



Montana Natural History Center

Fall/Winter 2021

# MONTANA Naturalist

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

## **Creatures of Connection:**

Wildlife Migration and Habitat  
Connectivity in a  
Changing Landscape

Shorebirds...in Montana? | Evolution of the Freshwater Burbot | Families for a Livable Climate | Nature Readings



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**Cover** – Snow dusts the peaks in Glacier National Park while cottonwoods blaze golden along the North Fork of the Flathead River on a glorious autumn day. Photo courtesy US Forest Service Northern Region.

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**Montana Natural History Center**  
Connecting People with Nature

120 Hickory Street, Suite A  
Missoula, MT 59801  
406.327.0405  
MontanaNaturalist.org

**STAFF**

Ser Anderson

**TEACHING NATURALIST**

Kellen Beck

**FRONT DESK ASSOCIATE**

Alyssa Cornell-Chavez

**COLLECTIONS REGISTRAR &**

**TEACHING NATURALIST**

Allison De Jong

**COMMUNICATIONS COORDINATOR**

Thurston Elfstrom

**EXECUTIVE DIRECTOR**

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**COORDINATOR**

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**TEACHING NATURALIST**

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# tidings

**As I write this, in late August,** rain is pattering down on my roof, air quality is moderate tipping into good, and it's a glorious 54 degrees at 11 a.m. After weeks of hot, smoky days (41 days of temperatures 90 or above in Missoula this summer), the relief I feel is immense. I know fire season isn't over. I know this may be only a temporary reprieve. But I am grateful nonetheless.

It's been a little hard to find hope lately, as COVID cases surge, climate crises erupt around the world, and we're all worn down from a year and a half of uncertainty with, once again, no end in sight. These past 18 months have been taxing, and I'm tired. We're all tired.

How do we find hope, then, when the news seems so discouraging? When it's been hard to get outside this summer due to heat and smoke? When, once again, we're wondering how safely we can hang out with people outside our households? When the latest report from the Intergovernmental Panel on Climate Change is so unforgivingly bleak?

Winona Bateman, director of Families for a Livable Climate (page 18), says that "action is our hope." Even if it's just clicking the donate button on the website of a local climate organization, or being a good neighbor and reaching out to the people in our community, or opening up a conversation about our climate (and life) worries—each small instance of us *doing something* provides a spark of hope.

We're grateful for the many people who do something (or lots of somethings) for MNHC: volunteer Barbara Gauch, who spent dozens of hours this summer reading to our youngest camp kids (page 17). And Alyssa Cornell-Chavez, MNHC's Collections Registrar, whose dedicated care of our specimens allows them to be used to their fullest potential: educating people of all ages about the natural world (page 20). And summer camp staff, interns, and other volunteers who share their love of nature so enthusiastically, in so many ways (pages 20 and 23).

These people, and their stories, give me hope, indeed. Equally inspiring are the rest of the stories in this issue: naturalist Liz Domenech's insightful piece on wildlife migration and habitat connectivity, and the people and organizations who are working to balance human needs with those of wild creatures (page 4). Ecologist Gil Gale shares the fascinating history of our native freshwater burbot, whose evolutionary journey spans hundreds of millions of years, marine and freshwater habitats, and the Permian extinction, and reminds us of the resiliency of the natural world (page 8). And author Sneed Collard and his son take delight in seeking out the surprising variety of shorebirds in Montana, reveling in the diversity and beauty we can find when we make a little extra effort (page 24).

So the next time you're struggling to find hope, remind yourself of the many, many good people doing small but beautiful things. Revel in this stunning planet we live on, and remember how gorgeous it is, despite everything. And then: make a little extra effort. Find one small but beautiful thing you can do. Spark hope.

**Allison De Jong**

EDITOR

[adejong@MontanaNaturalist.org](mailto:adejong@MontanaNaturalist.org)



ALLISON DE JONG

**Exploring the beautiful landscape of Waterworks Hill in Missoula with our son—and, we hope, inspiring love, delight, and stewardship for our planet.**



# Creatures of Connection:

## Wildlife Migration and Habitat Connectivity in a Changing Landscape

BY ELIZABETH DOMENECH

Fall has always been one of my favorite seasons in Montana. It is a time of transition: summer ceding its glory, change made visible through gold larch trees, amber aspens, and the deepening reds of willows. Fall fills me with nostalgia as we bid farewell to a season of lushness. Fall is also sign that it is time to make way for something new, to take stock and begin to settle in for the coming season of rest. This last fall, during the first year of the COVID-19 pandemic, I was certainly nostalgic, but I couldn't rest. I felt a growing sense of restriction. I felt isolated, trapped, and confined. As ungulates like deer, moose, and elk returned to the valley bottoms, I craved the freedom of movement with each haunting bugle of elk in rut.

### Why Animals Move and Migrate

Elk are one of several mammals in the Northern Rockies who rely on migration as a survival strategy. Migration typically refers to the seasonal movement of animals from one region to another. However, many mammals that may not migrate seasonally still cover a lot of ground in their lifetimes. Migration and movement through a landscape are survival adaptations. Some mammals, like grizzly bears, move out of their birth "home range" and establish residence someplace new, a strategy called genetic dispersal. For other mammals, like elk, migration is a way of life, undertaken each fall and spring. Migration can even vary within a species—some populations of elk, moose, and mule deer establish "resident" populations and remain local to an area, while others migrate each fall and spring.

PHOTO: © CHEMA DOMENECH





Both animals that migrate—such as elk—and those that require large home ranges—such as grizzlies—depend on intact, abundant wild spaces with adequate corridors connecting them in order to survive and thrive.

How far an animal travels in its lifetime depends on a variety of factors including food availability, suitable habitat, the presence (or absence) of potential mates, the size of the animal's home range or territory, and the genetic health of the population.

Elk have evolved to migrate to follow their primary food source: grass. In the winter, deep snow covers the hillsides that featured abundant grass in the summertime, so elk move to lower-elevation areas that receive less snowfall. Unlike their fellow ungulate the pronghorn, elk can withstand colder temperatures and, being taller, are more adapted to wade through deep snow than pronghorn, who must migrate further south to warmer, more arid environments. GPS collar data from the Wyoming Migration Initiative show that elk typically travel between thirty and ninety miles one way during migration, while mule deer and pronghorn may travel as far as 150 miles one way, returning to higher elevations as snowpack recedes in the spring and summer.

Grizzly bears, on the other hand, do not migrate seasonally, but they still require room to roam. An adult male grizzly bear can have a home range of up to 600 square miles or 384,000 acres. With a home range that large, even a protected area as big as Yellowstone National Park can be too small for species like grizzly bears who compete for resources and mates. Over time, some of these bears need to move out of their birth range to ensure the health and genetic diversity of their species.

### Barriers to Wildlife Movement

In a rapidly changing landscape, traveling long distances on foot is easier said than done. Roads, fences, land subdivision, and new development increasingly divide wildlife habitat into smaller pieces, a process called habitat fragmentation. In a fragmented environment, wildlife that need to move or migrate to survive encounter a number of barriers along the way.

Fences became ubiquitous in the West with the introduction of ranching, but they can be troublesome for ungulates like deer, pronghorn, and even elk. While physically capable of jumping over fences, pronghorn prefer to cross fences by dropping to their knees and crawling underneath the bottom wire. Young elk calves and deer fawns will crawl under fences rather than jumping them, too. Woven wire fencing, originally put in place to keep sheep in

pastures, often reaches the ground, making it difficult for pronghorn to pass underneath. Meanwhile, the mesh-like woven structure creates myriad opportunities for hooves to catch in wires. Sheep ranching has declined in Montana in the last twenty years, but fencing is expensive to replace, costing between \$4,000 and \$8,000 per mile including materials and labor. As opposed to woven wire fence, multi-strand barbed wire fence is historically used in cattle ranching. If the top wire is barbed and/or too high, deer and even elk can catch their hooves on the wire as they jump over, while fences with a bottom wire less than ten inches from the ground impede pronghorn movement beneath the fence. Often when ranches are sold and shift away from livestock production, the fences remain and, without repair, become dilapidated, creating new opportunities for wildlife to get caught on loose or hanging wire.

For species like grizzly bears who need to move out of their home range for genetic survival, it is nearly impossible to avoid roadways. A grizzly attempting to travel the roughly 400 miles from Yellowstone to Glacier National Park to reconnect with bear populations in the Northern Continental Divide Ecosystem would have to cross both Interstate 90 and I-15, along with numerous state and local roadways. Species like elk, deer, and moose encounter roads when attempting to reach food or water on the opposite side, or moving from spring calving grounds to summer feeding grounds. Encounters with wildlife on roadways endanger the safety of humans and wildlife alike. According to State Farm Insurance, in 2018, Montana drivers had the second-highest likelihood in the nation of a collision with a deer.

Migrating animals can generally avoid traveling through concentrated urban areas, but it is harder to navigate around “exurban,” or low-density, development. Defined as one residential unit per 1.7 to 40 acres, exurban development occupies almost fifteen times more area than urban development, hence the term “exurban sprawl.” As this type of development increases, the presence of certain species like elk is decreasing—in other words, development is pushing these species out of their historic habitat into other locations. Sometimes this displacement concentrates higher numbers of elk into smaller areas, which increases the risk of spreading disease and overgrazing.



## The Stakes are Getting Higher

In the Northern Rockies, climate and development trends indicate that it will only become harder for wildlife to move at a landscape scale. According to the nonprofit research group Headwaters Economics, 1.3 million acres of undeveloped land in Montana have been converted to housing since 1990. Nearly half of the homes built during this time were constructed on lots exceeding 10 acres—that is to say, in exurban areas. The coronavirus pandemic has heightened the awareness of and appetite for real estate purchases in Montana and while many communities welcome the economic boost, land and wildlife habitat are at risk of disappearing at an even faster pace.

Meanwhile, average temperatures in Montana rose by 2.7 degrees Fahrenheit between 1950 and 2017. Future projections indicate a shift towards earlier snowmelt and peak spring runoff, reducing water availability in the late summer. Snow that arrives later in the season and melts earlier than it used to creates a challenge for snow-adapted species like lynx, which relies on snowpack to follow its primary food source, the snowshoe hare. Warmer average temperatures push animals like pika, whose bodies can overheat when exposed to temperatures above 78 degrees Fahrenheit, to higher elevations. As the climate changes, animals will need to adapt, whether to follow food sources that are creeping northward, to expand their range in search of water late in the season, or to stay cool.

