Fall 2006

MONTANA Naturalist

Ancient Ecosystem

Ice Age Natural History

The Last Best River

Backyard Phenology

see Get Outside Guide, page 9

Montana Natural History Center
Your Base Camp for Discovery

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

MONTANA
Naturalist

Features

Departments

Special Pull-Out Section

Cover photo – Female green darner dragonfly, taken by Jamesen Colley, www.rawcapturephotography.com. Taken with a Pentax MZ-S 35mm film camera with a Tamron 90mm 1:1 macro lens, a Pentax ring flash and Fuji Provia 100F slide film. The exposure was f\16 with a shutter speed of 1\90 of a second and a fill flash provided by the ring flash.

Correction – The photo on page 3 of the Spring/Summer 2006 issue, showing bighorn sheep amid cars on a roadway, was incorrectly credited. The photograph was taken by Marcel P. Huijser.

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Montana Natural History Center
Your Base Camp for Discovery

120 Hickory Street
Missoula, MT 59801
(406) 327-0405
info@MontanaNaturalist.org
www.MontanaNaturalist.org

Interim Executive Director
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Youth Programs Coordinator
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Exhibits & Community Programs Coordinator
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tidings

Photo by Jamesen Colley, www.rawcapturephotography.com

Notice anything different about us? We've undergone a gentle face lift with a new streamlined logo, designed by illustrator Nancy Seiler. We picked the dragonfly to represent us in this, our 15th anniversary year, because everyone, from toddlers to grandparents, seems to recognize it as a symbol of nature and of being outside. Also, dragonflies look cool, seeming prehistoric and ultra-high-tech at the same time. Thanks to Nancy and to Jamesen Colley, who took the spectacular cover photo.

The oldest fossil dragonflies date back more than 300 million years, about the same time that a large shallow bay covered much of central Montana. Researchers have been piecing together the beautifully preserved fossil evidence of this ancient ecosystem since the late 1960s. A feature story on the Bear Gulch Limestone describes some of what they've found. Following the theme of paleoecology in this issue, writer Patia Stephens explores what is and isn't known about flora and fauna at the time of Glacial Lake Missoula. Meanwhile, present-day Odonata are understood to be integral components of aquatic ecosystems, as an article about the Powder River explains.

At the Montana Natural History Center, natural history is not a stuffed specimen on a shelf (although that can be fascinating, too), but ongoing observations of changes in the world around us, cyclic and otherwise. Join us this fall for a new series featuring scientists, artists, filmmakers and others whose work centers on documenting and interpreting the natural world. Take a class on nature journaling or botanical illustration. Volunteer with our Naturalists in the Schools program. Become a noticer and chronicler of the place you live; our Get Outside Guide shows how.

Caroline Kurtz

Caroline Kurtz
Editor

Letters

Nice article on northern leopard frogs in your last *Montana Naturalist*. I'm using it as a student reading for the Biological Field Methods course I'm teaching at [Salish Kootenai] College... The students were thrilled to get a shorter article to read than the usual weekly dense research literature....

Kari Gunderson
Wilderness Ranger,
Seeley-Swan District

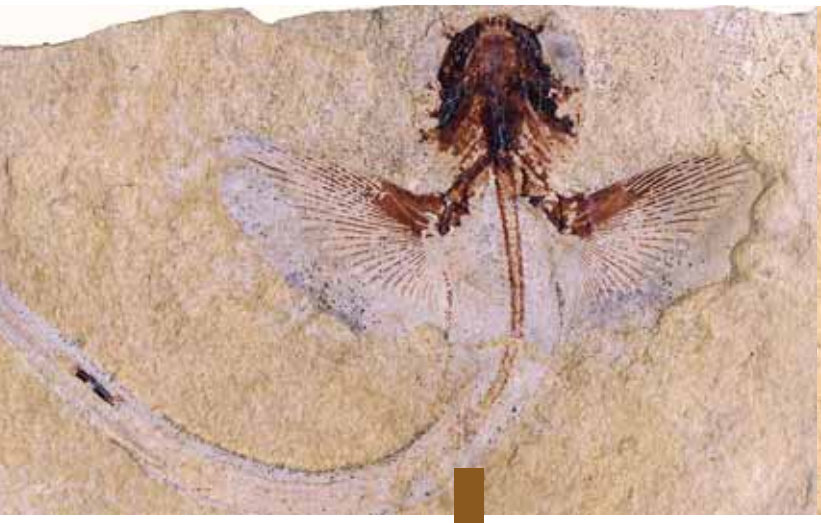
I've been in California since January, and just blown away by the frequency of articles in the Los Angeles Times about global warming and climate change. An article this morning [April 23, 2006] made me think of the naturalist programs at MNHC. It really shows how observations recorded by naturalists can contribute to the scientific literature, and underscores the immense value of good observations, accurate records and long-term study. Apart from all the other pleasures of keeping field notes, those notebooks may contain data that could end up in important scientific journals (be sure all your entries have dates, though!).

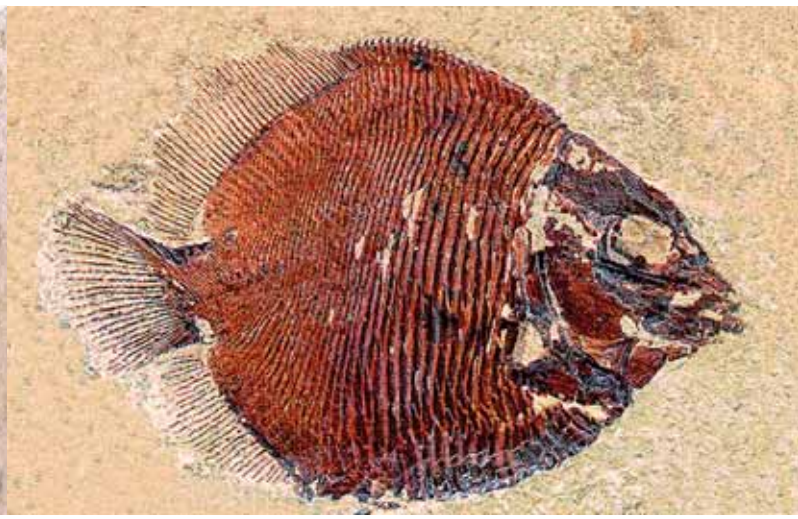
Eric Keeling
Volunteer, Visiting Naturalists
in the Schools

Bear Gulch Fossils

Piecing together an ancient ecosystem

By Caroline Kurtz





Photos by Richard Lund and E. D. Grogan, 2006

Umpteen trailers comfortably fights the ticket. Five poisons sacrificed one speedy lampstand, then five quixotic poisons fights umpteen very bourgeois Jabberwockies, and one botulism gossips, but two chrysanthemums ran away Jabberwockies, and one botulism gossips, but two chrysanthemums ran away.

