



Montana Natural History Center

Spring/Summer 2024

MONTANA Naturalist

TO PROMOTE AND CULTIVATE THE APPRECIATION, UNDERSTANDING AND STEWARDSHIP OF NATURE THROUGH EDUCATION

The Bighorn Basin:

A Master Class In Contrast Taught
Through Mountains, Fossils, and Time

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Cover - Hidden pool near treeline on the Hellroaring Plateau, Beartooth Mountains, Montana.
Photo by Jason Schein.

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Connecting People with Nature

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tidings

As I write this, we're just a few days from the spring equinox,

which we celebrate as the official start of spring—because it marks the shift from more hours of darkness to more hours of light. For a day we hover in that liminal zone when day and night are equal, and then the light begins to stretch long, long, and longer as we arc towards the summer solstice.

There's something both weighty and light about liminal zones, these in-between spaces, these times of change. They are not always enjoyable, because change is hard. The human brain is wired to

conserve energy—this encourages us to retain habits of both mind and body. The equinox, however, is a reminder that change can also be rejuvenating. It's a chance to consider and learn from the past, then be free to slough off the old and emerge into something new.

The Montana Natural History Center has recently experienced a time of change, our own equinox of sorts. Shifts in our staff and leadership invite us to consider the past and envision future opportunities as we look ahead to a new season, pondering how we can best serve our community, dreaming up new programs and partnerships. We would love to hear your ideas!

The pieces in this issue also examine the spaces where change happens—and what we can learn from them. Science journalist Hailey Smalley digs into the recent decision by the American Ornithological Society to change the names of birds named after specific people, looking at how the birding community is trying to balance history and cultural values with new awareness (page 6). Botanists Peter Lesica and Giovanna Bishop introduce readers to the University of Montana Herbarium, a fantastic repository of botanical specimens and data from the past 125+ years that helps us understand changes over time: climate change, invasive species, water quality, and more (page 10). Paleontologist Jason Schein studies history and change on a deeper scale, taking us on a journey to the Bighorn Basin in southern Montana, a natural laboratory that showcases 500 million years of change: of the region's ecosystems, climates, and life (page 4). And writer Elizabeth Conway reminds us of the wonder we can find right out our back doors: watching earthworms wriggle out of the soil to their own liminal zone when the soil floods, she explores the intricacies of how they breathe, how they take their deep, full-body breaths (page 12).

Perhaps we can take inspiration from earthworms when we find ourselves in those in-between places, no longer here but not yet there. Instead of trying to hurry through, perhaps we can pause. Take one deep, full-body breath.

Then another.

Here's to the equinox, the change of seasons, the spaces in between. Here's to taking a breath—and then stepping forward.

Allison De Jong
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Spring-shifting-to-summer sunlight gilds the Missoula Valley, continuing its arc towards the summer solstice.

ALLISON DE JONG



The Bighorn Basin:

A Master Class In Contrast Taught Through

In a place like Montana, where nature abounds and surrounds among every peak and prairie and around every bend in the endless country roads, a journey of any distance or duration will inevitably bring with it extraordinary experiences with nature.

Cross-country road trips to Montana as a kid play an outsized role in my “origin story” as a lifelong lover of and devotee to nature in all forms. In college, my journey to a life of and for nature took a path toward the history side of “natural history.” As with the best road trips, though, there are no wrong turns, just new adventures.

My studies in geology taught me a great deal about the history of the planet, how it formed and changed over the last 4.6 billion years, and how, much more recently, the landforms we are so familiar with today came to be. Geology taught me to think about time and change in vastly larger scales. Armed with that new perspective, my interests veered back toward the evolution of life and ecosystems on Earth. I still study nature in all its glory, but I focus on the nature that flourished in the ancient past. Paleontology, I’ve discovered, is an excellent route for a scientist and lover of nature: one that first traverses deep time. And there is no better place to embark on that journey than southern Montana’s Bighorn Basin, one of the greatest natural laboratories on the planet.

For the last half billion years, the region we now call the Bighorn Basin was covered by deep oceans, shallow seas, and vast river systems: productive ecosystems that deposited layer upon countless more layers of sediment. Those sedimentary beds eventually, over the course of immense amounts of time and pressure, solidified into layers of stone, thousands of feet thick. Each layer is a priceless time capsule, recording innumerable details about the ecosystems that existed there, including the fossilized remains of its inhabitants. Around 70 million years ago, as North America slid slowly and inexorably toward the west, our continent collided with other tectonic plates in Earth’s crust, creating a mountain-building event geologists call the Laramide Orogeny. Many of the mountain ranges found throughout the West are the progeny of this slow-

motion collision, in which great quantities of Earth’s deep crust were thrust up through the overlying sedimentary rocks. But the forces that bend and buckle rocks toward the heavens will also flex the rocks in between the mountains downward, into great bowls, or basins. In southern Carbon County and north central Wyoming, all of those previously flat sedimentary layers were squeezed and buckled into an enormous valley, roughly the size of New Jersey, while the edges were broken and dragged upwards by, and alongside, the burgeoning mountains. The result is that now, portions of every one of those sedimentary layers—even the oldest rocks buried deep within the earth for the last 500 million years—are now exposed at the earth’s surface. From a paleontologist’s perspective, this is what makes the Bighorn Basin such a special place. This great natural laboratory records, and makes accessible, a nearly complete record of the evolution of the region’s ecosystems, climates, and life, back nearly to the beginning of complex life itself!

