

MONTANA Naturalist

Spring/Summer 2014

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

The Bees & The Butterflies



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Cover – A native Hunt's bumblebee (*Bombus huntii*) nectars on a penstemon. Photo by Bob Hammon.

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tidings

2014 marks two important anniversaries—

one on a national scale, the other closer to home, but both near to my heart. Fifty years ago the Wilderness Act was passed, giving us the framework to preserve wild lands for future

generations, not only for the wild plants and animals inhabiting these lands, but as refugia of untamed wildness that benefit humanity as well. Fifty years: this is a good time to reflect on all that has been accomplished, but it's also a time to ponder what we want—and need—to do in the next fifty to honor the legacy that has been given us.

Many of us have special memories of times spent in wild places. In this issue, naturalist Katie Nelson reflects on the impact wilderness has on our perceptions (page 4); conservation biologist Jay Gore remembers the wild creatures he's encountered in his explorations of the sagebrush-filled landscapes of our state (page 14); and naturalist Charles Miller delves into the intricacies of our native pollinators, which feast on the nectar of both wildflowers and the exotics in our back yards—an instance of wildness finding its way to us (page 6).

The other anniversary this year marks is ten years of the *Montana Naturalist* magazine: a decade of bringing visions of wild flora, fauna, and phenomena to the community, and, we hope, inspiring our readers to explore the many wild places so close to where we live. In celebration of this landmark, we've changed the look—just a little—freshening ourselves up as we gaze forward to the next ten years.

What might the next decade (or five) bring? Continued protection of and reverence for our wild places, I hope, and more writer-naturalists to share their observations, studies, and experiences in those places, helping us to better understand our planet and our place in it. This is the Montana Natural History Center's mission, after all: to inspire people of all ages to love, and understand, and steward nature. Educating, and just plain engaging, kids in the outdoors—wild or not—is essential to meeting our long-term hopes and goals.

We're embarking upon a wonderful time for outdoor explorations. May the shift into spring and summer inspire you to get outside—whether it be following the tracks of your favorite animal or reveling in the beauty of an alpine flower while deep in the protected wilderness, or simply watching in wonder the magic of a pollinator in your own back yard.

Happy warm weather wanderings!

Allison De Jong

EDITOR

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PHOTO: GREG PETERS

Watching spring runoff swelling Sweathouse Falls in the Bitterroot National Forest.



THE THINGS We Carry IN WILDERNESS



BY KATIE NELSON

Views of the Mission Mountain
Wilderness from the Swan Valley.

"In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."

Piles of gear are strewn about my floor. Tent, stuffed. Socks, three pair. Rain jacket, gloves, long underwear—check. Binocs? You bet. Toothbrush, toothpaste, knife, spoon . . .

I will soon leave for a weekend trip into the Mission Mountain Wilderness. A former wilderness ranger, I long for the navy peaks, milky snow, dark forests, steep climbs and unseen treasures around the each bend. Years ago, Congress determined that the sky-skimming Mission Mountains deserved the highest level of protection under federal law. As a designated

wilderness, this area can only be accessed with human power: by foot, by horse, or by motorless watercraft. Without the aid of an engine, travel gear requires careful consideration: how heavy weighed against how useful. On this trip I will carry all I need on my back.

Emergency kit, stocked. Water bottles.

Sierra cup. Stove. Fuel, cap tightened.

Though the list always seems long, the weight in my pack feels good, secure. Reducing to necessities somehow makes the load lighter.

As the nation celebrates the 50th Anniversary of wilderness, the likes of Howard Zahniser, Bob Marshall, and Aldo Leopold will

achieve mythic status. Indeed the Wilderness Act's passage through Congress in 1964 remains no small feat. In today's political climate, it would be unthinkable. And yet, as the nation commemorates a half-century of wilderness, we must also consider the significance of wilderness in the changing present—and in the yet-to-be-determined future.

With the flats behind me and a pass ahead, my breathing syncs in step with the slope. The wrap of muscle finds rhythm: elevation in legs, energy from the diaphragm, weight on the hips, and steadiness from the swaying arms. Blood

pulses in my veins, skin sweats with effort, hair stands up to a slight chill in the air. As my working body draws its mind to the present, my attention drifts out and settles among the surroundings.

Gear strapped in my pack, I make my way through a melting Piper Lake basin. Though the grasslands around Missoula are in full balsamroot bloom, here the snow melts in patches. Newly unveiled vegetation lies in mats, still laced in sub-snow molds. Only glacier lilies have gathered the strength to come vertical. I take a moment to bend down low. My nose levels with a blooming lily. Several stems clustered in this area have two blooms instead of the usual one. Before long I find myself posing hypotheses as to why. The soil? Nurtured by rotting leaves from the shrub above? This protected alcove? Survival of the fittest—i.e., the most blossoms?

Each time I enter wilderness, my surroundings gently but adamantly filter into view. Many can relate to the experience of feeling obligations and inner dialogue melt away with miles walked. Just plain physical exertion wakens and focuses the brain. Initially, only big vistas capture our attention. But before long, we start to notice the lichen, the mushrooms, and the beetle crawling across the trail.

In wilderness, several things combine to improve our perception. One is nature's ability to reduce stress. In doing so, it reduces our distractions and allows us to be more present. Another is remoteness. Traveling through a remote place heightens that presence—in being more cautious, we are also more attentive to our surroundings. And finally, there is the wilderness itself.

The Wilderness Act prohibits a number of common uses. Some of these include motorized equipment, structures, roads, and installations—things that most Americans use on a daily basis. The restrictions affect more than the objects I carry and my means of travel. They fundamentally shape how wilderness is managed and studied. Even tools commonly used in research and land management are foregone for jobs, muscle, and time. Trail crews trade the roar of a chainsaw for the rhythmic whir of a cross-cut. Wilderness managers replace the thundering helicopter with a whinnying mule. Earth-moving equipment is exchanged for shovels and jobs. Though there are some exceptions, the Act's prohibitions set the tone for all sorts of activities.

In a society that values efficiency in terms of time, these trade-offs may seem perplexing, maybe even backward. Yet the

aim of these prohibitions isn't to achieve some romantic view of an antiquated past. Instead, they guide managers to use the minimum tools necessary to preserve wilderness character. In doing so managers strive to benefit nature, wildness, and solitude.

Having worked and recreated in wildernesses across the country, I've come to find that there are other benefits as well. Wilderness improves my relationship with my surroundings and my practice of natural history. It does so by limiting the materials I use to insulate myself from nature, the weather, the work of my muscles, the thoughts in my head, and the needs of my companions.

Thunder rolls through the basin and interrupts my thoughts. Clouds that had edged the ridge all morning find their way over the divide. Peck, plink, plop. I hear raindrops before I feel them. "Maybe it will . . ." I almost say "pass" when the clouds rip. A wash of rain drenches the firs, the remaining snow pack. Newly emerged lilies bounce under the liquid force.

