



Montana Natural History Center

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MONTANA Naturalist

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

Stranger Than Fiction:

The Dystopian
Lives of
Parasitoid Wasps



Gathering Camas | A Year on the Rocky Mountain Front | How to See an Orchid | Photo Contest Winners

inside

Features

4

GATHERING CAMAS

Returning to Indigenous Food Systems

BY ASPEN DECKER

7

STRANGER THAN FICTION:

The Dystopian Lives of Parasitoid Wasps

BY BRENNIA SHEA

10

HOW TO SEE AN ORCHID

There's More Than Meets the Eye

BY KRYST STANDLEY



10



20

Cover – An American black bear cub looks down from its resting place on a Douglas-fir bough as its mother grazes on grass in the Greater Yellowstone Ecosystem. Photo by Dave Shumway, shumwayphotography.com.

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4



7

Departments

3

TIDINGS

13

GET OUTSIDE GUIDE

Kids' Corner: Montana birds by Shea and Hazel Loos; make your own phenology wheel; photo contest winners!

18

COMMUNITY FOCUS

Missoula's little-known gem: the Clark Fork Native Prairie
BY ANNE GREENE

20

IMPRINTS

Montana Nature Week thank yous; Salish Immersion Project; join us for summer camps!; Montana's Ancient Past exhibit teaser; As To The Mission; Honoring Bill Gabriel; summer camp scholarship fundraiser

22

VOLUNTEER SPOTLIGHT

Sharing our appreciation: thank yous from MNHC staff



18



24

24

FAR AFIELD

Twelve Months on the Rocky Mountain Front

BY MAGGIE CARR

26

MAGPIE MARKET

27

REFLECTIONS

Blue Camas Ledger Art

BY ASPEN DECKER



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tidings

As I write this, in March 2021, we have hit the one-year mark of coping with a global pandemic. In this time of such isolation, it can be difficult to remember how interconnected we are, with the world around us and with each other. But I recently began a new project that, though accomplished alone in my home, has reminded me of those connections.

On January 1st, 2021, I started a phenology wheel.

I gathered a sketchbook, drawing materials, and bowls and glasses of various sizes, then spent a couple of hours drawing circles and lines in pencil, then pen. I bookmarked Missoula weather and moon phase websites on my phone and scrolled through the #phenologywheel tag on Instagram. Then, carefully, I began to fill in the first slice of my wheel.

Moon: waning gibbous, 94 percent illumination. Weather: some clouds, some sun, too warm for January. Naturalist note: dead leaves still lingering on the trees. Finally, I colored it in, and suddenly the whole page came to life, that one narrow slice a vivid pop against the white of the page.

Every day since, I've spent a few moments each evening filling in another slice. The observations and hues and drawings build on one another, the wash of color circling around the page, until I find myself, at the end of the month, with a rainbow page bursting with life: my own personal record of January, February, March.

All those little slices add up to a pretty spectacular whole. Any one piece, on its own, may not seem particularly special—but without it, the picture is not complete.

Looking at my growing collection of phenology wheels, I'm reminded that everything is connected. Each small piece is connected to every other piece, and every piece is necessary. Each piece, with its unique qualities and colors, enriches the whole—whether we're talking about the waxing and waning moon or ecosystems.

The pieces in this issue celebrate the fascinating interconnections we find when we look closely at the natural world. Whether it's the horrifying yet riveting story of parasitoid wasps, which have evolved to feed off (and ultimately kill) their hosts (page 7), or that of lady slipper orchids, which have an intricate partnership with mycorrhizal fungi as well as some astonishing adaptations to trick bees into pollinating them (page 10), we are caught by the truth of this John Muir epiphany: "When we try to pick out anything by itself, we find it hitched to everything else in the universe."

Humans, too, are part of this equation. Salish and Kootenai tribal member Aspen Decker examines the relationship between Indigenous people and their pre-colonial food systems, and how reconnecting to those ancient systems brings both physical and cultural renewal (page 4). The Clark Fork Native Prairie near downtown Missoula cycled from a prime bitterroot-harvesting location for Indigenous peoples to an industrial wasteland to a place where native plants thrive once more (page 18). And outfitter Maggie Carr observes the seasons flowing around and through her home along the Rocky Mountain Front, feeling her connection to the landscape deepen through her daily, monthly, and yearly observations (page 24).

What connections might you discover if you take a little time each day to observe the world around you? This spring and summer, as life bursts forth once more, take a look. We'd love to know what you find.

Allison De Jong

EDITOR

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Keeping a phenology wheel takes only a few minutes each day. Want to make your own? Check out our Get Outside Guide on page 13!



Gathering Camas

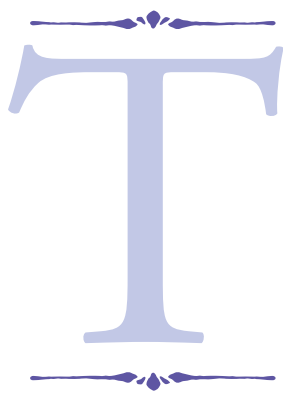
BY ASPEN DECKER

Growing up, I watched my mother gather *spełm* and other native foods that connected us to this land and our ancestors. I learned to speak *Nsélišcn* (Salish) when I was thirteen years old from my late elder Patlik Pierre. He linked my cultural knowledge with the language that our people used for thousands of years.

After having my children, the role of enculturating the *ṭaiáyagn* knowledge was up to me. *Nsélišcn* is the only language I speak to my children. For us, gathering traditional foods is still an essential part of our lives. One of the staple plants of the *ṭaiáyagn* food system is the *sxʷe?li* (uncooked blue camas), whose bulbs were traditionally dug up and cooked in a camas baking pit.

Last spring my family and I were out digging *sxʷe?li* and we only had three *pépéce?* (digging sticks). I explained to my children how we dig and process the *sxʷe?li*. First we give prayers and gratitude to the *sxʷe?li*, and then we begin digging. While digging up the *sxʷe?li* one has to be careful, or the bulb will break off while being pulled out of the ground. The large stalks and flowers are often deceptive because the bulbs may end up being quite small.

My five-year-old son did not have a *péce?*, so he started pulling up the *sxʷe?li* by hand. He walked around the area trying different places to dig the camas. While I dug up a couple of small bulbs, my son came back with a handful of *sxʷe?li* with huge bulbs. He showed me where he was digging, and it turned out to be the ideal place! It was a humbling moment—my young child was the one who ended up teaching me something about *sxʷe?li*. Such experiences during the cultural gathering patterns become a part of tribal memory



The *ṭaiáyagn* (Bitterroot Salish) were the first Indigenous peoples of Missoula. The oldest word for “Missoula” in Salish is *Nmesulétkʷ* and/or *Nmesulé* (“place of freezing water”), which originated during the time of Glacial Lake Missoula. After the warming following the last ice age, the Salish also began calling Missoula *Nláy* (“place of small bull trout”). *Nláy* was on the seasonal migration route of the *ṭaiáyagn*—they stopped there to dig *spełm* (bitterroot), because of its abundance there. Indigenous food systems, such as harvesting *spełm*, were disrupted by

colonialism. European settlers’ agricultural systems and forcible removal of Indigenous people from their homelands resulted in a significant decrease of native foods on ancestral lands.

Today, Indigenous peoples are working to restore native foods to their communities. Native food systems are essential to our cultural well-being and tribal food sovereignty; they are our connection with the land and ecosystems. Indigenous land management maintains a respect to ourselves, the animals, and the natural world. Acknowledging the *ṭaiáyagn* plants and their cultural importance connects me to my identity as a Salish woman.

The Salish language is a significant part of our cultural knowledge of both places and plants. Salish place names suggest what seasonal practices occurred in those places and how *ṭaiáyagn* people interacted with the land. The *ṭaiáyagn* names for the plants describe what they look like or how they were traditionally used. This Indigenous knowledge is passed down from one generation to the next. Prehistorically, Salish had no orthography, or written form; knowledge was perpetuated through oral storytelling and by practicing seasonal lifeways.



Top: Freshly harvested camas plants, with bulbs of varying sizes.