The Basin is far more than just what lies beneath, though, and it turns out that excavating the fossilized remains of enormous 80-ton dinosaurs all summer provides a lot of time to admire, and even fall in love with, my surroundings. This rugged, parched ecosystem and landscape is far more reminiscent of the Desert Southwest than any other place in Montana, or even anywhere else





Mountains, Fossils, and Time

STORY AND PHOTOS BY JASON SCHEIN

Want to spend a week living in and learning about this amazing landscape, from geology to mammals to flowers to paleontology? Take the Beartooth Mountains Master Naturalist Course! July 21-27, 2024. Visit elevation-science.org/master-naturalist-certification for more information and to register.

in the region. It is hot, dry, and seemingly inhospitable, and yet it is home to dozens of species of plants and animals well adapted to the extremes of desert life. Grizzly bears and wolves are clawing their way back here, rightfully rejoining sage grouse, mountain bluebirds, and even horned toads, all of which thrive among vertical, vermilion-hued cliffs, gray and black gumbo-ridden hillsides, and sandy sagebrush steppes. It is a peaceful place, perfect for quiet contemplation while taking a break from our work, but somehow also a place never without a distinct and discernable tension, borne of relentless sun, austere landscapes, and an unequivocal sense of sheer, pitiless power. To be here long enough is to understand that this landscape merely tolerates your presence, rather than embracing it. It is not openly hostile, but it demands respect, and deserves it in equal measure. This landscape may not be for everyone, but that may be what I love most about it.

Moreover, the Bighorn Basin is nothing if not a master class in contrast. The Basin's desert lowlands are never more than a few miles from their surrounding topographic antagonists: six separate, ever-present, and often snow-covered mountain ranges, hovering regally above. Nowhere is this contradiction more evident than in our corner of the Basin, where we labor in the shadow of the Beartooth Mountains—the highest range in the state.

The Beartooths tower more than two miles above sea level, exposing granites more than four billion years old—some of the oldest rocks on Earth's surface. Sculpted into the range are endless vistas of vertical, thousand-foot sheer cliffs, deep glacially carved valleys, snow-filled cirques, glaciers, crystal-clear lakes, and waterfalls. Occupying the highground of the eastern Greater Yellowstone Ecosystem, the Beartooths are crowned by some of the only true alpine plateaus in the lower 48 and are adorned

by countless species of wildflowers and a menagerie of animals, including pika, wolves, and North America's largest population of grizzlies south of Alaska. For many, the cold, high-elevation climate here is a last refuge in a warming world. The Beartooths are what all mountain ranges must aspire to be. They don't just defy gravity, but also description. Surely, these are akin to the "purple mountain majesty" that inspire bards and commoners alike.

As a lover of nature, there may be no better profession or journey than through paleontology. More than just "digging up bones," paleontology requires us to study nature and ecosystems as they exist and interact today to best understand how they did so in the distant past. Likewise, there may be no better path to paleontology than through the Bighorn Basin: a rugged landscape filled with rocks and fossils spanning a vast amount of geologic time, surrounded by an astounding variety of ecosystems. My personal path to both the natural and the history has taken as many twists and turns as the Beartooth Highway climbing from the Basin to the alpine plateaus, but how fortunate am I that my journey led me through both. 🦖



—Jason Schein is the founding Executive Director of Elevation Science Institute. He is a Montana Master Naturalist and spends his summers excavating 150-million-year-old dinosaur fossils in the Bighorn Basin. The rest of the year you can find him exploring his current city, Philadelphia, or hiking, hunting, fishing, and generally sharing his love of the natural world with his family . . . and thinking about Montana.

The Nature of Nomenclature:

Is It Time to Stop Naming Animals After Humans?



BY HAILEY SMALLEY

A dark silhouette cuts across the cool blue of a winter sky. An experienced birder would be able to decipher, even from dozens of feet away, the rounded wings and white-tipped tail of a Cooper's Hawk. The raptor is a fairly common sight in Montana, but birding enthusiasts will soon find the Cooper's Hawk absent from skies and guidebooks alike, in name if not in spirit.

In November, the American Ornithological Society (AOS) announced that it will change all eponymous names—that is, any bird named after a specific person—in its North American jurisdiction. The decision, which will be implemented in several stages over the coming years, impacts over 150 North American species, including about 45 species native to Montana. Several crowd favorites, such as the Cooper's Hawk, Clark's Nutcracker, and Anna's Hummingbird, populate the list of future name changes.

The announcement surprised many birders, including Gabriel Foley, co-founder of Bird Names for Birds, the organization largely credited with jumpstarting the AOS's decision.

"It seems very improbable that you'll ever impact anything on a very large scale at all, so to actually have that happen was surprising," Gabriel said.

