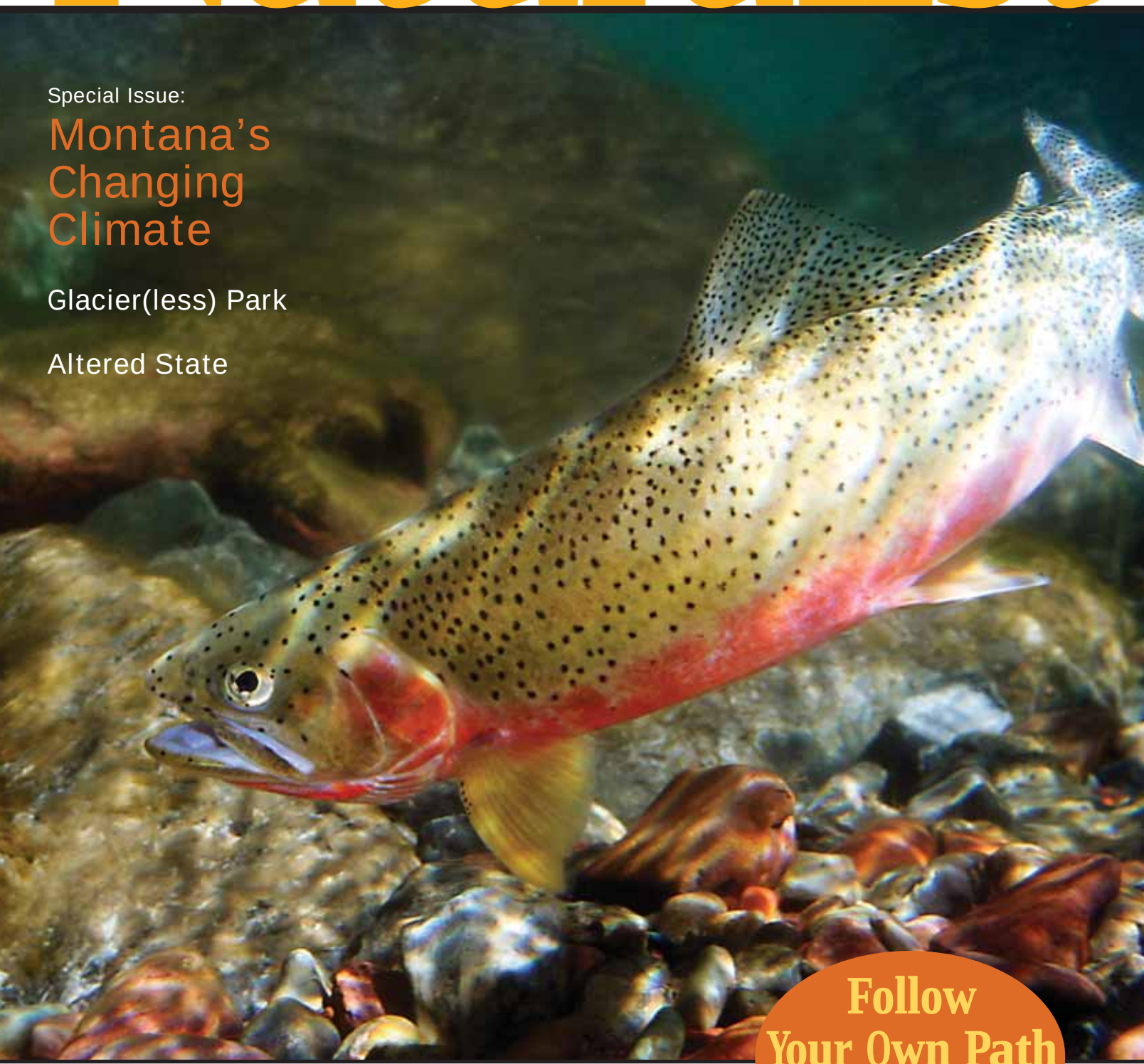
Fall 2007

MONTANA Naturalist



Special Issue:

Montana's Changing Climate

Glacier(less) Park

Altered State

Follow Your Own Path

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

Fall 2007

MONTANA Naturalist

Features

Departments

Special Pull-Out Section

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Cover photo – Westslope Cutthroat, North Fork Blackfoot River, Montana, taken by Pat Clayton (www.fisheyeguyphotography.com).

Correction – Due to an editing error, the osprey photo on page 4 of the Spring/Summer 2007 issue was attributed incorrectly. The photo was taken by Colorado photographer John Armitage.