Right: Aspen’s son shows her the perfect digging spot he found—a reminder that people of all ages can contribute to cultural knowledge.





Left: The designs on this *pèche*, which Aspen burned into the wood, show the story of how the bitterroot came to be.

Middle: These camas bulbs, mixed with lichen, have just been removed from the camas baking pit and are ready to be eaten.

Below right: A cedar bark basket, full of freshly dug camas bulbs.



that helps us further our understanding of the natural world. The Indigenous sciences are always growing and adapting, and this story of my son goes to show that anyone, young or old, can contribute to our knowledge.

The cultural Indigenous tools—such as the *pèche*—are also a vital part of harvesting native foods, and the process of making these tools is an important component of our culture. The *pèche*, which was often carved with designs and passed down to the women of the family, is made out of a stick and an elk antler. The handle is an approximately six-inch piece cut from the end of the elk antler, with a hole carved through the center. The stick is sharpened into a curved point on both ends, so that if one side becomes dull the *pèche* can simply be turned around and ready to use once more. During the camas dig, we poke the pointed end of the *pèche* into the ground near the camas and wiggle it, loosening the soil enough to reach down and grab out the bulb.

Once harvested, it was important that the native foods were properly dried and stored. Winter food storage was vital for the survival of *Tatáyaqn* people: they needed to gather enough food to feed the entire tribe throughout the winter. Cedar bark baskets were used for both gathering and food storage. Cedar bark is a natural bug repellent that keeps bugs and rodents away from the food supply, making the baskets clean and healthy for storing plants and dried meat.

Native foods are an important part of Indigenous health and well-being. Many of the native foods provide vitamins

and high nutritional value. Historically, the act of foraging these native plants also increased physical activity that kept Indigenous peoples healthy. After colonialization Indigenous tribes began leaning on commodity foods that lack nutritional value and play a primary role in diabetes and obesity. As we continue to learn more about the negative effects of processed food on Indigenous health, reconnecting to our native foods becomes even more essential.

Making a full circle back to our native food systems will benefit both Indigenous health and cultural well-being. To support the first peoples of Missoula, it's important for non-Indigenous people to acknowledge the Indigenous knowledge

and practices that have been a part of this land for thousands of years, because we all have a responsibility to steward the land on which we live.

—Aspen Decker is an enrolled member of the Confederated Salish and Kootenai Tribes (Tatáyaqn, Qlispé & Sqsé) and a reviver of her tribal language, Nsélišcn (Salish). She is an M.A. graduate student in the Linguistics Program at the University of Montana. She graduated with a B.A. in Tribal Historic Preservation from Salish Kootenai College.



STRANGER THAN FICTION: THE DYSTOPIAN LIVES OF PARASITOID WASPS

PHOTO BY GLENN MARANGELO



BY BRENN A SHEA

In 1859, when Charles Darwin was preparing to unveil *Origin of Species*, he began a correspondence with several leading scientists of the time in order to gain support for what he knew would be a controversial theory. Among them was Asa Gray, a Harvard professor and celebrated botanist. In their correspondence (which lasted nearly 30 years), Gray applauded Darwin's theory of evolution, but suggested that it was guided by a divine hand, and pleaded for Darwin to return to faith. Darwin, though, could not be persuaded and wrote, "I grieve to say that I am in an utterly hopeless muddle. I cannot think that the world, as we see it, is the result of chance; & yet I cannot look at each separate thing as a result of Design." While Darwin had observed countless examples of adaptation and variation, he mentioned a specific example to Gray in 1860 that seemed to solidify his staunch opposition to design: Darwin simply could not see evidence for divine guidance in the existence of a humble wasp.

This female parasitic ichneumon wasp is using her ovipositor to drill into the wood below, where she'll eventually deposit her eggs directly into the body of her preferred insect host.

A

ll wasps belong to the suborder of insects within the order Hymenoptera (which includes ants, bees, and sawflies), and the common name usually invokes the image of an angry yellowjacket assaulting sugary drinks in the

summertime. Ever sipped from a soda that a yellowjacket was also enjoying? You won't soon forget the experience. The wasps that conjure up traumatic summertime memories are the eusocial variety: they live within complex, hierarchical societies and fulfill specific roles within a caste system. They collectively raise their young and defend their nests with gusto. But the majority of wasp species within the Hymenopteran order are solitary parasitoids, meaning they don't build hives or engage in other eusocial behavior. Instead of relying on a communal approach to brood rearing, parasitoid wasps force other insects and arthropods to do it for them, in a truly dystopian manner that would make George Orwell cringe.

So what is a *parasitoid*? Parasitoidism falls under the umbrella category of parasitism, with the final outcome resulting in the death of the host. The strategy is like a parasite/predator combo, as the wasp utilizes the host's resources before the host eventually dies.

Parasitoidism evolved once within the Hymenopteran order, making it a highly conserved strategy that has existed for millions of years. In fact, parasitoidism within Hymenopterans evolved before the order diversified, meaning it was present before the evolution of bees, ants, and eusocial wasps. The trait was secondarily lost by these groups as they evolved eusocial behavior. Those that retained this strategy comprise some of the largest known insect families: Ichneumonidae, Braconidae, and the superfamily Chalcidoidea, with the latter containing an estimated 500,000 species, only 22,500 of which have been described. To put that into perspective, Formicidae, the ant family, contains an estimated 22,000 species, 13,800 of which have been described.

Parasitoid wasps remain vastly understudied, but it's not for lack of trying. Despite the overwhelming species richness, they can be difficult to actually find. Being solitary insects means researchers can't just search for a hive to track down thousands of individuals at once. Additionally, many species (specifically those in the superfamily Chalcidoidea) are *miniscule*. We're talking smaller than the period at the end of this sentence.

It's no surprise that such species richness would result in diverse parasitism strategies (they've had more than 200 million years to tweak and perfect them, after all), and each wasp species is adapted to preying on a specific insect species. Because of this host specificity, parasitoid wasps have been employed as biological pest management in the agricultural and horticulture industries. Some wasp species, like many of those in the family Ichneumonidae, have developed frighteningly long ovipositors that are capable of drilling through wood, like the *Dolichomitus imperator* female pictured. The female



1

will tap her antennae along the bark to “listen” for vibrations of her preferred host (*photo 1*), drill into the wood using a sawing motion with her ovipositor (*photo 2*), and oviposit her eggs (*photo 3*).

Wasps will either lay their eggs *on* (ectoparasitism) or *inside* (endoparasitism) their prey. For the prey, the end result is always the same: death. Ectoparasitic wasps will usually sting their prey in order to paralyze it, and drag the prey item back to a brood nest before laying eggs on the host's body. This strategy is usually utilized by wasps whose preferred prey are similar in size to the wasp itself; the infamous tarantula hawk wasp is one example. While this strategy is gruesome, nothing quite compares to the dystopian methods of the endoparasitic wasps.

Endoparasites live and feed off their hosts internally. A tapeworm is an example of an endoparasite, while lice would be



2



Tarantula hawk wasps can be as large as 2" long.

Right: The ovipositors—the tubular structures through which insects and other animals lay their eggs—of *Dolichomitus imperator* females are as long or longer than their bodies.



A true symbiotic relationship suggests that both parties benefit from the relationship. For the wasp, the virus is necessary for the survival of her offspring; the virus dampens the host immune response so the egg (and eventually larva) can survive inside the living host. The virus benefits from this relationship because it cannot replicate except in a part of the wasp ovary; the relationship is so fine-tuned that the virus is incorporated into the wasp genome, and the female wasp passes the virus to her female offspring.



3

considered ectoparasites. The female wasp uses her impressive ovipositor to lay her eggs inside the host's body. Once they hatch, the larvae feed off the host's internal organs as the *still-living* host goes about its daily life: feeding, growing, and, crucially, avoiding predators.

The wasp larvae, in turn, continue to grow, and in some cases, don't stop until the host is nothing but a husk. Once they've had their fill, the larvae erupt from their host's body in an event that rivals the chestburster scene from *Alien*.

In order to develop inside the body of another living organism, the wasp larvae face a major obstacle: the host's immune system. When the female wasp oviposits the egg into the body of her preferred host, she will also inject a concoction of bodily secretions to help the egg from being destroyed by the host's hemocytes (the insect equivalent of a white blood cell). These secretions include venom, proteins, and, in some cases, viruses.