Out with the jacket. Hood raised over my head, the wash turns into a drum. Though the quick storm was tremendous, I find it harder to marvel with all this racket. As the intensity wanes, I unveil my head. I'm surrounded by different dripping tones. Spring wet. Snowmelt wet. Post-thunderstorm wet.

We can observe such things—rain, flowers, snow—in urban areas: in city open spaces, along the river trail and in a backyard. Indeed, my dad, a man who has never set foot in wilderness, is one of the most dedicated naturalists I know. However, as someone who has carried on this family tradition, I can't ignore how wilderness improves my practice.

There will almost always be some layers insulating us from our surroundings. However, wilderness reminds us that we have a choice to reduce those layers—and to determine which are necessary. Even our most routine, daily tasks can be done in different ways—trading the shelter of a car for the shelter of a rain jacket. Although we may sacrifice travel time, our travel experience will be enhanced. There will be more opportunities to notice the sunrise, the stars, birds migrating through, and flowers blooming in the grasslands. We can enhance the human relationship with place, help communities recognize significant changes in climate and the landscape, while also encouraging ourselves to quiet the background noise in everyday toil. To step outside. To slow down. To observe and wonder. 🐾

—Katie Nelson has worked as a wilderness ranger and on wildlife studies throughout the American West. With an MS in Environmental Studies from the University of Montana, she now teaches natural history at the Wild Rockies Field Institute.

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain."

"An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions."

~Wilderness Act, 1964





How Montana's Pollinators Do What They Do

BY CHARLES MILLER

Spring is here, and with this season comes a fascinating panorama of activity between insects and flowers. The colorful flowerbeds and fields of wildflowers present an irresistible space that actually reflects the beauty of the insects themselves. This intricate partnership between flowering plants and insects has occurred for over a hundred million years.

The bargain between flowers and insects is of a serious nature: survival. It requires a trade of food in exchange for pollination. All of us can—and do—enjoy the show at a macro level, but what might we find if we look closer, delving into the minutiae of this plant-insect interaction?

Pollinators and Winter Survival

Bees are usually considered the champion pollinators, but butterflies and moths do their fair share. Although their goal is food, without the pollinating they do while collecting nectar we would find our food sources in jeopardy. Many of the wild bumblebees and commercial honeybees are in serious decline worldwide due to habitat loss and diseases caused by fungus and mites. All of us can help by planting butterfly gardens and providing shelters and hibernacula (in Latin, "tent for winter quarters") for them.

Getting through the winter in Montana can be challenging for insect pollinators. Only one butterfly, the Monarch, avoids the winter by true migration to Mexico and coastal California. Monarchs cycle quickly through several generations over the summer, the last of which repeats the mysterious migration south without ever having been there! Monarch butterflies can be observed here in Montana and a few have been seen at the Native Plant Garden at Fort Missoula. Milkweed, their host plant, can also be found in this area.

Butterflies will hibernate in all four life stages: egg, caterpillar, chrysalis, or adult. Some butterflies that hibernate in the caterpillar stage construct hibernacula on a host plant, such as the willow. In the spring the caterpillars leave the shelter and feed on the new growth. Blues, swallowtails and whites overwinter as chrysalises. Angewings, tortoiseshells, and our state butterfly the Mourning Cloak can hibernate in the adult form. In fact, Montana has at least eight species that do this. How do they do it? Most will seek shelter inside a loose hay bale or find an open barn or building. Some will find a hollow tree or sheltered crevice to crawl into and hope for a mild winter. Look and listen (more on that later) for the Mourning Cloak cruising on a late winter or early spring jaunt in Montana.

Special Structures Used by Bees and Butterflies

Bees are the best-known pollinators, but butterflies are probably more interesting to watch, and do their fair share of pollination. Many butterflies have stunning colors and wing patterns—and none of them bite, sting or emit a foul odor. They flit about in sunlit fields and gardens begging to be watched. Honeybees, bumblebees, butterflies, and other insects that collect pollen have a full toolbox consisting of leg baskets, brushes, and sweeping devices to accomplish the task. Some bees are pollen shakers. Bees also collect nectar by using their tongue and a short proboscis (a tubular mouthpart used for feeding) which they fold up like a pocketknife

tucked under their body when not in use. Most of the bees are fuzzy-bodied creatures with a honey crop inside their abdomen to store nectar.

In contrast, butterflies are primarily nectar-collecting insects with fairly smooth bodies and depend entirely on liquid food. They pay no attention to pollen, although they inadvertently transport some from plant to plant as they seek out nectar. The butterfly has a unique coiled proboscis which is an engineering marvel. This suction tube is watertight and very flexible lengthwise, like a zipper, so it can be extended and rolled up. It has a built-in oiler, a gland that secretes and lubricates the structure as it is extended.

Some bees fly with the proboscis extended, but rolling up the proboscis into a spiral is a unique adaptation of the Lepidoptera. The rolling up occurs passively with very little energy expenditure—and a good thing, too, since it happens thousands of times each day. This circular spring is made of a natural miracle substance called resilin, which has elastic properties closer to natural rubber than any other artificial material. Biomedical research is being done with a view towards using a similar substance for artificial joint replacements.

One classic pollinating story involves a prediction by Charles Darwin, who was far ahead of his contemporaries. He was shown an orchid flower from Madagascar in which the nectar was buried deep within the long petals—about 10-12 inches deep. He predicted that there must be an insect pollinator with a proboscis long enough to reach the nectar at the bottom of the spur. Though his notion was laughed at at the time, forty years later (and more than 20 years after Darwin's death), *Xanthopan morgani*, a hawkmoth from Madagascar, was discovered—with the predicted 12-inch+ proboscis. More recently this moth was finally filmed nectaring on the orchid (*Angraecum sesquipedale*, also known as Darwin's orchid). Look up "Darwin's orchid pollination" on YouTube to see the video.

Another fascinating Darwinian observation involves butterflies communicating by sound. Darwin describes in *The Voyage of the Beagle* a distinct loud clicking sound made by a butterfly in South America. A few other butterflies have been found to emit sound, usually a click something like a Fourth of July sparkler or small firecracker. One butterfly family, *Hamadryas*, includes several species of Cracker butterflies that produce clicking or clacking sounds. They can occasionally be found in Florida and Texas but are tropical South American species. The mechanism for producing this sound is suggested to be a wing-vein buckling mechanism in combination with a Vogel's hearing organ, also on the wing.