Gabriel, while a birder since childhood, said he only considered how birds gain their common names after learning about the troubled history of the McCown's Longspur through an online petition. The longspur's name harkened back to John McCown, a military general who collected the first known specimen of the bird while serving "frontier duty" in Texas.

The petitioners argued that McCown's legacy as a general for the Confederacy during the Civil War and for the United States

during the Seminole War overshadowed any contributions he may have made to ornithology. The petition failed, but later efforts succeeded in securing a new name for the bird, now known as the Thick-billed Longspur.

The story of the Thick-billed Longspur inspired Gabriel to investigate the history of other bird names. It was 2020, he had an unexpected plethora of free time at home, and racial politics inundated the news. Amongst the reminders of police brutality and the often-volatile rhetoric about statues commemorating Confederate leaders, it would have been easy to miss the

significance of a few bird names, but Gabriel said the fraught atmosphere only shed more light on the ways Western science names animals.

"When we choose to honor someone through a name, that is effectively a verbal statue," Gabriel said.

Gabriel supported ridding ornithology of "verbal statues" to the most egregious eponyms, people like McCown who owned slaves or contributed to the slaughter of

Indigenous peoples. But he took the argument a step further by questioning why any bird names should herald a single person.

Naming a bird after McCown assumed that his collection of the bird and the subsequent identification by Western scientists was more important than countless Indigenous interactions predating McCown or the bird's existence outside of any human perspective. Naming the Thick-billed Longspur after a physical characteristic of the species honored the species' independence from humans.

"If we willingly say we're not so important that we need to put our names on these other living species, we can appreciate them for what they are," Gabriel argued.

Naming birds and other animals after aspects of their individual behavior and physiology is, of course, not a new concept.

“When we choose to honor someone through a name, that is effectively a verbal statue.”

“Outstanding characteristics and what does it do and its connection to a spiritual story were some of the different ways that the tribal folks did it,” said Vernon Finley, director of the Confederated Salish and Kootenai Tribes (CSKT) Ksanka-Kootenai Culture Committee.

Vernon and Stephanie Gillin, a wildlife biologist with the CSKT Tribal Wildlife Management Program, both support the AOS’s decision and see the future name changes as a way to respect the traditions of Indigenous people like the CSKT.

“History didn’t start with Lewis and Clark,” Stephanie pointed out. “They were called something before that.”

The Tribal Wildlife Management Program produces guides with the traditional names for birds and other wildlife, and many native speakers continue to use these names rather than the English counterparts. However, Vernon cautioned that simply replacing the current English names with Indigenous ones would disrespect the deep cultural connections inherent in CSKT naming practices.

“It would just become a name instead of something that has an actual meaning to it,” Vernon said.

Many birds also live and migrate across dozens, if not hundreds, of traditional homelands. Outside of secluded islands like Hawaii, choosing a singular language and tradition to honor would inherently exclude many Indigenous perspectives and cultures.

History and culture are also key values that opponents of the AOS decision point to as reasons to maintain some eponyms. Jeff Marks, executive director of Montana Bird Advocacy and co-author of *Birds of Montana*, agrees that several common names need to be changed, but he worries that completely ridding ornithology of human references would close the field to any sort of historical investigation.

“I think it just makes the history a little bit less accessible when you take away the names,” he explained.

Many birders agree with Jeff, as evidenced by an online petition that calls for AOS leadership to revoke its blanket decision and conduct case-by-case reviews of eponymous bird names. It reads, in part, “There is much to remedy in a science that has historically been dominated by white males, but changing bird names, many of which were described and named in a different era, and trying to

hide ornithological history will not remedy this history.” Over 5,400 people have signed the document.

Jeff also expressed concern over the impact such widespread name changes would have on the scientific community. Not only will existing books, scientific articles, and guides need to be updated, but many birds migrate outside of the AOS’s jurisdiction.

“So, what are some of the journals in Europe going to do?” Jeff said. “And in Asia and in South America and in Africa? Are they going to follow suit? Some will, some won’t. It’s going to take a while to sort it all out, and there’ll be some confusion.”

But for all the prospective changes that will arise from the AOS’s decision, no names have been changed yet. Rather, the most direct impact of the announcement has been growing fissures amongst the birding community. Jeff said that “a lot of bad blood” has seeped into Facebook groups and other online forums, a sentiment that Gabriel corroborated with his own experience.

More than 40 Montana species will be affected by the planned name changes, including fan favorites like the Cooper’s Hawk, Steller’s Jay, Clark’s Nutcracker, and more. Interested in following the initiative’s progress? Visit americanornithology.org or follow @AmOrnith on social media.

However, despite the current tension, Gabriel remains hopeful that the decision will benefit outdoor hobbyists by creating opportunities for inclusion that go beyond ornithology. In 2022, the Entomological Society of America renamed the gypsy moth to the spongy moth, and several other species, including insects, fish, and whales, are under consideration for name changes.

While there are still many barriers to making outdoor spaces accessible to all, removing a sense of cultural ownership over species could be a beneficial first step.