We tend to think of viruses as invading pathogens: varicella-zoster (chickenpox), influenza (the flu), and of course, SARS-CoV-2. However, parasitoid wasps have evolved a symbiotic relationship with a family of viruses known as polydnaviruses. While parasitism evolved once within Hymenoptera, the evolution of this symbiotic relationship evolved twice, in two separate wasp families, independently of each other. The viruses, *Ichnovirus* and *Bracovirus* (named for the respective wasp families they've evolved with, the Ichneumonidae and Braconidae) are not closely related, suggesting that about 70 million years ago, on two completely separate occasions, a wasp met a virus and the rest was history.

W

hile it may seem like parasitoid wasps are perfectly adapted predatory parasites, their hosts are not without their own defenses. Defense strategies are varied; ever pick up a caterpillar that starts madly thrashing about? They use this strategy to avoid becoming a host for parasitoid wasps; the thrashing is an attempt to make the female wasp miss

sticking the caterpillar with her ovipositor. Some will consume toxic plants, and fruit flies will even seek out food containing high ethanol levels in order to self-medicate if they suspect parasitic wasps are nearby. In addition, parasitoid wasps are susceptible to attacks from other species of parasitoid wasps! These *hyperparasitoids* will attack the larval and pupal form of their preferred host; in other words, you end up with parasitoids who fall prey to smaller hyperparasitoids, resulting in what can only be described as a parasitoid nesting doll. The evolutionary arms race is ongoing and constant.

The life history of parasitoid wasps has fascinated (and horrified) scientists and naturalists alike for over a century. In his aforementioned letter to Asa Gray in 1860, Charles Darwin wrote, "There seems to me too much misery in the world. I cannot persuade myself that a beneficent and omnipotent God would have designedly created the Ichneumonidae with the express intention of their feeding within the living bodies of caterpillars[.]" While their methods seem cruel, parasitoid wasps play a crucial role in the ecosystem, maintaining the balance in their roles as both predators and pollinators. The wasp larvae feed on other arthropods, and the adults primarily feed on nectar—another brilliant evolutionary strategy that allows the adults and the larvae to feed free of competition from one another. Whether you find yourself in the "fascinated" or the "horrified" category, or somewhere in between, you have to admit, the existence of parasitoid wasps is certainly evidence of evolution in its finest form. 🐛

—Brenna Shea is a science educator and head bug wrangler for the Missoula Butterfly House and Insectarium.

HOW TO SEE AN ORCHID

BY KRYS STANDLEY



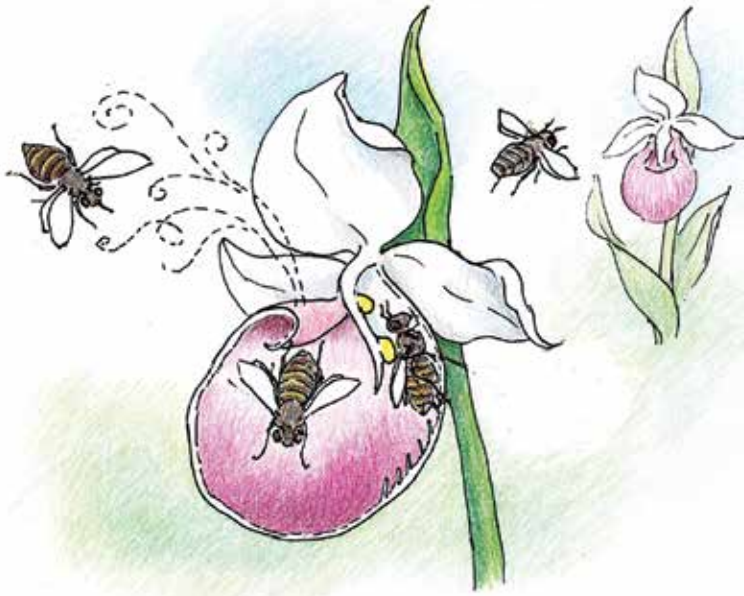
PHOTO BY KRYS STANDLEY

Among the images imprinted in my memory from childhood outings in the forests of western Montana, my first orchid sighting stands out for its ethereal quality. Recessed in my mind, the shaded understory of the conifer canopy is condensed to a dark backdrop, against which grows a lush, upright cluster of green leaves and glowing white flower pouches—tiny pillows as delicate as clouds. Connected to this snapshot is my mother's excitement as she led me and my two younger sisters into the thicket to reveal to us—and name—this wonder of nature: lady's slipper. At the time I had no idea this enchanting plant was an orchid, but I understood it was a rare and special find.

When, as an adult, my interest in local flora bloomed, I was surprised to learn that Montana is home to a huge variety of orchids—thirty-one species, to be exact—ranging from tiny and nearly camouflaged to large and showy, such as the mountain lady's slipper (*Cypripedium montanum*) of my childhood memory. Despite their variety of forms, orchid flowers have standard features: three petals and three sepals apiece. This configuration can be seen in mountain lady's slippers; however, these structures are highly modified. To recognize them, we have to take a closer look.

The distinctive white slipper pouch, for instance, is really a specialized petal called a labellum (a term derived from the

Latin *labium*, meaning lip). Behind the labellum and twice as long, four nearly identical, purplish-brown structures spiral outward. Two of these, the sideward spirals, are the lady's slipper's remaining petals. Its three sepals (specialized leaves that envelop and protect the developing flower bud) are similarly disguised: the upper spiral is one, while the bottom spiral, a conjoined sepal, counts as two. At the center point where sepals and petals meet, a yellow structure called a staminode hangs into the labellum's entrance, hiding the orchid's reproductive structures like a Renaissance fig leaf. Looking at this flower, we may see a tiny pillow, slipper, or bird's egg. If we were a pollinating insect, this flower would evoke entirely different associations.



Cypripedium sp., trapping a bee so that it goes through a narrow passage where it picks up the mass of pollen, or pollinium, which it will carry to the next flower.

For the small native bees that pollinate these flowers, the experience of a lady's slipper likely begins with the scent of a vanilla-like fragrance wafting from the orchid's blossom. Perhaps, as the bee lands on the labellum and crawls into the lady's slipper's pouch, where linear magenta markings run along the floor, it has an expectation of the pollen inside and is already mapping out a triumphant return to its colony.

These expectations, if they exist, will be fleeting. There is no pollen to be found and, once inside, the bee discovers itself trapped. Any attempt to leave the way it entered is thwarted by the slick, inward-bending edges of the entry hole. With nowhere to go but deeper into the flower, the bee eventually finds itself at the base of the column, a robust package containing both male and female reproductive organs. Here the orchid becomes a kind of carnival fun house. When the bee nears the column's base, its body weight triggers the opening of an elastic passageway near the back of the labellum. To escape the flower, the bee is forced to crawl upward, through one of two small openings behind the yellow staminode. As it squeezes through this passageway, the bee brushes against a gummy mass of pollen, which sticks to its thorax like a yellow backpack.

Although the bee is unable to access its pollen backpack, it is, at least and at last, free. Apparently undeterred by the trials this flower has put it through, the bee

flies on only to find yet another mountain lady's slipper. Variety in the plum-colored patterning on individual flowers may fool the bee into thinking these others are different, and more promising, types. When the bee crawls through the back passageway of a second lady's slipper flower, the gooey pollen mass on its back will transfer to an adhesive, bowl-shaped receptacle, completing the cross-pollination.

Humans, like bees, have had a long-standing interest in orchids. In Victorian England, wealthy orchid collectors would pay "orchid hunters" to travel to tropical locales, where they would collect exotic orchids and afterwards destroy the remaining orchids of that kind. Specimens brought home were thus more rare and monetarily valuable to their owners. Orchids became a symbol of personal wealth, created at the expense of species extinction and endangerment. (The upswing is that we humans do seem to be learning as we go: nearly everything currently written about wild orchids includes an admonishment against disturbing them).

