civil settlement. Read more about their work and the settlement's impacts on page four. On page 14, go under the sea to learn how the Center for Climatic Research (CCR)'s Andrea Dutton timestamps coral reef fossils to gain insight on the planet's response to warm periods. Then see how Morgan Edwards, an affiliate of both Nelson and the LaFollette School of Public Affairs, combines data sets, community knowledge, and modeling systems in her Climate Action Lab.

Great research doesn't only come from faculty at the Nelson Institute, but also our students. The 2020–22 water resources management cohort has finalized their program report, which focused on water quality in Lake Wingra's watershed. Read about their findings from cohort member James Winkleman on page 24. Then learn about water resources on the other side of the globe from Colleen Henegan, a PhD candidate in environment and resources, who's making major contributions to Zambian agriculture.

Beyond new research, we're also celebrating new faculty here at Nelson: one who is new to UW–Madison and one who is taking on a new title. First, please join me in welcoming Tim Portlock to the UW and the Nelson Institute! He comes to us from Washington University in Saint Louis and, while his new home is in Science Hall, he'll be working jointly with Nelson and the School of Education's Art Department. This is the first hire of a graphic artist in Nelson's history, and it is long overdue! Trained as a muralist, Tim deploys digital media platforms and tools from gaming software to 3-D animation to make art that investigates the social and economic impact of America's rapid deindustrialization and the impacts of environmental decline and climate change. Artist Steve Basel tells us that Portlock's works "carry a tone of solidarity, decrying the social and economic adversity underlying the urban decay we see, but simultaneously are emotionally distant and incredibly theatrical … The work virtually models a ruin photographer's paradise, augmenting the magnitude of desolation at every turn." You'll have to see for yourself. Welcome, Tim!

Congratulations are also in order for Paul Block, a professor of civil and environmental engineering and a core faculty member of CCR, who has been named the next Reid Bryson Distinguished Professor of Climate, People, and Environment. Block leads a research group that addresses critical water resources management challenges in local to international trans-boundary capacities through stakeholder and decision-maker collaborations, using engineering and socioeconomics to enhance management, adaptation, and sustainability of water resources. That is all precisely the spirit of Reid Bryson, CCR, and the Nelson Institute. Best wishes to Paul!

So, if we are in the middle of a catastrophe, and I think we are, it is one that has brought forward a new generation of tireless heroes, inspired thinkers and doers, and a generation of student determined to set things right. And they are all right here at UW–Madison.

As always, if you have feedback to share or topics you'd like to read about, I'd love to hear from you.

Read on!

Paul Robbins
Dean, Nelson Institute

Welcome Home

Welcome to Science Hall! As home to the Nelson Institute for Environmental Studies, this hallowed ground is where the future of our climate, culture, and well-being is decided and implemented. Like any building on campus, Science Hall has its own personality – and where others may see flaws, we like to put it into a new perspective. It's not old, it's historic! It's not garish, it's iconic! It's not haunted, it's … well, it might be haunted. Learn more about the history of Science Hall.

Litigation Mitigation

With funds from a Volkswagen Group settlement, Nelson Institute researchers boost air-related research.

By Chelsea Rademacher

Photo by iStock/ Elcova Lana

"Diesel dupe." "Dieselgate." "Emissionsgate." Headlines were ripe with nicknames when the news broke in September 2015 that Volkswagen Group had violated the Clean Air Act by installing software in their diesel engines that tampered with emissions-testing results.

After settling with owners of the affected vehicles — nearly 600,000 — the remaining settlement funds were distributed to organizations and institutions across the country that are working on environmental mitigation projects. The State of Illinois is directing funds to invest in transportation electrification. In Mississippi, the Jackson School District is purchasing six electric school buses and charging stations with their payout. And at the University of Wisconsin–Madison, researchers in the Nelson Institute for Environmental Studies' Center for Sustainability and the Global Environment are boosting clean-air research efforts. Settlement funds were awarded to two labs led by Nelson Institute faculty: the Gibbs Land Use and Environment Lab and the Holloway Group.

In the Gibbs Land Use and Environment (GLUE) Lab, director Holly Gibbs focused her portion of the funding on research and outreach surrounding tropical deforestation and its atmospheric impacts. Gibbs, who is also a professor of environmental studies in the Nelson Institute, is known across the globe for her work in this space, particularly on the intersection of agriculture and deforestation in Latin America.

In October 2022, Gibbs and her colleagues published a shocking study that showed just how devastating Brazil's beef industry is on the environment: despite Brazilian meatpackers best efforts, the study found that millions of cattle had been grazing on protected or illegally deforested lands in Brazil. In addition to the beef industry, GLUE is also studying oil palm expansion in Peru. Funding from the Volkswagen settlement has helped bolster research efforts in both of these areas. "These are the world's largest drivers of deforestation and the primary source of greenhouse gas emission to the atmosphere in [those] countries," Gibbs said.

The funds have helped GLUE contribute to timely policy discussions, such as a May 2023 European Union (EU) regulation that established "mandatory due diligence rules" for all operators, traders, and exporters of goods including cattle and palm oil. "This is a huge step forward for the world's rainforests," said Gibbs. "[With] the current monitoring approach … nearly 85 percent of deforestation goes without any assessment. This new EU deforestation regulation is a gamechanger since it means that Brazil and companies operating in Brazil will need to implement much broader and more stringent monitoring approaches."

With support of the settlement funds, Gibbs also traveled to Washington, DC, at the invitation of JBS S.A. — the world's largest meat processing company — where she presented her findings to high-ranking Brazilian officials.

From the ground to the sky, the second recipient of settlement funds, the Holloway Group, is focusing in on environmental justice and air quality by boosting research on monitoring tools. Led by Tracey Holloway — who holds the inaugural Jeff Rudd and Jeanne Bissell Professorship of Energy, Analysis, and Policy with the Nelson Institute and the Department of Atmospheric and Oceanic Sciences — the lab is using their funds to examine modeling and monitoring of sulfur dioxide, a pollutant produced by industries and power plants.

Regular exposure to high concentrations of sulfur dioxide is well known to cause respiratory illnesses in healthy adults, "but even much lower exposures can lead to emergency room visits and hospitalization for people with asthma, with cardiac problems, children, older adults, and other at-risk groups," Holloway said. Sulfur dioxide also morphs into sulfate aerosol, the leading component of the dangerous PM 2.5 pollutant. "Beyond these impacts on human health, sulfate contributes to acid deposition, which can damage plant tissue, impact aquatic animals and leach aluminum from soil while also affecting climate and cloud formation and brightness," said Holloway.

These pollutants have been regulated by the Environmental Protection Agency since 1971, and while they *are* being measured, it's not as robust as it could, or should, be. A limited number of sulfur dioxide monitors has led to completely unmonitored locations, which disproportionately affects neighborhoods that surround industrial sources as well as historically disadvantaged communities. And while air quality and climate policies are made using the available data, these holes and oversights can lead to unjust policies.

With funds from the Volkswagen settlement, Holloway's team has increased their research on AERMOD, a modeling tool that is widely used for linking data, health impacts, and policy. Their work currently includes comparing AERMOD readings with ground-based measurements, publishing a paper that highlights its strengths and weaknesses, and developing new, advanced methods to evaluate it. "Our work advances the science behind AERMOD, with the goal of developing best-practice guidelines for model inputs and considering the application of the model to environmental justice and public health," Holloway said.

Both Gibbs and Holloway are committed to maximizing the impact that these funds can have, not only to advance UW–Madison research, but to move toward a cleaner future. Recipients for settlement funds were identified and contacted by the case's attorneys — not through an application process. Nelson Institute Dean Paul Robbins is honored that the was selected as a beneficiary based on its reputation for world-class research. "When the attorneys called during the depth of the pandemic, presenting the opportunity to put the settlement money to work," Dean Paul Robbins explains, "I was reminded how prominent our science is, how high-profile UW faculty and the institute are. This is a pretty big deal. I'd like to get more phone calls like that one," Robbins said with a smile.

Tracey Holloway

Holly Gibbs

EnviroPros@10: History in the Making

As the Nelson Institute's environmental professional programs celebrate 10 years, we look back on their history — and ahead to their legacy.

By Chelsea Rademacher

Members of "EOI4" – the fourth cohort of environmental observation and informatics students – at the "Shack" after visiting the Aldo Leopold Foundation in Baraboo, Wisconsin. Photo by Sarah Graves

"I shall never be content until the beneficent influence of the university reaches every family in the state." Spoken by university president Charles Van Hise in 1906, this quote laid the groundwork for the infamous Wisconsin Idea, a principle that continues to guide UW–Madison today. Over decades, as society became increasingly global, so did the philosophy's belief that "the boundaries of the university are the boundaries of the state." If you're looking for a living, global example of the Wisconsin Idea, look no further than the Nelson Institute for Environmental Studies' environmental professional programs (EPP), which is celebrating its 10th anniversary this year.