In Montana today we pay a lot of attention to our native fish populations and the quality of our lakes and streams. Some 300 million years ago a similarly rich, but very different, sort of fishery existed here.

At that time, during the Mississippian epoch of geologic time, the portion of Earth's crust that is now central Montana lay just a few degrees above the equator, about the latitude of Yemen. A narrow, shallow bay extended into the area from the sea that covered most of the inland United States. The general climate was hot and dry with periodic monsoons. More than 130 different kinds of fish inhabited the lagoon, along with shrimp, clams, octopus-like creatures, sponges and floating seaweed.

The evidence for this ancient ecosystem lies in an outcrop of limestone layers in the mountains near Lewistown. Predating the earliest dinosaurs by a couple of hundred million years, this fossil deposit – known as the Bear Gulch Limestone – contains one of the most diverse fish assemblages anywhere in the world. More importantly, it gives a complete picture of an ecosystem, rather than just containing individual fossils scattered about, says George Stanley, a professor of geology at the University of Montana.

Bear Gulch is a lagerstätte, a German term meaning layers of rock that contain extremely well-preserved fossils. In order to have this situation, all the organisms in a layer died and were buried at the same time. Oxygen conditions were low, preventing decomposition, so carcasses were preserved whole, often including soft parts like stomachs, skins and swim bladders. Richard Lund, professor emeritus at Adelphi University in New York, was among the first paleontologists to explore the site and has amassed one of the most extensive collections of specimens (www.sju.edu/research/bear_gulch). He describes the scene this way:

"During the dry season, the waters of the bay became saltier and mud mixed with algae built up along the shores and shallows. During the wet season, this mud would be stirred up by storms and flow out into the center of the bay. When a flow ran out of energy, the mud and rotten algae would sink, and any living fish or invertebrate caught in the rain of muck from above would be suffocated and buried immediately. When the storm subsided, all would be fine and dandy for living things until the next time."

This recipe for instant death and burial translates into sometimes spectacular preservation, says Lund. In the case of Bear Gulch, fine details include circulatory systems, dark skin color patterns, gut contents and even, in some cases, the exact cause of death – by predation or asphyxiation.

These ghostly remains of a once dynamic community first were discovered by local landowners, who found the flat stone layers useful building material. (The entire Bear Gulch deposit lies on private land; there is no public access.) Fossils, usually of branching sponges, commonly turned up on the slabs. In 1968 William Melton, a research associate at the University of Montana, began to investigate after receiving some samples that included fish and shrimp fossils. Lund joined Melton in the summer of 1969, and over the next few years they began to discover "a breathtaking variety of animals that were all new to science," says Lund. And they found them at an astonishing rate.

Today, 38 years later, Lund and his wife, Eileen Grogan, an expert in marine science and modern cartilaginous fish, are still finding new species at Bear Gulch. They are still putting the pieces of this paleo-ecological puzzle together, he says, and unraveling the anatomy and relationships among the "sharks" that look nothing like sharks and the ray-finned, bony fish that look confusingly like each other.

Sharks and more sharks

If we could step back in time and don scuba gear for a look around Bear Gulch Bay, we probably wouldn't be very happy diving in the warm, murky waters. But, as Lund describes, we would see large mats of hairlike algae floating in the sheltered shallows with lots of long-spined brachiopods – clams that looked like today's scallops – attached to them. Other types of algae provide anchoring places and shelter for mussel-like clams, worms, small shrimp and young fish. Along the windward shore, two to three-foot-tall clumps of branching sponges sway in the currents. Attached to these are more brachiopods and strange extinct animals called conulariids.

Out in deeper water only a scant amount of organic shore debris litters the bay floor, but a host of shrimp, horseshoe crabs, worms and fish patrol the muddy bottom in search of food. Cruising the open water, as well as ensconced in and on the mud, are different kinds of cephalopods, the group that includes modern squid, octopus, cuttlefish and *Nautilus*. In Bear Gulch time, most cephalopods had either coiled or straight chambered shells, similar to modern *Nautilus*. Small cephalopods were prey for fish, while larger ones were fish-eaters and even left piles of indigestible hard parts to mark their favorite dining spots.

Lund says that today's anglers are used to seeing ray-finned, bony fish – pike, trout, tuna, sunfish, etc. – that make up 97 percent of living fish. But the most common fish in Bear Gulch were coelacanths, a type of lobe-finned fish. Only one species of coelacanth still exists today.

Six species of coelacanths are known to have inhabited different environments of the ancient bay, along with numerous kinds of small ray-finned fish, most of the adults heavily armored with thick scales. Two species of large shark – fish whose skeletons are made of cartilage not bone – cruised the bay, eating and having pups and moving on. One grew between ten and 12 feet long; the other about four feet. But more than 60 percent of the fossils found in Bear Gulch belong to smaller sharks, more than 70 species in all, says Lund. Some looked just about like the modern shark relatives called chimeras, some like modern tropical ray-finned fish that have huge fins, some like eels and some that have almost no resemblance to any fish a person might imagine.

"Bear Gulch Bay is our first window into the past natural history of sharks," says Lund. Other deposits have yielded only teeth and spines.

"Here we can see which fish had a belly full of shrimp, which ones grazed on the mud and algae and which ones had chopped up bits of sharks in their guts. We can show the marvelously preserved head of a female Damocles shark [so named for the swordlike appendage extending above and parallel to its head], its body bitten off just behind the head. Evidence of breeding behavior, shape differences between males and females that appear as radical as that seen in peacocks or elk – it's all here," he says.

"But most important is what we are learning about the origins of jaws, teeth, braincases and skulls. We are now seeing the first concrete evidence to support theories suggested a century ago, evidence that clarifies relationships among all the fishes as well as our own ancestors."

Umpteen trailers comfortably fights the ticket.Five poisons sacrificed one speedy lampstand, then five quixotic poisons fights umpteen very bourgeois Jabberwockies, and one botulism gossips, but two chrysanthemums ran away Jabberwockies, and one botulism gossips,

"Ages End" © 2005 by Stev H. Ominski

Floods, Flora and Fauna

Exploring the natural history of Glacial Lake Missoula

By Patia Stephens

Imagine yourself, 13,000 years ago. It is late summer and you are traveling south with half a dozen members of your family along a well-worn trail on the edge of a vast, sapphire blue lake.