On a more positive historical note, Charles Darwin believed orchids could expand human understanding of the world. In *The Various Contrivances by which Orchids are Fertilized by Insects* (his second published book, after the groundbreaking

Origin of Species), Darwin documented precise measurements of orchid flowers and their associated pollinators, as well as the intricate structures and processes through which pollination occurs. His intention with this volume was clear: to provide detailed evidence in support of his theory of evolution by natural selection. On a more personal level, Darwin wrote of orchids, "an examination of their many beautiful contrivances will exalt the whole vegetable kingdom in most persons' estimation."

Darwin's prediction holds true for me: the more I learn about the intricacies of orchids, the more appreciation I gain for the wider natural world. Orchids are seemingly endless in their variety: the orchid family, Orchidaceae, is the largest flowering plant family on the planet. There are over 25,000 wild orchid species, all perennial, and their profusion is matched by an array of survival tactics. Some tropical orchids have flowers that mimic the shapes of female pollinators and achieve cross-fertilization by enticing male insects into pseudocopulation. Others, like our local blunt-leaved rein orchid (the tiny-flowered *Platanthera obtusata*), attract their mosquito pollinators by imitating human body scents. And, in addition to their symbiosis with pollinating insects, all wild orchids depend on fungi.

The presence of fungi is critical to orchid germination. Orchids enter life in a state of limited resources: their seeds are the smallest of all flowering plants and are



Look for the tall stalks and small, pale flowers of Montana's blunt-leaved rein orchid in damp forests and meadows.

aptly named “dust seeds” because most are no larger than a speck of dust. A single pod can contain thousands or millions of microscopic seeds. Part of the package deal of having such tiny seeds is that there is no room inside for the food stores typically used to sustain a developing plant embryo. To further complicate matters, during the early part of their life cycle, orchids are unable to obtain their energy from raw materials in the soil or from the sun. Without food stores of their own or the ability to harvest nutrients directly from their environment, these tiny dust seeds are essentially helpless. So, how does a dust seed make it in these harsh conditions? Here is where soil-dwelling fungi enter the picture.

In looking at the unfolding growth process, we can once again take the mountain lady's slipper as an elegant example. Having landed on exposed soil and absorbed sufficient water, the tiny, spindle-shaped seed germinates, extending a single root into the earth. This is the extent of the lady slipper's energy reserves; whether or not it survives depends on if a compatible fungus is already present in the soil. Mountain lady's slippers associate primarily with a single family of fungi, Tulasnellaceae, which forms smooth patches and can be seen growing on the underside of rotting wood and forest debris. If Tulasnellaceae are present where the seed germinates, the fungus will connect with the root microbiome of the orchid. This symbiotic association, between fungi and plant, is called a mycorrhiza.

If we could view this process through the most precise of microscopes, we would see the slender, threadlike fibers of the fungus's mycelium reach out to, and penetrate, the outer layer of the orchid's root. These fibers then wind their way into the space between the plant's root cells. This creates a bridge between fungus and plant, allowing nutrients and water to pass between them. The mycelium continues to lengthen until its fibers form coils in the orchid root's intercellular space, embracing the infant orchid as thoroughly as possible to nurse it with water, carbon, nitrogen, and phosphorus gathered by Tulasnellaceae from soil nutrients. The fungus also provides the orchid with sugars obtained through its mycorrhizal associations with other photosynthetic plants.

Lady's slippers are classified as green orchids because they eventually send up broad, green leaves. However, they have a long juvenile period: it can take two or more years after the initiation of the mycorrhizal relationship before this occurs. Yet another four to six years may pass before their first flowering. This slow growth pattern connects to the lady's slipper's longevity; with a lifespan of up to 100 years, these



Striped coralroot orchids, unlike lady's slippers, do not photosynthesize, and thus are fully dependent on mycorrhizal relationships for survival.

orchids can outlive the typical human. Once leaves appear and the plant is able to draw its energy from the sun, the lady's slipper outgrows its state of dependency on the Tulasnellaceae and begins to give back to its fungal companion, which it provides with sugars obtained through photosynthesis.

Not all orchids mature to photosynthesize nutrients of their own. Some, like our local striped coralroot (*Corallorhiza striata*), never develop green

leaves and therefore remain fully dependent on their fungal companions throughout their lifespan. In place of leaves, small semi-translucent sheaths wrap the striped coralroot's crimson stalks. Its flowers, borne in vertical clusters on slender spikes, are striped red and white, like tiny peppermint candies. Striped coralroot is pollinated by a parasitic ichneumon wasp (*Pimpla pedalis*), but it can also self-pollinate. Like mountain lady's slippers, these coralroots are specialists in their mycorrhizal relationships—that is, they associate only with specific fungus species and their distribution is limited to the territory occupied by their fungal allies. In the case of striped coralroot, that fungus is *Russula*, which, as though dressed for the partnership, bears red-capped mushrooms with white gills and stalks.

Why would *Russulas* continue to associate with coralroots, given the apparent one-sidedness of the relationship? Some authors bemoan this apparent unfairness. However, the imposition of human ideas of justice may have little value in the world of ecology. What's more, scientific understandings of ecosystems evolve over time. We now know that mycorrhizas are widespread: 90 percent of plant species engage in these associations. Until the mid-1990s, however, botanists still believed coralroots fed directly on dead or decaying material in the soil, rather than obtaining nutrients through mycorrhizal partnerships. Certainly, there may yet be more going on in these subterranean associations than we currently understand.

My childhood impression of orchids—that they are rare and special—caught their essence. And yet, there is far more going on in the life of these remarkable plants than I could have imagined. In a way, orchids are larger than themselves, their very existence dependent upon a network of belonging and interconnection. The next time you encounter an orchid in one of these complex environments, how will you see it? Will your attention focus on the wildflower's exquisite beauty? Or, perhaps, will you see something more? 🐝

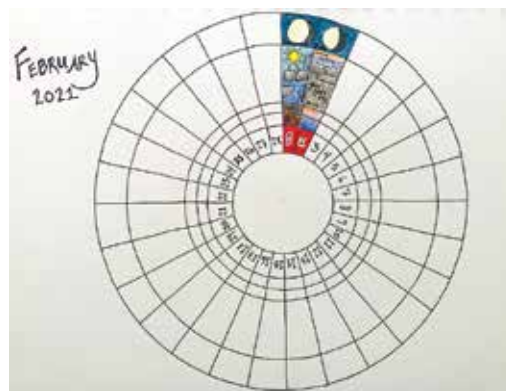
—Krys Standley is a researcher at the University of Montana, where she studies disability and health promotion, and a Master Naturalist who enjoys learning and sharing about ecosystem interconnectivity.

Make Your Own Phenology Wheel!

Phenology is the study of seasonal change, from flowers blooming to birds migrating to weather shifting. Keeping a phenology wheel is a great way to track the changes in weather, moon phase, plant growth, and more as the year progresses. You can make a seasonal, monthly, or daily phenology wheel—or anywhere in between! When you're done, you'll have a beautiful, unique record of the natural phenomena of the month, season, or year.

Supplies:

- Paper (thicker drawing or watercolor paper is great, but you can use anything you have handy!)
- A ruler and compass (or bowls, glasses, and other round things) to help you draw your wheel
- Pencil and/or pen (we like Micron pens)
- Colored pencils or watercolor paints
- Your observation skills!



You can divide each slice into several parts or just one, and fill them in with whatever information you want to record: weather, temperature, moon phase, plant and animal observations, and more.



get outside guide

Kids' Corner

These creations were crafted in art classes at Sussex School.



Magpie by Shea Loos, age 8
Papier-mâché, wire, hot glue



Bald Eagle by Hazel Loos, age 6
Sharpie, oil pastel, colored pencil

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.

get outside calendar



Programs for Kids

At the time of publication we are not currently offering our in-person **miniNaturalist** and **Saturday Kids' Activity** programs. Please check our website and Facebook/Instagram for updates.

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/ for information about the 2021-22 school year!

Registration opens on Friday, August 6th.



MNHC PHOTO



Volunteer Opportunities

Volunteers, we miss you! We're looking forward to the time when we have in-person opportunities once again—stay tuned. In the meantime, sign up for our volunteer newsletter at MontanaNaturalist.org/volunteer-with-mnhc/, and we hope to see you soon.