## Solutions: Towards Connected and Protected Habitat

To adapt to an uncertain future, animals with large ranges like grizzly bear, or even elk, need an expanse of habitat that is connected and protected over the long term. “Habitat connectivity” is the degree to which a landscape facilitates or impedes animal movement across that landscape. In contrast to habitat that is fragmented by roads, fences, or development, connected habitat allows wildlife to travel unimpeded to meet their survival needs.

These stretches of connected habitat are sometimes referred to as wildlife “corridors.” A corridor is simply the area within which animals can move through the landscape—either currently, as in historic migration routes, or in the future, as animals adapt to different climate scenarios. Grizzly bears are often touted as a focal species by conservation groups working to identify and maintain

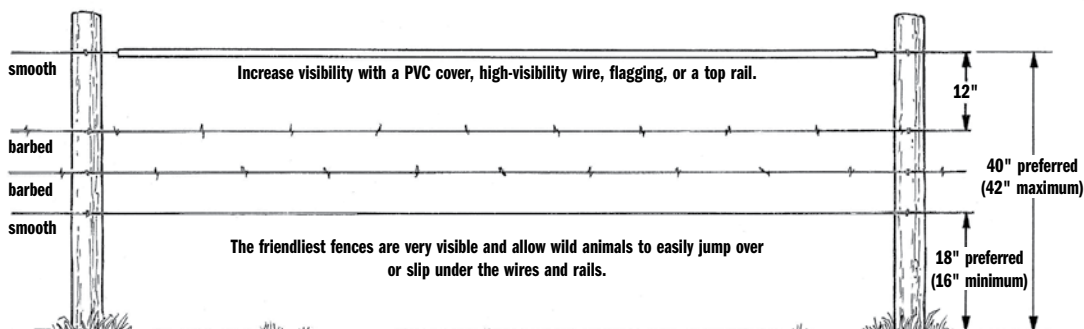
migration routes or corridors. Because grizzlies require so much room to roam, ensuring the conservation of enough habitat for grizzlies to move across the landscape inherently preserves the ability of many other species with smaller ranges to move and migrate. While it may seem daunting to connect habitat at the scale of grizzly or elk migrations, Indigenous peoples, conservation organizations, local communities, and ranchers are finding tangible and creative solutions to ensure wildlife can continue to adapt.

Modifying fencing can go a long way towards improving wildlife mobility while still maintaining livestock enclosures. The National Resources Conservation Program and the National Parks Conservation Association both have grant programs that provide incentives to remove old fences and install wildlife-friendly fencing that is more permeable. Figure 1 illustrates a wildlife-friendly four-strand fence design where the top and bottom wires are smooth. The top wire is low enough for adult animals to jump over, while the bottom wire is at least 16 inches off the ground so that animals like pronghorn can pass underneath. Where possible, experts recommend leaving fences open when there are no livestock in pastures and pinning up wires for pronghorn during fawning season in known crossing areas.



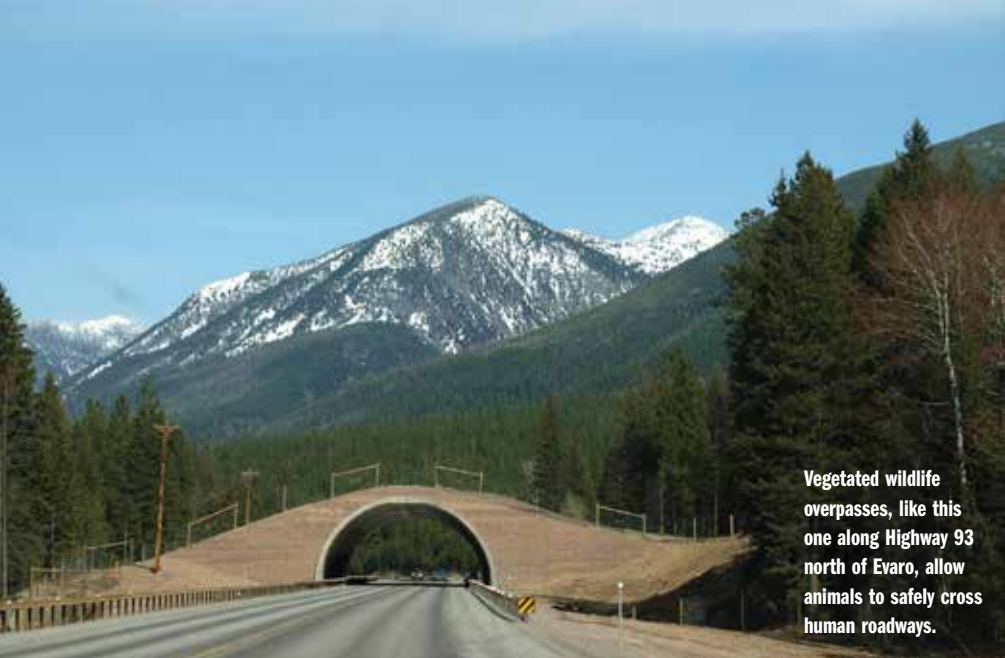
PHOTO: © THE NATURE CONSERVANCY

Wildlife crossing structures have emerged as a creative solution to better allow wildlife to move across roadways and reduce wildlife-vehicle collisions. Structures called wildlife overpasses span a roadway like a natural bridge, while wildlife underpasses, tunnels, and culverts allow wildlife to travel beneath a highway unharmed. Banff National Park in Canada, Pinedale, Wyoming, and the Flathead Indian



**Figure 1.** Recommended wildlife-friendly fence specifications. *A Landowner's Guide to Fences and Wildlife: Practical Tips to Make Your Fences Wildlife Friendly.* Paige 2012.

COURTESY ED JENNE AND MONTANA FISH, WILDLIFE AND PARKS



Vegetated wildlife overpasses, like this one along Highway 93 north of Evaro, allow animals to safely cross human roadways.

## FURTHER READING

Explore Big Sky. 2019. **Montana Partners Commit to Wildlife Vehicle Collision Reduction.** Available from <https://www.explorebigsky.com/montana-partners-commit-to-wildlife-vehicle-collision-reduction/30322>.

Headwaters Economics. 2020. **Montana Losing Open Space.** Available from <https://headwaterseconomics.org/economic-development/montana-home-construction/>.

Ouellet, N. (2016, July/August). **The Secret Lives of Elk: Uncovering One of America's Great Migrations.** Bugle, 104-118. Available from <https://migrationinitiative.org/sites/migration.wygisc.org/files/public/migration.pdf>.

**Yellowstone to Yukon Conservation Initiative.** <https://y2y.net/>.

Reservation in northern Montana have all successfully installed wildlife overpasses (take notice the next time you drive to Flathead Lake or Glacier National Park on Highway 93). Though expensive, these projects are a long-term investment in the safety of humans and wildlife.

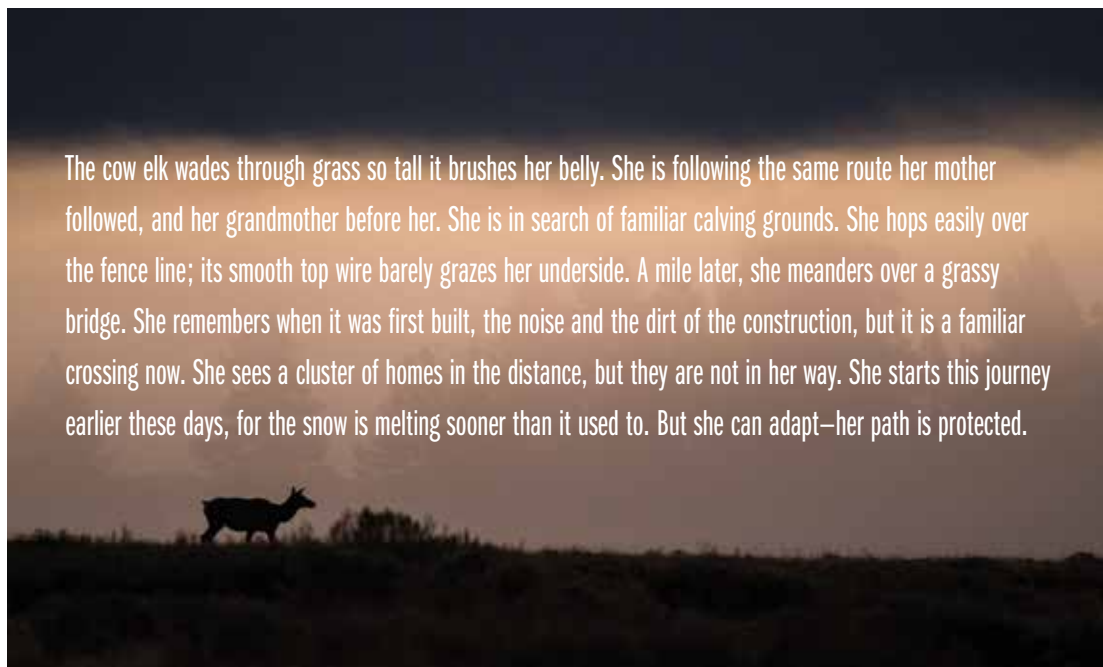
Connected habitat can still be at risk of sale and subdivision in the long term, which is why it matters whether the habitat is also “conserved.” Conserved habitat means that some mechanism is in place to ensure the habitat will remain intact over the long term—that it won’t disappear to development or fragmentation. Habitat conservation can take the form of public land like national, state, and local parks, or private land that has been conserved through voluntary agreements with landowners. In a state where 62 percent of land is privately owned, landowners are important stewards of the wildlife habitat and open spaces that we value in Montana. Conservation easements are voluntary compensated agreements with private landowners to limit future development of their land. Easements are an example of a tool that helps landowners afford to remain on their land amidst increasing development pressure, while also ensuring the long-term conservation of wildlife habitat or other natural resources.

Finally, communities can protect historic migration routes through careful local planning. Recently, the town of Canmore in Alberta, Canada, vetoed a proposed residential development that received significant pushback from the community for the

impacts the project would have on local wildlife. Community planning for wildlife does not mean that new development cannot occur; it’s about working to locate new development outside of critical movement corridors.

