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Dispatches from a sentinel species

Measuring PFAS and overall health in bald eagles

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STAY CONNECTED

On the cover: Since 1990, the Great Lakes Eagle Health Project has been measuring contaminant levels in young bald eagles. The results help protect both eagles and humans.

Researchers and communities working together

By **ALISON MIKULYUK**, Water@UW–Madison research program coordinator, and **SARAH PETERSON**, community engagement and professional development manager

Last fall, more than 70 water professionals, researchers, and community leaders gathered on the University of Wisconsin–Madison campus for the first-ever Water Partnership Workshop, hosted by Water@UW–Madison and Wisconsin Sea Grant. The energy in the room was apparent: conversations buzzed and ideas flowed freely as participants leaned into the opportunity to shape Wisconsin's water future.

The lively discussion revolved around one question: What should we research — together — next?

This type of collaboration is a reflection of the growing desire to turn scientific inquiry directly toward the priorities and needs of others. Known as community-engaged research (CER), this approach centers community voices and fosters collaboration in science.

CER requires us to evaluate whether science is asking the right questions. Are research projects grounded in concerns and priorities shared by the community? Are researchers answering them in ways that are fair and useful? When done well, CER also helps build trust in science and the scientific process, empowers communities to take action and build strength, and can help democratize knowledge production so that more people have access and stand to benefit.

A growing number of scientists are inspired to participate in CER; however, many don't know where to begin. In our roles at the Aquatic Sciences Center, we often hear the same question from scientists: How do I get started in a collaborative partnership with a community group?

Our attempts to answer that question led us to organize the Water Partnership Workshop in September.

Matchmaking researchers with community partners

Designing the workshop took several months and started with brainstorming about how we as coordinators could help build relationships between campus researchers and community partners. Early on, we decided to offer a full-day workshop structured around a set of topics that scientists and community members wanted to tackle together. Our goal was to spark new connections, foster collaboration, and provide a space where community-engaged water research projects could begin to take shape.

We reached out to over 40 contacts within Wisconsin's diverse water network, who then reached out across their networks in turn. Participants were almost always excited about the opportunity to connect. After a series of one-on-one meetings with community representatives, we identified a collection of eight organizations eager to participate, each with their own unique concerns related to water.

Behind the scenes, we began to match researcher expertise with the questions posed by community guests. As we

More than 70 water professionals, researchers, and community leaders representing a broad range of water-related topics gathered in September as part of an overall effort to turn scientific inquiry directly toward the priorities and needs of others, an approach known as community-engaged research.

recruited and aligned participants, we found ourselves creating a topic-specific seating chart that resembled something you'd see at a wedding reception. We aligned the participants on topic and interest, then balanced the groups to include experts and community members from a range of career stages and disciplines.

The multigenerational, multidisciplinary groups that emerged set the stage for what we hoped would be a set of really interesting and productive conversations.

Moving at the speed of trust

The eight groups that came together on September 11 arrived with a wide range of water topics that mattered to them.

Representatives from the Wisconsin Farmers Union discussed agricultural trade-offs between organic and conventional practices.

The Coon Creek Community Watershed Council explored ways of rethinking flood management to address aging dams throughout the watershed.

Wisconsin EcoLatinos discussed culturally relevant communication about environmental contaminants in Latino communities.

Representatives from the Black Earth Creek Watershed Association explored the impact of neonicotinoid pesticides on aquatic invertebrates in trout streams.

Southern Wisconsin Trout Unlimited discussed the relationship between urban stormwater management and trout streams.

A member of the Lac du Flambeau Band of Lake Superior Chippewa Indians spoke about tribal water rights and imagining ecology beyond a Western scientific framework.

Staff from the Great Lakes Inter-Tribal Epidemiology Center engaged in a discussion on emerging contaminants and cumulative impacts to tribal communities across Wisconsin.

Volunteers with two Madison-based lake associations spoke about phosphorus contamination and future management pathways.

Over the course of six hours, the workshop revealed some cross-cutting challenges. One theme that surfaced was that scientific data and tools are often too complex for practical use. There was shared consensus that researchers must prioritize translating research into simple, actionable decision-support tools.