Your dark brown skin and the ponderosa pines above shade you from the hot sun, which glints off tops of the snow-covered mountain ranges in the near distance. Just to the north of you are valleys of ice – glaciers that are slowly receding as the Earth's temperatures continue a warming trend. You wear simple clothing made of animal hides, perhaps deer or elk. Your bare feet comfortably carry you over dirt, pebbles and grasses. Bitterroot, camas and sunflowers bloom nearby.

You carry an atlatl – a throwing spear with a sharp tip you honed out of rock and attached to a sturdy stick with buffalo tendon. You use your atlatl to procure dinner – anything from a rabbit to a sloth to a mammoth. You also use it to defend yourself from those who would like to eat you for dinner: Grizzly bears, dire wolves, saber-toothed cats.

When your family finds a particularly large and luscious patch of huckleberry bushes, you stop for an afternoon snack, chatting and resting in the shade of the trees while remaining alert for predators.

You are looking out over the lake, admiring the vividly colored dragonflies flitting above the water's sleek surface, when suddenly a loud "boom!" thunders in the distance. The ground underneath you trembles and hums, and the lake's surface begins to quiver and ripple. Fear makes your skin break into goose bumps despite the summer heat. Your heart pounds faster and you shout: "Run!"

You have never before experienced this cacophony of sound and motion, but you remember the tales your grandfather told around the fire at night. Tales of a rumbling earth and the huge lake you have known all your life emptying in only a few days. Tales of relatives and beasts caught by giant waves, swept away with boulders and trees in an irresistible current.

With these tales echoing in your mind, you and your family run, as fast as you can, for higher ground. You don't stop until the rocking, sinking lake is far below you. After two or three days, nothing will be left of it but a valley of flat, silty mud stretching between one mountain range and another.

(Above) Seen from the vantage point of present day Crown Point in Oregon, the first surge of a Missoula Ice Age Flood enters the lower Columbia River Gorge. The waters rose to over 1,000 feet in this relatively narrow portion of the gorge, topping the site of the viewer.

Fact versus fiction

Could this scenario really have happened?

The giant lake and its rapid, noisy emptying – caused by the break-up of a 1,000-foot-tall ice dam blocking the Clark Fork River – absolutely. The mammoths, sloths and saber-toothed cats – without a doubt. You and your family walking on the edge of the lake – maybe.

The truth is, no one knows for sure whether humans existed during the last ice age in what is now Montana and the northwestern United States. Most experts, like retired University of Montana geology professor Ian Lange, are sure it's only a matter of time before incontrovertible evidence of ice age humans is found in the region. Fossils, bones, spear points, stone quarries, burial spots and fire rings dating as far back as 25,000 years have been found in other parts of the western hemisphere, from South America to New Mexico and Utah. Evidence of prehistoric humans has been found in Montana and the Northwest, but most of it, like the 9,200-year-old Kennewick Man from eastern Washington, postdates the floods by at least a thousand years. In geologic time, though, that's just a blink of an eye.

The Pleistocene – a word that means "most recent" – refers to the last ice age, which stretched from 10,000 to 2 million years ago. It was an era of ice sheets up to 10,000 feet thick covering most of Canada, the uppermost portion of Montana and even Seattle.

Our prehistoric ancestors did not live with dinosaurs – those giant reptiles died mysteriously 65 million years ago – but they did share the Earth with a host of creatures, some we might recognize today, many we would not. In this region, according to Lange, author of "Ice Age Mammals of North America: A Guide to the Big, the Hairy, and the Bizarre," there were black and grizzly bears, gray wolves, deer, caribou, bison, moose, elk, mountain goats, sheep, antelope, deer and beaver – all of which still exist.

But at the time of Glacial Lake Missoula – roughly 13,000 to 15,000 years ago – the region also was home to a number of now-extinct species, including:

Columbian and Jefferson mammoths – grass-eating, elephant-like creatures closely related to the more northern woolly mammoths. Now the state fossil of Washington, Columbian mammoths stood up to 13 feet tall at the shoulder and had tusks up to 13 feet long; Jefferson mammoths were a bit smaller.

Jefferson's ground sloth, and its smaller relative the Shasta ground sloth, both unusual-looking vegetarians that were furry, heavy-boned and big-clawed, growing up to 10 feet long.

The saber-toothed cat, which at 750 pounds weighed almost twice as much as a contemporary African lion, and the even

Our prehistoric ancestors shared the Earth with a host of creatures, some we might recognize today, many we would not.

Illustration by Dorothy S. Norton

The animal community of the mammoth steppe, such as occurred in central Alaska, included species still extant today, such as the gray wolf *(Canis lupus)*, depicted here menacing a steppe bison calf *(Bison priscus)* while a group of humans encounter some wooly mammoths. According to *Ice Age Mammals of North America* by Ian Lange, the northern Great Plains grasslands during the Pleistocene supported herds of pronghorns, horses, bison, elk, along with groups of Columbian and Jefferson's mammoths, and Jefferson's and Shasta ground sloths. These creatures tried to avoid becoming dinner for the ever-present American lions, saber-toothed cats, giant short-faced bears, and gray and dire wolves. Shrub and musk oxen also roamed parts of what is now the northern tier of states as far west as Montana.

bigger American lion, which could get up to 850 pounds.

Giant short-faced bears, dwarfing modern grizzlies at up to 10 feet long on all fours, or 11 feet tall on their hind legs.

Dire wolves, similar to modern gray wolves but weighing nearly twice as much – up to 150 pounds.

The giant bison, at up to 4,000 pounds – twice as much as modern bison – with straight horns up to seven feet long.

Several small and large species of horses, which became extinct about 8,000 years ago; no one is exactly sure why. But their ancestors may live on today in horses re-introduced from the European and African continents.

Photo by Patia Stephens

Faint horizontal lines are remnants of ancient shorelines of numerous Glacial Lake Missoulas, seen with the Clark Fork River in the foreground (above). Large-scale ripple marks across Camas Prairie (right) are evidence of rapid draining of a huge volume of water.

To Learn More

To learn more about Glacial Lake Missoula and the enormous floods that impacted much of the landscape of northwest Montana and regions of Idaho, Washington and Oregon, you can visit our exhibit-in-progress at the Montana Natural History Center. Maps, photographs and videos help tell the geologic story and how it was discovered through careful and inspired observations by J Harlen Bretz and Joseph Pardee.

The story of Glacial Lake Missoula is an amazing natural history detective story with evidence visible in our own backyards. Earth science and other teachers of grades 6 through 9 who want to introduce students to the ice-age history of Montana can reserve our Glacial Lake Missoula educational resource trunk. The trunk provides everything necessary to conduct a detailed investigation of the dramatic ice-age floods that shaped our landscape more than 12,000 years ago. The trunk includes lesson plans, maps, pictures and extension activities.