This ability to emit sound is also apparently a characteristic of our Mourning Cloak butterfly, although only two field guides mention it. I have been listening for this click from the Mourning

rolling up the proboscis into a spiral is a unique adaptation of the lepidoptera



Xanthopan morgani,
proboscis unfurled,
and Darwin's orchid



Cloak for almost a year with no success. Ben Gadd, a Canadian naturalist and author of *Handbook of the Canadian Rockies*, has heard the sound of the Mourning Cloak: a single click when the butterfly takes off in flight. The next time you come across a Mourning Cloak, listen for it—and let me know if you hear it!

Montana Spring and Summer Butterflies

Look (and listen!) for the Mourning Cloak cruising on a sunny late winter or early spring day. Other early spring flyers are the Satyr Anglewing (also known as the Satyr Comma) and the beautiful Orange Tip. If you can capture the Orange Tip, look

at the spectacular underside coloring pattern. A little later in the season, look along the Kim Williams trail in Missoula for the large Two-tailed Tiger Swallowtail. See how many butterflies you can find this summer—and think about the intricate dance they and other insects have performed with our flowering plants for the past hundred million years. 🦋

— Charles Miller retired as Director of Clinical Education for the Respiratory Therapy program at Missoula College and continues to teach there part time. He also teaches about insects and birds for the Master Naturalist classes at the MNHC.

Early Spring/Summer Butterflies

Look for these early flyers this spring and summer—and here's a list of their host plants to make it even easier to find them.



Spring Azure
Celastrina ladon
Dogwood, Cherry



Sara (or Pacific) Orangetip
Anthocharis sara
Mustards



Common Ringlet
Coenonympha tullia ssp.
Grasses



Mourning Cloak
Nymphalis antiopa
Willow, Cottonwood, Birch



Common and Small Wood Nymph
Ceryonis pegala and *Ceryonis oetus*
Grasses



Western Tiger Swallowtail
Papilio rutulus
Cottonwood, Willow, Alder, Aspen



Satyr Anglewing (or Satyr Comma)
Polygonia satyrus
Nettles



Lorquin's Admiral
Limenitis lorquini
Willow, Poplar, Chokecherry



Two-tailed Tiger Swallowtail
Papilio multicaudata
Chokecherry, Ash

The Life Cycle of a Butterfly

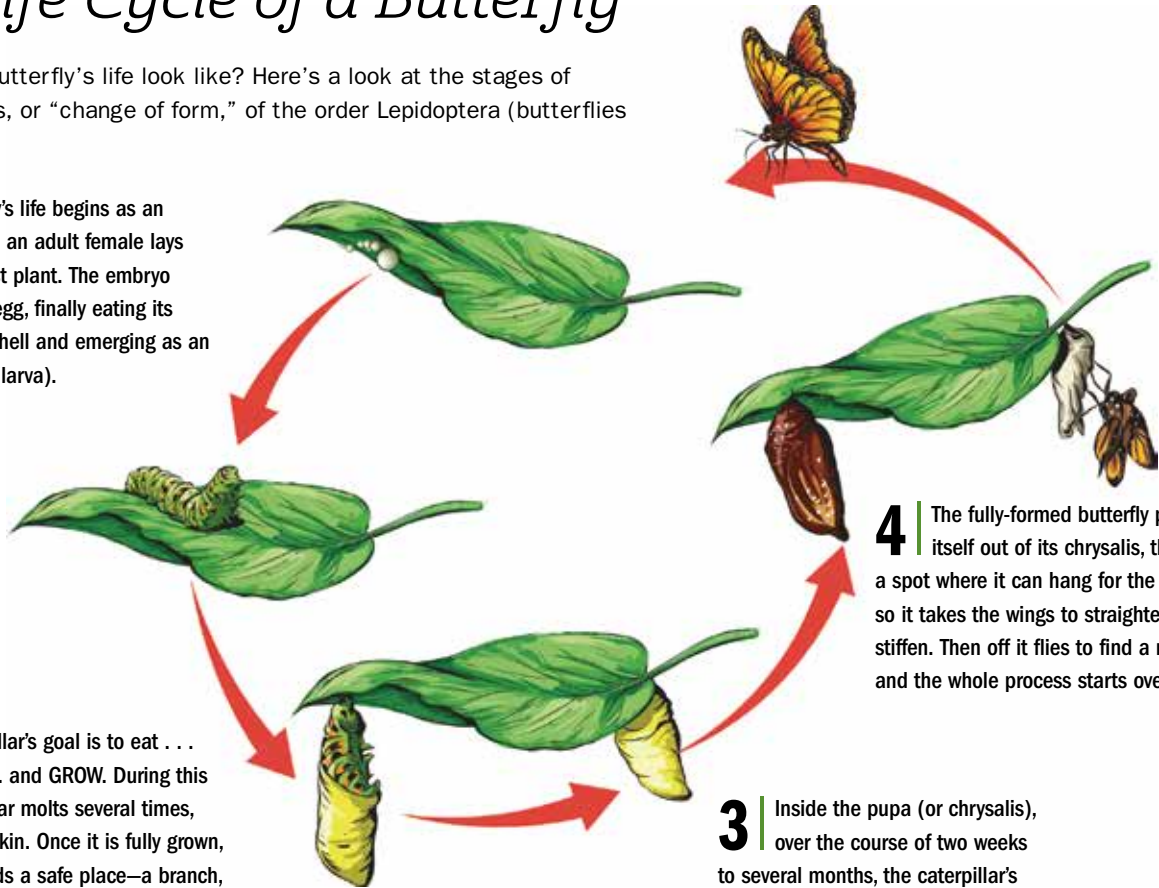
What does a butterfly's life look like? Here's a look at the stages of metamorphosis, or "change of form," of the order Lepidoptera (butterflies and moths).

1 A butterfly's life begins as an egg, when an adult female lays her eggs on a host plant. The embryo grows inside the egg, finally eating its way through the shell and emerging as an infant caterpillar (larva).

2 The caterpillar's goal is to eat . . . and eat . . . and GROW. During this time, the caterpillar molts several times, shedding its old skin. Once it is fully grown, the caterpillar finds a safe place—a branch, rock, or stem—to attach itself and begin its pupal stage.

4 The fully-formed butterfly pushes itself out of its chrysalis, then finds a spot where it can hang for the hour or so it takes the wings to straighten and stiffen. Then off it flies to find a mate . . . and the whole process starts over!

3 Inside the pupa (or chrysalis), over the course of two weeks to several months, the caterpillar's body breaks down and is rebuilt into an adult butterfly.