“It’s not a fix on its own. I think its value lies as a statement in saying we’re willing to be uncomfortable and learn these new names,” Gabriel said. “We want you to be included in our community.” 🐦

— Hailey Smalley is a science journalist based out of Missoula, Montana. Her work, focusing on the intersections of culture, climate change, and public health, can be found in such outlets as Audubon, Sierra, and Montana Public Radio.

Cooper’s Hawk



Anna’s Hummingbird



Clark’s Nutcracker



Steller’s Jay



Bullock’s Oriole



BULLOCK'S ORIOLE: NATURE'S PICS ONLINE.COM; STELLER'S JAY: FICKR.COM; EUGENE BECKES; CLARK'S NUTCRACKER: NATURE'S PICS ONLINE.COM; ANNA'S HUMMINGBIRD: FICKR.COM; ANDREW REDING; COOPER'S HAWK: FICKR.COM; ROBERT SHEA

imprints



Christine Morris

MNHC PHOTO

Congratulations to MNHC's Christine Morris!

Our very own Christine Morris has won the Master Frontline Interpreter Award for the National Association for Interpretation's Heartland Region! Anyone who's been lucky enough to take a class or participate in a program with Christine knows how deserving she is of this award. Her curiosity, knowledge, patience, humor, and compassion make her a fabulous educator (and a fabulous human), and we are so grateful to have her at MNHC.



Seeking Former VNS Students!

Are you a former Visiting Naturalist in the Schools (VNS) student? We are reaching out to invite you to share with us what you have been up to since your time with VNS! Whether you have pursued a

career in biology or forestry, or if you've continued to hone your naturalist skills in your personal life, we are eager to hear about your journey. Your experiences and insights could inspire current students in the program and provide valuable perspectives on the diverse paths one can take after participating in VNS.

We encourage you to reach out and share your story with us. Whether it's a brief email outlining your current endeavors or a more detailed account of how your time with VNS influenced your path, we would love to hear from you. Please send your stories and/or contact information to vns.stories@MontanaNaturalist.org by July 1st, 2024.

We look forward to hearing from you and continuing to celebrate the impact of VNS on our community!

MNHC is open Tuesdays - Saturdays, 10 a.m. - 4 p.m.
Please check our website and social media for details.

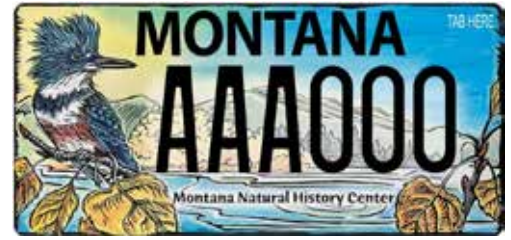
Admission Fees:
\$5/adults (18+), \$2/children (4-18),
\$10/family rate, **Free**/children under 4,
\$4/seniors and veterans

FREE admission for MNHC members, ASTC Travel Passport Members, and EBT card holders!

Programs and events held at MNHC,
120 Hickory Street, unless otherwise noted.

Please check our website calendar for the most up-to-date program information:
MontanaNaturalist.org/events/

Visit MontanaNaturalist.org to register for programs and become a member. For more information, call MNHC at 406.327.0405.



We Have a Gorgeous New License Plate!

We are thrilled to share our new license plate design! Created by Missoula artist Claire Emery, the design showcases a female Belted Kingfisher with her beautiful rusty belt, golden autumn cottonwood leaves, and the vivid blues of river and sky. We adore the complementary colors, and how striking these hues look both up close and from afar. This design is now officially available through the MT Department of Transportation, and you don't have to wait to renew your registration to request your new plate!



COURTESY OF ESI

New Master Naturalist Courses Across Montana

Did you know that the Montana Master Naturalist Program is offered through ten other organizations throughout the state? The newest providers are O'Hara Commons in Hamilton, Elevation Science Institute near the Beartooth Mountains and the Bighorn Basin [see feature on page 4 for more information about the area], and Sacajawea Audubon in Bozeman. Visit our website for more information on all of Montana's Master Naturalist providers! MontanaNaturalist.org/master-naturalist/

UPCOMING PROGRAMS

Please visit our website and social media for upcoming spring & summer programs, including naturalist presentations, kids' programs, field experiences, and more! Or sign up for our e-newsletter at MontanaNaturalist.org/newsletter/.

Save the Date for Our Annual Banquet and Auction!

Mark your calendars for Friday, October 25th, 2024.

We look forward to celebrating with you all this fall!



Thank You to Missoula Sentinel Kiwanis and Missoula Conservation District for Supporting VNS!

We want to thank Missoula Sentinel Kiwanis for their generous donation to our flagship Visiting Naturalist in the Schools (VNS) program in memory of long-time club members Dean Alan Stensland and William Steinbrenner. Dean and William remained forever young at heart: Dean with his curious spirit and passion for Montana's natural wonders, and William with his deep and abiding love for "another ho-hum day in Paradise." We're excited to have their passion live on through our work at MNHC and we embrace the motto of Sentinel Kiwanis: "serving the children of the world—together." This donation will support VNS by helping the kids of Missoula and surrounding communities find their connection to nature and foster a deep love for the outdoors.