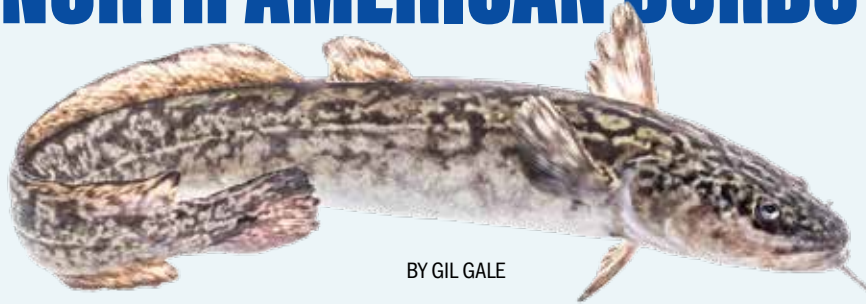
If the coronavirus pandemic has taught me anything, it has taught me that we, too, are creatures of connection. Maybe it’s our nomadic past still etched in our bones that draws us to migration routes, a connection to old pathways, collective history, heritage, and wildness. What happens if we lose these connections? I sense that there is no going back from fragmentation. We have an opportunity to keep this wild landscape connected, to mitigate our impacts to allow wildlife to adapt alongside us. Maybe in preserving this freedom for wildlife, we preserve it for ourselves. 🦋

—Elizabeth Domenech is a writer, naturalist, and advocate for conservation and wildness. She lives in Bozeman, Montana, where she serves on the board of the Yellowstone to Yukon Conservation Initiative and the NextGen board of the Gallatin Valley Land Trust.



The cow elk wades through grass so tall it brushes her belly. She is following the same route her mother followed, and her grandmother before her. She is in search of familiar calving grounds. She hops easily over the fence line; its smooth top wire barely grazes her underside. A mile later, she meanders over a grassy bridge. She remembers when it was first built, the noise and the dirt of the construction, but it is a familiar crossing now. She sees a cluster of homes in the distance, but they are not in her way. She starts this journey earlier these days, for the snow is melting sooner than it used to. But she can adapt—her path is protected.

# THE LONG JOURNEY TO A FRESHWATER HOME FOR THE UNUSUAL NATIVE NORTH AMERICAN BURBOT



BY GIL GALE

*"Proximity of descent, the only known cause of similarity of organic beings, is the bond between organisms, although often hidden by various degrees of modification."*

-CHARLES DARWIN

A cold late October dawn many years ago found Red Rocks Wildlife Refuge biologist Dick Sjostrom on his day off chugging his dinghy slowly through the dense aquatic vegetation along the fringes of Red Rock Lakes National Wildlife Refuge on his way to a favorite duck hunting spot. The mist clinging low to the water swirled alongside the boat as Dick strained to see his way past the bulrush islands barely visible ahead. Suddenly, the entire five-horsepower motor lurched forward as the prop shaft rose out of the water and then dropped quickly back into position. Thinking he had passed over a log, Dick slowed the boat. As he peered back over the stern into the dark surface, the engine lifted for a second time and he saw a smooth, thick, serpent-like body emerge and slide along the exposed shaft. The shape then flopped back into the black water with a splash of its rounded tail. In retelling the incident, Dick says a momentary thought flashed through his mind that he had encountered some prehistoric life form rising eerily from the deep. In fact, his sense of encountering something ancient was connected to more than a simple reflex reaction.

The animal that gave Dick that impression, the burbot or ling, has an intriguing ancient lineage and is one of Montana's and North America's most unusual native fish species. Other Montana fish species, such as the sturgeon, have a more direct tie to the distant evolutionary past. The burbot's ancestral connection is more subtle and complex. It traces back through time and gives us an origin story that, equipped with a little background knowledge, we can see expressed today in the form of the living fish and its living relatives.

The burbot (or ling or cusk in the East) is one of the oddest-looking fish in our North American higher-latitude freshwater systems. It lives in certain lakes, reservoirs, and rivers across Montana. It has been described as a cross between a catfish and an eel. It is a benthic (bottom-dwelling) species that seeks shelter during the day in burrows that it excavates on the floor of its river and lake habitats. You will never see this fish rising like a trout or leaping out of the water to gulp an insect near the surface. The burbot swims slowly because of its relatively small, rounded tail fin and ambushes rather than chases its prey.

Camouflaged with its mottled green and brown coloration, it lies close to the bottom of the water column waiting for prey to swim close and then launching an attack, trapping the victim with its large mouth and small backward-angling teeth. A crepuscular (twilight) hunter, an adult burbot relishes whitefish, lamprey eels, sculpins, lake trout, and even mice, frogs, snakes and the occasional fledgling bird that drops into the water.

The story of all fish species starts about 480 million years ago along the shores of an early supercontinent (see Figure 1). After countless incremental ancestral revisions, the North American burbot (*Lota lota*) emerged a few million years ago as the only freshwater species classified within the large marine Gadiforme (cod and cod-like) order. All of its relatives dwell in the oceans. Figure 1 illustrates how the modern-day burbot achieved that remarkable evolutionary distinction. While other freshwater fish species also have sea-dwelling relatives, the burbot has multiple traits that clearly tie back to its marine cousins.

Biologists continue to argue about whether evolutionary changes, such as portrayed in Figure 1, occur



# EVOLUTIONARY TIMELINE OF FISH SPECIES

**Figure 1**

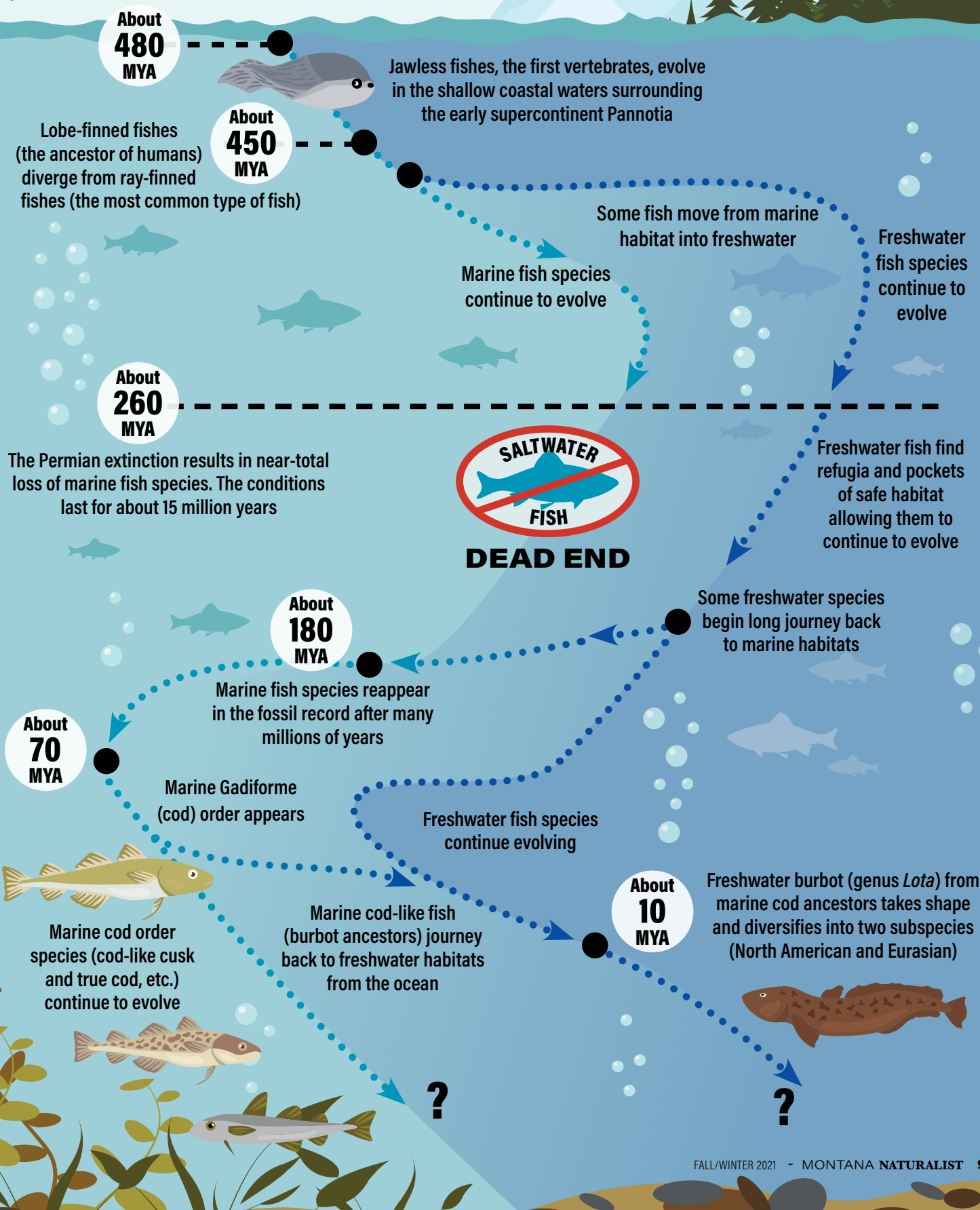
## LEGEND

MYA = Million Years Ago











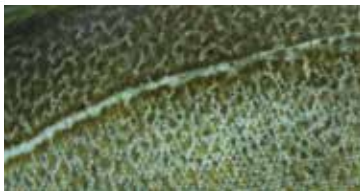
● = Major evolutionary milestone

➤ Freshwater evolution

➤ Saltwater evolution



**Table 1: Characteristics linking the marine cod order to the freshwater burbot**

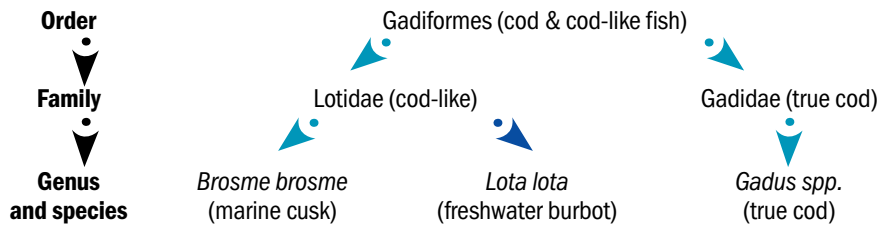
			
	Freshwater Burbot	Marine Cusk	Marine Cod
Specific Shared Traits			
1. Makes sounds unique to cod and cod-like species	✓	✓	✓
2. Spawns in winter (February - March), under ice	✓	Spawns later, April to June	✓
3. Spawns at night or when light levels are low	✓	✓	✓
4. Spawns in groups and forms writhing "spawning balls," with dominant males arriving first to the spawning location		Similar but limited documentation ↔	 ✓ Also includes mating between individuals
5. Dwells at the bottom of waterbodies	✓	✓	✓
6. Slow-moving, eel-like shape; ambushes prey along the bottom of waterbodies	✓	✓	Doesn't ambush its prey, but does feed at the bottom like the burbot and cusk
7. A single long dorsal fin and a rounded tail fin		Similar to burbot (a closer relative than the true cod)	Different shape (a more distant relative to burbot)
8. A single chin barbel: a taste-sensitive appendage that helps detect enzymes in the water from palatable food in murky waters or low light conditions (other North American freshwater fish, such as catfish and carp, have multiple barbels)			
9. Smooth, small scales with a slippery look and feel		Similar to both burbot and cod ↔	