EPP houses two distinct MS programs: environmental conservation and environmental observation and informatics. As professional programs — rather than thesis programs — these courses of study give early and mid-career professionals a fast track to advanced skills and expertise that help them become leaders in their fields. Both programs developed from two previous graduate programs: environmental monitoring and conservation biology and sustainable development. The environmental monitoring program, which offered both masters and PhDs, welcomed its first cohort around 1978, less than a decade after the Nelson Institute was initially established. While the program filled an important need for training students in the growing field of monitoring, it was discontinued in the early 2000s with the last PhD candidates graduating in 2006.

"It is the Wisconsin Idea to its full potential, locally and globally."

— Meghan Kautzer

Conservation biology and sustainable development (CBSD) came along later, with its first cohort arriving in 1990. Among its final students (the last graduated in 2014) was Nathan Schulfer, who graduated in 2012 and is now EPP's program director. While earning his degree, he also worked as a program assistant under the program's director, Janet Silbernagel, and played an important role in transforming CBSD into a new offering. By 2011, the program had only a few students, leading to questions of its continued existence. "The program committee, because the numbers were going down, started

Above, left: Members of EC4 cool their feet in the natural springs after hiking through Pheasant Branch Conservancy while on a field trip for their Conservation of Biodiversity class. Above, right: EC10 and EOI5 students give presentations using best practices in science communication during their fall professional seminar. At right: EC and EOI students frequent the UW Arboretum to learn conservation field techniques like plot sampling and camera traps. Photos by Meghan Kautzer (3).

to say, 'Maybe we should change CBSD to just focus on the professional side of things and leave research to the environment and resources program,' " Schulfer recalls.

Then in 2012, several events coalesced, creating the perfect environment for a re-imagined program. First up, Paul Robbins joined the Nelson Institute as its dean. In Bascom Hall, Rebecca Blank had signed on as the UW's new chancellor. And the Division of Continuing Studies saw an influx of "start-up" funds to help campus units develop what the university calls "131 programs," or programs that keep and capture tuition revenue. "That coming together really accelerated the push to think about a different approach for the CBSD program," says Schulfer.

Robbins, Schulfer, and Silbernagel, along with faculty associates Rob Beattie, Alberto Vargas, and Arlyne Johnson, were all part of the committee that ultimately ushered in the next era of CBSD: environmental conservation (EC), which accepted its first applications in the fall of 2013. "We're creating a new kind of conservation practitioner," said Dean Paul Robbins of the program's creation. "We're going to change the way people do conservation and the way they work with communities. To do that, you have to change the way you train people."

For EC program coordinator and Nelson Institute alumna Meghan Kautzer, the professional nature of the program fills a critical gap in the world of conservation. "We have science, and we will always *need* more science to back things up and make better decisions, right? But if the science were enough, we wouldn't have the problems we're facing right now," she says. "We need people who are trained, specifically, in taking and understanding the science and putting it to action effectively and efficiently."

Among the first cohort to take these skills into conservation work was Caitlin Williamson, who came to Madison after earning her undergraduate degree in biology and environmental studies at Lawrence University. "The program was exactly what I was looking for," Williamson says. "I didn't want to do the traditional research route. I wanted to build off the skills I had in my first job with more professional experience." Williamson is now the director of conser-

At left, top: Every year, students explore Madison's rich ecological freshwater environments and enjoy some team bonding time in the sun. Photo courtesy of Meghan Kautzer. At left, middle: A group of EOI6 students visit at Governor's Island to learn about detecting invasive species with remote sensing. Photo courtesy of Sarah Graves. At left, bottom: EC5 celebrates a great first half of the program after their final in-person coursework wrapped up. Photo by Meghan Kautzer. Above: Kathryn Bernard, an EOI5 graduate, poses outside of Science Hall after her Spring 2023 commencement ceremony. Photo by Sarah Graves.

vation programs at the Natural Resources Foundation of Wisconsin — along with holding Nelson Institute accolades including a Rising Star Alumni Award and a seat on its board of visitors.

With EC up and running, Robbins assembled another working group in 2014–15 to help create a second professional program. The idea was to take aspects from the environmental monitoring (EM) program, which had closed out in the early 2000s. "There is a huge need for it," says Schulfer. "It is an emerging and important space in the conservation field." Since the early 2000s, the sophistication of monitoring technology exploded, and professionals with satellite and drone expertise went from unique to necessary. With input from both EM alumni and industry experts — who shared what skillset gaps they were seeing among applicants — environmental observation and informatics (EOI) opened in 2017.

When EOI started, so did program coordinator Sarah Graves. "I am so close to that first cohort because I felt like we were both starting together," she reflects. "It was a lot of exploring for everybody, and I think that was really fun." In its six years, EOI has already grown to a network of 49 alumni. Thinking to the program's future, Graves hopes that it will develop as strong of a legacy as its predecessor, environmental monitoring, had. "Graduates of that program now are leaders in this field. They're who you go to when you think about environmental remote sensing," she says. "I hope that's what we see for EOI alumni — that they will really have made an impact on the field of environmental remote sensing and how to use spatial data for conservation."

The impact of the Nelson Institute's environmental professional programs is already being felt across the globe; more than 230 students have graduated from both EC and EOI, going to careers that span sectors and the globe. "It *is* the Wisconsin Idea to its full potential, locally and globally," says Kautzer. "And knowing that the conservation decision-makers are going to be EC-ers and EOI-ers, it gives me a lot of faith."

As the environmental professional programs celebrate their 10th anniversary, the curricula of both programs have become more and more relevant to the current environmental and workforce landscape. "Anyone who is thinking about global climate change, worldwide decline of species, and the fate of our air and water is asking the exact same question: 'What's next?' We answer that question with every graduate from these programs," says Nelson Institute Dean Paul Robbins. "If we have one role in the future, it's preparing these remarkable people to help shape it for everyone's good."

"If we have one role in the future, it's preparing these remarkable people to help shape it for everyone's good."

— Paul Robbins

UniverCity Alliance Hits the Road

To celebrate partnership across Wisconsin, UniverCity Alliance went on UW–Madison's 175th anniversary celebration state tour.

By Abigail Becker, UniverCity Alliance

L-R: Gavin Luter (UCA), Dave Mack (Marathon County), Sarah Schutt (Wisconsin Alumni Association), Katie Rosenberg (Wausau), and Philip Rentmeester (Marathon County) celebrate UCY partnerships during a stop on the UW–Madison State Tour. Photos courtesy of Abigail Becker (3)

Showcasing partnership around Wisconsin, UniverCity Alliance (UCA) hosted three community events in August as a part of the University of Wisconsin–Madison's 175th anniversary celebration. By highlighting UCA initiatives and UniverCity Year (UCY) partners in Pepin County, Milwaukee, and Wausau, these events demonstrated the impact that UW–Madison has across the state.

"UW–Madison lives out its full potential when the university extends its knowledge and resources across the state and learns from all Wisconsin communities," UCA managing director Gavin Luter said. "The Wisconsin Idea is a two-way street that involves knowledge-sharing between communities and the university, and we were excited to showcase that principle during these events."

These events were a part of the state tour held in partnership with the Wisconsin Foundation and Alumni Association. "Having partnerships like UniverCity Alliance and working with other colleagues on campus and [the UW–Madison Division of] Extension and other university departments is a terrific illustration of how UW–Madison has extended its reach and its impact across the state in such wonderful ways," said Sarah Schutt, chief alumni engagement officer and executive director for the Wisconsin Alumni Association.

Pepin County
Tour Date: August 3

In 2018, Pepin County partnered with UCY to ignite innovation in economic development, education, and sustainability. Part of this work centered around tourism in Pepin County. UW–Madison journalism students created marketing materials, including print advertisements, social media posts, sightseeing guides, and postcards, that promoted Pepin, Durand, Stockholm, and Pepin County as a whole.

"The UniverCity Tour stop in Pepin was a great opportunity to shed more light on this collaborative program and feature the marketing students' work in helping us showcase Pepin County as a tourist destination," Village of Pepin tourism commission chair Sue Fedie said.

On August 3, Destination Pepin and UCA highlighted these projects and Pepin County's unique cultural and geographic assets at the Villa Bellezza Winery & Vineyards. Denise Parker, the tourism commission's vice chair, said she was excited to host the event to put a spotlight on Pepin.

"It not only was able to showcase our beautiful area to those that may have not traveled here before as a destination but was also able to let other area partners know about the wonderful work that the UW–Madison stu-

L-R: Pepin County employees Denise Parker, Sue Fedie, and Leanna Kavanaugh; Luter; and Village of Pepin president Randy Kallstrom flash a *W* during their county's event.

dents did in putting together promotional and marketing materials for our Pepin County and three of our [communities]," Parker said. "It is great to take part in collaborations like this to showcase all that Wisconsin has to offer when working together."

Milwaukee
Tour Date: August 17
Convened by UCA, the Wisconsin Heat Health Network gathered in Milwaukee at Third Space Brewing to share the latest research on extreme heat events in Madison and Milwaukee. This network includes collaborators from UW–Madison's campus, including UCA, the Wisconsin Initiative on Climate Change Impacts, and the Global Health Institute, in addition to Dane County, the cities of Madison and Milwaukee, the Wisconsin Department of Health Services, and climatologist Larry Kalkstein of Applied Climatologists, Inc.