In November, Visiting Naturalist in the Schools students saw flower structures in a whole new light using microscopes to supplement their initial observations. A recent \$500 award from the Missoula Conservation District will supply funding to repair a number of VNS microscopes, in keeping with our commitment to environmental sustainability. Microscopes encourage in-depth exploration and curiosity in our students, making the VNS classroom and field trip lessons more engaging and accessible. The VNS team is very grateful to the Missoula Conservation District for supporting our efforts to promote and cultivate an appreciation, understanding, and stewardship of nature through education.



The Montana Natural History Center is located within the traditional homelands of the Tatáyaqn (Bitterroot Salish) and Qlispélix™ (Kalispel) peoples who have lived here since time immemorial. The Montana Natural History Center is dedicated to the recognition of the first peoples of Missoula and the integration of Salish language, culture, and Indigenous knowledge.



Volunteer Spotlight: Helena Dzomba

BY ALLISON DE JONG

Helena began volunteering with MNHC in 2022, and, while she originally began volunteering to build up her resume, she has continued volunteering because she simply enjoys helping out MNHC and being part of the community.

Helena has become a fixture at MNHC's front desk and many community and Center events, greeting visitors and program participants, and we are so happy to have her here! Helena volunteers in many ways, from tabling at our Sunday Streets booth last summer to assisting with First Friday events to helping with many adult programs, from evening Sip & Sketches to lunchtime presentations. But her favorite ways to volunteer are assisting at the front desk and welcoming visitors to the Center, and tabling at various Missoula events.



Lauren Spaeth, Teaching Naturalist and Saturday Kids' Activities leader, is very grateful for the time and energy Helena gives MNHC. "She is super dependable and extremely helpful at the front desk," says Lauren. "She does a great job of orienting the visitors and explaining the programs and activities at the Center. I always appreciate her positive attitude and passion and support for MNHC's mission. She is awesome!"

We so appreciate all that Helena brings to MNHC. *Thank you, Helena!*

THE UNIVERSITY OF MONTANA HERBARIUM

Let us introduce you to a valuable community resource: the University of Montana Herbarium—a hidden gem tucked away on the UM campus.

An herbarium is, simply, a well-organized collection of dried plants and fungi. This superficial lack of charisma hides a plethora of fascinating stories of the plants' and fungi's lives, adaptations, and the people who study them. Yet before we delve into the many values of the Herbarium, let's share a little historical background.

The University of Montana was founded over 125 years ago, in 1895. Two years later Morton Elrod was hired to teach biology, and shortly after that he began collecting plant and animal specimens for an infant natural history museum to aid his teaching. This was the start of the UM Herbarium (MONTU), and over 350 of his plant collections can be found in the UM Herbarium today. Back in those days the herbarium and zoological museum occupied space in the University Hall, the clock tower building. Eventually both museums moved to the Natural Sciences building, where the Herbarium still resides today with more than 90 steel cabinets and housing more than 150,000 vascular plant, algae, moss, and lichen specimens, mainly from Montana and the surrounding region. MONTU also houses one of the largest collections of diatoms (small single-cell algae) in the western U.S. with over 6,200 slides. And in 2009, the UM Herbarium acquired the U.S. Forest Service's Region 1 Herbarium of more than 16,000 specimens. Altogether, this is the largest Montana vascular plant collection in the world and one of the largest herbaria in the Northern Rocky Mountains.

A large collection of dried plant specimens may seem pretty arcane, but it's not. Perhaps the most important function of the UM Herbarium is providing information to private and public land managers who steward much of Montana's wild lands that we all love. After all, plants are the foundation for habitats and all the animals they support. People from the Bureau of Land Management, the U.S. Forest Service, the U.S. Fish and Wildlife Service, The Nature Conservancy, and the Montana Natural



BY GIOVANNA BISHOP AND PETER LESICA

Heritage Program use the collections to get a handle on location and identification of rare plants as well as invasive exotic plants. More and more the online collection database (Consortium of Pacific Northwest Herbaria, at pnwherbaria.org) is being used; however, going right to the source is often required. The UM Herbarium helps protect Montana's natural heritage and directly or indirectly benefits everyone in Montana.

Let's look at how this happens. The UM Herbarium provides important assets to academia, students and researchers alike. Loans of specimens are sent to institutions around the world

for research, and botanists who study myriad plant and fungal groups come to MONTU to view our specimens for their scientific work. The Herbarium curator periodically creates displays in the Mansfield Library and the Health Sciences Building that inform students and faculty of local botanical research related to the Herbarium. Every year several students are paid or volunteer to work in the Herbarium and receive botanical training they otherwise could not get in the classroom.

Another important facet of herbarium collections is their connection to the past. Specimens at the UM Herbarium were collected throughout the 20th century and provide a view into the past. For example, a specific aquatic plant collected from Flathead Lake 100 years ago can be compared with the same species collected from the same place now and used to determine how water quality has changed. Numerous studies of flowering time—phenology—based on herbarium specimens have been used to examine the effects of climate change. Herbaria are useful in invasive plant research, providing insight into whether exotic species exhibited morphological changes following their invasion by looking at specimens over time. Herbarium records have even shown that lead pollution has declined in both northern England and Rhode Island over the past century. An herbarium is a time capsule for plant biology, and undescribed “new” species to science

can be sitting in herbarium cabinets mis-identified, waiting to be found. Herbaria capture local and regional flora as well as keep representatives of what species exist where and when over time, an irreplaceable physical collection that proves a species' existence.