TOP ROW: BURBOT: WIKI.FISHINGPLANET.COM; CUSK: NOAA; CODFISH: A-Z-ANIMALS.COM  
4. LEFT: FLICKR.COM/USFWISNTPRAIRIE; 4. RIGHT: PETER PROVOSCH, GRIDA.NO/RESOURCES/3489  
7. LEFT: YWIMAGES, DEPOSITPHOTOS.COM  
8. LEFT: ROSTISLAVSTEFANEK, SEZNAM.CZ; DEPOSITPHOTOS.COM; 8. CENTER: FACULTY OF NATURAL SCIENCE PER HARALD OLSEN/NTNU; 8. RIGHT: COD: A-Z-ANIMALS.COM  
9. LEFT: PILENS, DEPOSITPHOTOS.COM; 9. RIGHT: WHITE\_NIGHT, DEPOSITPHOTOS.COM



**Table 1**

The burbot ancestor carried some unique traits borrowed from both the cod and the cod-like cusk back into the freshwater environment. These traits remained intact over millions of years, passing on to the cod-like genus (*Lota*) of the modern burbot. Scientists continue to tease out chromosomal similarities between species in the cod order (Gadiformes). This table displays some of the key behaviors and physical features that connect the burbot to its marine relatives.

**Figure 2: Classification of Cod relatives**

at a predictable constant rate (called gradual speciation) or in a more chaotic, unpredictable pattern caused by environmental disturbances (called the “sloshing bucket” model). Many scientists propose that the evolutionary process taps into both patterns to varying degrees.

Geologic and climate perturbations are inevitable events that surface over the multimillion-year evolutionary time scale. Biology responds to those unpredictable factors with an inherent adaptability. As Jeff Goldblum’s character said in *Jurassic Park*, “Life finds a way.” The biggest hiccup in fish evolution occurred around 260 million years ago when the forces of the Permian extinction spread across the globe. The causes of this event remain jumbled and unclear. It lasted for around 15 million years and probably involved a blend of several catastrophes occurring both simultaneously and sequentially. “The truth is sometimes untidy,” said Doug Erwin of the Smithsonian Institute in reference to the event. Causal evidence for the Permian extinction gives multiple clues ranging from 1) a huge asteroid impact to 2) the acidification of oceans by fallout from massive volcano eruptions to 3) the depletion of oxygen in the oceans to 4) the introduction of toxic levels of CO<sub>2</sub> and bicarbonate that made the seas bubble like club soda. The case remains open and unsolved.

What is known is that marine vertebrates disappeared from the oceans during this long global disruption, creating a wide gap in the marine fossil record. The Permian extinction reset the evolutionary clock by making freshwater habitats the sites of origin for almost all existing fish species. Dr. John Weirs, evolutionary biologist at Stony Brook

University, with his colleagues, recently uncovered this connection. “The most surprising research result emerging from this work,” he says, “is that all ray-finned fishes (the dominant taxonomic class of fish) we see today appear to be derived from a freshwater ancestor.”

The sturgeon is one example of a Montana native species group that did survive the Permian extinction, and even went on to become the dominant big fish in every major river system in North America and Eurasia while still holding onto its early form and genetic makeup. Tens of millions of years ago, the forebear of the modern burbot returned from the sea to occupy a freshwater niche alongside its most ancient coinhabitant. See Figure 1 to trace the burbot ancestor’s circuitous route as it broke away from its marine cod relatives and adapted back into a freshwater environment.

When the burbot’s ancestor pioneered its way into the freshwater habitats from the sea, it brought with it a number of traits borrowed from its marine cod-like relatives (Table 1). Two of the more intriguing traits include acoustics and spawning behavior. The burbot communicates with a particular sound pattern shared by other members of the Gadidae family. Like its marine cod relatives, the burbot makes distinct sounds, similar to a revving motorcycle, during the winter spawning season. The sounds, produced by internal muscle contractions, serve as mating signals to nearby burbot in the dark, under-ice conditions. Gadoid (cod-related) fish share another unique characteristic with their winter nighttime group spawning or “spawning ball” technique of fertilizing eggs (see Table 1 details).

Many fish species display some traits comparable to those in Table 1, but the similarities do not coincide with any close genetic kinship. The burbot, cusk, and cod show how the evolution of related species stretches out over time and space, while the species remain closely connected with multiple similarities in behavior, adaptations, appearance, and genetics. There isn’t a perfect match in all features but the cumulative similarities (as shown in Table 1) paint a vivid picture of a common history and close ancestors. “When you encounter this fascinating fish,” says Chris Clancy, retired Montana Fish, Wildlife and Parks fish biologist, “try to reflect for a moment on the journey its ancestors took over millions of years of a changing planet and climate as well as multiple mass extinctions. Through resilience and likely good luck, today’s native fish are survivors and we should do all that we can to protect them.” And who knows what the future may hold? *Lota lota* is probably not the end of the line for the burbot, and it’s exciting to ponder where its journey may lead.

The development of a biologically diverse assemblage of organisms that stays in tune with their ever-changing habitats is both intuitively simple and astoundingly complex. As conservationist and *National Geographic* photographer Frans Lanting said, “Biodiversity starts in the distant past and it points towards the future.” The origin story of the homely burbot serves as just one more illustration of that point. 🐟

—After a long career with the U.S. Forest Service as a rangeland and wildlife habitat manager and ecologist, Gil Gale continues an active role in the effort to educate about and conserve biological diversity.

## Nature Journal Observations from Master Naturalists

An essential component of MNHC's Master Naturalist course is keeping a field journal. Here are a few observations from our 2021 participants.



▶ Maggie Schaefer,  
notes on Northern  
Flicker and Western  
Meadowlark

▶ Andrea DeNino,  
notes on a Hooded  
Merganser



▶ Sadie Russell,  
notes on lichen  
found in  
Pattee Canyon





# Natural History Books We're Reading:

## *Recommendations from MNHC Staff*



**We admit it: MNHC staff nerd out both at work and home. Here's what we've been reading lately. We'd love to know what your favorite natural history books are—please send us your recommendations!**

From **ALLISON DE JONG, MONTANA NATURALIST EDITOR:**

**Writing Wild: Women Poets, Ramblers, and Mavericks Who Shape How We See the Natural World** by Kathryn Aalto. "Think of these pages as a glance backward and a look forward, as well as a celebration of women who bring a different dimension to nature writing," writes Kathryn in her introduction. In this lovely book, she reflects on 25 women (while recommending dozens more) over the past 200 years whose writing about the natural world continues to influence and inspire us.

From **KELLI VAN NOPPEN, ID NATURE COORDINATOR:**

**Wild Souls: Freedom and Flourishing in the Non-Human World** by Emma Marris. This insightful, philosophical book examines wildness, nature, and the challenges inherent in protecting wild creatures and preserving the environment through telling inspiring stories of animals around the world.

From **BAILEY ZOOK, SCHOOL PROGRAMS COORDINATOR:**

**Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants** by Robin Wall Kimmerer. A gorgeous book that weaves together science and Indigenous knowledge, inspiring us to recognize and celebrate our reciprocal relationship with the natural world.

From **PAT LITTLE, DEVELOPMENT AND OPERATIONS COORDINATOR:**

**What the Robin Knows** by Jon Young. This book provides a fascinating look at what birds communicate both in "normal" conditions (feeding, courtship, etc.) and when there is a disturbance (raptor, cat, human, etc.). For anyone who is used to identifying birds by ear this goes a step further into understanding what the birds are up to and why.

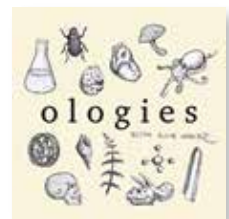
From **THURSTON ELFSTROM, EXECUTIVE DIRECTOR:**

I recently picked up A **Field Guide to Mesozoic Birds and Other Winged Dinosaurs** by Matthew P. Martyniuk again. (Mostly to just look at the wonderful illustrations.) It's super informative and the chapter titled "Bird Origins & Evolutions" is both fascinating and fun to read.

From **CHRISTINE MORRIS, COMMUNITY PROGRAMS COORDINATOR:**

**Roadside Geology of Montana** by Hyndman and Thomans. This new edition of our state's roadside geology guide is a pleasure to read, with its beautiful in-color maps, diagrams, and photos. It is clearly written and provides a wonderful overview of Montana geology.

**Bird Love** by Wenfei Tong. It is beautiful as a coffee table book, with photos of birds from around the world. It also is an excellent read for anyone interested in the fascinating details of bird courtship and mating. Do you ever wonder about those lovely, long magpie tails? They do serve a purpose! Read the book to find out about honest signals and much more. This is a book you will reference again and again.



### AND ONE PODCAST:

Maybe you have little time to read these days—we understand! If you have time to listen, we highly recommend the excellent science podcast **Ologies** with Alie Ward. It's a favorite amongst several of our staff. Learn about all the "ologies": dendrology (trees), selachimorphology (sharks), ursinology (bears), pinnipedology (seals & walruses)...and so many, many more. (Indigenous fire ecology! Molecular neurobiology! Space archaeology!) It's both educational and entertaining, and you'll learn things you didn't know you didn't know.

**Note:** This podcast has some adult language and themes; younger listeners can check out the new, kid-friendly version: **Smologies**.