"Without collaboration between a large group of people who are stakeholders, there's no way we can really combat the problem of heat and health," Kalkstein said. He is working with graduate students to collect and analyze data that will inform a warning system in Madison and Milwaukee based on health outcomes that considers mortality and weather data.

"It's so important to share where we're at and where we want to go because we can just move so much further when we can communicate, we have a shared understanding, and we're able to pool our resources and our time," said Nelson Institute environment and resources PhD student Becky Rose.

Wausau
Tour Date: August 30
During the last stop on the UW–Madison State Tour, UCA hosted an event with UCY partners Marathon County and the city of Wausau at the South Area Fire and Emergency Response (SAFER) headquarters.

Marathon County worked with UCY from 2020–23 as in its effort to become the healthiest, safest, and most prosperous county in Wisconsin. Projects addressed sustainability, economic development, evidence-based decision making, equity, and emergency medical services.

"The UniverCity Alliance provided us an excellent example, a great demonstration of that commitment to the Wisconsin Idea," Marathon County emergency management director Philip Rentmeester said.

Wausau will be working with UCY from 2022–25 addressing a range of issues, including housing, walkability, and community development. "We're really excited," said Wausau Mayor Katie Rosenberg. "I hope that I'm standing here next year on [UW–Madison's] 176th birthday and telling you all how successful this is."

Members of the Wisconsin Heat Health Network and UCA pose for a group photo at Third Space Brewing in Milwaukee. L-R: Larry Kalkstein, Becky Rose, Natalie Meier, Nicholas Mailloux, Luter, Maggie Thelen, Elizabeth Berg and Sara Pabich.

Reflections on Climate Change and Tourism and Outdoor Recreation

Natalie Chin, climate and tourism outreach specialist, shares the local impacts of climate change — and what can be done to help.

By Dea Larsen Converse, Wisconsin Initiative on Climate Change Impacts

Tourism in all seasons is a major driver of our state's economy, and is subject to the impacts of a changing climate. Photo courtesy of Travel Wisconsin

Published in 2021, the Wisconsin Initiative on Climate Change Impacts (WICCI) assessment report reviewed climate impacts across the state, spanning industries from fisheries to forestry. For the next several months, we'll be highlighting interviews with some of the people who provided critical background and context to WICCI's 14 working groups. This month, hear from Natalie Chin — a climate and tourism outreach specialist at Wisconsin Sea Grant and coleader of the Tourism and Outdoor Recreation WICCI Working Group — who explores the climate impacts on Wisconsin's local recreation opportunities.

What should people be aware of?
The intersection between climate and tourism and outdoor recreation is complex. Impacts are going to vary depending on the location as well as the type of business, activity, or client base. There are a lot of different factors that complicate the matter of how climate change will impact tourism and outdoor recreation in the state. We do know that the industry is very important to our economy in Wisconsin.

Can you give some examples of climate impacts on local recreation opportunities?
There will be climate impacts on winter recreation and snow and ice cover. If you're in the ski business and losing snow, that's concerning. In other seasons, opportunities might increase if it's warmer for longer during the year. Again, it is complex and how this benefits businesses and communities will depend on the school calendar and other factors.

What advice would you give to parks and recreation departments?
As I'm sure many parks and recreation professionals already know, there is a lot of uncertainty when it comes to climate change projections. No one knows for sure exactly what's going to happen. Moving forward, it will be important to focus on adapting and being flexible with future planning.

Where can people learn more about adaptation options?
We discuss some adaptations in our working group report and resources linked to our webpage. One of the resources is the Northern Institute of Applied Climate Science Adaptation Workbook and climate change adaptation menus, which can be applied on a project scale. There definitely are [also] opportunities to consider tourism and outdoor recreation assets in comprehensive and hazard mitigation planning. When we talk about climate change, we're talking about long time scales so I think those plans are a great place to consider projects since you're thinking five, 10, 25 years ahead.

> *"Recent air quality impacts from wildfires definitely illustrate potential negative impacts for outdoor recreation, especially if we're expecting hotter and drier conditions in the summer in the future."*
>
> — Natalie Chin

Do you have hope for the future?
I feel the responsibility to do what I can to help people to deal with the climate crisis. I think the energy of young people around climate change and action happening at the federal level gives me some hope.

Support WICCI
The Wisconsin Initiative on Climate Change Impacts (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.

Natalie Chin

This condensed interview is part of a series highlighting interviews done for the 2021 WICCI Assessment Report. The full interview is available at wicci.wisc.edu.

Next month: Get updates on air quality from Wisconsin's Environmental Mesonet, a network of 14 weather and soil monitoring stations across Wisconsin, on Twitter @Wisconet. Follow the Wisconsin State Climatology Office for updates on drought conditions in Wisconsin on Twitter @WI_ClimateSCO.

Q & A with Andrea Dutton

When she first started college, Andrea Dutton didn't know she wanted to be a geoscientist. Now, she works on solving Earth's biggest geological puzzles.

By Laila Smith

Dutton sampling a fossil coral reef with a hammer and chisel. Photo by C. Quanbeck

Andrea Dutton stumbled upon the field of geoscience by complete accident. As an undergrad at Amherst College, she had been studying chemistry on the med school track, until she enrolled in a linear algebra course that was recommended for pre-med students. "The first homework assignment was to prove that zero plus one equals one," Dutton recalls, "and I got it wrong." After that assignment, she dropped linear algebra and enrolled in an introductory geoscience course to take its place. Thankfully, her pre-med knowledge of physics, biology, and chemistry helped her excel. "I felt like a detective using all different kinds of clues to try to figure out this big puzzle of what happened in the past," she says.

Today, Dutton works in the UW–Madison Department of Geoscience and is a member of the Nelson Institute's Center for Climatic Research. She is teaching a paleo oceanography course this fall, and in the spring she will teach two more courses in carbonate sedimentology and introductory geology. Dutton also encourages undergraduate students to become involved with research in her lab.

What do you do as a geoscientist?

I study fossil coral reefs to try to understand how ice sheets and sea level responded to warm periods in Earth's history. Corals live near the sea surface because they need the sunlight to survive, so I use that to track the

position of the sea level through time. To figure out the age of the corals, we do isotope geochemistry called uranium-thorium dating. Uranium gets trapped in coral skeletons as it grows and decays to thorium over time, so we use that like a clock to find out how old that coral is and how long it's been since it grew.

What do you wish people knew about your field?
Geology is such a diverse field, from the types of research being done to the people that are involved in it. There are people doing high level computing, amazing chemistry, or geophysical studies of the earth. The idea that geologists just go out into the field with rock hammers is outdated, and I want people to know that there are so many different and exciting things we do as geologists.

You completed some fieldwork not too long ago. Can you tell me about that?
I recently went to Mexico, just south of Cancún on the Riviera Maya. My team worked in a cave system which is called Río Secreto, or "Secret River," because all of the surface water filters down into the cave and runs out into the ocean. Because the cave is so close to the coastline, when the sea level rises, the water level in the cave also rises. We were collecting stalagmites, which grow from the cave floor, because they won't grow when the water level rises too high and covers them. If the water level drops again, the stalagmites might start growing again. Using the same uranium-thorium technique, we can date the stalagmite growth to figure out when the sea level was high enough to flood the cave.

"I want people to know that there are so many different and exciting things we do as geologists."
— Andrea Dutton

What are you hoping to learn from this work?
Our goal was to sample stalagmites that were either near or above the current water level because we're trying to target time intervals when sea levels were higher than present and date exactly when those periods were. Something interesting about this fieldwork in particular is that along the coastline, a few kilometers from the cave, there's a fossil coral reef that my team has worked at in the past. We can see from the reef exactly how high the sea level got, but we don't know exactly how old the corals are since they are too weathered

Top: A stalagmite in the Río Secreto cave system. Photo by Andrea Dutton; Bottom: Dutton drilling into a fossil coral reef in Western Australia. Photo by C. Quanbeck

to get reliable ages from. We're hoping to get better timing estimates from what's in the cave to pair with what we've learned on the coastline, because it's all one system.

What do you do with the findings from your research?
I do a lot of outreach regarding climate change and sea-level rise. I think it's really important for people to understand what we know, and public interaction has been really important to me throughout my career — it's something that naturally grew from the research I was doing. I feel a moral and ethical obligation to share this information with the public. It's an important piece of who I am as a scientist, and something that I'll continue to do here at UW–Madison.

Read an extended interview online.

On Art and the Environment

Environmental art is booming — and artist and professor Tim Portlock has questions.