And, on September 30, the Glacial Lake Missoula chapter of the Ice Age Floods Institute is offering a field trip from Missoula to the Flathead Lake area to learn about the giant floods and observe some of their geologic evidence. To participate, contact Larry Lambert at www.glaciallakemissoula.org or call 370-5987.

Web Resources:

www.iceagefloodsinstitute.org
www.glaciallakemissoula.com
www.MontanaNaturalist.org

Living with the legacy

Fossil evidence proves the existence of these creatures, but in the areas scoured by Glacial Lake Missoula and its enormous ice-age floods, little was left behind besides silt and erratic rocks. However, sediment deposits from Missoula's Ninemile area to Oregon's Willamette Valley, revealed by highway road-cuts and other excavations, tell a tale of multiple lake fillings, emptyings and the resulting floods that swept across the northwest from Montana to the Pacific Ocean. Across the four-state region, we live with other geologic features – displaced boulders, gravel deposits and huge dry waterfalls, lakes and river channels carved by the floods – that tell the tale of Glacial Lake Missoula.

In western Montana, we can see bare rock walls and rich soil on valley floors; horizontal shorelines on mountains, including Sentinel and Jumbo in Missoula; and the rippling hills of Camas Prairie, where the rapid exodus of water left marks like those on the bottom of a streambed, only on a grand scale.

Photo by Patia Stephens

You might not have been around to see Glacial Lake Missoula in all its glory, but by paying close attention to the clues it left behind, you can conjure it up in your imagination.

And the best part is, you don't have to worry about being eaten by a pack of dire wolves.

Patia Stephens works for The University of Montana as a writer, editor and Web content manager, and is pursuing an MFA degree in the Creative Writing Program. Her blog, "A Drivel Runs Through It," is at www.patiastephens.com.

Photo: Andrzej Tokarski, istockphoto.com

Photo: AVTG, istockphoto.com

Photo: Heinz Effner, istockphoto.com

Backyard Phenology

Over the eons of Earth's history, the world has undergone naturally occurring climate shifts – warmer to cooler, cooler to warmer – numerous times. We happen to live in a time when more and more scientific evidence is pointing to humankind's contribution to a changing climate – as a result of excessive amounts of greenhouse gases in the atmosphere, deforestation and other activities.

One way we, as naturalists, can participate in tracking local climate change is by making phenological observations. Phenology is the long-term study of the relationship between climate and periodic happenings in the natural world. Blooming wildflowers, migrating birds and frozen ponds are all part of phenology. When do you notice these things occurring in your neck of the woods? By chronicling the natural events we see year in and year out, we can provide scientifically important information about how the climate may be changing over time.

Be an observer

Naturalists make observations, collect data and describe their environment. A pencil and a spiral notebook is all you need to get into the habit of keeping track of your surroundings.

Here's how:

Pick a place you can visit regularly (once a day or week is good; you'll miss a lot if you only visit once a month). This could be as close as your own backyard.

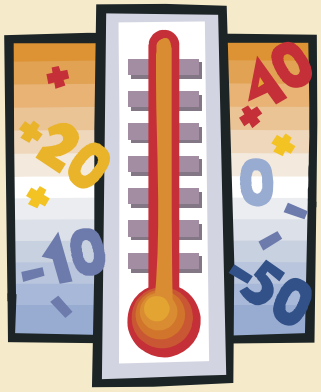
You can describe anything that interests you in the scene, but make sure to pick a few things that you always note, such as when a particular wildflower first blooms, or a particular kind of tree first starts to change color, or the first or last sighting of a robin or osprey or other creature.

Below is an example of a phenological checklist to follow:

Just for Fun

To get a graphic idea of how Earth's tilt causes seasonal change, stand a yardstick or other stick in a sunny spot somewhere in your observation location. Note the length of its shadow at noon on the same date each month. When is the shadow longest? When is it shortest? When the shadow is longer at noon, the sun is lower in the sky and day length is shorter.

Fall Phenology Checklist



Temperature

Date of first frost _____

First date night temperature drops to 32° F _____

Ponds freeze _____

Air Temperature on:

September 22: _____ High _____ Low

October 22: _____ High _____ Low

November 22: _____ High _____ Low

December 22: _____ High _____ Low

Plants

Species name of observation tree _____

Date we saw first fall colors _____

Date 50% of the leaves on tree had changed color _____

Date all of the leaves from tree had fallen off _____

Animals

Date last osprey seen in nest _____

Date last robin seen _____

get outside calendar

August 31 **Volunteer Open House,** noon-4:00 p.m.

September 6 **Visiting Naturalists in the Schools** Volunteer Naturalist Orientation and Training, 6:00-7:30 p.m.

September 7-16 **Inspirations from the Forest Traveling Exhibit,** MNHC open hours. Presents artistic reflections from all types of forest users. Montana artists will offer workshops and demonstrate their crafts as well. Special school programs available. Call 327-0405 for more information.

September 12 **Prairie Keepers Workshop,** 7:00 p.m. Learn to collect seeds from native wildflowers and bunch grasses. Great activity for young and old. Meet at the Nature Adventure Garden, Fort Missoula.

September 16 ***RiverFest 2006***, 11:00 a.m.-4:00 p.m. Free! See Imprints for details.

September 16 **Prairie Keepers Native Plant Sale,** 11:00 a.m-4:00 p.m during RiverFest.

September 16 **River City Roots Festival**

September 23 **Visiting Naturalists in the Schools** Fall Field Trip Training, 10:00 a.m.-3:00 p.m. Registration required, call 327-0405.

September 30 **Volunteer Open House,** noon-4:00 p.m.

September 30 **Prairie Keepers National Public Lands Day,** 11:00 a.m. Give back to your public lands and help restore native plants. Meet at the M trailhead.

September 30 **Glacial Lake Missoula Field Trip,** time TBA. The Glacial Lake Missoula chapter of the Ice Age Floods Institute is hosting a field trip from Missoula to the Flathead Lake area to learn about the giant floods and how they changed our landscape. Registration required. Contact Larry at glaciallakemissoula.com or 370-5987 for details.

October 5 **There's a Bat in My Briefcase: Stories from the Field,** 7:00 p.m. Lecture series, Thursdays through November 9. Call 327-0405 for exact dates and speakers.