# get outside calendar



## Programs for Kids

**Our Saturday Kids' Activities are back!** Schedule TBD; on scheduled Saturdays families can drop in between 1:00 and 3:00 p.m. for a hands-on kids' activity. Check our website calendar for specific dates and topics. Free with membership or cost of admission.

The Montana Natural History Center is a content provider for Streamable Learning ([streamablelearning.com](http://streamablelearning.com)), whose innovative programming connects districts and classrooms across North America for live and interactive online educational events. Subscriptions for homeschools/families is just \$14.99/month (first 30 days free). Check out our upcoming events!

**We are restarting our miniNaturalist program—outdoors!** Join us on **Thursdays from 10:00-11:00 a.m. in the Nature Adventure Garden.** Check our website for updates. Free with membership or cost of admission.

### OCTOBER

**October 12**

**Millipede vs. Centipede,** 9:10 a.m. and 11:10 a.m., for grades 3-5.

### NOVEMBER

**November 12**

**Meet a Mushroom,** 10:10 a.m., for grades 4-6.

### FEBRUARY

**February 9**

**Super Spiders,** 10:10 a.m. and 12:10 p.m., for grades 1-5.



## Join Us for Homeschool Naturalist Programs!

We are excited for a fresh new year of our Homeschool Naturalists programs! We look forward to getting outside, exploring the natural world around us, and inspiring curiosity together. We offer a variety of programs for pre-K through 8th grade, so please check out [MontanaNaturalist.org/homeschool/](http://MontanaNaturalist.org/homeschool/) for information about the 2021-22 school year!

MNHC PHOTO



## Volunteer Opportunities

**Volunteers, it's been great to see some of you again this year!**

For upcoming volunteer opportunities, check our website or sign up for our volunteer newsletter at [MontanaNaturalist.org/volunteer-with-mnhc/](http://MontanaNaturalist.org/volunteer-with-mnhc/), and we hope to see you soon.

**MNHC is currently open Tuesdays - Saturdays, 11 a.m. - 4 p.m.**  
**Please check our website and social media for details.**

#### Admission Fees:

**\$4/adults (18+), \$1/children (4-18), \$8/family rate, Free/children under 4, \$3/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.**

**Programs subject to change.**

**Please check our website calendar for the most up-to-date information.**

**Visit [MontanaNaturalist.org](http://MontanaNaturalist.org) to register for programs and become a member. For more information, call MNHC at 406.327.0405.**

## PHENOLOGY FOR OCTOBER-MARCH

### OCTOBER



Milkweed seed pods explode open and spread their seeds

**Short- and long-tailed weasels molt into their dense white coats**

### NOVEMBER

Elk move down from their higher summer and fall elevations

**Ruffed Grouse stay near aspens and cottonwoods for their food supply of buds**



### DECEMBER

Owls, snowshoe hares, and grouse find shelter beneath spruce trees

**Geminid meteor shower peaks on December 13th**



### JANUARY

**Mourning cloaks and commas hibernate under leaves and in rotten logs**

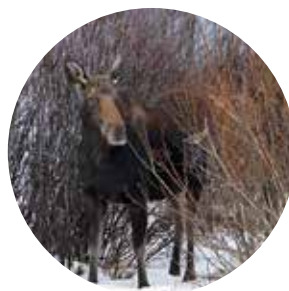
Deer and elk begin to shed their antlers



### FEBRUARY

Great Horned Owls begin nesting

**Moose forage for twigs in willow thickets**



### MARCH

Marmots come out of hibernation

**Snow and Ross's Geese stop at Freezeout Lake**



WEASEL: BRANT OLSÉN, FLICKR.COM; RUFFED GROUSE: MDE, WIKIMEDIA; GEMINID METEOR: ASIM PATEL, WIKIMEDIA; MOURNING CLOAK: ROBB HANNAWACKER, FLICKR.COM; MOOSE: JIM PEACOCK, YNP; GEESE: STEVE EMMONS, USFWS





## Adult Programs

*Masks and social distancing required for all in-person programs.*

We're planning to offer various 2-3-hour outdoor Naturalist Field Day programs this fall and winter; other in-person adult programs may include lectures, Sip & Sketches, and trivia nights, depending on COVID. Please check our website and social media for the latest information, or sign up for our e-newsletter at [MontanaNaturalist.org](http://MontanaNaturalist.org).

### SEPTEMBER



**September 18**  
**Annual Banquet & Auction,** 5:00-9:00 p.m. Join us outdoors at Ogren Park Allegiance Field for a special night of supporting and celebrating MNHC's 30 years of connecting people with nature.

**September 21**  
**Saunter with a Naturalist in the Evening,** 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at Maclay Flat. Registration required.



**September 23 - October 28**  
**Introduction to Nature Journaling,** Thursdays, 6:00-8:00 p.m. at MNHC. \$125; \$105 MNHC members. Registration required.

### OCTOBER

**October 7**  
**Artist Talk with MNHC Artist-in-Residence Tracy Hall,** 4:00-6:00 p.m. FREE.

**October 19**  
**Saunter with a Naturalist in the Evening,** 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at the Native Plant Garden at Fort Missoula. Registration required.

**October 21**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at the Native Plant Garden at Fort Missoula. Registration required.

### NOVEMBER

**November 2 - December 7**  
**Online Field Notes Writing Workshop,** 6-Part Class, Tuesdays, 10:00-11:30 a.m. \$120; \$100 MNHC members. Registration required.

**November 16**  
**Saunter with a Naturalist in the Evening,** 4:00-6:00 p.m. \$10; \$5 MNHC members. Meet at the Crazy Canyon trailhead. Registration required.

**November 18**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at the Crazy Canyon trailhead. Registration required.



**November 30 - December 10**  
**Certified Interpretive Guide Training Course,** Tuesdays, Thursdays, & Fridays, 9:30 a.m.-3:00 p.m. In person at MNHC. \$235; you can pay an additional \$150 to become an official Certified Interpretive Guide through the National Association of Interpretation. Registration required. Visit [MontanaNaturalist.org](http://MontanaNaturalist.org) for more information and to register.

### DECEMBER

**December 14**  
**Saunter with a Naturalist in the Evening,** 4:00-6:00 p.m. \$10; \$5 MNHC members. Meet at the Kim Williams Trail. Registration required.

**December 16**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at the Kim Williams Trail. Registration required.

### JANUARY

**January 18**  
**Saunter with a Naturalist in the Evening,** 4:00-6:00 p.m. \$10; \$5 MNHC members. Meet at Greenough Park. Registration required.

**January 20**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at Greenough Park. Registration required.

### FEBRUARY



**February 1 - May 3**  
**Spring Montana Master Naturalist Course,** Tuesdays, 4:00-7:00 p.m., plus two Saturday field days, February 12 & April TBA. \$425; \$395 MNHC members. Registration required.



**February 15**  
**Saunter with a Naturalist in the Evening,** 4:00-6:00 p.m. \$10; \$5 MNHC members. Meet at Kelly Island. Registration required.

**February 17**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at Kelly Island. Registration required.

### MARCH

**March 15**  
**Saunter with a Naturalist in the Evening,** 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at the Crazy Canyon trailhead. Registration required.

**March 17**  
**Saunter with a Naturalist in the Morning,** 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at the Crazy Canyon trailhead. Registration required.



## Join us on our monthly Saunters with a Naturalist!

Bring your curiosity and your own naturalist knowledge and join MNHC Naturalist Ser Anderson on a naturalist saunter—choose morning, evening, or both! We will focus on exploring the changing seasons, making observations, following our curiosity, and learning from each other. Whether you are an experienced naturalist or just starting out, these walks are for you!



## get outside guide

### Kids' Corner

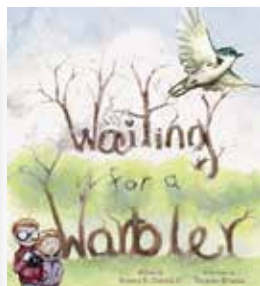
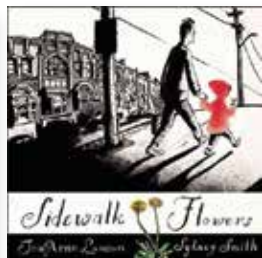
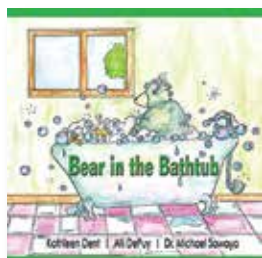
Our summer campers created so many fun nature art projects this year! One of our preschool-kindergarten camps made caddisfly larvae cases—both small and kid-sized! (Both are easy projects to do at home.)



MNHC PHOTOS



Another group made a gorgeous collaborative mud painting, made by mixing dirt, water, and tempera paint and painting it onto butcher paper. (Yup, you can do this one at home, too!)



## Natural History Books, Kids' Edition: Recommendations from MNHC Staff

From PAT LITTLE,  
DEVELOPMENT & OPERATIONS  
COORDINATOR:

***Bear in the Bathtub*** by Kathleen Dent, Alli DePuy, and Dr. Michael Sawaya. [This book is available in the MNHC gift shop!] Kathleen and Alli are from Missoula, and make up Inspired Classroom, an educational organization that connects students, teachers, and experts. The book is for kids and the illustrations contain many by children. It's a cute story about why bears need to cool off in the summer.

From JENAH MEAD,  
TEACHING NATURALIST:

***Sidewalk Flowers*** by Jonarno Lawson, illustrated by Sydney Smith. In this wordless children's book, a little girl's world is transformed as she discovers nature along her urban walk. As she collects the overlooked flowers growing between the cracks in the sidewalk, she begins to give them away as gifts to others that might be just as overlooked—showing them reverence and transforming their worlds as well.

From ALLISON DE JONG,  
MONTANA NATURALIST EDITOR:

***Waiting for a Warbler*** by Sneed B. Collard III, illustrated by Thomas Brooks. This engaging story follows two curious, nature-loving children in Texas as they wait for the arrival of a migrating Cerulean Warbler from Central America. Will it make it the long, stormy 600 miles across the Gulf of Mexico? Filled with lovely illustrations, fascinating information about migrating songbirds, and useful tips about birding and creating bird-friendly spaces, this book is a wonderful resource for readers of all ages.



Butterfly life cycle by Lena Hanson, age 6.



## Calling All Kids!

Do you have any nature art, photography, poetry, or stories you'd like to share? We showcase kids' work in every issue in our "Kids' Corner"—and here's your chance for that work to be yours!