Montana Natural History Center
Your Base Camp for Discovery

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www.MontanaNaturalist.org

tidings

Cow elk

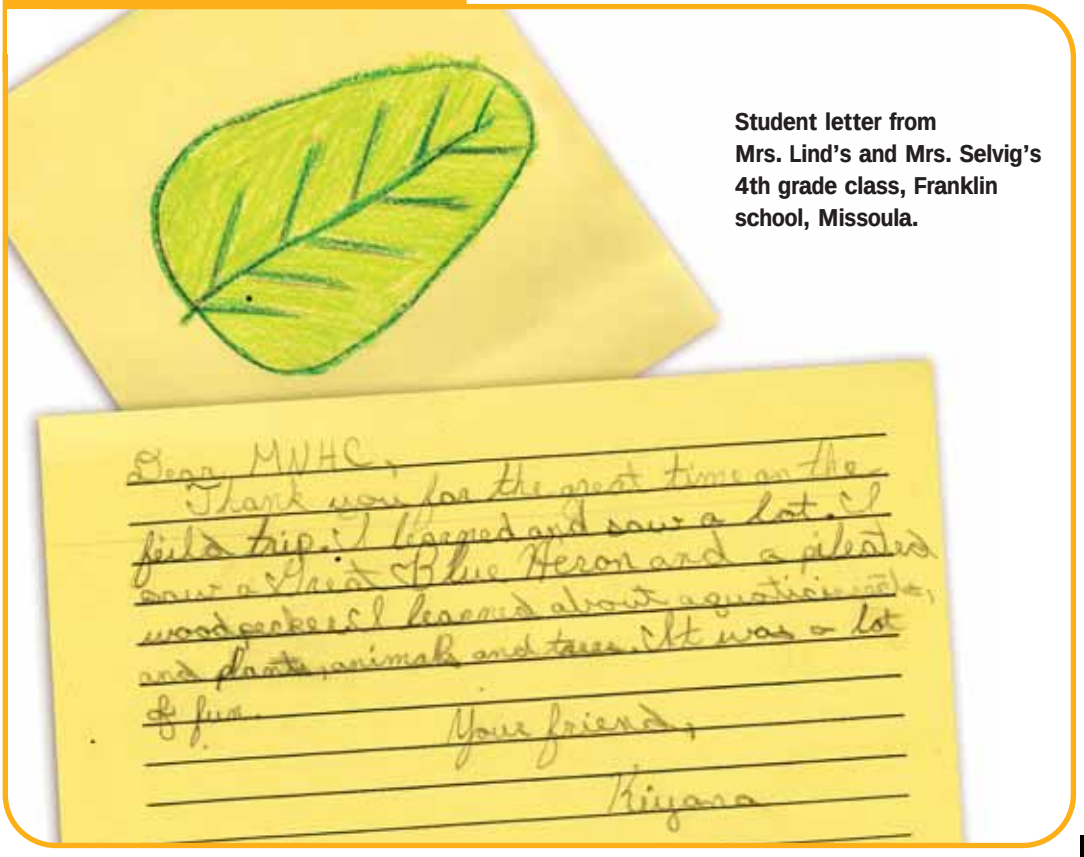
Photo courtesy Eugene Beckes

With this issue of *Montana Naturalist* we broach the subject of climate change as it may affect or be affecting familiar Montana landscapes and ecology. During this summer of heat and smoke, it's been all too easy to feel that a substantially different-looking future is a foregone conclusion. As articles in this issue point out, there is a lot of circumstantial and some hard evidence to support the idea of a permanently changed climate in Montana, and they suggest areas of our natural history that may be especially sensitive to change. However, we consider this issue just a beginning. We will continue to look for stories that illustrate what climate change might mean for us as research and observation add to our understanding of how less snow, earlier springs and longer, hotter summers impact plant and animal communities. We invite you to learn along with us about the various individuals, organizations and initiatives in the state involved in tracking change and helping conserve habitat to buffer its effects. In this issue see especially the online resources listed in the Get Outside Guide and Project BudBurst, a citizen-science project that can help quantify the effects of warming temperatures on seasonal phenomena. We hope this issue gives you something to think about and prompts you to renew or deepen your acquaintance with the incredibly rich and seasonally changing natural history of Montana. Fall is beautiful!

Caroline Kurtz

Caroline Kurtz
Editor

Letters



Student letter from Mrs. Lind's and Mrs. Selvig's 4th grade class, Franklin school, Missoula.

1911, (USGS)

Glacier National Park's Vanishing Namesake:

A Picture's Worth

By Deborah Richie Oberbillig

[Adapted from an article that originally appeared in Legacy *magazine (May/June 2007), published by the National Association for Interpretation (www.interpnet.com.) – Ed.]*

The icy burnish of glaciers draped across jagged peaks drew intrepid photographers to northwestern Montana at the dawn of the 20th century. Their stunning images played a pivotal role in convincing Congress in 1910 to designate Glacier as the 10th national park. Today, those same black-and-white archived prints, paired with modern photographs taken at the exact same locations, are bringing global climate change into sharp focus.

Rapid climate change affects every national park, but Glacier stands out for two reasons. The first is the vanishing of its namesake. The second is the convergence of science and interpretation in the Repeat Photography Project—the brainchild of ecologist Dan Fagre, the global change coordinator for the Northern Rocky Mountain Science Center of the U.S. Geological Survey.

For 7,000 continuous years, today's glaciers have shaped the land, water and wildlife of the park. Of the 150 glaciers photographers saw a century ago, only 26 remain and most are shards of their former

1913, W. C. Alden (USGS)

2005, Blase Reardon (USGS)

LEFT: Shepard Glacier from Pyramid Peak, Glacier National Park.