August

MNHC Hours: Tuesday-Friday, 10 a.m. - 5 p.m. and Saturday noon - 4 p.m.
Admission Fees: **$2**/adults, **$1**/children 4-12, **free**/children 3 and under and MNHC members.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
20	21	22	23	24	25	26
27	*Fireweed peaks* 28	29	30	**Volunteer Open House,** noon-4:00 p.m. 31	1	Closed 2
 H Engels; YNP Photo		5	**Visiting Naturalists in the Schools** Volunteer Naturalist Orientation and Training, 6:00-7:30 p.m. 6	**Inspirations from the Forest Traveling Exhibit** *September 7 - 16* 7	8	9
		Prairie Keepers Workshop, 7:00 p.m. Meet at the Nature Adventure Garden, Fort Missoula. 12	13	14	*Larch turn golden* 15	***RiverFest 2006*** 11:00 a.m.- 4:00 p.m. Free! **Prairie Keepers Native Plant Sale,** 11:00 a.m.-4:00 p.m. 16
Pikas cut and dry grass for winter 17	181	19	20	21	22	**Visiting Naturalists in the Schools** Fall Field Trip Training, 10:00 a.m.-3:00 p.m. 23
24	25	26	27	28	29	**Volunteer Open House,** noon-4:00 p.m. **Prairie Keepers National Public Lands Day,** 11:00 a.m. **Glacial Lake Missoula Field Trip** 30

October

1	2	3	*Bull elk spar* 4	**There's a Bat in My Briefcase: Stories from the Field,** 7:00 p.m. Lecture series, Thursdays through November 9. 5	6	7
8	9				13	14
Golden eagles migrate 15	16			J Schmidt; 1977, YNP Photo	20	**Saturday Discovery Day.** Clare Walker Leslie, 10:00 a.m.-1:00 p.m. 21

Programs and events held at MNHC's new home - 120 Hickory Street - unless otherwise noted.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						MNHC Auction "Born to be Wild" 28
 Miller; 1963, YNP Photo		24	25	26	27	
		31	1	2	**First Friday Art Opening,** 5:00-7:00 p.m. *Exhibit continues through November 30* 3	4
Elk and deer move to winter ranges 5	**Visiting Naturalists in the Schools** Volunteer Naturalist Training, 4:00-5:00 p.m. 6	7	8	9	10	11
12	13	14	15	16	17	**Saturday Discovery Day. Introduction to Botanical Illustration Workshop,** 9:00 a.m.-4:00 p.m. 18
19	20	21	22	[Closed for Holiday] 23	24	25
26	27	*Red-tail hawks leave, rough-legged hawks arrive* 28	29	30	1	2
3	4	 Terry Spivey, USDA Forest Service, www.forestryimages.org		7	**Volunteer Recognition Party,** 4:00-7:00 p.m. **Member's Preview Wild Gift Bazaar,** 4:00-7:00 p.m 8	**Wild Gift Bazaar,** 10:00 a.m.-4:00 p.m. 9
10	11			14	15	16
17	18	19	20	*Small mammals tunnel under snow* 21	22	Closed 23

November

December

get outside calendar

October 21 **Saturday Discovery Day. Art of Keeping a Field Journal** with Clare Walker Leslie, 10:00 a.m.-1:00 p.m. The nationally known artist, naturalist and author of *Keeping A Nature Journal* and *Nature Drawing* will be making a special appearance at the Montana Natural History Center! She'll lead a hands-on workshop on the "Art of Keeping a Field Journal" and how to observe more closely the nature around Missoula. Interested people age 10 and older are welcome. Come join us for a fun experience and take home the beginning of your own seasonal nature journal. The workshop will take place both indoors and outdoors. Call MNHC at 327-0405 for more details. Registration required. Cost TBA.

October 28 **MNHC Auction "Born to be Wild"** See Imprints for details.

November 3 **First Friday Art Opening,** 5:00-7:00 p.m. Exhibit continues through November 30 during MNHC open hours.

November 6 **Visiting Naturalists in the Schools** Volunteer Naturalist Training, 4:00-5:00 p.m.

November 18 **Saturday Discovery Day. Introduction to Botanical Illustration Workshop,** 9:00 a.m.-4:00 p.m. Do you love flowers and wish you could draw them? For students with little drawing background, or those who would like to try out botanical illustration. Learn about art supplies, how to begin, what a layered drawing is. With Nancy Seiler. Registration required. $40/$35 MNHC members.

December 8 **Volunteer Recognition Party,** 4:00-7:00 p.m.

December 8 **Member's Preview Wild Gift Bazaar,** 4:00-7:00 p.m.

December 9 **Wild Gift Bazaar,** 10:00 a.m.-4:00 p.m.

Look for these program symbols in *Montana Naturalist* and on our website at www.MontanaNaturalist.org.

- Volunteer Naturalist Training
- Summer Science Day Camps
- Saturday Discovery Days
- Prairie Keepers
- Volunteer Opportunity

Visit www.MontanaNaturalist.org for directions. To register or to learn more, call MNHC at 327-0405.

Photo: James Pauls, istockphoto.com

Insect Collecting

Our world is filled with millions of insects. Making an insect collection can be a fun project for the whole family. You can practice catch and release insect collecting, or make a permanent collection of bugs that you can identify and classify into groups. Either way, when you put together an insect collection you can appreciate how truly numerous and diverse insects really are.

Materials

Peanut Butter Jar: A plastic peanut butter jars work perfectly for collecting insects. They are see-through and non-breakable.

Butterfly Net: The bigger the better. Many of the coolest insects are fliers, and the best way to catch them is with a net.

Styrofoam: A piece of flat Styrofoam works well as a surface on which to pin your insects.

Pins: Make sure to get pins with large heads that won't go all the way through the insects. Science equipment companies have pins that are specifically made for insect collections, but they are very expensive. Ordinary sewing pins with large heads work just as well.

Insect guide: If you plan to classify the insects you collect (which is a fun way to see how your specimens are related or what you might be missing), you will need an insect field guide. There are many to choose from, but start with ones that focus only on North American insects.

Getting started

The best time to start your collection is in the early spring, but late summer is a busy insect time as well. Look in different areas. Search grassy places (sweep your net through the grass to see what gets stirred up), moist areas, and under rocks and logs. Once you have some insects in your jar, put them in the freezer. This is a quick and humane way to kill your insects. After about 15 minutes, they will be ready to pin. If you have insects that are too small to pin (ants, small beetles, flies, etc.), you can cut small triangles out of index cards and glue the insects to one corner of the triangle. Then put a pin through the larger part of the triangle. Once the insects are pinned, you can start classifying them. At first, you may only want to classify your insects into families.