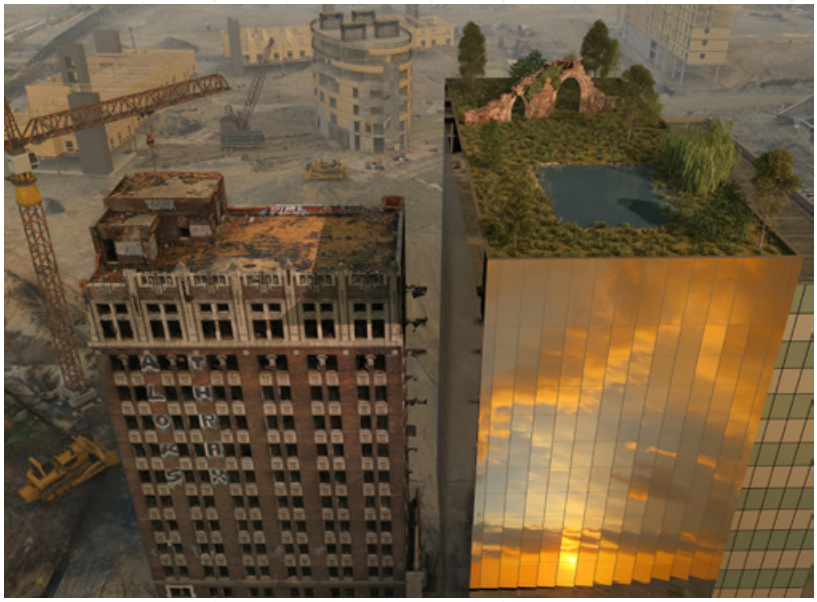
By Chelsea Rademacher

"Prequalified," archival pigment print, 58 x 43. 25, 2020. Images by Tim Portlock (3)

What links the environment and art? What medium is the most effective to inspire people to act? What does it mean for art to be accessible? These are some of the questions posed by Tim Portlock, a new professor in the Nelson Institute for Environmental Studies. Hired jointly between the Nelson Institute and the Art Department in the School of Education, Portlock comes to campus from the Sam Fox School of Design and Visual Arts at Washington University in Saint Louis, where he served as the chair of the undergraduate art program. He brings with him a world-renowned background as both an educator and an artist, having worked at l'Université Paris-Sorbonne and shown his work in galleries across the world.

"From a really young age I've always wanted to be an artist. I don't think there was really a time when I seriously thought of being anything else," Portlock says. He completed most of his formal training as a painter before shifting into digital art with the advent of the internet. Part of what drew him to digital art was the inherent accessibility of it: "Today we take it for granted, but when the internet became popularly accessible, it enabled people to access art from nearly anywhere in the world. You didn't have to physically be somewhere, and you didn't have to be part of an elite audience with special access," he says.

When it comes to the accessibility of his work, Portlock isn't talking just sheer numbers of viewers, he wants his art to be conceptually accessible, too. "I think ideas in contemporary art are frequently encoded in such a way that is difficult for the average person to relate to … but if I have ideas that I think are important, I want to share them with the broadest



Top: "Sundrenched", archival pigment print, 58 x 43. 25, 2020; Bottom: "Just Steps Away," archival pigment print, 43.25 x 58, 2020

public," he says. "Oftentimes, thinking like this is contradictory to making good or thoughtful work. I try to do both things: make engaging work that appeals to people *and* gets them to consider serious issues."

But as he explored the world of accessible, digital art, Portlock began to miss certain aspects of the "traditional" art world and his background in painting. "Digital image making is much more collage oriented. You can create original elements, you can incorporate pre-existing elements someone else has made, synthesize those things together, and then you can make an infinite number of multiples that are exactly the same," he says, compared to the "uniqueness" of painting where you create something brand new. "I started to synthesize things from the well-established history of art [with] things that were possible from this new medium of digital," he says. The results are painterly, digital compositions that combine imagined and real spaces — the latter often inspired by his previous home in Philadelphia.

Portlock's digital collages ask viewers to consider how contradictory environments overlap in both space and time. In "Nickels from Heaven," for example, we see a city that is both modern and aged, rising and crumbling. If work like this makes you wonder whether environmental art is supposed to simply raise questions versus inspire action, so is Portlock. More and more of today's art is focusing on the environment, Portlock explains, and investigating both the reasons why — and the effectiveness of art as a medium to talk about the environment —is why he came to the Nelson Institute. "Is this piece meant to ignite concern about the environment? Is this piece meant to treat the environment as more of a philosophical concern? What is the point of bringing up the environment?" Portlock ponders. "I'm interested in examining what that means in a more rigorous way and contributing to a vocabulary for discussing what it means when an artist talks about the environment and their work."

"Culture can illuminate our present in a more visceral way."

— Tim Portlock

In the spring semester, Nelson Institute students will have the opportunity to explore these questions alongside Portlock through a new capstone class centered around art and the environment. The class will also explore how different artistic mediums can shape the work's message — and ultimately, the desired outcome for the audience. "Let's say you want to motivate people to take concrete steps. What is the most effective way of doing that? Through culture, like art? Is visual art the best cultural tradition to address these [issues]? Is film better? Are video games better?" he asks.

"There are a lot of different ways to communicate with people and convey urgency or knowledge. Science communication is one way, and culture is another," he adds. "It can illuminate our present in a more visceral way for some people."

Paul Block

Center for Climatic Research Names New Bryson Professor

Civil and environmental engineering professor Paul Block will hold the distinguished professorship for the next three years.

By Chelsea Rademacher

Department of Civil and Environmental Engineering professor and Nelson Institute faculty affiliate Paul Block has recently been named the Reid A. Bryson Distinguished Professor Chair for Climate, People, and Environment. The professorship, named after CCR's founder, Reid Bryson, is a prestigious three-year appointment that provides financial support and leadership opportunities to bolster interdisciplinary research and leadership as it relates to climate change, the environment, and society.

"Professor Block is going to bring outstanding expertise and leadership to the Reid Bryson Distinguished Professorship through his vast and societally relevant experience in water resource management, risk and uncertainty quantification, and hydrological forecasting in support of decision-makers worldwide," says CCR director Michael Notaro of Block's nomination.

"I'm very pleased and honored to be selected and look forward to serving in this role. It's a unique opportunity on a couple different fronts," Block says, looking forward to expanding his connections both on campus and beyond. "Here at the UW, [I'm excited] to expand my network across both the Nelson Institute and also campus and better understand who fits into this broad landscape of climate, people, and environment."

Block's work has historically focused on the "climate and people" side of water resources management and disaster management. Having earned his master's and PhD from the University of Colorado, Block came to UW–Madison in 2013 to join the College of Engineering as an assistant professor. He's now an associate professor, teaching engineering classes like Decision-Making, Hydroclimatology for Water Resources Management, and Water Resources Systems Analysis. In addition to his affiliation with the Nelson Institute and CCR, he's also connected to the Global Health Institute and Wisconsin Energy Institute.

"I'm excited to use this professorship to continue to advance interdisciplinary research with clear societal applications."

— Paul Block

Through the Department of Civil and Environmental Engineering, Block leads the water systems and society research group. "We focus quite a bit of our research effort on addressing hydro-climate variability, specifically seasonal forecasts. What do we anticipate the climate will be like next season in terms of precipitation or streamflow or water quality?" he explains. "We then link outputs from those models with people and the environment by asking, 'How is that useful? What decisions can be made based on that information? Can stakeholders benefit from having long-lead probabilistic predictions?' "

He shares an example from a recent research trip that he and a graduate student took to the Colorado River Basin — a hotspot for water resources management policy and research. "A reservoir operator allocating water toward irrigation or municipalities or downstream users has to decide how much and when to release," he says. "If the operator has access to predictions of inflow months in advance, ideally that may enhance their allocation decisions. But the forecasts are never perfect, so how this uncertainty translates through to on-the-ground decision-making is also incredibly important."

Another piece of Block's research is applying similar models to disaster preparedness, particularly for flooding. "It's really about triggering anticipatory action," he explains. Recently, he's been working with emergency managers across the upper Midwest and humanitarian organizations in South America to understand how they use climate forecasts in their planning — and if not, why. "While my disciplinary expertise is engineering, these challenges clearly go beyond engineering and climate science. We've been lucky to collaborate with many UW–Madison

Block's research interests take him to bodies of water across the country – some of which he explores at water level; others from above, like the Colorado River, pictured above with the Mike O'Callaghan-Pat Tillman Memorial Bridge stretching over it. Photos courtesy of Paul Block (3)

Block and colleague Julie Quinn, an assistant professor at the University of Virginia.

experts in life science communications and sociology and economics here on campus to better understand and connect some of the human dimensions," Block says. "I'm excited to use this professorship to continue to advance interdisciplinary research with clear societal applications. In reality, this is critical to make real, meaningful strides forward."

In addition to expanding his interdisciplinary network on campus, Block also looks forward to stewarding CCR's Climate, People, and Environment Program — or "CPEP" — seminar series. These on-campus presentations are hosted weekly during the academic year, and feature lectures by both visiting experts and local faculty, scientists, and students. "We have so many excellent resources; so much talent and expertise across this campus. We want to be able to tap into this — not only to internally benefit, but also promote the Wisconsin Idea."