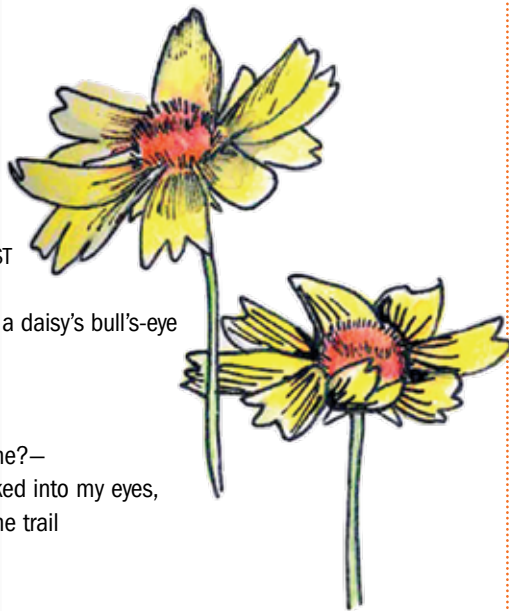


Waiting for a Fly: A Summer Day in the Rattlesnake

BY ALICIA GIGNOUX, MASTER NATURALIST

Staring straight at a yellow spider on a daisy's bull's-eye
I could have spent a half a day—
then, looked up to see
a weasel staring straight at me.
He ran full force to greet me, greet me?—
stopped six feet away, stood up, looked into my eyes,
turned away, and skipped back up the trail
to cache our stolen moment behind
a fallen sunlit apple tree.

This poem was written in MNHC's Nature Writing Workshop led by Missoula poet Chris Dombrowski, who also teaches poetry through the 406 Writers' Workshop.



Calling All Kids!

Do you have any nature art, photography, poetry, or stories you'd like to share? We'll be showcasing 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.



SUN	MON	TUE	WED	THU	FRI	SAT	
Summer Outdoor Discovery Camps See Imprints for details, page 16.	<p>June 23-27 Insect Insanity! (Grades K-1) A is for Avocet (Grades 1-3) Go Fish! (Grades 1-3) Big on Bugs (Grades 3-5)</p> <p>23</p>			<p> Volunteer Work Party at the Fort Gardens, 4-6 p.m. Education topic: Journaling: Plants and Pollinators</p> <p>25</p>		<p> Naturalist Field Day, 9 a.m.-5 p.m. Grassland Ecology in the Blackfoot.</p> <p>28</p>	
	<p>June 30-July 3 (No camp on Friday, July 4) Animal Architects (Grades K-1) Tracks and Scat (Grades 1-3) Art Expedition (Grades 3-5)</p> <p>30</p>	<p>July</p> <p>July Gallery, all month. Stephanie Frostad: Beloved Montana.</p> <p>1</p>	<p> miniNaturalists Pre-K Program at Greenough Park, 10-11 a.m. Volunteer Work Party, 4-6 p.m., Grass ID</p> <p>2</p>	<p> 3</p>	<p>4</p>	<p> Saturday Kids' Activity, 2-3 p.m. Creatures of Silver's Lagoon.</p> <p>5</p>	
	<p>July 7-11 Mini-Biologists (Pre-School) Theatre and Nature (Grades 1-3) Wild Explorers (Grades 3-5)</p> <p>7</p>			<p> Volunteer Work Party at the Fort Gardens, 4-6 p.m. Education topic: Native Plant ID</p> <p>9</p>			
	<p>July 14-18 Predator Prowl (Grades K-1) Bodacious Birds (Grades 1-3) Hooked on Fishing (Grades 3-5)</p> <p>14</p>		<p> Glacial Lake Missoula Chapter Meeting, 4 p.m.</p> <p>15</p>	<p> miniNaturalists Pre-K Program at Greenough Park, 10-11 a.m. Volunteer Work Party, 4-6 p.m., Medicinal Plants</p> <p>16</p>		<p> Naturalist Field Day, 9 a.m.-5 p.m. Spiders.</p> <p>19</p>	
	<p>July 21-25 Diggin' in the Dirt (Pre-School) Mammal Mania! (Grades 1-3) Birds of a Feather (Grades 3-5) Backcountry Explorers (Grades 6-8)</p> <p>21</p>			<p> Volunteer Work Party at the Fort Gardens, 4-6 p.m. Education topic: Journaling: Plants and Pollinators</p> <p>24</p>		<p>Huckleberries peak</p>	
	<p>July 28-August 1 Hooray for Habitats! (Grades K-1) Rockin' Rocks (Grades 1-3) Jr. Stewards (Grades 3-5)</p> <p>28</p>						
	<p>August 4-8 Waddling Waders (Pre-School) Bugs and Slugs (Grades 1-3) Outdoor Adventures (Grades 3-5)</p> <p>4</p>			<p> miniNaturalists Pre-K Program at Franklin Park, 10-11 a.m. Volunteer Work Party, 4-6 p.m., Grass ID</p> <p>6</p>		<p> Saturday Kids' Activity, 2-3 p.m. Busy Beavers.</p> <p>9</p>	
	<p>August 11-15 Wonderful Wetlands (Grades K-1) Jr. Naturalists (Grades 1-3) Water Wonders (Grades 1-3) Eco Warriors (Grades 3-5)</p> <p>11</p>	<p>Perseid meteor shower</p> <p>12</p>	<p> Volunteer Work Party at the Fort Gardens, 4-6 p.m. Education topic: Seed Collecting</p> <p>13</p>			<p> Naturalist Field Day, 9 a.m.-5 p.m. Entomology 101.</p> <p>16</p>	
			<p> Glacial Lake Missoula Chapter Meeting, 4 p.m.</p> <p>17</p>	<p> miniNaturalists Pre-K Program at Franklin Park, 10-11 a.m.</p> <p>20</p>			

June Gallery, all month. **Stephanie Frostad:** **Beloved Montana.**

June 6 MNHC Grand Reopening & Gallery Show, 4:30-6:30 p.m.

June 7 Naturalist Field Day, 9:00 a.m.-5:00 p.m. **Ecology and Identification of Local Grasses.** \$80; \$70 MNHC members.

June 10 Naturalist Trivia at Draught Works Brewery Community Pint Night, 5:00-8:00 p.m. Trivia begins at 6:00 p.m.

June 18-20, 23-24 Summer Master Naturalist Course, 8:00 a.m.-4:00 p.m. on W, Th, F, M, T. \$395; 2 college credits available. Call 327.0405 to register.

June 18 Glacial Lake Missoula Chapter Meeting, 4:00 p.m. Free and open to the public.

June 28 Naturalist Field Day, 9:00 a.m.-5:00 p.m. **Grassland Ecology in the Blackfoot.** \$80; \$70 MNHC members.

July Gallery, all month. **Stephanie Frostad:** **Beloved Montana.**

July 16 Glacial Lake Missoula Chapter Meeting, 4:00 p.m. Free and open to the public.

July 19 Naturalist Field Day, 9:00 a.m.-5:00 p.m. **Spiders.** \$80; \$70 MNHC members.

August Gallery, all month. **Group Show: Summer Work.**

August 16 Naturalist Field Day, 9:00 a.m.-5:00 p.m. **Entomology 101.** \$80; \$70 MNHC members.