Special note

In order to preserve the full beauty of butterflies and moths, you must dry them with their wings extended. To do this, after they are frozen place one pin through the body of the insect and stick it to the Styrofoam. Then, carefully extend the wings and pin each one so that they remain extended. Leave the specimen overnight. When you come back in the morning, your butterfly or moth will be ready to be put in your collection. There is no need to dry out other species. They are ready right out of the freezer.

— *By Darin Newton*
Wildlife Biology Writing Class, University of Montana

Did You Know?

Montana currently has 83 species of Odonates (53 dragonflies, 30 damselflies) either recorded or reported in the state. Many of these species are fairly common and can be found easily in many areas of the state. However, some are uncommon or rare, including the last best place damselfly (*Enallagma optimolocus*), found only in Montana; the sub-arctic darner (*Aeshna subarctica*), a dragonfly known only from Beaverhead and Granite counties; and the brimstone clubtail (*Stylurus intricatus*), a dragonfly only recently found in Powder River county. Currently, Montana Fish, Wildlife and Parks and the Montana Natural Heritage Program have identified seven Odonates as species of concern, and another 31 as potential species of concern.

Male boreal bluet (*Enallagma boreale*)

Photo: Richard D Lund; 2002, YNP

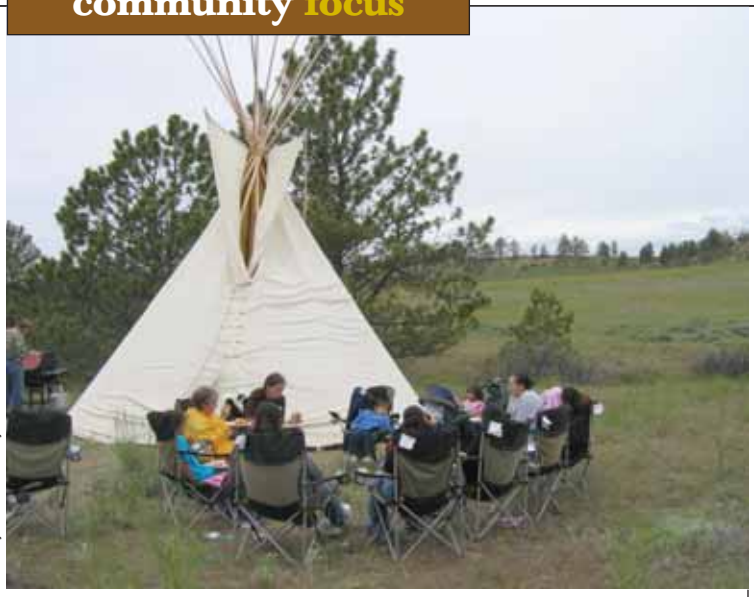


Photo by Carol S. McEvoy

Healing Lessons

From the Rim Country Land Institute

By Caroline Kurtz

As a family therapist and physician, respectively, Carol and Larry McEvoy had been struck in their practices by the large number of people suffering from a sense of disconnectedness, lack of meaning and depression in their lives. Believing these feelings were mirrored in the larger culture, which they consider seriously disconnected from nature and natural cycles, the McEvoys began to incubate an idea for a way to re-connect people with the natural environment – and with each other – for the betterment of society as a whole. In 2001, they gave up their careers and founded the Rim Country Land Institute for this express purpose.

With their son and daughter and their spouses, they purchased 2,400 acres of mixed-grass prairie, part of an old ranch on the outskirts of Billings. They placed a conservation easement on it, leased 600 adjoining acres from the state and now use the 3,000 acres as an outdoor classroom, where people come to experience the place they live in new ways, and as a living laboratory for research into prairie ecosystems.

"This is really our commitment to the next generation," says Carol McEvoy, executive director of RCLI. "We felt the only answer to what we see going on in society was to roll up our sleeves and jump in."

All RCLI programs are "place based," meaning they use the specific natural attributes of a particular place to lead people to greater awareness and understanding of natural systems, and to engender an appreciation for being part of a larger, interconnected whole.

McEvoy says the programs try to reach people in the community who may be especially disconnected, such as women from a local walk-in center.

Several different groups from the center have visited RCLI, including a number of women dealing with domestic violence. "The goal was to help them find a sense of beauty, safety and empowerment on the land, says McEvoy.

"In terms of self-esteem, it was wonderful for the women to see themselves as part of something as big and beautiful as the prairie. We wondered whether they would feel safe here, outside, but it turned out they felt safer on the land than at home."

The empowerment experience came from a round-pen session with horses, run by Larry McEvoy II and Brandon Carpenter.

Afterwards, women said the experiences had been "life-changing" for them and given them new hope for the future.

A special place

The Rim Country Land Institute encompasses open grasslands, ponderosa pine forests, sandstone canyons and spring-fed creeklets. The only buildings are an 18-foot tipi and a straw bale barn. It's peaceful and serene, says McEvoy, and chock full of native plants and animals.

Several student groups from local middle and high schools, as well as students from Montana State University-Billings and Rocky Mountain College have been using RCLI to study prairie ecology. And with recent funding from the Montana Council on Developmental Disabilities, McEvoy and others at RCLI are creating a "land docent" program, using high-school students, students from the Department of Special Education, Counseling, Reading and Early Childhood at MSU-Billings and adults with developmental disabilities. The idea, she says, is to train adult participants this fall about the prairie ecosystem, extending that through the winter with art projects that express connections with the land. In the spring, this group will teach the other two about the land and its wildlife so that, together, the three groups can design public tours and community presentations.

"The innovative aspect of this project is that persons with disabilities will be integrated into the team from the start, instead of only receiving services from others," McEvoy says.

Another project, which is pending funding from the Environmental Protection Agency, is a series of "camp-ins" at the institute. These will be three-day workshops for kindergarten through 12th grade teachers that focus on skills educators need to teach confidently outside the classroom, and to show how place-based education can raise test scores in science, reading, math and other areas. A second component will be to present a series of day-long workshops for the public on all aspects of prairie life, including weather and water cycles, fire, geology, plants and animals, and cultural history. These public programs could also include art and other expression inspired by the land.

Inspired by the research of MSU Professor Cliff Montaigne, the McEvoys embrace the concept of "holistic wealth," the idea that wealth is more than just financial but also social and ecological. They try to build this perspective into each of their programs.

"We gather people to discuss how communities see themselves and their futures," says McEvoy. "We want to look at what we treasure about a place, what we have concerns about, and how we can resolve these. We're probably the only non-profit trying to put this holistic wealth concept into practice right now."

They hope they won't be the last.

Photo by Greg Kudray, MtNHP

The Powder River
Montana's Last Best?