Another theme spoke to how essential trust is for developing effective solutions, requiring two-way communication and the involvement of trusted community messengers. It highlighted how academic research operates at a certain pace, often driven by grant cycles, project management milestones, or tenure review timelines. However, CER is not only in the hands of researchers, so it must always strive to move at what we've come to call the "speed of trust."

Future collaborations

It's our hope that we helped forge lasting connections that day. While we don't know yet what will come of the projects and ideas that were generated, we know we're learning more about a model by which to facilitate trust and exchange.

We hope that the Water Partnership Workshop was more than a one-day event – we envision it as a catalyst, demonstrating the power of bringing many voices together around shared water interests. We hope it helped lay groundwork for future collaborations that are community-initiated, interdisciplinary, and action-oriented.

We are already planning our next collaborative event, refining the model using feedback we received from participants. We strongly believe that this is what water research should look like: people coming together, listening deeply, honoring community agency, and building something better, together.

If you're interested, reach out to water@mailplus.wisc.edu to join us. ■

COVER STORY

Dispatches from a sentinel species

Measuring PFAS and overall health in bald eagles

By JENNA MERTZ

Gavin Dehnert, emerging contaminants specialist, Wisconsin Sea Grant

Emily Cornelius Ruhs, ecoimmunologist and postdoctoral researcher, Field Museum

It hadn't been a successful morning for the Great Lakes Eagle Health team.

Traveling by boat, truck, and foot, the team was searching for active eagle nests along the Wisconsin River in Nekoosa, Wisconsin. Tree one was a dud, and tree two, a heartbreaker. Dan Goltz, one of the team's climbers and a wildlife biologist with the Wisconsin Department of Natural Resources, scaled a 70-foot tree only to be met with a gentle breeze blowing through an empty nest.

The team, however, had reasons to be optimistic about tree number three.

For one, it was streaked with whitewash, or eagle poop. Loath to defecate inside their nests, baby eagles poop off the sides, spraying the ground with what looks like white paint. Fresh whitewash usually indicates an active nest.

The second promising sign was that the tree was a white pine – Goltz's favorite. Snapping on a hot pink helmet, he spiked his shoes into the trunk and began to haul himself upward.

And then there was what was happening above Goltz's head. A bald eagle, clear against the high-noon sky, flew into view and began to circle and chirp. A second soon joined to voice its displeasure at the man approaching the nest.

"That's a great sign when you hear the bird chirping at you like that," said Brian Dhuey, WDNR research technician, peering through the trees. "It means there's something to protect."

The presence of the eagles energized the team on the ground. Lindsey Long, a WDNR wildlife veterinarian, kneeled on a blue tarp and began to unpack her equipment: tubes, syringes, glass slides, a small machine that repels mosquitoes. Two volunteers listened as she explained sampling protocol, and Dhuey shuffled among the dry leaves.

Now, they waited. Necks craned toward the sky, the team watched Goltz climb, hoping for news of a bird.

What eagles can tell us

The Great Lakes Eagle Health Project (**GreatLakesEagleHealth.com**) has tracked contaminant levels in bald eagles across Wisconsin since 1990. Currently funded by the National Oceanic and Atmospheric Administration (NOAA) and U.S. Geological Survey, the project brings together federal, state, tribal, and academic partners to test eagles for a variety of pollutants, like heavy metals and PCBs, and investigate how they're affecting eagle health.

In 2023, Wisconsin Sea Grant's emerging contaminants specialist Gavin Dehnert joined the project to investigate a new problem: per- and polyfluoroalkyl substances, or PFAS.

Dubbed "forever chemicals," PFAS don't break down easily, are harmful to human health, and have been found in high concentrations in drinking water in communities across Wisconsin.

Top right: Climber and wildlife biologist Dan Goltz carefully removing an eaglet from its nest. Image by Great Lakes Eagle Health Project

Bottom left: White pines are easier to climb than cottonwoods. The deeply furrowed bark of cottonwoods can chip off under the pressure of climber Matt Stuber's spurred boots.

Dehnert said eagles are what's known as a "sentinel species," organisms that can alert humans to environmental toxins — like a canary in a coal mine. Due to their diet, bald eagles are particularly good indicators of how much PFAS are in the environment.

"They eat a lot of the same foods that we do," said Dehnert, like fish and deer. "And because they also eat both aquatic and terrestrial food sources [...], they give us a really good idea of how much contamination is in the area."