August 20 Glacial Lake Missoula Chapter Meeting, 4:00 p.m. Free and open to the public.

Huckleberries peak

Volunteer Opportunities

April 21 Volunteer Naturalist Training, 3:30-5:00 p.m. **VNS Field Trip Training.** Learn how to teach kids about the flora and fauna of western Montana during the May VNS school field trips. No experience necessary.

Volunteer Work Parties at the Fort Gardens, Thursdays, 4:00-6:00 p.m. Education topics listed below.

May 1 Garden Playscaping

May 15 Native Garden Landscaping

May 22 Plant Sale!

May 29 Native Bees

June 5 Grass ID

June 12 Native Plant ID

June 19 Medicinal Plants

June 26 Journaling: Plants and Pollinators

July 3 Grass ID

July 10 Native Plant ID

July 17 Medicinal Plants

July 24 Journaling: Plants and Pollinators

July 31 Invasive Weeds

August 7 Grass ID

August 14 Seed Collecting

Where the Water Falls

TEXT AND WATERCOLORS BY
STACIA MARTINEAU

In exploring our beautiful, river-crossed state, one can't help but come across water flowing—and with flowing water come waterfalls. A waterfall is, simply, a body of water falling over a steep precipice or incline at least three feet high. But this simple definition allows for myriad complex possibilities; there are, in fact, more than 16 different kinds of waterfalls! Here are the basic seven:

1 Cascade: water descending over an uneven surface. This can be gradual, stepped or steep, smooth or rough. A few types of cascade waterfalls include:

- **Horsetail:** tall and narrow, it maintains constant contact with the bedrock.
- **Fan:** spreads out as it falls so that the base is wider than the top.
- **Slide:** maintains constant contact with a smooth, gradual bedrock slope (usually granite).

2 Cataract or Plunge: large amounts of water descending vertically and losing almost all contact with the rock surface.

3 Sheet or Block: occurs when the width of the waterfall is greater than its height.

4 Punchbowl: a narrow stream descending vertically into a larger, deeper pool.

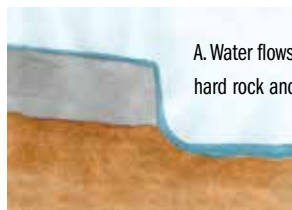
5 Tiered: two or more smaller waterfalls descending in a quick series.

6 Curtain: very similar to a cataract but with less water. These waterfalls must be taller than they are wide.

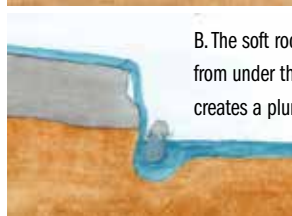
7 Segmented: split into two or more paths due to diverted channels in the stream or river above.

An added bonus: waterfalls can be any combination of these basic types. You can have a segmented cataract or a tiered sheet. The possibilities are infinite!

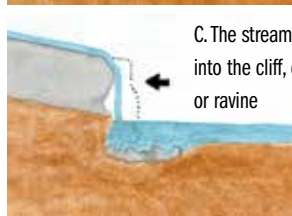
The unique shape of a waterfall is a result of the geology of the area. Most waterfalls form when a river or stream flows from stronger rock to weaker rock. The weaker rock is more sensitive to the process of erosion—where large rocks are broken down into smaller rocks by wind and water—and, as a result, will erode faster. After a few thousand years, the weaker rock will give way to a plunge pool, the deeper water at the base of a waterfall. At the same time, the river or stream will slowly carve into the cliff, ultimately creating a gorge or ravine.



A. Water flows over layers of hard rock and soft rock



B. The soft rock erodes out from under the hard rock and creates a plunge pool



C. The stream or river recedes into the cliff, creating a gorge or ravine

Answering the question “What is a waterfall?” is much more complicated than a simple dictionary definition. That’s why waterfalls are so much fun! This summer, get out into the mountains and find some waterfalls. Ask yourself: What kind of waterfall is it? What do the rocks look like? How might it look in a thousand years?

Stacia Martineau grew up in Shoreline, WA, between the Olympic and Cascade Mountains, where she goes hiking with her family and two dogs. She is currently studying geology at UM and plans to graduate in December. She wrote this piece for the Global Water: Writing in Geosciences class at UM.

Waterfall Quiz:

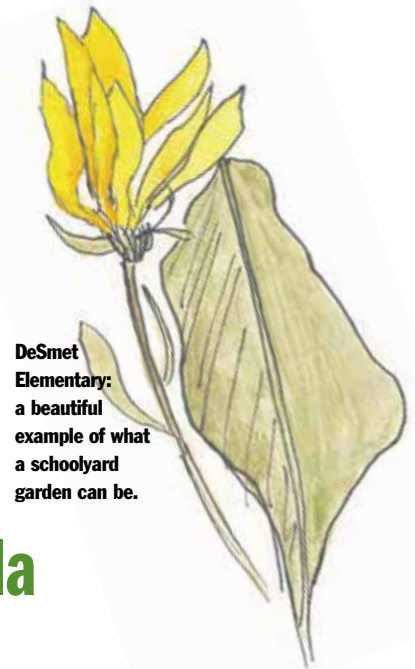
Can you match up the picture with the type of waterfall?

1. Cascade
2. Cataract
3. Sheet
4. Punchbowl
5. Tiered

Answers: A. Punchbowl, B. Tiered, C. Cascade, D. Cataract, E. Sheet



PHOTO: LISA HENDRICKS; FLOWER DRAWING: BETH BAKER



DeSmet Elementary: a beautiful example of what a schoolyard garden can be.

Schoolyard Gardens Growing in Missoula

BY ALLISON DE JONG

Springtime: the sun emerges, the soil warms, and backyard gardeners begin their joyful plotting and planning.

This year, however, a couple of Missoula educators have taken their planning to the next level: through a US Forest Service More Kids in the Woods grant, Sue Reel, a wildlife educator for the Lolo National Forest, and Lisa Hendricks, a former classroom teacher, have been working to help local schools create native plant and pollinator gardens in their schoolyards and learn about pollinators.

Until now, when Missoula-area schools have wanted to plant a schoolyard native plant garden, they've had to start from scratch, learning as they go. But Hendricks and Reel knew there were plenty of resources in the area. The two have spent the last several months creating a kit on pollinator education, which includes lesson plans, activities, background info, and a list of resources and a network of knowledgeable people and organizations in the community who can provide information and possibly even supplies. The kit will be available both online and through the Montana Natural History Center this fall.

Native plant gardens are popular school projects, Hendricks says, but often, after the initial burst of energy gets the garden planted, interest wanes. Reel and Hendricks'

goal is to form a sustainable network of support so that schools can plant, maintain, and use their gardens year after year as a simple, hands-on way to do place-based education just outside their doors.