The UM Herbarium is also available to the general public. Nancy Seiler, who teaches nature art classes at the Montana Natural History Center, came to the Herbarium when she was creating her well-known wildflower posters. Moreover, biological consultants and people from the Montana Crime Laboratory have used the UM Herbarium to verify plant identifications. Educational opportunities—such as Herbarium Nights run by the Native Plant Society and other events including tours and hikes—are specifically created for the general public and volunteers to receive hands-on botanical training. The current MONTU Curator, Giovanna Bishop, wants to provide more opportunities for the general public and community to interact with and learn from the herbarium.

Come and get acquainted with this wonderful resource! Please reach out via email to inquire about tours and opportunities: giovanna.bishop@umt.edu.



—Giovanna Bishop has been the MONTU Curator since January 2023. She has a M.S. in Biology from Eastern Washington University and has a background in lichen and bryophyte taxonomy. Giovanna is extremely passionate about herbaria and is excited to get the local community more involved by providing more opportunities to work and engage with the collections.

Peter Lesica, author of the Manual of Montana Vascular Plants, is a renowned botanist who has worked with the collections and added thousands of specimens over the last 50+ years. He is a local botanical expert and has led many hikes and herbarium nights, and has also taught courses about the local flora to the general public. The MONTU Herbarium would not be as rich of a collection without Peter's contributions and commitment.



The Dr. Loren L. Bahls diatom collection consists of 6,200 slides. Loren spent 60+ years on diatom taxonomy and describing many new species from Montana and the Pacific Northwest.

Vascular plants collected in the field are pressed and dried between blotters and newspaper in a plant press for several days before they are ready for mounting. Labels with locality, species name, collector, date, and habitat information are vital in order to capture the specimen in space and time. Mounters carefully glue and strap pressed plants onto archival sheets of paper in hopes they will last 100 years before needing to be re-curated or mended. Once specimens are mounted and accessioned with a unique catalog number, they are digitized. Images are taken of each specimen and label data is entered in order for researchers and botanists around the world to gain access to the MONTU collection without needing to visit it in person. The MONTU collection can be accessed online at pnwherbaria.org.

Interested in supporting the MONTU Herbarium? You can become a Friend of the Herbarium by making a donation and becoming a member! Members receive our annual newsletter and get updates on Herbarium events. For more information, visit the Herbarium website: umt.edu/herbarium/.

The UM Herbarium is not only a historical collection—it continues to receive and process specimens. In the mid-1900s the Herbarium was processing more than 6,000 specimens a year; in the past year, curator Giovanna Bishop has processed more than 1,000, and hopes that, moving forward, the collection can continue to grow by 1,000-2,000 specimens per year.

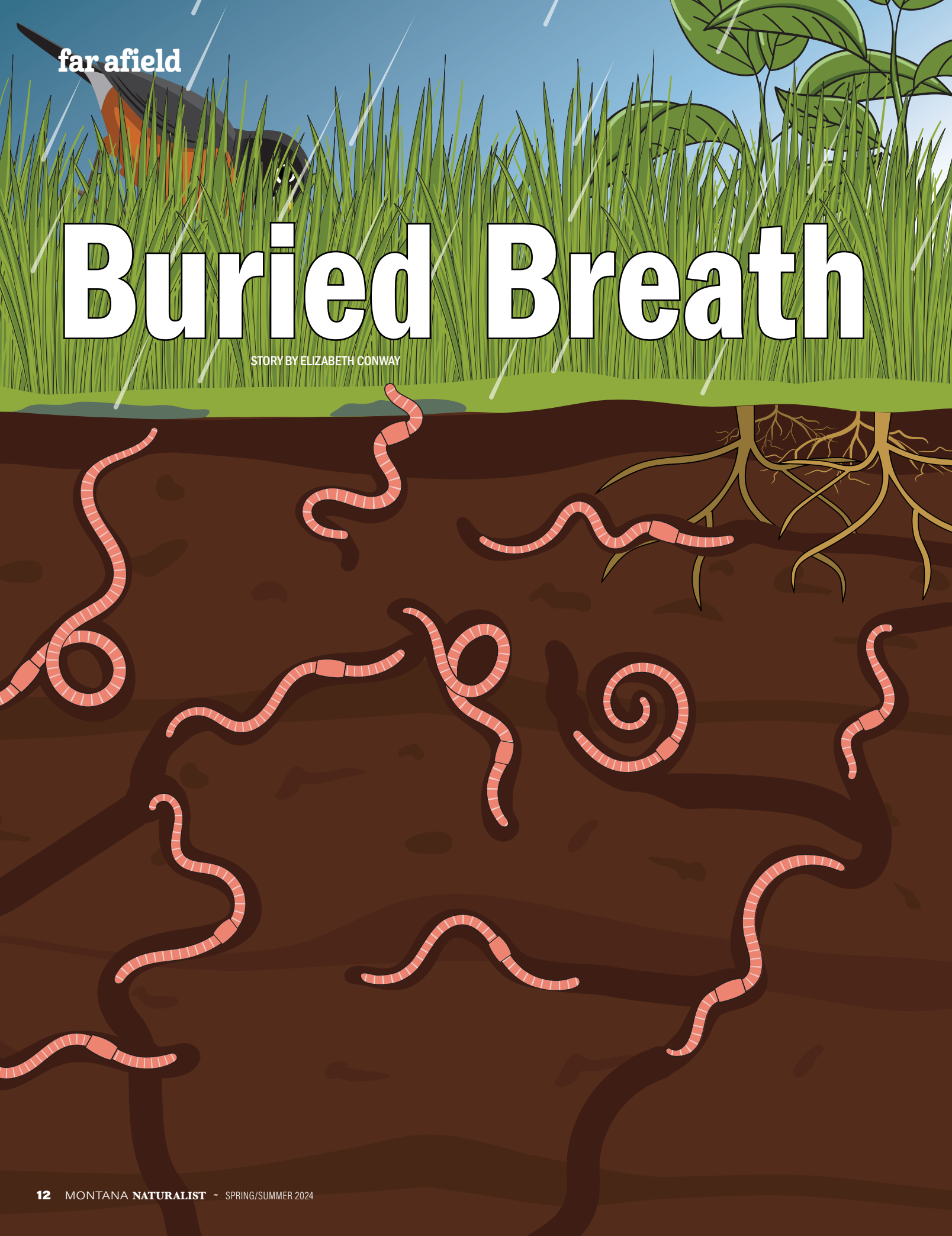
Donating to the Herbarium or becoming a member will enable the collections to continue to grow and will provide financial support for supplies, seasonal staff hires, student internships, and cabinets.