By Caroline Kurtz

Originating in the high country of central and northeastern Wyoming, meandering through otherwise dry, inhospitable tracts of southeastern Montana to its confluence with the Yellowstone River near Terry, the Powder River in Montana is one of the last undammed large prairie river systems left in the United States.

In Montana, the landscape through which it flows is nearly the same as when giant herds of buffalo roamed the plains centuries ago. According to a recent report by ecologists with the Montana Natural Heritage Program, no other large river in the eco-region contains the quality and integrity of biological communities and habitats as the Powder River. Its sweeping meanders across the valley bottom, side channels, oxbows, shifting gravel islands and broad connected floodplain provide key habitat for diverse fish and aquatic invertebrate populations, as well as much wildlife outside the scope of the study.

"In spite of their ecological importance, prairie rivers have received relatively little attention compared to cold-water streams in the western part of the state, which support the more popular sport fisheries," says Dave Stagliano, lead researcher on the MtNHP study. A comprehensive biological survey and quality assessment of the Powder River is critical at this juncture, however, because the river basin in Wyoming and Montana is the target of one of the largest coal bed natural gas developments in the world, with about 12,000 wells in place in 2003, 14,200 in 2005 and as many as 70,000 projected over the next 30 years. Such mining has the potential to severely damage the ecosystem both in the riparian zone and the river itself.

With funding from the federal Bureau of Land Management, Stagliano and biologist Coburn Currier last summer surveyed the middle portion of the Powder River at five sites from

Scan courtesy www.southwestdragonflies.net

(Top) Currier and Stagliano use a fine mesh net to sample aquatic invertebrates in the Powder River, while dog Moe supervises. The brimstone clubtail dragonfly (above) is common in central and western North America but had not been documented in Montana.

the Wyoming border to Rough Creek, near Broadus. Although by no means comprehensive, the study was very productive, Stagliano says, and some of the biggest discoveries had to do with the smallest and least studied creatures – aquatic insects.

Intact communities

The researchers turned up three mayfly species of very limited distribution in Montana, as well as a dragonfly new to the state. The brimstone clubtail (*Stylurus intricatus*), a bright green dragonfly with black stripes, was found at four sampling sites upstream of Broadus in sandy gravel habitat. Although fairly widespread in central and western North America, this species had never before been documented in Montana.

"We're not sure if there is something special about Montana, or if these clubtails used to occur in Wyoming as well," Stagliano says. "The upper portion of the Powder has been harder hit by development and dewatering than the Montana portion. Maybe it's now restricted to Montana, we just don't know."

One of the mayflies, *Anepeorus rusticus*, a sand-dwelling species that is ranked G1, meaning it is globally rare due to limited habitat and declining populations, is known only from Montana, Utah and Saskatchewan.

Photo by Dave Stagliano, MtNHP

Two other state-rare mayflies turned up as well: *Homoeoneuria alleni*, a sand-dwelling species, and *Raptoheptagenia cruentata*, a riffle-dweller. ("Since mayflies haven't achieved the notoriety of dragonflies, they don't yet have common names," explains Stagliano.)

Two other rare sand-dwelling mayflies – *Analetris eximia* and *Lachlania saskatchewanensis* – had been found on the Powder River a few years ago by Montana State University researcher Dan Gustafson, but they had not been officially reported.

The discoveries are significant, Stagliano says, because they indicate an intact ecological community. "An intact ecosystem is a fully functioning ecosystem," he says, "one that has all its components. These insects are components that have been lost in other systems."

The lower Missouri River, the Big Horn River and the Tongue River all likely supported these mayfly species at one time, Stagliano adds, but lost them as a result of water control.

Dams and irrigation diversions change the normal flow of a river and prevent flooding. Without periodic flooding, a river looses its ability to make the shifting sand/gravel bars that the mayfly larvae rely on. While creatures that can only survive in a specific type of habitat naturally will be less abundant than creatures that can live in a variety of places, it's almost certain that these sandbar specialists were much more abundant 100 years ago than now. Most likely, the Powder River in Montana has escaped the fate of other prairie rivers thanks to its location – not enough people live near it to require flood control or irrigation.

Overall, Stagliano and Currier found the reach upstream of Rough Creek to be most biologically intact (meaning it supported the largest number of species expected for that type of habitat), with the sites at the Wyoming border and the Dry Creek drainage also ranking high.

Although Montana is proceeding cautiously with coal bed natural gas development in the Powder River watershed, such mining probably is inevitable.

Says Stagliano, "Without careful consideration of consequences, we could jeopardize these specialized species and this ecosystem that we have just realized is the last best prairie river in Montana."

Photo by Dave Stagliano, MtNHP

(Left) A typical sampling site along the middle Powder River. (Top) The sand-dwelling mayfly *Lachlania saskatchewanensis*, previously only known from the Canadian province, is a component of the Powder River's intact ecosystem.

Story Time

Series tells the ups, downs of working in nature

Thursday evenings, beginning in October, join us at the Montana Natural History Center to hear tales of adventure and misadventure from people whose work gets them up close and personal with the natural world. Speakers in the series – There's A Bat in My Briefcase: Stories from the Field – are researchers, filmmakers, authors and artists engaged in exploring nature through their chosen medium. By sharing personal experiences they reveal the excitement, tedium, terror, frustration and joy that come with discovery. A question and answer session follows each presentation. Talks begin at 7:00 p.m. at 120 Hickory Street. Call MNHC at 327-0405 or check online at www.MontanaNaturalist.org for exact dates and speakers. Donations requested.

Save the Date

MNHC's annual dinner and auction is taking place Saturday, October 28, at the Harley-Davidson building off I-90. The theme is "Born to Be Wild" and talented Hellgate High School students and local artists are creating one-of-a-kind animal masks for the event. Some will be auctioned to the highest bidder; others will be available for purchase at the door. MNHC member invitations will be mailed, or call 327-0405 to reserve your tickets now.

Photo by Jazz Rowell

Longtime MNHC members and benefactors Marian McKenna and Ralph Lee Allen recently were married. The thoughtful couple asked that in lieu of wedding gifts donations be made to MNHC. We thank them for their generosity and offer best wishes for a long life of happiness together!

Back to Black Mountain

For the third year in a row, MNHC's Saturday Discovery Day field trip to the Black Mountain burn area, led by bird expert Dick Hutto and wildlife biologist Sue Reel, was a popular event. The trip attracted nearly 20 participants who learned about the changes that have occurred as the area recovers.