In addition to measuring PFAS levels, Dehnert and Emily Cornelius Ruhs, an ecoimmunologist and postdoctoral researcher at the Field Museum, are studying how the contaminants affect eagle health, specifically their physical bodies and immune function. Do PFAS weaken eagles' ability to fight off illness? Do they impact hormone levels? How are eagles growing and developing?

"We don't know a lot about it or how it impacts wildlife," said Cornelius Ruhs.

But a lot of information can be gleaned from a blood sample.

Landing the bird

The news was good. Secured to the tree with ropes, Goltz had peered across the eagles' platform of sticks and declared there was not one, but two nestlings in tree number three. The task now was to safely transport the birds through the canopy to the team below.

The climbers use what's essentially a chicken hook — a tripod leg with a hook on the end — to coax the eagles toward their bag. Goltz's hook had green glitter on it, which, he deadpanned, mesmerized the birds.

A joke, perhaps, but sometimes the rally cap prevails. Goltz's bag lowered into view, and Dhuey swiftly claimed it.

Bird in tow, Dhuey walked back over to the team. He weighed the bird, still in its drawstring pouch, and knelt next to Long. With blue surgical gloves on their hands, they peeled back the bag to reveal the fluffy bundle they'd been chasing all morning. Dhuey held the bird as Long made final preparations for the blood draw.

"Want to see a baby dragon?"

Chocolate brown with sulfurous yellow feet, the nestling was no less striking than its parents. Its talons were curved and black, and under Dhuey's strategic grip, they looked positively reptilian. The eaglet looked around at the team, a breeze riffling its feathers.

Long was ready. She helped Dhuey lay the nestling on its back and covered its head to keep it calm. One hand holding the feet, one hand unfurling the wing, Dhuey secured the bird. Long grabbed the syringe. The choreography between them was familiar and swift, two researchers practiced in the art of data collection.

Long crouched over the wing. Soon, dark red began to spiral through a thin tube into the syringe.

continued on page 6

Above: Each year, the team chooses different sampling sites. In May of 2025, they focused on the Wisconsin River.

Top left: Eaglets in the nest. Image by Matt Stuber

Top right: The team only takes blood samples from eagles under 12 weeks old because their main exposure to PFAS is the food their parents bring. The blood samples provide clues to how contaminants move through and accumulate in the food web.

Bottom right: Every precaution is taken to ensure the safety of the birds, from keeping handling to a minimum to only sampling eaglets that are old enough.

Outdoor learning series connects elders, students, and the land

By JENNA MERTZ

Julia Noordyk, water quality and coastal communities outreach specialist, Wisconsin Sea Grant

Evan Brenkus, First Nations graduate assistant

In late September, Randy Cornelius kneeled in the middle of the Communiversity Park woods to greet a patch of wild ginger. Around him, a small group of University of Wisconsin–Green Bay students and staff leaned in to look at the leggy, yellowing plants with heart-shaped leaves. Cornelius pointed to one taller than the rest.

"I call them grandmas, the big ones," he smiled.

It's a fitting name. From a young age, Cornelius learned about the many uses of plants from his own grandmother, who took him foraging. Now, the Oneida Nation elder is the teacher, and this fall, he shared stories and knowledge as part of the "Outdoor Learning from an Elder" series.

Organized by the UW–Green Bay Center for First Nations Education and Wisconsin Sea Grant, the series invites students and staff to get outside and learn more about natural areas on and off campus. Evan Brenkus, this year's Sea Grant First Nations graduate assistant, worked with Julia Noordyk, Sea Grant's water quality and coastal communities outreach specialist, to plan the events.

"Having our elders come out and talk about their experience with the land, and working with nature in general, and sharing that knowledge with students on campus is just an amazing opportunity in my eyes," said Brenkus.

Above: Randy Cornelius holds up the root of a wild ginger plant.

Right: A group of UW–Green Bay students and staff gather around Cornelius as he explains the uses of wild ginger.

Sharing language and culture across generations

The Oneida language was central to September's plant walk. In addition to introducing himself in Oneida, Cornelius handed out Oneida language field guides and invited participants to practice the tobacco-offering speech he recites when harvesting plants. Offering tobacco, Cornelius explained, shows respect to the plant and strengthens people's relationship to the land.