MNHC is currently open on a limited basis. 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 to register for programs and become a member. For more information, call MNHC at 406.327.0405.

PHENOLOGY FOR APRIL-SEPTEMBER



APRIL

Glacier lilies spring up through snow

Painted turtles sun themselves on rocks or logs near water

MAY

Listen for the courtship drumming of male Ruffed Grouse

Swallowtail butterflies flutter



JUNE

Downy Woodpeckers and Mountain Bluebirds feed their young

Moose calves are born



JULY

Young Bald Eagles are leaving their nests

Cottonwood fluff floats on the breeze



AUGUST

Fireweed is in peak bloom

Columbian ground squirrels begin to hibernate



SEPTEMBER

Alpine larch turn gold in the high country

Pronghorn breed





Adult Programs

MARCH

March 25

Beaver Ecology Workshop with Rob Rich, 10:00 a.m.-12:00 p.m. \$40; \$35 MNHC members. FULL.

APRIL

April 1

Missoula Rocks: The History & Geology of Downtown Missoula with Bruce Baty and Kristjana Eyjolfsson, 10:00 a.m.-12:00 p.m. \$25; \$20 MNHC members. FULL.

April 5

Virtual Naturalist Book Club, 6:30 p.m. FREE. Meets monthly via Zoom on the first Monday of the month. Limited to 10 participants; registration required.

April 13-May 18

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

April 15

Ninepipe Wildlife Refuge Birding Experience with Pat Jamieson, 10:30 a.m.-12:30 p.m. \$40; \$30 MNHC members. FULL.

April 15

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.

April 20

Saunter with a Naturalist in the Evening, 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at Greenough Park. Registration required.

MAY

May 4-27

Online Certified Interpretive Guide Training Course, Tuesdays & Thursdays, 10:00 a.m.-2:00 p.m. \$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 for more information and to register.

May 18

Saunter with a Naturalist in the Evening, 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at Council Grove State Park. Registration required.

May 20

Saunter with a Naturalist in the Morning, 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at Council Grove State Park. Registration required.

May 21-23

First Annual Nature Journaling Conference at the Montana Natural History Center. FULL. Visit MontanaNaturalist.org for information on other upcoming programs.



JUNE

June 7-11

Summer Montana Master Naturalist Course. FULL.

June 15

Saunter with a Naturalist in the Evening, 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at Kim Williams Trail on the south side of the Van Buren Street pedestrian bridge. Registration required.

June 17

Saunter with a Naturalist in the Morning, 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at Kim Williams Trail on the south side of the Van Buren Street pedestrian bridge. Registration required.

JULY

July 13

Saunter with a Naturalist in the Evening, 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at O'Brien Creek. Registration required.

July 15

Saunter with a Naturalist in the Morning, 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at O'Brien Creek. Registration required.



AUGUST

August 24

Saunter with a Naturalist in the Evening, 5:00-7:00 p.m. \$10; \$5 MNHC members. Meet at the Kelly Island Fishing Access (location may change). Registration required.

August 26

Saunter with a Naturalist in the Morning, 10:00 a.m.-12:00 p.m. \$10; \$5 MNHC members. Meet at the Kelly Island Fishing Access (location may change). Registration required.



SEPTEMBER

September 7-November 23 Fall Online Montana Master Naturalist Course, Tuesdays, 4:00-6:00 p.m., plus in-person field weekend September 25-26. \$330; \$300 MNHC members. Registration required.

September 10-12

First Annual Nature Writing Conference at the Montana Natural History Center. \$250. Join us for a weekend of lectures and workshops with local nature writers! Registration required. Visit MontanaNaturalist.org for more information.



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!

PHOTO CONTEST WINNERS

Thank you to everyone who submitted photos for our photo contest—we received many lovely entries and had a fun but challenging time narrowing them down.

Congratulations to our five winners, who have each won a family membership to MNHC.

YOUTH CATEGORY

Camerin Gregoire, age 13
Missoula, MT
Heart Lake in Jewel Basin



MONTANA PLANTS

Keri Geiser
Big Sky, MT
Preston Park Wildflowers



MONTANA LANDSCAPES

Randy Heaton
Missoula, MT
Masonic Lodge in Bannack, MT



MONTANA ANIMALS

Everett Headley
Stevensville, MT
Perched Proudly:
Grinnell the Red-tailed Hawk



PEOPLE IN NATURE

M.S. Evans
Butte, MT
Along the Big Hole River,
near Divide, MT
Instagram: @seanettleart
Twitter: @SeaNettleInk



The Clark Fork Native Prairie: *A Little-Known Gem in the Heart of Missoula*

BY ANNE GREENE

For Missoulians, open space is a source of pride. Today, we can boast of over 7,000 acres in and around the city where we can enjoy nature and the outdoors—places where we can hike, bike, and run, or simply relax and play.

It wasn't always so! Back in 1979, when a few city council members and private citizens envisioned these open spaces, Missoula's appeal was threatened by rapid growth. Housing developments were marching up surrounding hills. The Clark Fork River was polluted and lined with abandoned railway tracks, power lines, and concrete rip-rap. Bike trails were non-existent.

With the passage of the first open space bond in 1980, Missoula launched an ambitious program of buying and managing lands for a linear park along the south side of the Clark Fork River. One of the first parcels to be protected was Parcel C, approximately ten acres of industrial land between Higgins Avenue and Madison Street. Part of this parcel became the Clark Fork Native Prairie. Its history, and the people who created it, make a fascinating story.

For millennia, Indigenous people harvested bitterroots here. The Salish called the area *Nlʔaycəstm* or “Place of the Small Bull Trout” and set up camps during the month of May (*spéʔm spqniʔ*), “the month of the bitterroot.”

After European settlement, the area became an industrial corridor complete with railway tracks and a switching yard for the Milwaukee Railroad, storage buildings, and a tank farm owned by Exxon.

Once the bond passed, the City owned Parcel C, but had little money to improve it. Enter Hellgate High School, who needed practice fields for its athletic programs and could raise money to buy and manage them. With a levy in hand passed by voters and a joint-use agreement with the City to use part of Parcel C, the high school district purchased the Exxon land. Vo-tech students were conscripted, and, with their heavy equipment, tore up tracks, removed ballast and trash, and landscaped their property and the City's. The resulting practice field and track were not exactly what the Open Space Committee had in mind, but these amenities have been heavily used by the high school and public ever since.

What was left of Parcel C became the two-and-a-half-acre Clark Fork Native Prairie. Because the language of the bond stated that some land be revegetated with native plants, the goal was to recreate the native plant communities that were in the valley when the Lewis and Clark Expedition visited in 1806 (see sidebar).

In 1990, after two attempts to establish native vegetation failed, freelance Missoula botanist John Pierce was asked to help. For John, it was the beginning of a 30-year commitment that continues today.

With no money and just a handful of volunteers, John faced a herculean task. Native plants had to be found, transported to the Prairie, transplanted, and cared for until they were established. Some plants were donated by Bitterroot Native Growers, but the majority were salvaged from parts of the valley slated for development. Sometimes, likely sites were suggested by friends, but more often, John biked around the valley looking for “For Sale” signs. When he found one, he checked if the vegetation was free of weeds; if so, he phoned the landowner. Could he remove the native plants before the bulldozers arrived? The answer was often “yes.”

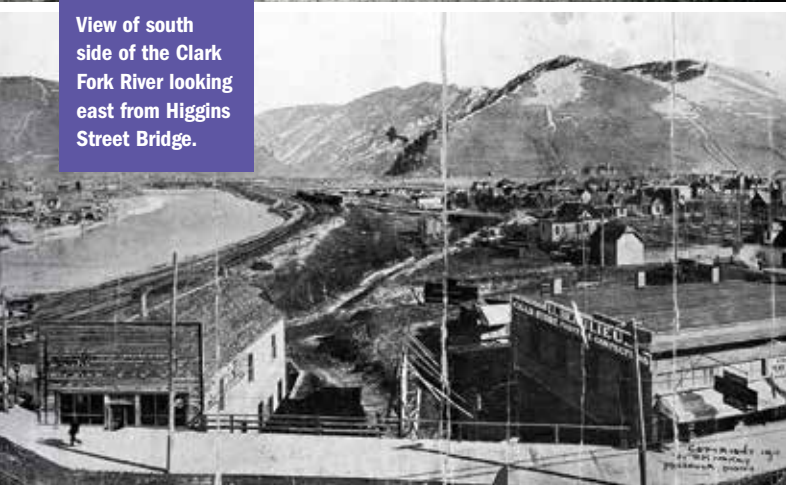
Virtually all the work was done by volunteers. Many were private citizens, and others were Hellgate students working on senior projects or helping on student volunteer days. Over the years, their donated time and John's have amounted to many thousands of hours.