Mission-Centered *Sustainability*

A monthly update from faculty, staff, and students in the Office of Sustainability - Education and Research. This month's column is from Missy Nergard, director of sustainability.

Missy Nergard

I recently attended the Illinois State Fair (proudly wearing a Badger T-shirt!), and at the farrowing exhibit, I was approached by a UW–Madison alumna. She volunteered in the barn to help educate the public about animal care and livestock production. We conversed over a pen of snoozing piglets and connected through our affinity for the university and sustainability. It was a moment that exemplified the potential of UW–Madison's impact on the broader world. That potential excites me about sustainability in higher education, and it's why I came to UW–Madison.

UW–Madison has a distinct, mission-centered approach to sustainability that leverages the purpose of the university as well as its breadth and diversity of knowledge to address complex, interwoven issues. Most other institutions focus sustainability efforts on campus operational metrics such as waste or energy consumption. Those metrics are important but can miss the mark in terms of where higher education can have the most impact for a sustainable world. It would be a dereliction of our mission and the Wisconsin Idea to think that we will have succeeded as a university if we have only helped the environment here in Madison.

Our campus's approach acknowledges the interconnection of our mission and the environmental impacts of education and research — and then comes full circle by leveraging our knowledge and research enterprise to help address those environmental impacts on campus, throughout the state, and across the globe.

I came to the UW in 2018 as its first full-time director for sustainability. I was motivated to apply because of the distinctiveness of the opportunity: UW–Madison was one of the first institutions to clearly identify that education and research are a catalyst for sustainability impacts at a global scale. The university now has an office of professional staff, faculty, and students who connect the institution's mission and operational efforts, and who help to optimize the passion, expertise, and hope of the campus community for our shared futures.

Each member of our campus community has a role in sustainable practices, yet each of us is simultaneously contributing to the institution's environmental impact. It's quite the conundrum, but we are fortunate to be in a place where our mission is discussing, researching, and developing knowledge to help people navigate such conundrums for the benefit of all.

Director's Cut

A quarterly update from Carol Barford, director of the Center for Sustainability and the Global Environment

Research papers are the "coin of the realm" at R-1 universities, and like other research centers at UW–Madison, the Nelson Institute Center for Sustainability and the Global Environment (SAGE) publishes a lot of papers. Topics range from air pollution chemistry to slavery in the Amazon, methane leaks, tropical forest sounds, solar energy adoption, irrigation, urban expansion, Indigenous resource rights, human-powered transport — the list is long!

One of SAGE's best papers, which laid the foundation for a series of highly cited work on global agriculture, is Navin Ramankutty's analysis of global cropland change over time, published in 1999. SAGE was in its formative stages in 1999 and was then known as the Climate, People and Environment Program. Navin was a student in the land resources PhD program (now environment and resources) at the Nelson Institute and not yet a postdoc in SAGE. However, SAGE and Navin's career launched together, and this paper became a SAGE flagship with a high volume of reprint requests and 2,411 citations to date.

How did Navin and his coauthor and advisor, Jon Foley, simulate spatial distributions of croplands going back to 1700? First, their mental model of croplands recognized biological and physical as well as human elements. Census records supplied the national and sub-national human data going back centuries; crop production records bridged between human and bio-physical systems. These temporally explicit data were linked to spatially explicit data of 1992 crop production and land cover characteristics measured via satellite. Tie it all together with a rule-based model of land-use change and violà — "hindcast" global maps of cropland area going back to 1700. This type of "data fusion" is now a hallmark of SAGE.

To commit to the croplands analysis must have been a leap of faith after training as a mechanical engineer (bachelor's) and an atmospheric scientist (master's), because it included tasks that aren't part of the cutting edge in those fields. Navin built large data sets to drive his analysis (large for 1999, anyway!) which meant requesting and compiling data by hand – no web crawling, no AI. The result is a fascinating look at regions of the world over the span of the Modern Era, complete with the details and quirks that a careful analysis can provide. Recommended reading!

Ramankutty, N., and Foley, J. A. (1999), Estimating historical changes in global land cover: Croplands from 1700 to 1992, Global Biogeochem. Cycles, 13(4), 997–1027, doi:10.1029/1999GB900046.

Carol Barford
Director, Center for Sustainability
and the Global Environment

Q & A: Meet Morgan Edwards

At the corner of climate crisis and policymaking stands Morgan Edwards and the Climate Action Lab.

By Anica Graney

Morgan Edwards

What do you get when you combine the immediacy of the climate crisis with the nuances of public policymaking?

You don't have to answer that, but Morgan Edwards could with her ongoing research at the Climate Action Lab, a University of Wisconsin–Madison research lab that focuses on energy and climate policy led by Edwards. An assistant professor of public affairs at the La Follette School of Public Affairs, Edwards also has affiliations with the Nelson Institute for Environmental Studies and Center for Sustainability and the Global Environment and a variety of other centers on campus. Edwards teaches Cost-Benefit Analysis, an advanced graduate project-based course, along with Evidence-Based Policy Making as part of the undergraduate certificate in public policy.

With a BS in environmental science and economics, SM in technology and policy, and PhD in engineering systems, Edwards is more than capable of diving into every aspect of energy and climate change, especially when it comes to problems where social and technical factors both play an important role. In doing so, she combines large datasets, community knowledge, and systems modeling to assess the multidimensional impacts of human energy use and help design plans to move towards a more just and sustainable energy and climate future.

I sat down with Edwards to discuss her research and teaching and what she has learned over the past decade about how to make climate policy work.

What's your favorite thing about teaching/working with students?
Oh, there's so many things! I really enjoy working with students to develop open-ended projects. A lot of the work they do, especially as undergraduates, has a right and wrong answer. In the real world, the most interesting and important problems are a lot more complicated. I think having the kinds of classes that are more subjective, where there's not just one right answer, really prepares students for their future jobs and life beyond the university. That's a really fun aspect of teaching.

You lead the Climate Action Lab at UW–Madison. What have you been up to there?
It's an exciting time to be working in energy and climate policy! We focus on modeling and tracking the effects of climate actions from local to global scales. One of our big projects is working to create better ways to capture the details of energy technologies in the models we use for setting long-term climate policy targets. A big part of that work is thinking about how to model technologies like carbon dioxide removal. Many of them are in the early development stages today, and whether they can

scale up quickly in the future is really uncertain. We're working on ways to better model new technologies, even when we don't know a lot about them or the role they might play in climate action.

Another big project focuses on planning equitable fossil fuel phaseout in buildings. Currently we burn a lot of natural gas to provide heat in our homes, especially in colder climates like here in the Midwest. A lot of this work is driven by the needs of community partners. There are important questions about how to transition in a coordinated way so that we don't leave folks behind. We also work to understand how to best balance long-term climate solutions like electrification with shorter-term solutions like repairing or replacing leaky gas pipelines in cities.

How did you get into this climate crisis/energy responsiveness side of policymaking research?

I always knew I wanted to work on addressing the climate crisis. When I started college as an undergraduate, I thought I wanted to study climate policy, so I majored in economics and was studying political science. My thinking at the time was we know the science of climate change, so now we need to focus on solutions and implementation.

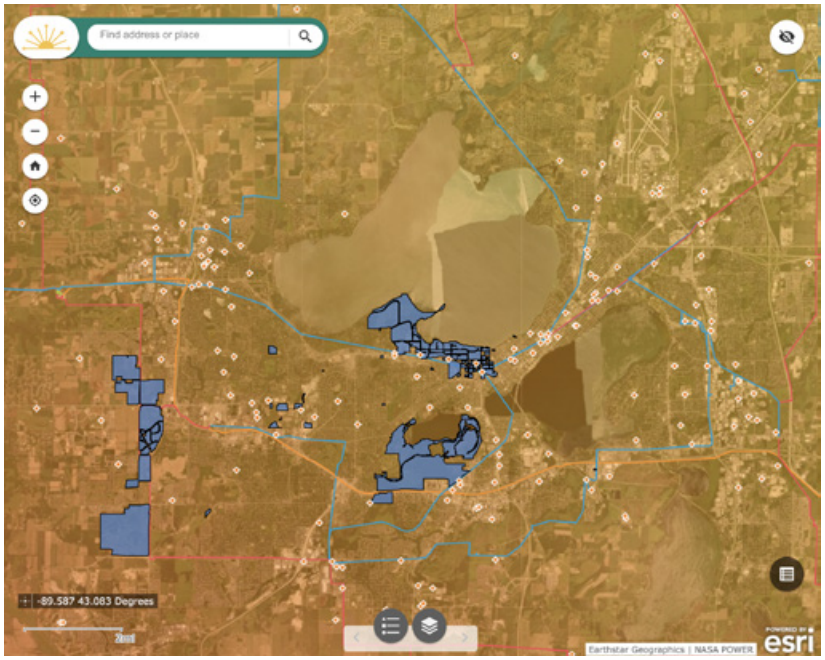
Then, as I continued in my undergraduate degree, I began to realize there are lots of big unanswered scientific questions as well, especially about the effects of energy technologies and how the technical and policy sides interact. So, I switched, and I studied environmental science, did my PhD in engineering systems, and then went back to public policy as a President's Postdoctoral Fellow at the University of Maryland. Now, I'm happy to be affiliated with the Nelson Institute, where I don't have to divide myself between science and policy but can do both at the same time.