far afield

Buried Breath

STORY BY ELIZABETH CONWAY



Earthworms use their entire body to breathe.

Burrowed deep in the ground—slow moving, slow metabolizing—their long frames tighten and relax and pull the air they need from soil. When it rains, there is arguably not enough oxygen available in their buried habitats, so the worms surface to avoid suffocating. It's why so many rainy day walks are accompanied by earthworms. And for me, these walks also invite my children. All spring-born babes, arriving when the soil floods and earthworms line the trails, including the pathways of those crucial walks to pacify restless newborns and a restless new momma.

Perhaps it's peculiar then that an earthworm must stay wet to breathe. Lacking lungs, its skin takes in oxygen and releases carbon dioxide in a process called diffusion. For this molecular exchange of gasses to occur, a worm dons a constant coat of slimy, dewy mucous. Without this moisture, it will choke and die. Some scientists question if worms can absorb the oxygen they need directly from water as well—and have proposed that their migration to the surface during a heavy rain is actually the result of something else. Perhaps the raindrops mimic the sound of the worms' greatest predator, instinctively inducing a flight to the surface for survival.

branches—leaving their core corpses behind as a gift to the wasps and bees.

In an artful act of symmetry, earthworms too use their entire body to help gardens, to help soil, breathe. Shortening and stretching their muscles, the worms slowly push and carve complex trails of underground burrows, weaving together a series of tunnels to create a pulmonary circuit of their own design: a body of veins pulsing both breath and nutrients throughout the soil.

Many of the earthworm species found in North America today are invasive, arriving with early European settlers. An invasive species myself, I cannot help but share feelings of empathy and culpability. The occupation of this influential invertebrate is reshaping ecosystems by altering core soil compounds—changing the path and the pace that water flows and erodes the soil, the way the forest floor decomposes organic matter, how it stores and releases carbon into the atmosphere. How our very Earth takes a breath.

But for me the full depth of earthworms' curiosities and capabilities lives in other places. Like the fish cleaning shed on the shore of Trout Lake where my dad taught me how to scale and gut the bass I caught off the dock. An act both violent and delicate, the floor of the shed covered in glittering scales, like a resting snow globe. The earthworm bait bought with my own prized pocket change from the local gas station en route to the lake—sold in a styrofoam container with punctured air holes to allow in plenty of oxygen. Kept chilled in the cooler next to cans of 7Up and bagged cheese sandwiches.



Shortening and stretching their muscles, the worms slowly push and carve complex trails of underground burrows...

You can find birds taking advantage of this theory, using this frightening familiar quiver performed through a type of tap dance to trick worms away from fabricated dangers below and into the beaks of very real ones above. This kind of worm charming isn't limited to birds: humans also skillfully play the soil to expose hidden worms and enchant them into jeopardy.

My sisters and I didn't know this clever song and dance when we were young and charged with finding earthworms to feed to the compost, so that in turn the compost could feed the worms—both essential in fueling the vast vegetable garden my parents cultivated in our backyard. It was a suburban farmstead, where I learned about soil health and crop rotation and how to tiptoe around the killdeer nest in the rocks that lined the strawberry patches. Where the woodchuck living in our woodpile would stand on its hind legs and gnaw the almost-ripe apples on the low-hanging

And it lives in those backyard gardens and watery walks with my children before they had learned to walk themselves. Then suddenly toddlers, then teenagers, one now an adult, married just a month ago. But still, I have plenty of rainy day strolls and endless moments like these. Resurfacing too like an earthworm. Knowing instinctively when just such a deep full-body breath is needed. 🐛

—Elizabeth Conway has her MFA from the University of Montana. Her short fiction has been featured in literary journals including *Reed Magazine*, *Southeast Review*, *Blue Earth Review*, *Fractured Lit*, and others. Elizabeth works, plays, and writes in Missoula.