Now well-established, the Prairie is extremely diverse, with over 90 species of plants providing a stunning progression of blooms over the growing season. Visit in March and early April, and among greening bunchgrasses, you'll discover brilliant yellow buttercups, lacey biscuitroot flowers, and single, nodding yellowbells. In May, marvel at clouds of snow-white serviceberry flowers and massive crowns of yellow balsamroot contrasting with bright purple lupines. June and July bring magnificent spikes of white yucca flowers and rose-like crowns of prickly pear cactus. In August and September, golden bunchgrasses are interspersed with subtle blooms of goldenrod and sticky, yellow gumweed.

Despite its maturity, the Prairie still needs volunteers and advocates. While many of the native plants can now outcompete



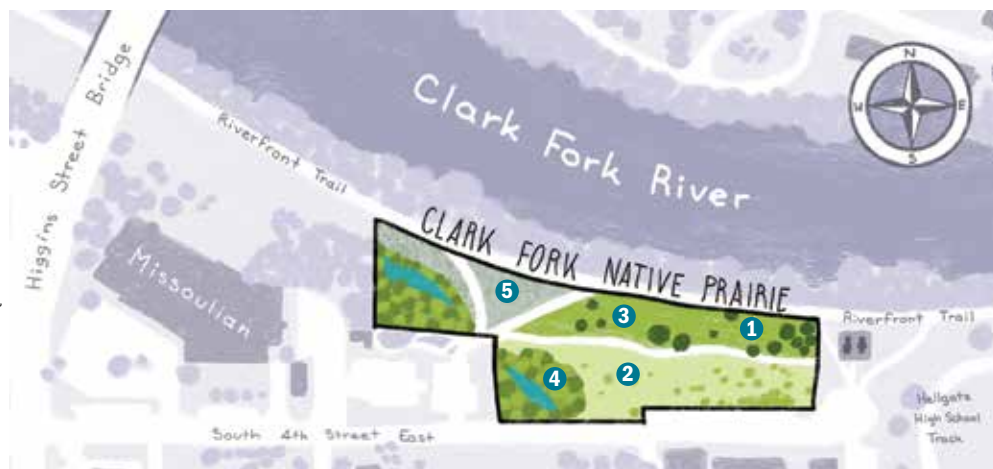
Teepees pitched on the south side of the Clark Fork River.



View of south side of the Clark Fork River looking east from Higgins Street Bridge.



Arrowleaf balsamroot
(*Balsamorhiza sagittata*)
and silvery lupine
(*Lupine argenteus*),
Clark Fork Native Prairie.



MAP ILLUSTRATOR: ISABEL QUIRAM

Plant Communities of the Clark Fork Native Prairie

Beginning at the eastern end of the Prairie, a visitor can wander through five plant communities native to Montana.

- 1 Antelope bitterbrush grassland: look for the large, spreading antelope bitterbrush shrubs (*Purshia tridentata*), arrowleaf balsamroot (*Balsamorhiza sagittata*), silvery lupine (*Lupine argenteus*), bluebunch wheatgrass (*Pseudoroegneria (Agropyron) spicatum*), and wild tarragon (*Artemisia dracunculus*).
- 2 To the south is a section that represents the native plants of south-central Montana, with yucca (*Yucca glauca*), fringed sage (*Artemisia frigida*), needle-and-thread grass (*Stipa comata*), and two species of cacti (*Opuntia fragilis* and *Opuntia polyacantha*).
- 3 Further west is the bluebunch wheatgrass community dominated by bluebunch wheatgrass (the state grass), Sandberg bluegrass (*Poa sandbergii*), prairie junegrass (*Koeleria macrantha*), yarrow (*Achillea millefolium*), and biscuitroot (*Lomatium cous*).
- 4 Along the irrigation ditch at the southwest end of the Prairie are plants characteristic of a riparian shrubland: red-osier dogwood (*Cornus sericea*), common chokecherry (*Prunus virginiana*), and western serviceberry (*Amelanchier alnifolia*).
- 5 Lastly, the west end of the Prairie features a sagebrush grassland dominated by big mountain sagebrush (*Artemisia tridentata*).

invasive weeds, given the right conditions, invasives can explode. Thus, every summer, the Prairie gets a thorough going-over that includes weeding, tree-trimming, and fence repair. In addition, supporters of the Prairie need to make sure that it's not impacted by recent development on Fourth Street, and public education is essential to ensure the Prairie's protection and long-term future.

In return, the Prairie provides a refuge of quiet beauty in the heart of the city—a rarity in the West where intact native grasslands are dwindling due to plowing, development, grazing, and weed competition. Moreover, the Prairie harbors hard-to-find examples of genetically unique subpopulations of plants that serve as an invaluable source of native seeds that are well-adapted to the local area. As our climate changes, the Prairie demonstrates how our native plants can be used in landscaping that needs no irrigation, fertilizer, or mowing. And the Prairie serves as a valuable outdoor classroom for the Montana Natural History Center and others who conduct classes there for master naturalists, nature artists, photographers, and birders.

Visit the Prairie and learn more about its native plants and how to volunteer at our Open House and Tour on May 22, 2021, between 2:00 and 4:00 p.m. Help us ensure this unique grassland continues to thrive in the future. 🦋

Anne Greene is a biologist and author of Writing Science in Plain English. She is a volunteer at the Clark Fork Native Prairie.

Thanks to: Mitchell Rose Bear Don't Walk, Kelly Chadwick, Mark Fritch, Anne Garde, Erick Greene, Jim Habeck, Don Harbaugh, Gwen Jones, Rosalyn LaPier, Ken Lousen, John Pierce, Isabel Quiram, and Lin Smith.

Antelope bitterbrush (*Purshia tridentata*)

Yucca (*Yucca glauca*)

Opuntia cactus (*Opuntia polyacantha*)

Sagebrush buttercups (*Ranunculus glaberrimus*)



PHOTOS BY ERICK GREENE

imprints

Thank you so much to all those who celebrated (virtually!) with us during Montana Nature Week last October. We missed seeing you all in person, and are so grateful that you celebrated with and supported us anyway! 150 generous friends helped us raise more than \$138,000 in support of nature education for children and adults. And, of course, we couldn't have done it without the following businesses and individuals whose generosity and hard work made the entire week possible. (Please accept our apologies for any missed names.) **Thank you!**



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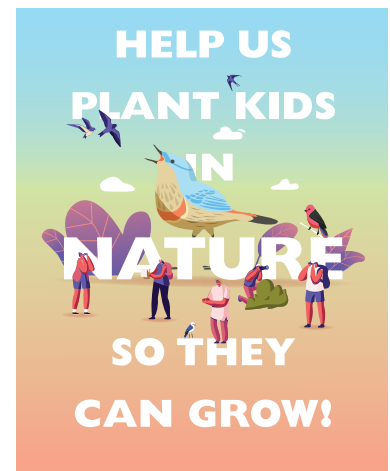
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**And a Montana-sized
 thank you to our Montana
 Nature Week committee—
 we couldn't have done
 this without you:**
 Suzanne Elfstrom
 Hank Fischer
 Anne Guess
 Stephanie Lambert
 Michelle Nowels
 Rick Onken
 Rick Potts
 Caitlin Thompson
 Jackie Wedell

SEND KIDS TO SUMMER CAMP!

Join us to celebrate the return of spring and many of our favorite bird species in conjunction with our annual summer camp scholarship fundraiser. We're getting birdy with bird-themed gifts, MNHC's naturalists' top tips for successful backyard birding, guided birding tours, and more when you donate to support a child in need! Join our email list or follow us on Facebook and Instagram to learn more.