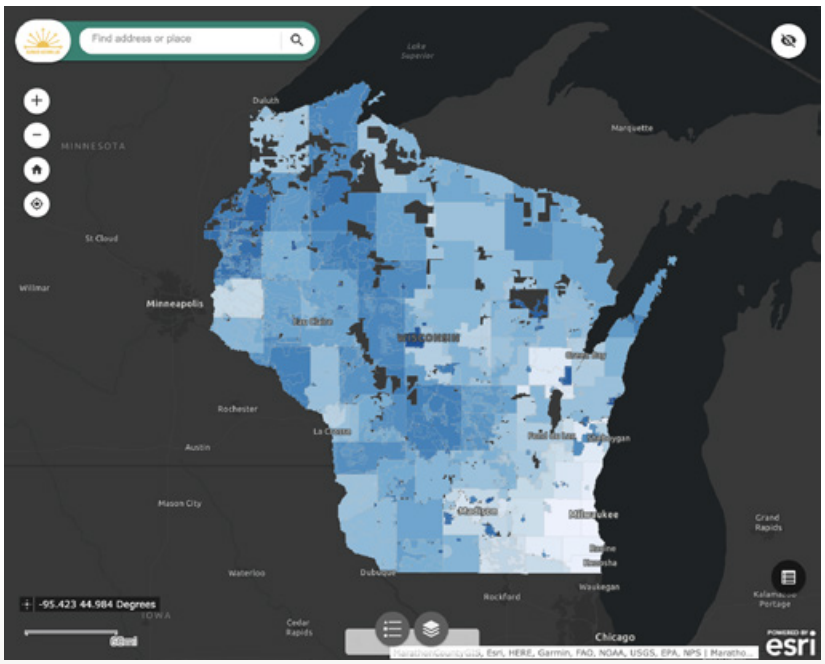
What are some common misconceptions about climate policy?

That the costs of addressing the climate crisis are very expensive. The costs of not acting are far, far greater than the cost of doing something about it. We're also seeing that for a lot of climate solutions are getting more and more affordable, and in some cases, cheaper than conventional fossil fuel technologies.

Any advice for students who are interested in climate policy?

This is a very solutions-oriented field, so I would suggest finding a question that's really interesting to you and try to come in with an open mind about the way that you might answer that question. You might find that the tools you need are ones that you're not familiar with, so don't be afraid to go out and learn new things. We need all hands on deck to solve the climate crisis!





The Climate Action Lab often creates maps utilizing the tools at their disposal. To learn more about how these maps are made, visit the Climate Action Lab's website.

Turning Ditches into Rain Gardens

WRM graduate bridges science, education, and community through practicum project.

By Anica Graney

Winkelman and his WRM group install rain gardens in the Madison area. Photo by James Winkelman (3)

Hello, property owner! Do you have unsightly ditches ruining your curb appeal? Do these ditches tend to flood when it rains? Well, look no further than installing your very own rain garden!

Don't worry, this isn't an infomercial, but if that hook made you curious about rain gardens and their benefits, then a recent water resources management (WRM) cohort has the resources for you! WRM graduate James Winkelman and his project-mates completed a report analyzing Madison-area rain gardens along with the tools necessary for local property owners to start their own rain garden journey.

James Winkelman

This project was years in the making, and for Winkelman, it came after a bachelor's degree in environmental geoscience from the University of Buffalo and a seven-year–long career in education. It wasn't until moving to Madison in 2017 that Winkelman began to search for a master's program that would elevate his background in the environmental field.

In his search for the next step, Winkelman found the Nelson Institute's water resources management MS, an easy choice as his wife, Julia, was working on her PhD within the atmospheric and oceanic sciences (AOS) department at UW–Madison. "For me, what really stuck out was the collaborative nature and working aspect of the WRM practicum," Winkelman said.

While Winkelman may have spent the first part of his career teaching environmental education, it had been a while since he was on the opposite side of the classroom. His first class was Small Watershed Engineering with WRM chair, Anita Thompson. "Starting with an engineering class right out of the gate was a bit scary, but Anita was super understanding and made sure to answer any of my questions in office hours or whenever they came up," Winkelman said.

As Winkelman continued in the program, he appreciated how customizable his degree was, even taking a few life science communication courses, like Photography for the Sciences. "I was like, 'are you sure I'm allowed to take this course?' And then they approved it," Winkelman said. "It was super beneficial to me — learning about science communication and getting people interested in things."

With a specialty in soil/water interaction, Winkelman was able to do a few projects with UW–Madison's soil science department as well as gain some field experience. His specialty aided him as a teaching assistant for an undergraduate soil science class, but not as much when he assisted with AOS's Climate Change 100 course, which is when he would turn to Julia. "She'd give me a lesson on anything I didn't have that much experience in," Winkelman said. "It was a big benefit to use her expertise and knowledge, and a perk of being able to collaborate with different departments."

As part of the WRM practicum, students must form groups to tackle a contemporary problem in water resources. Winkelman and his group chose to research ways to improve water quality in Madison's Lake Wingra, ultimately landing on rain gardens, a practice used to increase water reabsorption in a depressed area as well as treat polluted stormwater runoff. "Basically, getting plants to do the work before the water gets to a treatment plant or to our streams, rivers and lakes" Winkelman explained.

"For me, what really stuck out was the collaborative nature and working aspect of the WRM practicum."

– James Winkelman.

Each member of the group chose a section of the project to spearhead, with Winkelman choosing to lead the GIS mapping portion and plotting a section of the Lake Wingra watershed. From this, Winkelman and his group created an interactive map to show stakeholders and community members the feasibility of installing a rain garden on their property. "Hopefully the map will make it easier for property owners to find out if a rain garden will work out for them," Winkelman said, "or let them know that they should find some other solution for their property, like a rain barrel."

Winkelman's group also completed infiltration testing on existing Madison rain gardens and even had the opportunity to help build a few. They hope their research will promote rain garden installation in Madison, but from surveys they conducted, know that there are barriers to entry for local property owners, specifically installation and maintenance education and confidence in how the project will turn out. Winkelman says the next step is for there to be a community base with leaders as contact points for others who have questions or concerns. Basically, neighbors helping neighbors.

Winkelman and his WRM group conducted infiltrometer testing to determine the infiltration rate of water into the soil.

In order to determine the best conditions for soil infiltration, Winkelman and his group test on different grounds, including this native plant garden.

Now graduated and working for the Wisconsin Department of Natural Resources, Winkelman is currently in the process of moving to California, Julia's home state, as she accepts a post-doctoral position. Winkelman says he will be looking for a new position in California that hopefully intersects community education and science, just like his experience in the WRM program.

Learn more about the water resources management MS.

A Zeal for Zambia

PhD student Colleen Henegan travels abroad in pursuit of her research interests.

By Anica Graney

The effects of climate change leave a dried basin on the Lusitu River in Zambia. Photo by Colleen Henegan

Lend Nelson Institute PhD student Colleen Henegan your ear, and she'll tell you all about her time in Zambia, a landlocked country in the south of Africa. As Henegan recounts the months she spent researching, surveying, and living alongside the people of Zambia, it's easy to see the passion she has for her work.

"I stayed in a village just outside of Kafue Town, and it's just one of the most beautiful regions of Zambia that I've seen," Henegan said. "It's an agrarian community full of hills with beautiful sunsets and sunrises."

Henegan has been to Zambia four times in the past four years to research edible insect farming and the impacts of climate change on agriculture in Zambia with her good friend and research assistant, Mwansa Matokwani. Her time on this research topic is chronicled by Matokwani's now four-year-old daughter, Wandipa, who was born shortly before Henegan arrived in Zambia in 2019.

"[Matokwani] and I clicked incredibly well when we first met in July of 2019, and she's become one of my closest friends," Henegan said. "I first met her daughter when she was one month old, and it's been so fun to see her grow up."

While in Zambia for her PhD research, Henegan also used her experience as inspiration for her Pulitzer Center reporting fellowship. There, she wrote about the effects of climate change on Zambian agriculture along with reflections of a changed world since the COVID-19 pandemic.

The reporting fellowship is a culmination of years of dedicated interest in language arts and environmentalism; Henegan majored in Environmental Studies and minored in English Literature while an undergraduate student at Denison University in Granville, Ohio. After graduating in 2012, Henegan joined the Mississippi Delta Corps for Teach for America where she was trained as a biology teacher, earning her teaching license and teaching high school science for a combined six years in rural Arkansas and Austin, Texas.

"I kind of fell into teaching after graduating. Teaching was something I had always enjoyed, and I wanted to develop those skills a bit more," Henegan said. "Then after six years of that, I realized my passion lies in contributing

to the environmental field as well as teaching – so academia allows me to do both!"