"Even if a school can't build a garden in their yard, they may be able to do landscaping, put in some native plants here and there, and use that as their outdoor classroom," says Reel. "And we include native plants that don't need a lot of maintenance—drought-tolerant, xeriscaping, resilient plants—which will help with long-term sustainability."


Native plant gardens, even small ones, also create habitat for pollinators, from insects to birds. With the worldwide decline of honey bees in recent years, supporting habitat for native pollinators is increasingly important. And kids love learning about pollinators. "They can immediately see the relevance of pollinators," Reel says. "Pollinators produce food for us. It provides a great learning opportunity."

Such projects also provide great service-learning opportunities. With a schoolyard garden, students have the chance to learn about Montana's native plants and research our native pollinators, including ways to protect them and provide the best habitat for them. They'll learn the difference between gardening for

plants and gardening for wildlife (for instance, weedmat is a no-no—it interferes with native

bees that nest underground). Students get to connect to the wider community, too, whether by making interpretive signs and posters for visitors or writing informational booklets. "It's so much more powerful if the students are involved in the planning," says Hendricks. "It gives them ownership."

All in all, native plant gardens provide rich potential for learning across many disciplines, beyond science to art, writing, math, social studies. And they give teachers an easy way to get their students outside, allowing for less planning and more flexibility. Whether it's warm and sunny or cold and rainy, teachers can take their classes outside for fifteen minutes to see what's happening in the garden.

Hendricks and Reel's ultimate goal is to make starting a schoolyard garden as simple as possible. "You don't need something huge—just a small plot will get you started," says Reel. "And it's beautiful. You're just watching butterflies, bees, hummingbirds. It's really rewarding." 

Reel and Hendricks are offering a teacher workshop on Native Plant & Pollinator Gardens on Thursday, May 8th, from 3:00-6:30 p.m. at the Fort Missoula Native Plant Garden. See page 15 for more information.

Views Through the Scope: Montana's Sagebrush Sea



Sage-Grouse



Elk



Bald eagle



Black wolf

BY JAY GORE

Being physically fit and retired is very rewarding. I am a wildlife ecologist and have pursued many conservation endeavors into retirement. I particularly enjoy getting into sagebrush-filled high mountain valleys in spring. These places are the haunts of wintering elk, antelope, mule deer, the occasional wolf, and also where sage-grouse males find dancing grounds, called leks, to display and attract females. Few people experience this springtime backcountry, so I thought I'd share some close-up views of these special places.

APRIL 2012 I am in the Centennial Valley assisting the National Wildlife Federation and Montana Fish, Wildlife and Parks census sage-grouse on their leks. At the Fish Creek lek, I am counting the displaying males in my spotting scope. Behind the sage-grouse I see about 125 elk grazing on the south-facing slope of the Gravelly Mountains. Pretty cool, I think. But wait, here comes a long-billed curlew in its courtship flight. For a moment, I can see all three of these critters in my scope's field-of-view. A rare morning, indeed!

APRIL 2004 I am in Basin Creek in Beaverhead County for a lek count. While counting birds on their lek, I see 17 elk, crossing through in the distance, but within the spotting scope's field-of-view. And there's a pair of long-billed curlews on the ground in courtship display just beyond the sage-grouse. It's another magical moment of seeing these three species in a single field-of-view.

I hear the curlew's call out the truck's window as the sun just peeks over the eastern snow- and pine-capped mountains. At the same time I hear the beautiful warbling call of the rare sage thrasher.

A few minutes later, a small family group of Canada geese are calling overhead. These are not things we observe or hear from the office desk or upon morning rising in urban environs. This rare mix of wildlife can only be found in a few habitats in North America, let alone in the world. Such experiences make life special, indeed!

JUNE 2002 Yellowstone National Park is extra special in June when many wildlife babies are visible in the sagebrush. For many years I have assisted in conducting a carnivore class for agency folks in the Lamar Valley in June. At Slough Creek, several of us are watching a grizzly sow and her cub on the mountainside across the creek. In my binocular field-of-view is a dead tree snag at the edge of the creek. A bald eagle alights on this snag as I watch the bears: two threatened species in one binocular field. But wait, here's a black wolf trotting along the far creek bank, its path taking it between the bears and the perched eagle. Three rare species in one field-of-view! I'll never forget this gold star biological day. Now, just over a decade later, all three of those species are recovered and have been removed from the Endangered Species list—something I'd been working toward for 23 of my 48+ career years in wildlife conservation.

Montana: what a great place to live. It will soon be time for me to pack the truck for another spring safari into the sagebrush sea. 🦋

—Jay Gore, a Certified Wildlife Biologist, has been a Montana resident for 17 years. During his career, he has worked for the Tennessee Fish and Game Commission, US Army Corps of Engineers, US Fish and Wildlife Service and the US Forest Service. Most of his work involved conservation of endangered species.



PHOTO: LISA HENDRICKS

Schoolyard Native Plants & Pollinators Teacher Workshop

Enjoy an afternoon at the Montana Natural History Center Native Plant Garden and Classroom at Fort Missoula. Learn about organizations across Missoula that can help create or enhance a native plant garden at your school. Whether you are adding native plant features to a vegetable garden or taking advantage of a small plot on your schoolyard, you can be attracting and providing valuable habitat to pollinators. Teachers will receive hands-on activities that meet educational standards and can be easily integrated into the classroom. You will learn about pollinators, get experience in the garden, and come away with lots of resource materials and free native plants!

Thursday, May 8th, 3:00-6:30. Snacks and light dinner provided. OPI credit available. Call 327.0405 to register.

MNH PHOTO

Get Your Naturalist On This Summer!

This spring and summer are bringing you these fantastic opportunities for delving deeply into Montana's natural history:

The Master Naturalist Spring Flower Weekend, May 17-18, goes on the road again this year, this time to the beautiful Blackfoot Valley to study spring flowers on the prairie. UM botany and Missoula College biology instructor Greg Peters and MNHC naturalist Brian Williams will lead the group in honing their skills and increasing their confidence in keying out flowers and building their knowledge of plant families. The group will overnight at a cabin, with Saturday dinner and Sunday breakfast included. Cost: \$130 for members; \$145 for non-members. Call 327.0405 or visit www.montanaturalist.org to register.

The Summer Master Naturalist Course, June 18-20 and 23-24, is an intensive field course based at the Native Plant Garden at Fort Missoula and taught by Brian Williams. The focus will be on learning the core skills of identification in three areas: 1)

flowers and trees, 2) birds, and 3) insects. Past guest instructors have included Valerie Bayer, Annie Garde, and Charles Miller. Cost: \$395; 2 college credits available. Call 327.0405 to register.