Send submissions to Allison De Jong, Editor, at 120 Hickory Street, Missoula, MT 59801 or by email to [adejong@MontanaNaturalist.org](mailto:adejong@MontanaNaturalist.org).



## Volunteer Spotlight: Barbara Gauch

BY SER ANDERSON

**T**hough Barbara Gauch doesn't consider herself a nature person, she is endlessly interested in exploring the world. Originally from New Jersey, she moved to Missoula from Seattle to, as she puts it, "have something completely different." She was interested in getting to know the civic culture of her new home, as well as the outdoor culture that is so important to so many of her new neighbors, and became an MNHC member. She attended meetings of the Glacial Lake Missoula chapter of the Ice Age Floods Institute, participated in a number of MNHC programs and trips, and, most recently, became a regular participant in MNHC's monthly Saunter with a Naturalist program.

At the beginning of the summer, Barbara asked about volunteering with MNHC's summer camps. Drew Lefebvre, MNHC's Volunteer Coordinator, proposed she read to our youngest summer camp group, preschool- and kindergarten-aged kids. A dedicated volunteer through Missoula Aging Services' RSVP Volunteer Program, Barbara had previously read to and with slightly older students in elementary schools. Barbara hadn't worked with kids that young before, but decided to jump right in. "I thought I'd enjoy it," she says, "have something to offer, and learn a lot."

Barbara read to the PreK/K campers almost every afternoon for all nine weeks of our camps and enjoyed getting to know each group. She found it interesting that preschool kids aren't yet worried about not knowing things, unlike the older students she'd worked with before. "The things they know they are very happy to share," she says, "and the things they don't know don't bother them. I find that charming and very easy on the nerves."

One of Barbara's favorite books to read to the PreK/K campers is *The Very Quiet Cricket*, and anything else by Eric Carle. All of Carle's books are geared for reading aloud to children, with vibrant colors and repetition. Barbara herself has a very engaging reading style, pausing to ask questions about what the campers see in the illustrations and giving them opportunities to share

**"The things they know they are very happy to share, and the things they don't know don't bother them. I find that charming and very easy on the nerves."**

**Barbara read to our youngest campers almost every afternoon this summer.**



what they see and know about the story topics.

It has been particularly important and exciting for us to have Barbara volunteering with MNHC this summer since COVID has limited our volunteer opportunities. We are looking forward to welcoming more volunteers through our doors in the near future, and couldn't have started with a better volunteer than Barbara. As Bailey Zook, MNHC School Programs Coordinator, says of Barbara, "She's just all-around delightful!"

We are so grateful for the time and stories she has shared with our youngest campers.

***Thank you, Barbara!***



Winona Bateman and her family have been finding—and creating—hope in action for several years now.



# "Action

## Families for a Livable Climate:

### *Telling Stories, Making Connections, Finding Hope*

BY ALLISON DE JONG

**A**s I ticked off the days of this year's unprecedentedly hot, dry, smoky summer, obsessively checking the forecast and hourly air quality, I couldn't stop the ever-present worries about climate change from surfacing. This year, my family bought two additional HEPA filters (bringing our household total up to three), an air quality monitor, and high-grade filters for our furnace; we also installed a ductless mini-split system to provide energy-efficient cooling and heating to the least energy-efficient parts of our house. And I understand the privilege inherent in being able to make those purchases, in being able to make our small home a sanctuary of cool, clean air even on the hottest, smokiest days. My husband and I were particularly motivated by wanting to protect our three-year-old son's lungs and brain and body.

To a parent, the specter of climate change is a particularly haunting one. After reading the most recent climate assessment from the Intergovernmental Panel on Climate Change, I'm feeling more haunted than ever.

Three years ago, in October 2018, Winona Bateman felt equally shaken after reading the previous IPCC report, which had just been published. Next came anger—and then motivation. "I woke up and realized I had to do something," she told me. "I had flexibility in my life, which is a big privilege, and I knew I needed to use that to get involved and make change."

So she did.

Winona got involved with local and statewide climate organizations, and realized there was a voice missing: that of parents and families. "An intergenerational focus felt really important," she says. She began connecting with other families who had similar concerns, and by fall 2019 they had a core team, an organization, and a name: Families for a Livable Climate.

Climate change is a hot topic—both literally and figuratively—but Families for a Livable Climate (FLC) has worked hard to connect people through shared values and personal stories. One of FLC's particular inspirations is atmospheric scientist and science communicator Katharine Hayhoe, who focuses on building trust as a community and then engaging in climate conversations

from that foundation. "That's one of our guiding principles," says Winona. "That's how we got started."

The fledgling organization became fiscally sponsored on March 11, 2020, the day the World Health Organization declared COVID-19 a global pandemic. Like everyone else, FLC pivoted to online outreach and events, from a "Decarbonize Your Money" workshop to "The First Step to Tackling Climate Change" talk with Katharine Hayhoe (watch the recording at [livableclimate.org/our-livable-future](https://livableclimate.org/our-livable-future)). One hundred twenty-five people attended the latter, and half a million dollars of private savings and investments were moved out of fossil fuels after the former. Other programs focused on similar topics, helping families to make connections between choices they can make personally and larger systemic change.

Despite the popularity and effectiveness of these virtual events, Winona and her team knew that in-person conversations were essential. "One of our theories of change is that one-on-one conversations are really critical," she says, but those are harder to have during a pandemic when everyone is Zoom-weary. In the coming year, FLC plans to focus on one-on-one organizing: their core team going out and having conversations about climate. "We're interested in engaging as many people as possible," says Winona. "We're interested in movement building."

And why are these climate conversations so important? "One of the key barriers to action right now is that people don't talk about climate change," Winona says. Data from a September 2020 Yale study on climate change communication in the U.S. shows that, while 72 percent of people believe climate change is happening, only 35 percent talk about it often. Sixty-four percent of people talk about it rarely or never. And for a crisis that is affecting everyone (and everything) on the planet in increasingly devastating ways, we need to be talking about this much, much more. "If we don't confront our reality and face the climate emergency, we can't change it," says Winona. "We can't make a future for our kids. It's that simple."

So FLC is working to increase the number of people talking about climate—and is bringing families into the conversation.





Winona and her daughter Ellis at the Global Climate Strike in September 2019.

# is our hope.

“Parents and caregivers are everywhere,” as Winona says, and raising our voices as families, as caregivers, as parents, is powerful. It’s also a wonderful way to connect. I ask myself every day how I can make the world a better place for my kid, as I know many parents do. Families for a Livable Climate is creating space to connect, to share, to talk about the worries that keep us awake at night. Parents and others who care for children can sympathize with each other’s concerns and challenges—and find hope in those connections.

When I asked Winona where else she found hope, she responded simply, “Action is our hope.” Action can be starting a conversation—in fact, it’s one of the most important actions we can take every day. Many people already participate through the (paid or unpaid) work they do. But action, says Winona, is also taking a step or three beyond what we’re already doing: Donating to local climate groups. Calling or writing our elected representatives. Even if it’s just a few minutes a week—taking ten minutes to raise our voices for climate, for our children, for the planet—every person can be part of the movement.

And it is a worldwide movement. While those of us in the global North have been feeling the worsening impacts of our shifting climate only recently, those in many other parts of the world have been coping for much longer. Equally unequal is the fact that climate change has been driven largely by Western, wealthy, and Whiter countries and communities, while BIPOC and socio-economically disadvantaged people have been disproportionately bearing the brunt of the climate crisis. But an exciting new fellowship is working to amplify and connect the climate work happening around the world: the

Climate Parent Fellowship, created by Parents for Future Global and Our Kids’ Climate. The first cohort of Fellows consists of twelve women climate leaders from across the globe, who will receive training, mentorship, funding, and other resources to make their climate organizing more sustainable. Winona is honored and humbled to be the U.S. Fellow; she joins Fellows from Brazil, Canada, Ghana, India, New Zealand, Nigeria, Poland, South Africa, Vietnam, and the U.K. “Being part of our Our Kids’ Climate is an incredible partnership for us,” says Winona. “It’s amazing to have an international perspective on climate parent organizing, and to hear stories about what’s happening in our sister climate organizations.”

Telling stories is another powerful way to connect, and FLC has recently partnered with Stories for Action to launch Montana Climate Stories, a project that shares Montanans’ personal experiences of how climate change is impacting their lives and communities. Bringing these stories together shows how much we’re interconnected, and how widespread and personal the impacts of climate change are. “Personal stories, personal experiences,” says Winona, “they really transform the conversation.”

Families for a Livable Climate invites everyone to join the conversation. For those who worry about how climate change will affect children’s lives and futures, for those who feel paralyzed by the enormity of the problem, for those looking for the small (or big!) actions they can take, FLC has created a supportive community for climate action. “Our futures are tied up together,” says Winona. “We are connected. We can’t change the whole world—but we can all do something.” 🐾



FAMILIES FOR  
A LIVABLE CLIMATE  
CONNECT. ENGAGE. ACT.

## Want to get involved?

Visit Families for a Livable Climate online at [livableclimate.org](https://livableclimate.org).

- Sign up for FLC’s magazine (print or digital), *The Changing Times*, at [livableclimate.org/changingtimes](https://livableclimate.org/changingtimes)
- Check out upcoming events (workshops, trainings, and more) at [livableclimate.org/events](https://livableclimate.org/events)
- And a wonderful guide to getting involved, whether you have “nearly zero” time or a few hours a week: [livableclimate.org/new-and-inspiration/2021/7/12/friend-our-climate-needs-you-now](https://livableclimate.org/new-and-inspiration/2021/7/12/friend-our-climate-needs-you-now)

## Local, statewide, and international climate organizations:

**350 Montana:** [350montana.org](https://350montana.org)

**Bitterroot Climate Action:** [bitterrootcag.org](https://bitterrootcag.org)

**Climate Smart Missoula:** [missoulaclimate.org](https://missoulaclimate.org)

**Moms Clean Air Force Montana:** [momscleanairforce.org/state-chapters/montana/](https://momscleanairforce.org/state-chapters/montana/)

**Montana Climate Stories:** [mtclimatestories.org](https://mtclimatestories.org)

**Montana Environmental Information Center:** [meic.org](https://meic.org)

**Montana Health Professionals for a Healthy Climate:** [montanahphc.org](https://montanahphc.org)

**Mountain Mamas:** [mtnmamas.org](https://mtnmamas.org)

**Our Kids’ Climate:** [ourkidsclimate.org](https://ourkidsclimate.org)

**Parents for Future Global:** [parentsforfuture.org](https://parentsforfuture.org)

**Sierra Club Montana Chapter:** [sierraclub.org/montana](https://sierraclub.org/montana)

**Sunrise Movement Missoula:** [facebook.com/sunrisemissoula/](https://facebook.com/sunrisemissoula/)

## imprints

# Behind the Scenes: Caring for Collections

BY ALYSSA CORNELL-CHAVEZ, MNHC COLLECTIONS REGISTRAR

The Montana Natural History Center houses a diversity of specimens from Montana and even around the world: bird heads, whale vertebrae, javelina skulls, bison pelts, and the list goes on! Specimens on loan from the Philip L. Wright Zoological Museum and the University of Montana Paleontology Center as well as donations from the community fill our collection storage, feature in our exhibits, and augment our education programs. I feel privileged to be the person who gets to care for them all.