The words were familiar to Brenkus, who began taking Oneida language courses in high school. A fan of math, he fell in love with the patterns and continued studying the language throughout college. He loves it so much, in fact, he's currently developing a keyboard that will allow speakers to easily type the language.

"It's hard to describe how complex it is, and how formulaic it is, and how interesting and intricate it is," he said. "It's like a living math equation. That's the best way I can describe it."

A former student regent on the Universities of Wisconsin System Board of Regents from 2023-2024, Brenkus is used to navigating multigenerational spaces.

"[The regents] were very keen on listening to what the student regents had to say because they're there on the ground," he said. "I learned so much. I grew up a lot."

Back to the woods

The September plant walk was the first of three outings with Cornelius. In October, participants visited Trout Creek on the Oneida Nation Reservation to learn about wetland restoration and bird habitat, and in November, they headed to the Wequiock Creek Natural Area for a discussion on hunting and sustainability.

"We're really grateful for Randy," said Noordyk. "He's generous with his time and knowledge, and he's a great storyteller, too. I think people are enjoying the opportunity to get outside and learn from him."

There will be another series in the spring of 2026. For more information, contact Julia Noordyk at **noordykj@uwgb.edu**. ■

continued from page 4

Keeping eagles in the sky

Once collected, the blood samples are smeared onto slides and prepared for further testing. That's where ecoimmunologist Cornelius Ruhs comes in. Her job is to decode what the blood says about the nestlings' health.

"The blood sample is used for many things. The first one is a white blood cell count," she said. "And that's pretty much the same as what you would get at a doctor's office, like a CBC or blood panel."

Cornelius Ruhs also measures total antibody levels in the bird's blood, levels of two different thyroid hormones, and corticosterone, a stress hormone. Additionally, the team is running a new test that's only been done on humans and other primates. Known as an "ex vivo blood challenge," the test mimics bacterial and viral infections in a tube containing live blood from the bird. The blood can then be sent off and analyzed for how it responded to the challenges.

All these data points tell a story about how well a baby eagle can fight off infection, like bird flu. The hypothesis is that "being exposed to high levels of PFAS might cause [eagles] to not respond as well or mount a response to a viral or a bacterial challenge," said Cornelius Ruhs.

And that's a concern for an iconic bird that, in the 1960s, was nearly extinct due to widespread use of the chemical DDT.

Long-term studies like the Great Lakes Eagle Health Project, however, can sound the alarm before something like that happens again. Bald eagles are beloved birds, and many folks want to continue seeing them thrive.

A good day's work

In under ten minutes, the team had taken blood and measured beak, wings, and feet. Dhuey then snapped a lightweight metal band to the eagle's ankle, a way to track and identify the bird. The cuff glinted like new jewelry above the outsized yellow feet.

Long and Dhuey then folded the bag over the bird to be ferried back up the tree as quickly as it came down.

Top left and right: Results from blood samples not only help reveal the movement of contaminants through the food web, they also provide a picture of the overall health of the eagle population.

Center: The team takes basic physical measurements to evaluate the general health of the bird.

The experience at tree number three went unrivaled. After lunch – the team had gotten ice cream, they claimed, to ensure their good fortune – they found an unoccupied nest in a cranberry bog and ended the day with another eagle-less climb up a tall white pine near the river.

It was clear that camaraderie kept the team going, even during the busts. They work two weeks together every year, crammed in aluminum boats, fighting heat and mosquitoes, processing blood samples in hotel parking lots. Several team members said they spend the weeks following field season looking out of car windows, scanning for nests. They can't help it.

This spring, it's the Mississippi River.

"Every day is just getting us back to eagle sampling field season," said Cornelius Ruhs. ■

WATCH THE VIDEO

Great Lakes Eagle Health Project

Aquatic Sciences Center videographer Bonnie Willison joined the Great Lakes Eagle Health team as they searched for eagle nests.