As To The Mission

Diversity, Equity, and Inclusion

As 2020 drew to a close, so did MNHC's strategic planning efforts for 2021 through 2025. It was an interesting year to conduct strategic planning activities, and certainly a year that allowed—and even encouraged—us to focus on some things in a new way.

One of those things was diversity, equity, and inclusion efforts. As a nature center, we know very well the importance of diversity in the natural world, how an ecosystem needs rich and varied species, and all their unique interactions, to thrive. Each species, no matter how small, contributes something vital to the whole. And the same holds true for the human-centered world. For several years, MNHC has reflected on and begun to implement ways to make the Montana Natural History Center a place that celebrates diversity in all its forms. We have also recognized that equity and inclusion are critically important factors to our ultimate success in promoting and cultivating the appreciation, understanding, and stewardship of nature. If certain parts of our community are not included in this mission, how can we ever hope to achieve it?

Which is why I am thrilled that the Montana Natural History Center has chosen to prioritize increasing diversity, equity, and inclusion as one of the major goals of our 2021-2025 Strategic Plan. Some of these initiatives are already underway, like our amazing collaboration with Salish and Kootenai tribal member and Salish language revivalist Aspen Decker, whose work is showcased in this issue (pages 4-6 and page 27). But we also have a lot of learning ahead of us: how to deal with inherent bias, how to take the blinders off, how to listen.

As an organization, we are committed to this growth—to learning and welcoming all into our Center and programming. In the words of an MNHC staff member, “we are working to make MNHC a place that supports diversity, where staff, program participants, and volunteers from all walks of life feel absolutely at home.”

Thurston Elfstrom

Thurston Elfstrom,
 Executive Director



Salish Immersion Project

At the end of 2020, MNHC staff began working with Aspen Decker, a member of the Confederated Salish and Kootenai Tribes and a Salish language revivalist, to create an immersion initiative to bring Salish language and culture into MNHC programming and operations. From publishing pieces on Salish history and culture in *Montana Naturalist* and *Field Notes* on Montana Public Radio, to incorporating Salish knowledge into our Master Naturalist and Visiting Naturalist in the Schools lesson plans, to including the Salish names for mammal and bird specimens in our exhibit area, this project is intended to help MNHC create a diverse perspective of Salish people, bringing awareness of Salish culture, language, and knowledge to the greater Missoula community.

Aspen Decker and her daughter gathering camas bulbs (*Saxifraga*), a traditional Salish food.



PHOTO BY CAMERON DECKER

After cancelling our in-person camps last summer, we're thrilled to welcome pre-K through 5th graders back to our Outdoor Discovery Day Camps this year! Our camps feature daily field trips, skilled instructors, unique opportunities to connect with scientists and naturalists, and lots of time for exploration and play in the outdoors.

We're offering ten full weeks of camps this summer, including four camps in collaboration with the Missoula Butterfly House and Insectarium. Learn more and register on our website: MontanaNaturalist.org/summer-camps/.

We can't wait to see you this summer!



Montana's Ancient Past Exhibit: Coming Soon!

Our newest exhibit, funded with a generous grant from the Institute of Museum and Library Services, follows the 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 all the way until the present day. We plan to install the exhibit this summer; keep an eye out for an opening date in the near future!



HONORING BILL GABRIEL

Last year, we lost a giant in environmental science and advocacy. Bill Gabriel was generous in life and that spirit of giving extended beyond his passing. Often when MNHC staff met with Bill he would stress the importance of stability and education. Bill graciously made the Montana Natural History Center a recipient of his estate gift, and we are thoughtfully putting his generosity to work. We are honoring him by utilizing his gift in three strategic capacities to expand the health of the organization. First, we are building on MNHC's financial stability by adding to our operating reserves. Second, we are investing in staff through compensation and a benefits package. Finally, we are furthering the professional development of staff through ongoing education and diversity, equity, and inclusion training.

Thank you, Bill—your generosity will leave a lasting legacy on MNHC and future generations of naturalists.

If you'd like to discuss leaving your legacy at MNHC through an estate gift please contact Mark Schleicher, Development Director, at 406.327.0405 or mschleicher@MontanaNaturalist.org.



COURTESY OF BILL GABRIEL FAMILY

VOLUNTEER SPOTLIGHT:

In this issue, our staff wanted to express their gratitude for the myriad ways in which our volunteers inspire, teach, and motivate us. Volunteers, we miss you, and we can't wait to see you in person again—soon, we hope.

"MNHC volunteers are some of the world's best humans. I'm grateful to have worked with so many generous, patient, kind, knowledgeable, and enthusiastic volunteers, and I've learned to be a little more of each of those things because of you. Thank you for sharing your time and your lives with us!"

~Bailey Zook

"The volunteers at MNHC bring so much knowledge, joy, passion, and fun to all of our programs. We are so lucky for their continued support and want to thank them for all of their hard work! Kallie Moore has dedicated so much of her time and shared all of her incredible knowledge to help us make our new exhibit truly special. Thank you, Kallie, for helping us put this all together!"

~Alyssa Cornell-Chavez



"I will never cease to be impressed and inspired by the people in our community who lend MNHC their time and talents. Marian McKenna cares for our library collection with dedication and passion. Jenny McConnaha organized our *Field Notes* database in the most beautiful and efficient way possible. And the talented writers, scientists, and naturalists who have written lovely, informative pieces for *Montana Naturalist* and *Field Notes* are too many to name—I feel privileged to work with every one of them."

~Allison De Jong

"To all the VNS volunteers, particularly the ones I've had the pleasure of working with directly, thank you for the thousand ways, large and small, you make our program better. From helping me keep track of time and stay on task in the classroom, to helping me reflect on successes and areas for improvement after a lesson. From sharing your naturalist observations to giving students individual attention and encouragement as they journal and make discoveries during the lessons. Even on days when you aren't able to join me in the classroom and through this last year of limited in-person teaching, the skills and teaching tricks I have picked up from watching you engage with students help me continue connecting students with nature."

~Ser Anderson



"I am always learning from our dedicated and knowledgeable volunteers. This past year Pat Jamieson taught me some wonderful new tips for beginning birders to use; Bruce Baty, as usual, answered a variety of geology-related questions; and Kelly Dix provided excellent and crucial input for improving our online Master Naturalist course. Claudia Hewston provided me with beautiful examples of success from passionate hard work as she motivated volunteers at the Fort Missoula Native Plant Garden."

~Christine Morris

"Our volunteers are some of the most thoughtful and dedicated people in our community! I miss interacting with you all on a regular basis, and can't wait until we can see each other again. Until then, thanks for everything you do for MNHC!"

~Drew Lefebvre

"A huge thank you to the volunteers on our auction planning committee and summer camp scholarship fundraising committee. These important fundraising events would not be possible without your creativity and hard work. Thanks so much!"

~Glenna Tawney



Top: Kelly Dix, teaching fourth-grade students in our Visiting Naturalist in the Schools program (pre-COVID).

Middle: Kallie Moore has worked tirelessly on MNHC's new exhibit, Montana's Ancient Past.

Bottom: Bruce Baty, teaching one of his popular geology field days.

Twelve Months Along the

STORY AND PHOTOS BY MAGGIE CARR

My home—and by “home” I mean the landscape from which I experience the seasons and life—sits a few miles northeast of Ear Mountain along Montana’s Rocky Mountain Front. If there were an inland ocean, the Front would be the shore, and the rolling prairie to the east the waves of the horizon. It is a brutal landscape with winds occasionally notching well over 100 miles per hour. But it is also delicate, a home to frogs and tiny hummingbirds and rare plants.

January

The echo of wind building and building and building and then the rush and rattle against the house, against the trees, against the power lines. Like a freight train in the distance, becoming increasingly louder as I wait for it to approach. This month is sparse. A time of paring down. Of cleaning out—the wind takes away anything not heavy or tethered down. Even my mind feels clearer, less fraught with the busy static of other parts of the year. The routine of life is slower—daily visits to check horses, fill water. Ear Mountain, and whether or not I can see it, a barometer for weather.