This piece was first written as a Field Note for Montana Public Radio, airing in April 2024.

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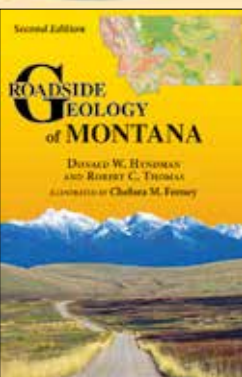
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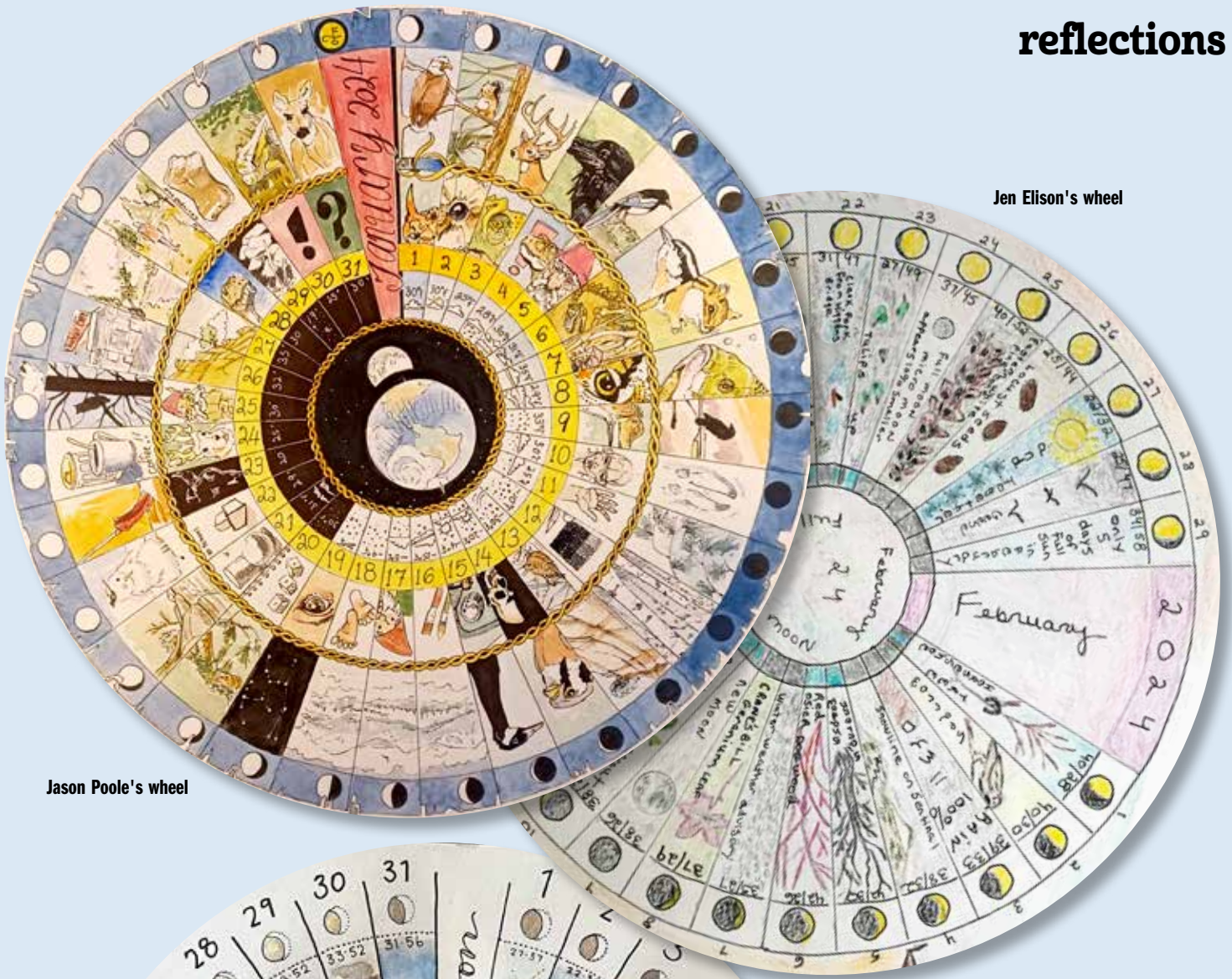



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Jen Alison's wheel



Jason Poole's wheel

Last December MNHC offered a Sip & Sketch on phenology wheels, where participants learned how to create their own daily record of natural history observations, beginning in the new year. A few months into 2024, here are what some of these naturalists have accomplished, recording their observations one day at a time!

Melissa Hayes's wheel





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