From supporting scientific discovery to facilitating human connections, museum collections contain unlimited potential. It is the job of the people who work in museums to help protect and foster that potential. As Collections Registrar, I oversee all of the specimens that call MNHC home. This can entail checking specimen conditions, cataloging and inventory, facilitating loans and donations with the community, doing background research, finding storage solutions, curating for exhibits and programs, and so much more. There is never a dull day with our collections!

One of my favorite aspects of working with collections is that each specimen has a different story. That story might have great historical significance or scientific purpose, or it might help us create an exhibit narrative. No matter its purpose or story, each specimen is important. Ensuring respect for and the longevity of each specimen is why positions like collections registrar exist. And the field is constantly evolving. Museum practices look a lot different now than they did one hundred years ago. I am attending collections care and management courses this year, and probably more in the future, to help stay up to date on all the current museum practices.

If you are interested in donating or learning more about our specimens, please feel free to reach out to me at MNHC (406.327.0405 or [acornell@MontanaNaturalist.org](mailto:acornell@MontanaNaturalist.org)). If it wasn't already obvious, I really enjoy talking about collections!

**Alyssa Cornell-Chavez, MNHC's Collections Registrar, with specimens from MNHC's permanent collection and on loan from the Philip L. Wright Zoological Museum.**



Summer campers watching Ospreys on their nest at the PaddleHeads stadium.

MNHC PHOTO

## Reflections from a Summer Camp Instructor

Environmental education combines my passions of education and the natural world, providing the opportunity to share information about the natural world with young people, and at the same time learn with and from them as well. Highlights from this summer usually involved a field trip, whether visiting Jocko Fish Hatchery or seeing an Osprey banding. Being able to allow campers to see, in person, the wildlife and other species that we talk about during lessons was a very transformative experience. It always makes my day when the kids get so excited to tell their parents/guardians about these experiences! This was one of the best summers of my life, working not only with amazing and supportive staff but also wonderful kiddos who taught me so much. I have learned to stay curious, have an imagination, and that creativity comes in many forms.

— Ashley Sinclair, 2021 MNHC Summer Camp Instructor



COURTESY ASHLEY SINCLAIR



# As To The Mission

## Standing at a Climate Crossroads

While I had already confirmed with our *Montana Naturalist* editor, Allison De Jong, that this piece would be about human-caused climate change, I had not intended to write it on the same day that the United Nations Intergovernmental Panel on Climate Change presented a bleak view of the planet Earth's future. But here I am, writing this with the knowledge that things are perhaps worse than feared. Far worse, in fact.

Because, as a planet, we are at a crossroads. Will we take the fork in the road that could lead towards a less severe future or the one characterized by even more deadly heat, smoke, and very real environmental disaster and habitat loss? This is a scary question.

This summer has been characterized by, first, hot temperatures, followed quickly by more heat and wildfire smoke. The latter rolled into the West and Midwest quickly, reaching even the East Coast, right after Independence Day.

And climate change scientists and associated reporting tell us that early and prolonged wildfire seasons are going to be the increasing normal across the western United States.

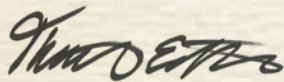
At the Montana Natural History Center, we've spent the summer adapting our practices to safely host our summer camps in much hotter weather than previous years. And did I mention the smoke? Its effects on our biology are not fully understood, but no one thinks it is good for our health. Because of the negative health implications, we had to spend more time indoors with our campers (instead of being outdoors in the ultimate classroom, surrounded by birds, trees, and wildflowers). And the adaptations we have had to make for summer camps have affected other programs: we've cancelled or postponed interpretive nature walks because the air is so unhealthy, and we've had to close our exhibit hall to visitors because the summer camps are using the space. This last measure is particularly frustrating since we have a new Montana fossils exhibit that explores climate change over the 3.7 billion years that life has proliferated on earth, with a special focus on human-caused climate change.

I'm not certain that the significance of the changes we've made this summer due to extreme, human-caused climate change is understood by our summer camp participants. However, it is not lost on the staff. Most people who work for a nature center have a vested interest in the environment. We are all concerned for the planet, perhaps even more so after today.

But I am heartened by what MNHC is doing to bring more climate change science and learning to western Montana, shining a light on the issues at hand.

And by the time this issue hits stands and mailboxes, our 2021 summer camp season will be in the books and we will be back to welcoming greater numbers of people back into our exhibit hall, where they will not only learn about the ecology and geology of our state, but also about global climate change and what we can all do to lessen the impact our species is having on the planet.

If you have a question or want to know more about climate change, come in and see our new exhibit, where you can learn what you can do and commit to actions to help make our future safer.



**Thurston Elfstrom,**  
*Executive Director*



**MNHC summer campers getting a hands-on experience with nature: the best way to learn to love, understand, and steward it.**



## FIELD NOTES: PANDEMIC EDITION

One of MNHC's most successful new programs during the pandemic was our online, six-part Field Notes workshop, which we offered several times. Participants Zoomed in from across Montana and as far as California, Georgia, Maine, New York, and even Panama to learn about and discuss various forms of nature writing and to craft, workshop, and revise their own Field Note. This past year, many of the Field Notes written in the workshops have been aired on Montana Public Radio. If you've missed them, visit [MontanaNaturalist.org/field-notes/](https://MontanaNaturalist.org/field-notes/) to catch up!

**Interested in participating in the next workshop?** It runs on Tuesdays from November 2 - December 7; sign up at [MontanaNaturalist.org](https://MontanaNaturalist.org). Interested in writing a Field Note? Contact Allison De Jong at [adejong@MontanaNaturalist.org](mailto:adejong@MontanaNaturalist.org).



Recording a  
Field Note  
outdoors at the  
Fort Missoula  
Native Plant  
Garden last fall.

MNHC PHOTO



ANDREW LEE

## Wings Over Water Builds New Curriculum

Although our middle school program Wings Over Water (WOW) has taken a COVID-forced hiatus for the last couple of years, we've still been hard at work behind the scenes! WOW engages students in STEM through an in-depth program centered on our favorite charismatic raptor, the Osprey. This year, rather than invite middle school STEM teachers to Missoula for a hands-on workshop, we've been spending our time improving and polishing our curriculum to make it better than ever.

Anyone who's ever written science curriculum knows what a challenge it can be! That's why we're thrilled to be partnering with Jamie Garaventa, education specialist and science teacher extraordinaire. Jamie is an expert in all things STEM, including the Next Generation Science Standards, which provide the most up-to-date framework for building K-12 science curriculum. With Jamie's experience in the classroom as well as her knowledge of the standards, the WOW collaboration has gotten even stronger. We're hard at work building a brand-new curriculum for WOW, and we can't wait to share it with all of our teachers when we're done! **To learn more about WOW, visit [MontanaNaturalist.org/wings-over-water](https://MontanaNaturalist.org/wings-over-water).**



Crinoid fossil  
and crinoids  
as they would  
have looked  
when alive.

JENAH MEAD ILLUSTRATION

## Dive into Montana's Ancient Past!

We are thrilled to unveil our newest exhibit! Made possible by a grant from the Institute of Museum and Library Services, **Montana's Ancient Past** follows the rich fossil record of life in Montana, starting 4.5 billion years ago when the earth was still lifeless, and traces the path of evolution and extinction through changes in geology and climate all the way until the present day. We've partnered with Kallie Moore and the University of Montana Paleontology Center, who is graciously loaning us many of their specimens, which come alive with colorful text and maps, as well as detailed drawings from our very own staff artist Jenah Mead. Stop by soon to meet Montana's wide-ranging cast of ancient creatures: feathery crinoids, many-finned fishes, massive dinosaurs, and more!





## Open AIR Artist-in-Residence:

Stop by MNHC between September 20th and October 18th to see the gorgeous work of Tracy Hall ([tracyhallart.weebly.com](http://tracyhallart.weebly.com)), our Artist-in-Residence



this fall! Tracy is a freelance artist in Missoula, selling art, prints, and zines, and providing graphic design and illustration commissions, including book illustrations and t-shirt and poster designs. She graduated from the University of Montana in 2015 with a degree in English and Creative Writing. Since then, she has pursued an interest in combining storytelling with visual art through zine-making and artwork which imagines a vision of a rich and storied world. Tracy will be working in our Naturalist Field Station in September and October, with an "Artist Talk" on Thursday, October 7th, from 4:00-6:00 p.m.

## SPOTLIGHT:

**We had two wonderful naturalists help with our programming this summer, from Saturday Kids' Activities to our Master Naturalist courses: Samantha Getty and Elena Ulev.**



**Sam Getty**, MNHC's summer intern, graduated this past spring from the University of Montana with a B.S. in Wildlife Biology. While at UM she took MNHC's Master Naturalist course. "It was life-changing," she says. "It was a chance to test the knowledge that I learned at UM and gain new skills that have helped me connect with the world around me in a new way." During her internship, Sam took the Certified Interpretive Guide course offered through MNHC, and used those skills to write and host tours at the newly remodeled Philip L. Wright Zoological Museum, where she has long volunteered. Participants got a behind-the-scenes look at the museum's day-to-day operations and had the opportunity to observe research-grade specimens of species from around the world. Sam also assisted with Naturalist Field Days, a summer butterfly count, our Nature Journaling Conference, and our two summer Master Naturalist courses; and collected, identified, and pinned almost 40 new specimens to add to MNHC's insect collection. "I have had a fantastic time helping out at MNHC over the summer and will absolutely be recommending this internship to students and anyone interested in education and outreach," says Sam. "Thank you, Christine and MNHC, for the amazing summer!"