February

Cold, sometimes silent. Ice cracking across ponds and along rivers as new ice forms and shifts. Light, almost gentle snow that briefly blankets the foothills, maybe a day or two or even a week (if I’m lucky) without wind to live under the comfy weight of winter. Mule deer near the house, eating kinnikinnick

and trying to get at the hay in my shed. Sometimes I wake up and they are nestled against the edge of the house. I call them my pets even though they are not. I am in their wintering ground, but they tolerate me. On the coldest days, I see coyotes out in the pasture, moving along edges, looking for a meal. Sometimes they keep me up at night with their howls. If January is for paring down, February is distilled. A time of reflection and staying put.

March

Chinook wind—warm and melty. The giant arch bowing just east of the mountains. And then a shift and more snow, the limber pines harboring drifts several times their size. The biggest snow month and skiing more frequently. A good reminder to take advantage of what is while it is here. And then, the fuzzy nubs of pussy willows emerge. Sometimes even the bright splash of douglasia flowers on rocky south-facing hillsides. I hear my first Sandhill Cranes. I hear Snow Geese on their

return south. March is a month of extremes, of waking up, of yearning. Every year, a metaphor for change and excitement. Even the ants feel it as they emerge on their hills on the first warm day.

April

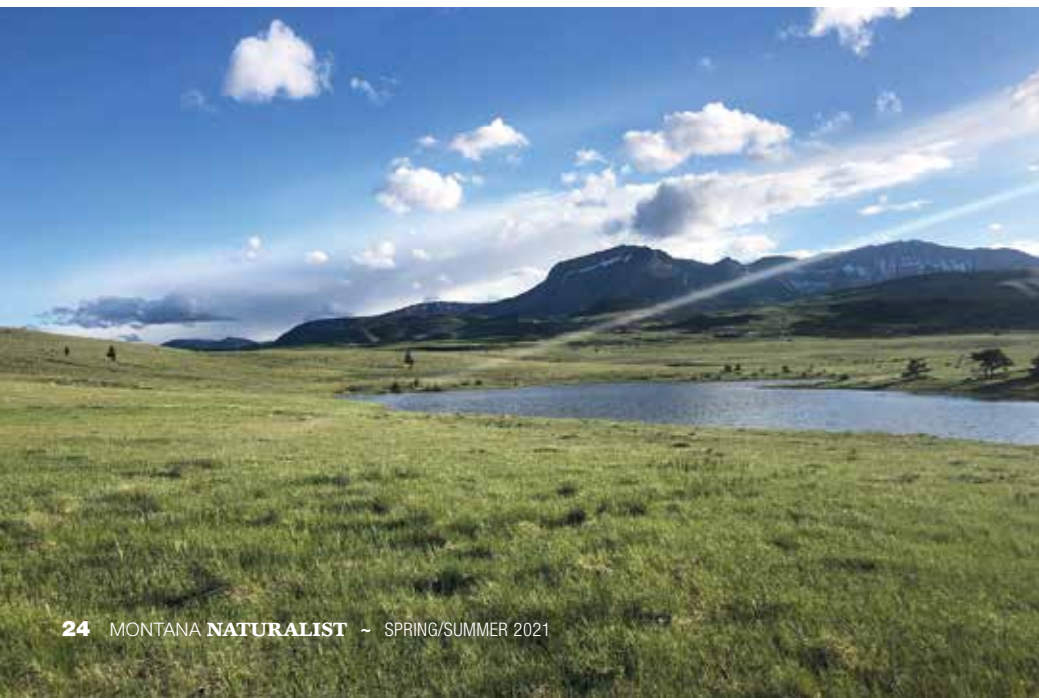
More flowers. Pasqueflower and townsendsia and kittentails and draba. Exactly when depends on snow level and temperature, but always they appear. Faithful companions to a well-rehearsed march through each season. I ride horses, fix fences, look for deer sheds in the pasture. And, yes, find my first tick. Everything is ugly turning beautiful. The first bluebird arrives.

May

Meadowlarks, boreal chorus frogs, flickers, and, later in the month, Mourning Doves. A symphony awaking. And more flowers, arrowleaf balsamroot and lupine exploding on the hillsides. Maybe a fawn or calf. May feels like an inhalation after a long absence of air.

June

The horses munching constantly, getting shiny and fat. They won’t even come up to me. Rushing water with spring rain and snowmelt, the force of runoff measured by how murky the water becomes. Banks eaten



Rocky Mountain Front

away and new gravel deposited downstream. The slow and steady gravitational pull inevitable. Sometimes an ephemeral stream forms near my house. My neighbors once floated it in inner tubes; now it is just a bunchgrass prairie. This is the month I think this place cannot be that different from the Serengeti.

July

The arrival of nighthawks whistling through the air as darkness descends. Bumblebees zipping their way between flowers. Horseshoes hitting the rocks along the trail. Thunderheads hanging to the west, and I keep my eye on them. Yes, some mosquitoes and horseflies, but they are not bad. It seems the other eleven months are either a building to or receding from July. The mountain top of months.

August

The crunch of drying grass. The rustle of rodents pilfering berries from bushes. Or even a bear—every big chokecherry bramble must be looked at with suspicion. The grasshoppers rattling in the grass like a snake on the defense. Often a slight smoke haze. The late flowers—somehow most of them are purple—bee balm and dotted gayfeather and fireweed and hollyhocks. Maybe some rain or a slight cooling

period in mid-August, but mostly heat and a baking of everything that spring and summer gushed forth.

September

Elk bugles—the call for companionship or for territorial spats. More grasshoppers tickling the grass. The occasional owl *hoot hoot-ing*. The first cold mornings and the yellow and orange and red that ensues. The sound of leaves beneath footsteps. The horses are getting thicker hair now. September is one of my favorite months, a feeling of coming home and settling in. The golden autumn light is an inviting hearth.

October

Trees falling, CRASH. The ground is not frozen, but the wind is strong and their limbs are weighted with an early heavy snow. The flutter of dry leaves lifted off the ground then settling again in a new location. Sometimes a heavy freeze that turns every leaf brown and black before they have a chance to fall. An in-between month for the critters and me, trying to take advantage of the last warmer days while still shoring up for the months to come.

November

The hum of the slowly freezing earth. The crackle of the fireplace, and the dog

snoring softly next to it. Hunting season, frequent shots in the distance. The birds are gone, the flowers are gone, the softness of summer is gone, the warm days are gone, the green grass is gone. But the raw landscape is still here, still the same.

December

And again, the wind. The splitting noise rhythmically cutting through the air as firewood chunks leap from the maul. The nicker of the horses, anticipation of a treat. The revolution of another twelve months, each their own season, draws to a close at the hands of someone else's clock. Because, really, the seasons never end or close. They flow from one to the next in a sort of unorganized order that provides a cadence to life out here. 🦅

—Maggie Carr grew up west of Choteau, Montana, where she still resides. She co-owns and operates Dropstone Outfitting, an adventure hiking company specializing in stock-supported hiking trips in the Bob Marshall Wilderness. She enjoys riding horses, skiing, playing with her dog, writing, and reading.

Maggie crafted this reflection in MNHC's "Stories in Place" Workshop in January 2021.



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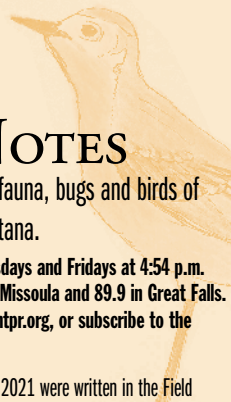
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Sx^we?lí (Blue Camas)

BY ASPEN DECKER



Aspen Decker is an enrolled member of the Confederated Salish and Kootenai Tribes (*Tai'áyaqn, Qlispé & Sq̓lsé*) and a reviver of her tribal language, *Nsélišcn* (Salish). Her Indigenous ledger art is a contemporary digital adaptation of traditional ledger art. Drawn or painted on ledger paper, the traditional art form derived from the old symbols and style of prehistoric petroglyphs and pictographs. The women and the horses depicted here were inspired by two separate black-and-white photographs of Flathead Salish people from the 1800s.



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