Henegan then enrolled in the Nelson Institute and moved to Madison to begin her master's degree where she began taking classes like Climate Change Ecology, Agroecosystems and Global Change, and Literary Ethnography. These courses provided Henegan with the skills and knowledge necessary to create meaningful change in the environmental field, but it was her Public Health and Global Environmental Change course taught by Professor Jonathan Patz that she said, "changed my life."

"I realized my passion lies in contributing to the environmental field as well as teaching – so academia allows me to do both!"

– Colleen Henegan

While in class, Patz invited Valerie Stull, a postdoctoral researcher at his research lab, to give a presentation on farming edible insects and how it can help combat malnutrition in areas affected by climate change. "I loved her presentation so much," Henegan said, "that I went up to her afterward and asked her to teach me all she knew."

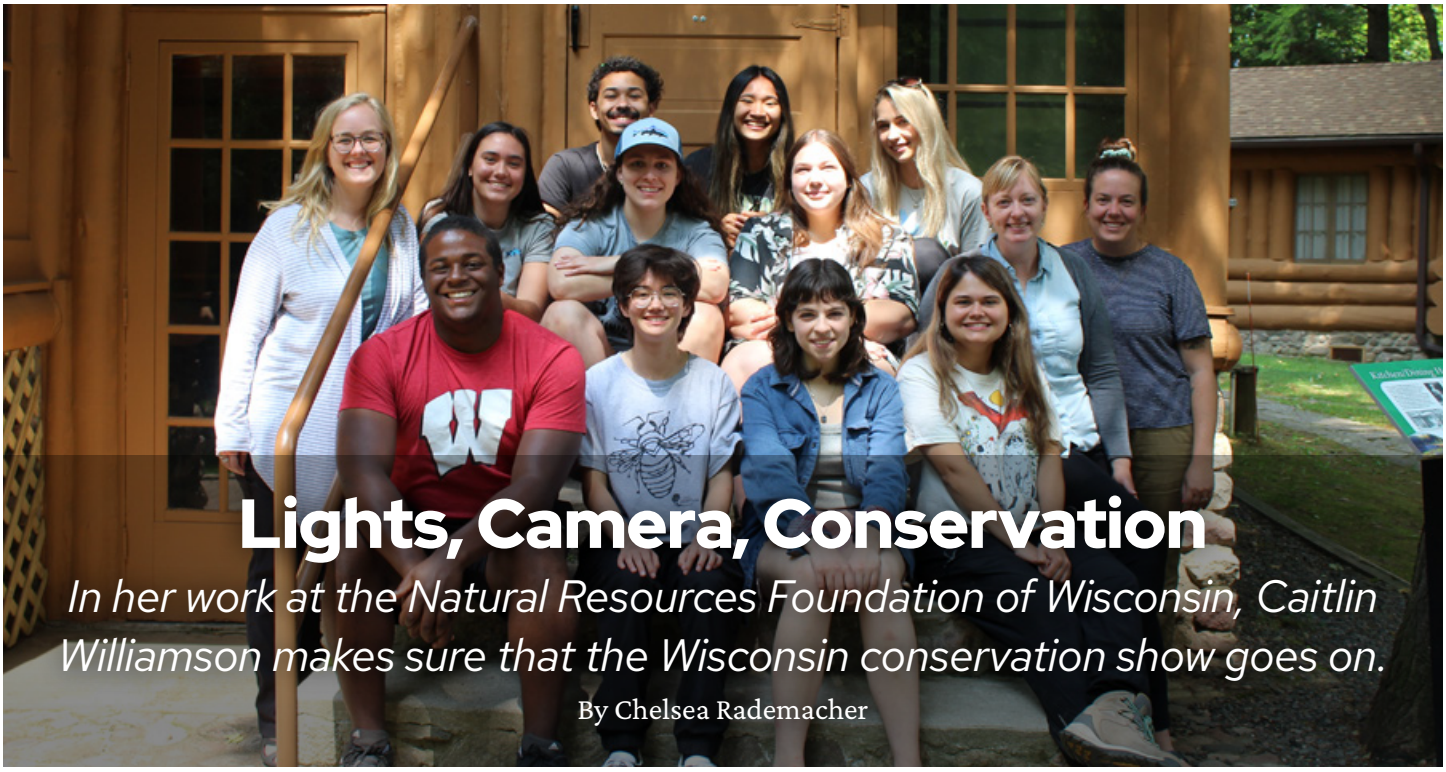
Stull took Henegan under her wing, introduced her to the country of Zambia, and the rest is history. Now working on her PhD, Henegan's focus has shifted more toward the future impacts of climate change on crop yield and the ways in which farmers can adapt, with a special focus on female-led farms. She hopes that her work will help prepare for future climatic changes that are disproportionately affecting tropical regions, like Zambia along with the women and children that live there, like Matokwani and her daughter.

"I've reflected on how Wandipa will be my age in 2050, which is when many of our climate models start to get much scarier," Henegan said. "It really changed how I view my work to think about how she will be experiencing the future."

As Henegan reflects back over the years spent at the Nelson Institute, she advises students interested in earning their PhD to think of it as a marathon. "I think one of the best things to do with something that's this long, is to really embrace it as part of your life," Henegan said. "It's important to be done within a good timeframe, but to also take the time to appreciate this moment in your life and to really live it."

Congratualtions

to Colleen Henegan as she accepts a University of Wisconsin–Madison Morgridge Center for Public Service Fellowship. With the purpose of further institutionalizing and supporting community-engaged scholarship (CES), Morgridge Fellows teach, research, and perform scholarly activities to fulfill campus and community objectives. Henegan will spend the 2023–24 academic year serving as an ambassador for CES within the Nelson Institute and hopes to develop a capstone class that reflects the value of interdisciplinary and community-engaged work.



Lights, Camera, Conservation

In her work at the Natural Resources Foundation of Wisconsin, Caitlin Williamson makes sure that the Wisconsin conservation show goes on.

By Chelsea Rademacher

Williamson (middle row, second from right) with the 2023 cohort of the Diversity in Conservation Internship Program. Photo by Tim Van Deelen

Pretend, for a moment, that you're in the audience for Taylor Swift's highly talked about Eras Tour. There's state-of-the-art videos playing on enormous screens around the stadium, perfectly timed to the perfectly balanced audio. There's choreography. There are costume changes. And somewhere in the stadium — behind the stage, or perhaps beneath it — there's the stage manager, making sure that all of the pieces are working together, and that everything goes off without a hitch. In the equally complex and impressive arena of Wisconsin conservation, that person is Caitlin Williamson. "Stage manager?" Williamson asks. "Yeah, I'll take that!" she says with a smile.

It's a timely metaphor: Williamson, the Natural Resources Foundation of Wisconsin's director of conservation programs, had just gotten back from a road trip to Kansas City, Missouri, for Swift's concert. A long drive from Madison, to be sure, but it was a short trek from Williamson's hometown of Omaha. The Nebraskan metropolis is where Williamson first developed an interest in nature. Her parents weren't the most outdoorsy folks, Williamson recalls, but recognizing her love for animals and nature, they signed her up for nature day camps at Fontenelle Forest every summer. When she aged out of camp in high school, she went from camper to counselor — a role she continued throughout college. "That was a huge part of my life, and also part of why environmental education is a really special and important part of the work I do," Williamson says. "I've grown into my career because of those experiences I had as a kid."

When Williamson left Nebraska, it was to study biology and environmental studies at Lawrence University in Appleton, Wisconsin. "For a long time, I thought I wanted to be a wildlife biologist and do field work," she says. While in college, she interned with the wolf management team at the Wisconsin Department of Natural Resources (DNR). She loved making a difference for the animals … but realized she missed working with people. That's one of her superpowers, she says: networking and making connections. The realization helped her look at the field of conservation differently. "There are other types of conservation work that support wildlife in our lands and waters in different ways [than] being in the field all the time."

Looking for her next step, she came to Madison and started working as a research assistant for Erik Olson, a PhD candidate in the Nelson Institute's environment and resources program. Through that, she met Nathan Schulfer, the institute's current director of international and professional programs. This was around 2012, and Schulfer — then a teaching and program assistant — was helping to create a brand-new Nelson program: environmental conservation, a fast-track, professionally focused master's program that would take the place of the now-former conservation biology and sustainable development master's program. "That sounds exactly like what I'm looking for," Williamson said

when Schulfer told her of the program that was starting the following year. "I didn't want to do the traditional research route. I wanted to build off the skills I had in my first job with more professional experience." Williamson applied, was accepted, and joined UW–Madison's first cohort of environmental conservation students. She'd always planned on going back for a master's degree, but like her preconceptions of what conservation work looked like, she thought she'd end up in a traditional wildlife or natural resources master's program. "The professional program was way more aligned with my interest, my passion, and doing direct actionable work," she says.