**Sam's additions to MNHC's insect collection: butterflies, beetles, and more!**

*Thank you, Sam!*

**Elena Ulev**, MNHC's summer teaching naturalist, taught and assisted with several adult and kid programs over the summer months. Elena grew up in the suburbs of Chicago, Illinois, and has been interested in nature from a very young age. She obtained a B.S. degree in Wildlife Biology from the University of Missouri-Columbia and moved to Missoula in 1999. Elena worked as a wildlife technician, botany technician, and hydrology technician for the U.S. Forest Service as well as a technical science writer for the Fire Effects Information System. In 2020 she obtained her Master Naturalist certification from MNHC and discovered a new passion—teaching people about nature, specifically ornithology and botany. From running MNHC's newly reinstated Saturday Kids' Activities to leading birding and plant walks to assisting with our August Master Naturalist Course, Elena's natural history education skills have been put to good use! In her free time Elena enjoys camping, backpacking, and paddleboarding with her daughters Ella and Lucy and husband Seth, as well as playing African drums, making jewelry, and gardening.

*Thank you, Elena!*





AMERICAN AVOCET AT BOWDOIN NWR



SPOTTED SANDPIPER AT COUNCIL GROVE



# Chasing Shorebirds . . .

STORY AND PHOTOS BY SNEED B. COLLARD III

It was May 26 and my son Braden and I were closing out the third full day of our 2020 Montana birding safari. We had started in Missoula a couple of days earlier, overnights in Bear Canyon and Billings, and were now heading east toward a hotel in Williston, North Dakota, before heading up to Westby, Montana, the following day. One of our priorities for the trip was seeing shorebirds. Yes, you heard that right. Shorebirds. In Montana.

It doesn't seem logical, does it? Why, after all, would birds that like lengthy shorelines with lapping waves be attracted to a state dominated by mountains, forest, and grasslands? When we'd first started birding several years before, we didn't think they would. Except for avocets, stilts, killdeer, and the occasional snipe, we paid shorebirds scant attention. The more we birded, though, and the more we learned, the more we discovered that a remarkable variety of these birds do indeed visit the Treasure State.

That doesn't mean that they're easy to find. Most shorebirds, in fact, just quickly zoom through on their way to and from breeding grounds farther north. On the first three days of our safari, we'd managed to see only the usual Spotted Sandpipers, Killdeer, and Wilson's Snipe, along with some slightly more exotic Long-billed Curlews in a field south of Three Forks. What's more, we had few guarantees we'd see additional shorebird species the rest of the trip. But suddenly, as we made our way toward the North Dakota border, both Braden and I swung our eyes toward a couple of enormous puddles at the side of the highway. Before Braden could even shout "Birds!" I hit the brakes and skidded onto the shoulder in a cloud of dust and gravel. Adrenaline pumping, we grabbed our binoculars and spotting scope and leaped out of the minivan.

Braden was far better at shorebirds than I, so while he took the first turn at the scope, I scanned with my binoculars.

"Killdeer," I said. Then, "American Avocet."

"Stilt Sandpipers!" Braden exclaimed.

"Whaaaaat?" I swung my binoculars to where he was looking. I'd been studying this bird hard and although I'd seen it before, I'd never gotten a good look. Now, twenty-five of the graceful creatures bobbed and probed in the puddle below us.

But the fun was just beginning.

Over the next hour, we spotted a Willet, more Wilson's Snipe, Long-billed Dowitchers, Wilson's and Red-necked Phalaropes, and Semipalmated Sandpipers—all in a place we never could have predicted!

Not surprisingly, Braden made the find of the day. Focusing in on a medium-sized bird that could have easily been four or five other species, he carefully dissected its size, bill length, colors, and markings. Finally, he stood and looked at me, a delighted grin on his face.

"White-rumped Sandpipers!"

"No way," I said. I took my turn at the scope, and Braden ticked off its features one by one. The clincher was a thin line of spots sweeping back just below the wing. I gave him a high-five. "Wow. I can't believe you found that."

"Me either."

But that's how "shorebirding" goes in Montana. Sure, you *should* find shorebirds at obvious hotspots such as Bowdoin and Medicine Lake National Wildlife Refuges, but in actuality, these cagey critters can and do pop up anywhere. In fact, our highway puddles turned out to be the best Montana shorebird spot of our entire birding careers. So what's the key to finding shorebirds? There are three, actually: timing, persistence, and knowledge

## Montana hosts a number of breeding shorebirds

including Spotted Sandpipers, Long-billed Curlews, Mountain Plovers, Killdeer, Black-necked Stilts, American Avocets, Willets, Upland Sandpipers, Wilson's Snipe, Wilson's Phalaropes, and Marbled Godwits. With the exception of Killdeer and Wilson's Snipe, all of these must be seen during breeding and migration season, usually April or May through September or October.

Dedicated birders, however, must catch the many *other* shorebird species during narrow, fluctuating windows in late spring and fall. That's when these birds pause briefly here to rest or feed before completing their journeys to arctic breeding grounds or back to the temperate coastal shorelines and more tropical destinations where they overwinter. To find these birds, you must get extremely lucky—and bird *a lot*.

Many of our best shorebird finds have been in puddles or flooded fields after heavy spring or fall rains. One of our favorite





KILLDEER AT FREEZEOUT LAKE



WILSON'S SNIPE AT NINEPIPE



LONG-BILLED CURLEW AT MOSS LANDING

# in Montana?

Missoula locations is Moccasin Lane near the old Stone Container plant. You have to catch it just right, but when it's had flooding, we've found Baird's Sandpipers, Pectoral Sandpipers, Killdeer, Lesser Yellowlegs, Wilson's Snipe—even a Red-necked Phalarope—there. Plenty of other times, however, we've come up completely empty-handed, so during the right months, we hit this spot again and again.

**Refuges such as Ninepipe and Pablo also can be productive**, but again, it takes persistence. A couple of years ago, we found a coveted Buff-breasted Sandpiper at Ninepipe—and have never seen one since. Just up the road at Pablo NWR, we've been skunked countless times looking for American Golden Plovers, a species that has firmly earned the title of Nemesis Bird! Other birds, such as Solitary Sandpipers, we get just by running around everywhere during the right seasons.

**And that brings me to the third requirement for finding shorebirds—**knowledge. Without question, shorebirds are one of the toughest groups of birds to identify. The only reason we find rarer shorebirds is because we have devoted hundreds of hours poring over field guides and photographs trying to learn the nuances of closely related species. If we hadn't been prepared, we never would have recognized what we were looking at in countless situations—including our epic puddles near the North Dakota border.

And honestly, even knowledge doesn't always guarantee success. Distinguishing between a Long- and Short-billed Dowitcher takes memorizing a dozen subtle features along with keen powers of observation. I probably miss that ID half the time. Differences between Western and Semipalmated Sandpipers also constantly trip me up, even though I've studied these birds extensively. It doesn't help that shorebirds don't always read the field guides on what they're supposed to look like!

All of that said, chasing shorebirds can prove fun and immensely rewarding for both beginning and advanced birders. This fall, grab your binoculars and a guidebook, and start visiting the ponds, puddles, and fields near you. I can't predict what you'll find, but I can almost guarantee you're in for some delightful surprises. 🐦

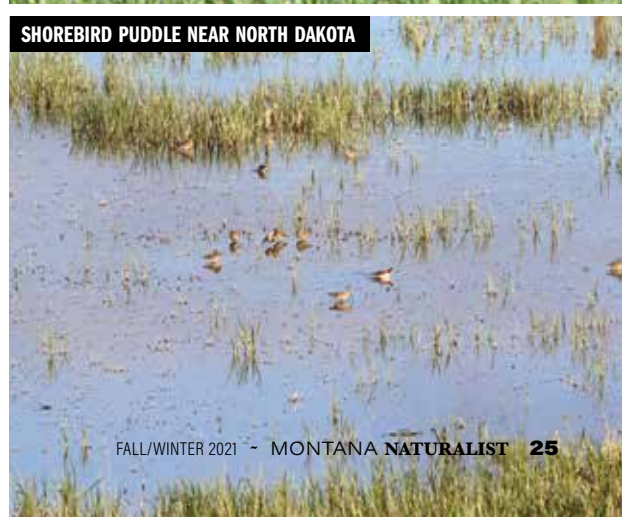
—Snead B. Collard III is the author of more than 85 children's books including *Woodpeckers: Drilling Holes & Bagging Bugs* and his newest picture book, *Waiting for a Warbler*. His adult memoir *Warblers and Woodpeckers: A Father-Son Big Year of Birding* was a Montana Book Award Honor selection and a finalist for the High Plains Book Award. These and his other titles can be ordered from your favorite independent bookstore or online. Learn more about Snead at [sneadcollardiii.com](http://sneadcollardiii.com) and follow his and Braden's birding adventures at their blog [fathersonbirding.com](http://fathersonbirding.com).



BLACK-NECKED STILT AT BOWDOIN



UPLAND SANDPIPER AT WOLFPOINT



SHOREBIRD PUDDLE NEAR NORTH DAKOTA



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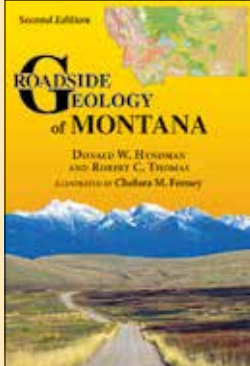

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# Changing

BY ALISA SINGER

**"As we witness our planet transforming around us we watch, listen, measure...respond."**

This past summer the United Nations Intergovernmental Panel on Climate Change published their Sixth Assessment Report. While its findings were stark, to say the least—including the observation that many of the climate changes caused by fossil fuel emissions, from sea level rise to ocean acidification to more intense drought and flooding, are irreversible for hundreds or even thousands of years—it also made clear how much of a difference human actions can make in decreasing the severity of those effects for future generations.

**The question is: how will we respond?**

**Read the full report at [ipcc.ch/report/ar6/wg1/](https://ipcc.ch/report/ar6/wg1/).**

*Alisa Singer's striking artwork was commissioned by the IPCC and based on a map used in the August 2021 report. For more climate change-inspired art, visit [environmentalgraphiti.org](https://environmentalgraphiti.org).*



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