The Glacier Institute Summer Master Naturalist Course, June 27-July 1, is a week-long residential course focused on developing skills to read the landscape. Taught by Brian Williams and Greg Peters, the course will use big themes of biogeography, succession, and habitat to frame what is taught, but the focus will be cultivating an ability to see this big picture first-hand through accurate reading of the details—the plants and animals whose presence tells the story of the landscape of beautiful Glacier National Park. Cost: \$725 (includes room and board at the Glacier Institute). Visit www.glacierinstitute.org to register.



PHOTO: ERIK LARSON

SPOTLIGHT:

When you next visit MNHC, you'll see a new face at the front desk! Lena Viall joined MNHC in February as our Executive Assistant. Lena has a B.A. in English-Creative Writing from the University of Montana. Her previous experience includes interning and freelancing for the Rocky Mountain Elk Foundation's *Bugle* magazine and work as a legal secretary and administrative assistant. In her free time Lena enjoys exploring Montana's nooks and crannies with her boyfriend, Erik, volunteering around the Missoula community, biking, reading, gardening and cooking. Be sure to say hello to her the next time you stop by MNHC!

imprints

Summer Outdoor Discovery Day Camps



Discoveries galore await your children outside this summer! Dive into fun with our Summer Outdoor Discovery Day Camps for kids of pre-school age (3-4) through 8th grade. Our week-long camps engage children in the study of nature through field trips, arts & crafts, and scientific exploration. Teens can gain experience in outdoor education through our Leaders in Training Program. Camp themes and content are geared toward students entering the grade levels noted in the fall of 2014.

Full payment due upon registration. Registration is confirmed ONLY after full payment is received. Registration fee includes a **\$50 non-refundable deposit**. Call 327.0405 or visit www.MontanaNaturalist.org to register today!

Camps begin and end at the MNHC near McCormick Park at 120 Hickory Street in Missoula. Camps include local field trips to surrounding natural areas.

Day Camp Program Hours

Pre-school Camps: Monday - Friday, 9 a.m. to 12 p.m.

Half-day camps: Monday - Friday, 9 a.m. to 1 p.m.

Full-day camps: Monday - Friday, 9:30 a.m. to 4:30 p.m.

Before and after care is available free from 8:30 to 9:30 a.m. and 4:30 to 5:30 p.m.

Cost

Full-day camps

\$175/members, \$195/non-members

Half-day camps

\$85/members, \$120/non-members

Pre-school camps

\$75/members, \$95/non-members

Scholarships are available.

MNHC memberships can be purchased annually for \$50 per family.

Pre-School

Morning Camps

For children ages 3-4

Monday - Friday, 9 a.m. to 12 p.m.

\$75/members,
\$95/non-members

Animal Orchestra

June 16-20

What's that noise outside? In this camp, we'll learn about and listen to crickets, learn a few easy bird songs, and make our own music with some great instruments.

Mini-Biologists

July 7-11

Spend a fun week learning about insects, mammals, skulls, and tracks. We'll investigate some cool habitats around the Montana Natural History Center and make our own plaster tracks.

Diggin' in the Dirt

July 21-25

This week we'll find animal tracks, explore what lives underground, and spend some time poking around in the mud to see who lives there.

Waddling Waders

August 4-8

We'll spend some time looking at aquatic invertebrates and get our feet wet in a very shallow and safe pond. We'll also find out fun facts about fish and all the cool bugs they eat.

K-1st grade

Half-day camps

Monday - Friday, 9 a.m. to 1 p.m.

\$85/members,
\$120/non-members

Insect Insanity!

June 23-27

In this camp, learn about terrestrial and aquatic invertebrates and spend some time dipping our nets into the water and sweeping them in the grass to see what we find. We'll make our own insect nets, learn about metamorphosis, and make an insect habitat to observe our catches during the week.

Animal Architects

July 30-July 3 (No camp Friday, July 4)

This week we'll spend our time exploring a new animal's habitat each day and then practice our construction skills and stretch our creativity as we recreate its home. We'll check out nests, dig some burrows, and discover how spiders spin their webs. Love to build? This camp is for you!

Predator Prowl

July 14-18

What's a predator, and what do they eat? Are humans predators? Are you better at camouflage or finding your prey? We'll learn about some surprising predators found here in Montana and look at some real predator skulls.

Hooray for Habitats!

July 28-August 1

In this camp we'll explore different terrestrial habitats found around MNHC and Fort Missoula. We'll catch insects, look for tracks, and learn about some of the birds that live in the city. We'll also make a habitat for the aquatic critters we catch and set a scent station to see who comes to visit at night.

Wonderful Wetlands

August 11-15

Want to spend the week getting your feet wet? We'll explore exciting, nearby aquatic habitats every day. We'll wade, look for aquatic invertebrates, keep an eye out for osprey, and learn about how important water is to all living things.

1st-3rd grade

Full-day camps

Monday - Friday, 9:30 a.m. to 4:30 p.m.
\$175/members, \$195/non-members

Jr. Survivor

June 16-20

Want to learn some useful outdoor skills? We'll spend the week learning about building shelters, how to stay safe and not get lost, how to use a compass and read a map, and bear awareness. We'll also learn Morse code and write each other messages, make our own first aid kit to keep, and even make some delicious ice cream!

A is for Avocet

June 23-27

Never seen one? Here's your chance! We'll explore Lee Metcalf and other natural areas looking for animals to match up with all the letters of the alphabet and see if we can meet the challenge of finding a critter for every letter! B is for Barn Owl, C is for Cricket, D is for Deer...

Go Fish!

June 23-27

Learn about stream ecology, fish in Montana, and how to catch the big one. In addition to fishing, we'll learn about aquatic invertebrates and how they are important to fish. We'll visit local streams and ponds, create our own tackle boxes, and use waders, nets, and fishing poles to reel in adventure.

Tracks and Scat

June 30-July 3

(No camp Friday, July 4)

Improve your stalking skills as we learn about tracking in this fun camp. We'll be on scat patrol as we explore local natural areas and look for signs of wildlife. We'll create our own track guides, practice tracking each other through the woods, learn about how biologists use telemetry to study animals, and build a scent station to see who hangs around MNHC at night.

Theatre and Nature

July 7-11

Produce a nature-themed play for parents and the other camps including costumes and scenery! We'll get inspiration from hiking and exploring outdoors and put on our play on Friday, July 11. Campers have the option to be part of the props and use their artistic abilities for scenery creation if they do not want a speaking part.

Bodacious Birds

July 14-18

What's that soaring in the sky? Who's that doing all the honking on the ground? We'll spend the week identifying birds, learning bird calls, and discovering what makes these feathered dinosaurs so unique.

Mammal Mania!

July 21-25

Come learn about some of the amazing mammals that are found in Montana. We'll take a trip to the Bison Range to look for one of the largest mammals in the state and spend the week learning about mammals that live nearby. We'll also take a trip to the Zoological Museum at the University, make our own tracks, and spend some time studying skulls.