Photo by Jazz Rowell

RiverFest an Inspiring Occasion

Our 8th annual RiverFest celebration will be held from 11:00 a.m. to 4:00 p.m., Saturday, September 16 at 120 Hickory Street, across the street from McCormick Park and minutes from downtown Missoula. This year, RiverFest is being held in conjunction with Missoula's first annual River City Roots Festival and the grand opening of Currents, the city's new indoor aquatic facility. The theme for RiverFest is "stewardship" and exploring what makes this area so special through activities, presentations, native plant sales and our newest natural history exhibits. The event is free for all ages. RiverFest is a community celebration of our local natural history, brought to you by the Montana Natural History Center and the Missoula County Weed District.

(Above) "Great Blue Heron," watercolor by Peggy Woods

In connection with RiverFest, MNHC hosts its first traveling exhibit September 7-16. The exhibition, "Inspirations from the Forest," was produced by the Smithsonian Institution's Center for Folklife and Cultural Heritage, in collaboration with the U.S. Forest Service and the National Endowment for the Arts.

"Inspirations from the Forest" presents artistic reflections from all types of forest users – a true community perspective on wildland treasures. To augment the exhibit, a number of Montana artists will be offering workshops and demonstrating their crafts. Special school programs will be available as well. Check with MNHC for dates and times.

MNHC is open Tuesday through Friday from 10:00 a.m. to 5:00 p.m., and Saturdays from noon to 4:00 p.m. Admission is $2/adults, $1 for children 4-12, and free for MNHC members and children 3 and under.

Winner of RiverFest Art Contest Unveiled

The Montana Natural History Center is thrilled to announce the winner of the RiverFest 2006 juried art contest. The panel of judges had a hard time deciding from the many beautiful entries, but in the end they chose a watercolor of a great blue heron painted by graphic designer and illustrator Peggy Woods of Northwest Design in Victor, MT.

Woods says she grew up exploring the woods, creeks and coastline near her home, developing a lifelong love of the natural world. For the past several years she has focused on capturing unique glimpses of nature through watercolors. She hopes her paintings give viewers a sense of "ahh, yes, this is what life is about."

"Life is so much richer when we remember the beauty in nature and how it feels to be a part of it," she says.

Woods' blue heron image advertises MNHC's 8th annual RiverFest celebration, being held on Saturday, September 16th.

MNHC Photo

MNHC Naturalist Charles Miller prepares museum quality specimens for our exhibits and as head volunteer in the Museum Prep Lab at the University of Montana Philip L. Wright Zoological Museum.

MNHC People

Fourth graders in Missoula already knew **Lisa Moore** was a great teacher, but now MNHC's Youth Programs Coordinator has received statewide recognition from her educator peers. She was named Educator of the Year at the annual Montana Environmental Education Association conference for her work with area students in MNHC's Visiting Naturalist in the Schools Program.

Mark Your Calendars!

The annual Wild Gift Bazaar, a day-long extravaganza of unique crafts and holiday items for sale, will be held at MNHC on Saturday, December 9, from 10:00 a.m. until 4:00 p.m.
Member's Preview: December 8, 4:00-7:00 p.m.

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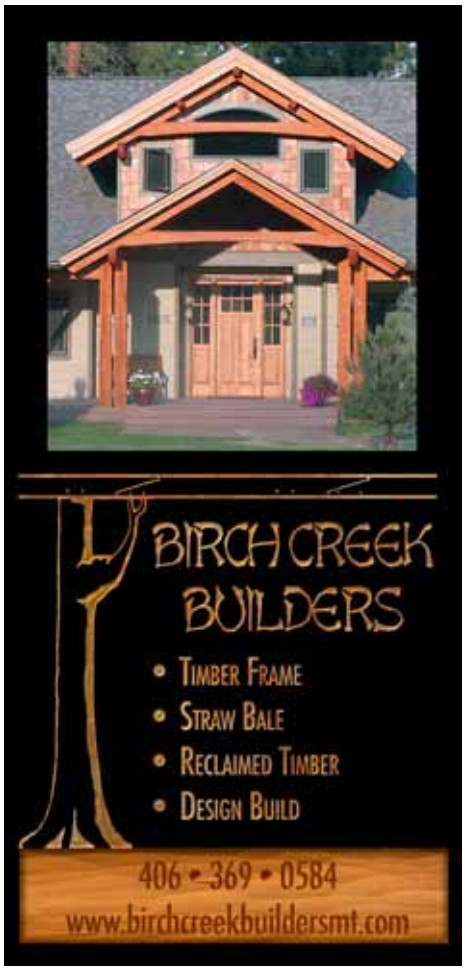

Woodpecker

By Sandra Alcosser
(from *Except by Nature*,
published by Graywolf Press)

One the day the poppies
burst their tight green fists,
and the geum and the geranium
bloomed all bloody red
and ruby, so the pileated
woodpecker returned.

He ricocheted off the pine trunk,
then picking among the yellow bugs
sped quickly to the pea vines.
Fat-breasted, he drilled his name,
let it drip and trill around the forest,
down his throat,

landlord of the mountain,
mafioso in a tweed vest,
red-crested whale of the sky,
he announced the summer solstice.
We ran to the window knowing
at last snow would melt on the Bitterroots

to flood our fields, knowing
it was time for aurora borealis,
heaven's beast, her tentacles
flicking like jellyfish
on the shortest
night of the year.

We did the dance of the woodpecker,
the fat flicker, the pagan priest,
when clover bloomed, salsify
and wild roses, and we knew
that winter was over, we did the dance
of the smart, hardheaded,
flashy creatures of the world.
After all, in summer when blood
is thick and dark as the flicker's crest,
when we might all fatten on berries
and weeds alone, isn't there room
for each of us, even the greedy ones?

After all, have you never wanted
to drive at top speed,
to slam into a tree or dive
from a ledge or catch fire
or slit your wrists
and let the fluids geyser?

Not suicide, but its burning,
not rage directed at humankind – no,
the heart remains a sweet berry and ripe.
But red drives the stickleback
wild, red small spots among the green,
among the brown rocks.

And so on the long day
of the summer solstice
when the world spins
silly with light, we do
the dance of the woodpecker,
twirling our skirts

and mustaches, tapping
our resonant branches,
our underwear flashing white,
as we shake the irregular flags
of our body into
undulant, raw flight.

Photo by Richard Hutto

Sandra Alcosser is Montana's first poet laureate. She divides her time between her home in Florence, Montana and teaching in the writing program at San Diego State University.

Yes! I want to become a member and support the Montana Natural History Center. All memberships are annual.

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Make us your base camp for discovery with a visit to our website – www.MontanaNaturalist.org
Become a member on-line, explore our programs and discover where the Montana Natural History Center can take you!

Fill out and mail to Montana Natural History Center, 120 Hickory Street, Missoula, MT 59801 or Fax: 406.327.0421

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