During her first week as a Nelson student, Williamson flexed her networking superpower at the program's welcome reception. There, she met Ruth Oppedahl — the Natural Resources Foundation of Wisconsin (NRF)'s then-director. From that encounter, she nabbed a part-time volunteer position at the NRF. "Very serendipitous, I suppose," she reflects. Or perhaps not, considering her superpower. It's how she got the research assistant job ("I knew it'd be important to build some connections, especially in a new city," she says of moving to Madison). It's how she met Schulfer and became one of the first graduates of the environmental conservation program. And it's how she got her foot in the door at the NRF, where she's now been for nearly a decade.

"There are other types of conservation work that support wildlife in our lands and waters in different ways [than] being in the field all the time."

— Caitlin Williamson

Formed in 1986, the NRF is a statewide nonprofit that, through funding, partnerships, and education, helps protect the state of Wisconsin's lands, waters, and wildlife. Williamson joined during her master's studies as a part-time program and development coordinator, which grew into a full-time position after graduation. In 2017, she was named the foundation's director of conservation programs. It's her dream job, even though she didn't always know this type of conservation work was possible. "A lot of my work is, by its nature, partnership building," she says. "That's surprisingly been a big piece of my job that I love the most. Yeah, it's benefiting so many amazing critters, but getting to support the people who support those wildlife species is really amazing, too."

Enter Williamson, Wisconsin conservation stage manager. She finds the bigger picture and makes sure all the pieces fit. Take, for example, Wisconsin's Rush Creek State Natural Area, nearly 3,000 acres of land along the Mississippi River. It's home to rare and migratory birds, a trout stream, and some of the last remaining goat prairies in the state. The DNR has managed the property for decades with a small but mighty crew. Williamson helped build and support partnerships with the NRF, the Northern Institute of Applied Climate Science, the Wisconsin Initiative on Climate Change Impacts (a Nelson Institute partner organization) — and a $300,000 grant from the Wisconsin Conservation Society to create Wisconsin's first climate adaptation site. "We have so much science and knowledge, but there's a lack of connecting that to what the people on the ground can actually do to make a difference," Williamson says. "I help to support Wisconsin's conservation field and catalyze that work. [Rush Creek] is an example of a project that's going to have a really big impact."

When it comes to producing the future of the state's conservation efforts, Williamson doesn't only look at land, water, and wildlife resources — she looks at people. More specifically, she empowers the next generation of conservationists. Over the summer, she's been hard at work managing and coordinating the third cohort of the NRF's Diversity in Conservation Internship Program for college students. Interns are paired with a specific NRF partner organization, where they work throughout the week. Then on Fridays, the cohort comes together for programming at the NRF. Williamson leads these Friday activities, which range from field trips to Milwaukee to learn about environmental justice and urban conservation to tours of the former Badger Army Ammunition Plant and the Ho-Chunk Sacred Earth Reservation to Williamson's own area of expertise, networking.

"That's something that we really designed this internship program to help with … whether it's networking or creating your resume or how we communicate. I think those are equally, if not more important than the actual expertise in ecology or wildlife," Williamson says. "So many of us get into [conservation] because we love wildlife. But it all comes back to people and bringing people together towards a common vision for how we can help care for what we love about the state."

Profiting Sustainably

Kyle Tanger makes big plays in corporate sustainability by prioritizing his offensive line.

By Chelsea Rademacher

Tanger speaks at a "Future of Food" dinner. Photos courtesy of Kyle Tanger

In Kyle Tanger's playbook, the best defense is a good offense. You read that right: instead of blocking problems, start by … well … not having those problems in the first place. This might not work for the Badgers' starting line, but it sure does for corporate sustainability, which has quickly become a top priority for companies. An expert in this space, Tanger helps companies see that big plays score big returns. For about 12 years, the Nelson Institute alumnus has been a U.S. sustainability consulting leader for global consulting powerhouse Deloitte. His job isn't just helping companies adopt more sustainable practices — though that's certainly part of it — but to *sell* sustainability through a language that businesses understand: profit.

> *"We're finally turning sustainability from a defensive strategy into an offensive strategy."*
>
> — Kyle Tanger

As Tanger explains it, the average cost of emitting one ton of greenhouse gasses into the atmosphere is about $173. "That is the cost of electricity, or the cost of diesel fuel for their trucks, or refrigerants that leak from their freezer cases, or whatever it might be," he outlines. So, if a company were to cut back 1,000 tons of carbon emissions, they'd be looking at $173,000 of cost savings. Sold? So was Walmart, who Tanger started working with in 2006. "Their ambition is to remove a billion tons of emissions from their supply chain. That means 173 billion dollars of costs, prospectively," Tanger says. They coined it Project Gigaton™, which launched in 2017 with an end-date goal of 2030. They're already most of the way there. "Those are the kinds of impacts that are really exciting: when people very deliberately marry the environmental impacts to business impacts. It gets things done quicker."

Beyond Walmart, Tanger's client portfolio is as impressive as it is varied. He's worked with food and agriculture companies like Cargill and Tyson, location-based operations like Disney World, and film studios that are looking to clean up their production practices. He's even strengthened his funny bone, helping to write sustainability-related content for *Family Guy* and the *Simpsons Movie*. "That was wild, Tanger reflects, "to think that somebody's going to pay you to write about sustainability into movies."

To get companies on board, Tanger's team starts with the business case: this project will lead to X amount in savings or new revenues. It's a crucial starting play, because sustainability projects often require multiple business units who mightn't typically interact or work together. "Sustainability projects are often very cross-functional within a company," Tanger explains. "Having a really strong business case to start is critical to get everybody on the same page [and] get everybody's buy-in."

From there, his team pairs their scientific backgrounds

— environmental science, atmospheric chemistry, soil science engineering — with market analyses to ask questions and look for efficiencies. The biggest clue in the hunt for problems? Carbon. "What we find is that carbon … is an incredible proxy for operating efficiency because it occurs in so many different ways. It comes from equipment that leaks, it comes from inefficiencies, it comes from using too much fertilizer," he says. "It's just a great proxy for finding overall operating efficiencies."

Let's say, for example, that Tanger is working with a popular, nationwide restaurant chain that specializes in hamburgers. To find the full carbon impact of one to-go order, Tanger traces it back to the source: beef cattle. "We'll look at all the different things that can happen through that cow's life cycle and how you can influence its feed, grazing practices, waste management practices, even looking at the weight that animals are grown to before they're harvested," he says. "You get a chance to look at every aspect of that life cycle and ask, what could be different? What would it take for something to be different?"

Kyle Tanger

After leading with the potential savings, pinpointing specific efficiencies to tackle, it's time for the next hurdle: *literal* buy-in. "We have a climate-smart option for you. Are you interested in buying it?" Tanger will ask. "The answer so far has been, 'We're very interested in buying it. We'll pay a premium to buy it.' And that premium is paying for all of these sustainability practices — and it's giving us enough money that we can go back and do the next tier of sustainability practices and reinvest." As the saying goes, it takes money to make money. In this case, it takes money to make both money and a difference. Tanger's own suspicion is that if the aforementioned burger joint increased their menu prices by 10 percent ("Which is a small fraction of what we have experienced with recent inflation, by the way," Tanger points outs), they could cut their carbon footprint in half.

When it comes to corporate sustainability, it's not just increasing a company's bottom line. This is where Tanger's offensive strategy comes in: in recent years, operating sustainably has become critical for brand image and recruitment. These are the initiatives that Tanger considers the "broader calculus" of a company's sustainability practices. "How does this impact the company's brand? How does this impact the perception that company has in terms of their ability to recruit and retain top talent?" he asks. "It's so much fun because we're finally turning sustainability from a defensive strategy into an offensive strategy."

"When people very deliberately marry the environmental impacts to business impacts, it gets things done quicker."

— Kyle Tanger

If Tanger's strategy has you ready to sign on the dotted line, you may be surprised to learn that, while a student at UW–Madison, he didn't earn his degree in marketing or sales. "I started in business thinking that's what I needed to do to get a job. I just found myself loving all of my science classes instead." Instead of business, he majored in zoology and biological aspects of conservation, bolstered by an environmental studies certificate in the Nelson Institute. "The [Nelson] program did such a good job of being deliberately varied in the coursework that was required of you," Tanger reflects. "What all of that created, if I look back at it, is it made you a critical thinker and somebody who really examines a challenge and evaluates it."

And it turned out that he didn't need a business degree to get a job; when he graduated, he got an exciting offer from the Wisconsin Department of Natural Resources … with a less exciting salary. "I had been applying for graduate school at the same time and decided, 'Well, why not continue this path and get even more of an education in it so I can hopefully be more effective?' " He went on to earn a master's of public administration in environmental policy and a master's of science in environmental science from Indiana University in Bloomington.

Now, more than two decades into a career in sustainability and the environment, Tanger reflects on that initial job offer. For him, it's not a bad thing — it shows just how far careers in the environment have come. "A lot of us back in that day would've taken that and said, 'Well, that's just doing environmental work. It's low paying, but at least I like what I do.' Now you can become *wealthy* by doing what you do. And I think that's awesome," Tanger says. "There's a lot of people that made a ton of money polluting the earth. Why shouldn't we get paid even more for fixing it?"

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Friday, Sept. 29

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Rendezvous ON THE TERRACE

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