Rockin' Rocks

July 28-August 1

What do you know about geology? Come spend a week learning about minerals and rocks through fun activities. We'll make our own fossils, learn about the three different types of rocks, and find out what chocolate chip cookies can teach us about mining. We'll have a rock show for parents and other campers on Friday, August 1. *Campers will be exposed to peanuts in this camp.*

Bugs and Slugs

August 4-8

The world of invertebrates is full of amazing creatures. We'll spend the week looking for insects and other invertebrates using nets, hand lenses, and microscopes to learn more about what makes them unique. We'll make our own bug nets to keep, set traps to lure insects in, and do some awesome experiments to learn all we can about bugs and slugs.

Jr. Naturalists

August 11-15

Explore some awesome hiking trails around the Missoula and Seeley Lake areas! We'll hike short trails every day, swim at Beavertail Pond, kayak the Clearwater Canoe Trail at Seeley Lake, play fun games and explore our amazing surroundings, and learn how to use naturalist tools like compasses and maps.

Water Wonders

August 11-15

Spend the week getting your feet wet! We'll explore aquatic habitats around Missoula, learn about the water cycle, do some fishing, try out the kayaks, and learn all about cool critters that live in the water.

3rd-5th grade

Full-day camps

Monday - Friday, 9:30 a.m. to 4:30 p.m. \$175/members, \$195/non-members

Mineral Madness

June 16-20

Come learn about some of the amazing geology in Montana. We'll spend a week learning about minerals and rocks through fun activities. We'll make our own fossils, learn about the three different types of rocks, and take a special field trip to the mining museum in Butte.

Bug on Bugs

June 23-27

Who doesn't love learning about insects? We'll spend the week seeing what six-legged creatures

we can catch and learning about metamorphosis. We'll do some great experiments to learn more about—and maybe grow to love!—misunderstood 'creepy crawlies.' We'll also start our own (live) insect collection to be released at the end of the week.

Art Expedition

June 30-July 3 *(No camp Friday, July 4)*

Come join us as we spend a creative week perfecting our art skills and being inspired by nature. We'll visit the Missoula Art Museum, make baskets and bird feeders out of natural and recycled materials, paint amazing landscapes, and much more! We'll host an art opening on Thursday, July 3, to show off our creations.

Wild Explorers

July 7-11

Come spend a week in the woods that includes one amazing overnight camping trip. We'll explore local trails in Seeley Lake and the Ninemile, and spend one night sleeping out under the stars. We'll kayak, learn about native plants and animals, and practice Leave No Trace Principles.

This camp will feature an overnight camping trip from July 10-11. There is an extra \$25/camper cost for food for the overnight in addition to the cost of \$175/\$195. Sleeping bags, pads, and tents are available for free rentals; just let us know what you need when you sign up for camp.

Hooked on Fishing

July 14-18

Join us for this very special camp sponsored by the Hellgate Hunters and Anglers. Learn about stream ecology, fish in Montana, and how to catch the big one. We'll also learn about aquatic invertebrates and how they are important to fish. We'll visit local streams and ponds, create our own tackle boxes, and use waders, nets, and fishing poles to reel in adventure.

Birds of a Feather

July 21-25

This week we'll learn about raptors and their amazing adaptations. We'll study as many Montana raptors as we can, from osprey and hawks to eagles, owls, and falcons. We'll use binoculars, make kites, and try to find the owl at Lee Metcalf.

Jr. Stewards

July 28-August 1

How can we take care of this amazing place we live? This week we'll start a recycling project at MNHC, begin a composting worm bin for summer camp and staff food scraps, pull some

weeds at the Native Plant Garden at Fort Missoula, and learn about Leave No Trace principles. We'll also do some exploring and appreciating natural places in and around Missoula.

Outdoor Adventures

August 4-8

Join us this week to learn some amazing outdoor skills. We'll brush up on our fishing, do some orienteering, and learn archery skills with real bows and arrows in a fun, safe environment.

Eco Warriors

August 11-15

Interested in learning about how we can make power with the sun, wind, and water? Come learn all about the fields of Biomimicry and "green" design. You'll see some examples of great inventions, create a solar-powered motor boat, and make a solar-powered oven to roast s'mores in.

6th-8th grade

Full-day camps

Monday - Friday, 9:30 a.m. to 4:30 p.m. \$175/members, \$195/non-members

Backcountry Explorers

July 21-25

Want to spend a week in the woods this summer that includes a fantastic overnight backpacking trip? We'll hike beautiful trails every day and explore the world around us. We'll also learn about plants and animals common to our region as we get out and explore, and practice Leave No Trace Principles. This camp will include a tubing adventure and an overnight to a Forest Service cabin with some amazing backcountry hiking! Participants should be prepared for a 2-3 mile hike with a small pack.

This camp will feature an overnight camping trip from July 24-25. There is an extra \$30/camper cost for food for the overnight in addition to the cost of \$175/\$195. Sleeping bags, pads, tubes, and tents are available for free rentals; just let us know what you need when you sign up for camp.

Teens!

Leaders in Training Program

Teens ages 14-17 may volunteer for a Leader in Training position and gain experience working with children through summer camp instruction by assisting camp instructors with programs. Students must commit to one day of training at the start of the summer and must participate in at least one full week of camp as a junior instructor. Contact MNHC for more information.



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Sign up for our Summer 2014 Montana Master Naturalist Course and learn all about the trees, flowers, animals and insects of the place we call home. Taught by MNHC Naturalist Brian Williams, this is a five-day intensive course held on Wednesday, June 18th, through Tuesday, June 24th, with the weekend off. For complete details call 327.0405, or visit our website at www.MontanaNaturalist.org.



Holland Falls

BY LAUREL NAKANISHI

We walk right up to it:
thunder rush, chutes and swirling pools,

banks studded with icicles
pointing sideways, wind-thrown, each stick
lined in sheet ice. The tree limbs bowed
or carried away. I am carried away.

It pours from its banks, steadfast, insistent
drawing-on. And all too swiftly

it leaves us for the waiting lake:
placid, echoed with mountains. Each a peak,
each a craggy snow-covered love.
They hold her ringing. She closes her eyes

and names them. Imagine the origin –
the well deep and springing, the first words

for season, for the sun pushing within us,
seeds and leafing out. Her hands,

warm, the clouds moving in –
be here, be here for a while.

—Laurel Nakanishi is a poet and a teacher. She is the recipient of the Richard Hugo memorial scholarship, the Greta Wrolstad travel award and a Fulbright scholarship. This year she won the Epiphany Editions chapbook award for her collection: *Manoa Makai*. Born and raised in Honolulu, Hawaii, Laurel received her BA at Lewis & Clark College and MFA at the University of Montana.



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Connecting People with Nature

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