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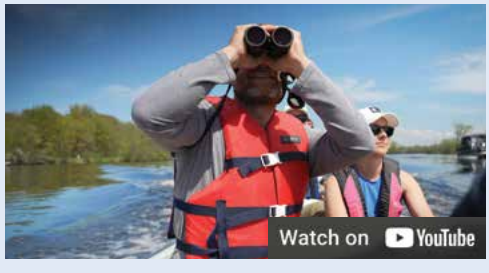

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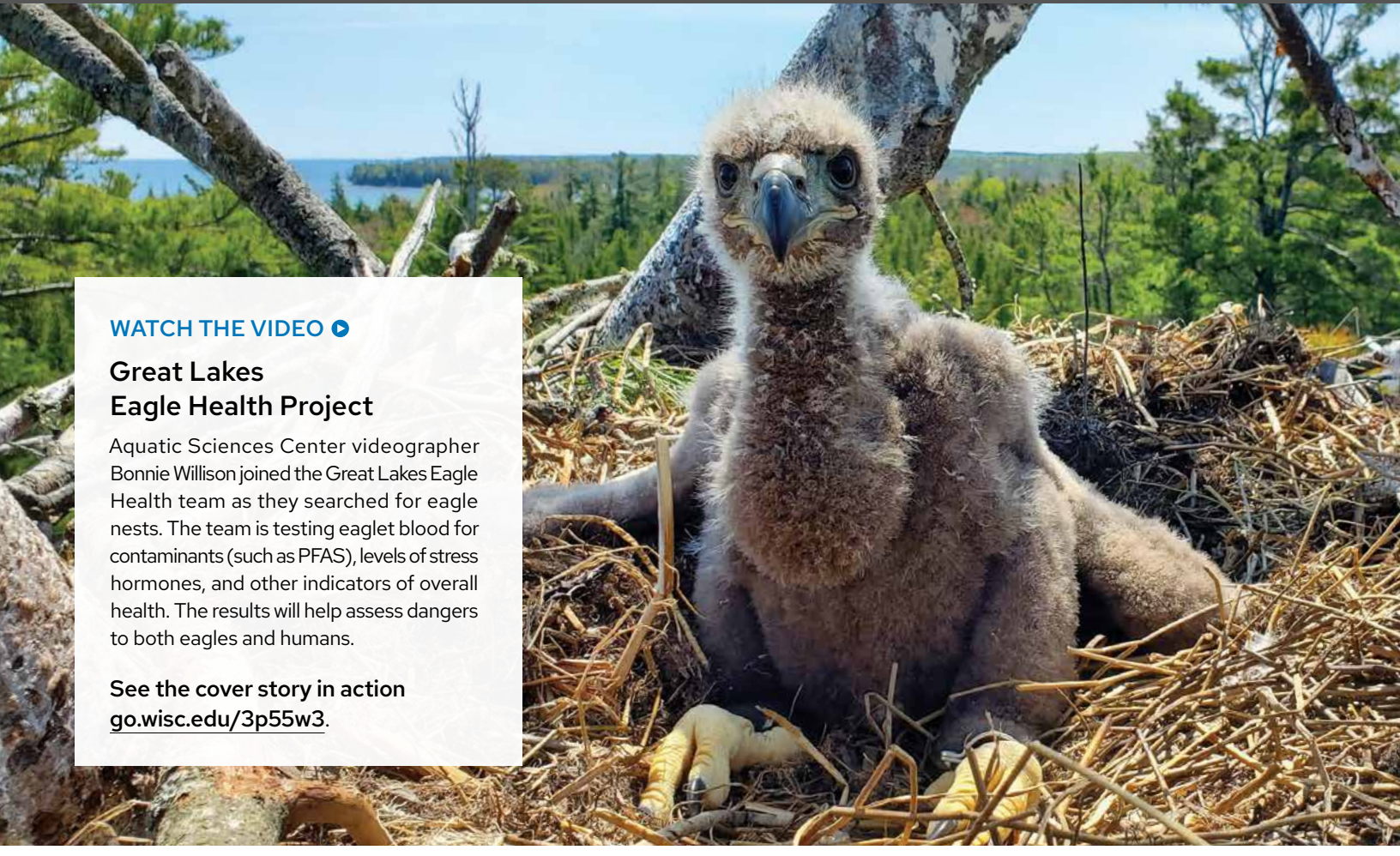

WATCH THE VIDEO

Great Lakes Eagle Health Project

Aquatic Sciences Center videographer Bonnie Willison joined the Great Lakes Eagle Health team as they searched for eagle nests. The team is testing eaglet blood for contaminants (such as PFAS), levels of stress hormones, and other indicators of overall health. The results will help assess dangers to both eagles and humans.

See the cover story in action
go.wisc.edu/3p55w3.