RIGHT: Piegan Glacier appears unchanged in this pair, but the meadow in foreground has undergone significant vegetation change. Although the Glacier has not melted noticeably, years of fire suppression and changing climate may have allowed the invasion of conifers in what was an open meadow in

1998, Lisa McKeon (USGS)

Grinnell Glacier taken from the Grinnell Glacier trail, Glacier National Park.

This pair of photographs depicts significant change in the size of Grinnell Glacier, whereas Gem Glacier, in the upper left of both photographs, does not appear to have changed much. Gem Glacier is Glacier National Park's smallest glacier and Grinnell Glacier is the park's most visited glacier.

A Thousand Words

grandeur. Less than a third of the glacier-covered landscape is left. In the past century, temperatures here have risen by 1.6 degrees Celsius—three times the global mean increase. Scientists predict that by the year 2030, Glacier will be glacier-less.

"Losing the glaciers is the equivalent of shutting down the geysers in Yellowstone National Park," says Fagre, who is stationed in West Glacier.

Fagre started the Repeat Photography Project in 1997 in the interest of science. He and his staff searched through a historic archive of some 12,000 photographs to unearth images of glaciers taken by Morton Elrod, T.J. Hileman, Ted Marble, F.E. Matthes, and several others, dating to the early 1900s. The next summer, researchers hiked with copies of photos in hand to the precise spot where the photographer had stood to record a glacier. Sometimes, they bushwhacked for miles through grizzly country, guided by GPS devices. Then, the modern photographer stepped into the ghostly tracks of a century ago and clicked a digital shot.

Since 1997, more than 60 photographs taken of 17 different glaciers are adding to the science and the interpretive story. Thirteen of these 17 glaciers show an alarming retreat. The few that don't, like Piegan Glacier, are protected from melting by facing north-northeast along the Continental Divide, where wind deposits winter snows. Even at Piegan, ecologists can see the effects of a warming climate by inspecting changes in vegetation around the glacier.

Glaciers and snowfields store water and release it slowly to recharge the streams and rivers over the summer. Fagre says the snowpack in the park now melts two to three weeks earlier than in the past. That sounds at first like good news for early access to the famed Going-to-the-Sun Road over Logan Pass. But the flip side is the park dries out sooner, which in turn leads to more wildfires than normal. High-elevation forests of spruce and subalpine fir that ought to be too wet to burn now become tinder dry by late summer. Streams dwindle or even dry up by late summer without late-season flows, harming fisheries, and shutting down angling seasons.

the foreground of the 1930 photo. Also, the demise of the ecologically important whitebark pine is visually underscored in this pair of photos. Notice how the rounded profile of the tallest trees (whitebark pine) in back of the meadow have been replaced by the spikey- topped sub-alpine fir in the 1998 photo. Dramatic declines of whitebark pine are caused primarily by white pine blister rust and fire exclusion.

1930, George Ruhle (Glacier National Park Archives)

1998, Lisa McKeon (USGS)

1932, George Grant (GNP Archives)

1988, Jerry DeSanto (USGS)

The loss of glaciers signals the end, too, of wildflower meadows, the Weeping Wall, and for mountain goats and pikas that depend on alpine living. High-altitude meadows only exist because heavy snow and a short growing season prevent tree seedlings from surviving. Warmer temperatures allow trees to thrive at higher elevations and choke out the meadows. More trees also suck up groundwater, which leaves even less for waterfalls and trout streams.

"Losing the glaciers is the equivalent of shutting down the geysers in Yellowstone National Park"

Weeping wall

Photo courtesy Glacier National Park

Snow that falls later and melts earlier throws off the built-in timing for animals that change color to blend in with their surroundings. A white snowshoe hare or ptarmigan against bare rock make easy pickings for predators. The rate of change far exceeds the ability of animals to adapt.

Lynne Dixon, a veteran park interpreter, gives boat tours and leads hikes regularly to Grinnell Glacier, the easiest to reach. Even without the photos in hand, she says that here, it's obvious that the glaciers are melting.

"In one summer, you can see the melt lines and hear the crash of big ice chunks hitting the lake. The overlook is now far from the glacier itself."

Wolverine

Photo courtesy Yellowstone National Park

The day I talk with her she's working at the desk at Logan Pass in late September. I ask her if global climate change is affecting the visitor experience. Yes, she tells me, because it's all happening so fast. The tree lines are ascending, the alpine meadows are dwindling, the glaciers calving, and early spring runoff from melting snow increasing.

We turn, then, to the more immediate subject at hand—my sighting of a wolverine along the popular trail to the Hidden Lake overlook.

My mother and I were sauntering back from the one-mile trek, basking under a brilliant sun, indigo sky, and air as tangy crisp as a Macintosh apple. The wolverine burst from a clump of stunted subalpine fir, galloped across the trail and clambered bow-legged up the glacial gravels to a plateau 20 feet above us. Unbelievably, it turned back toward us, raced down the slope to pounce fox-like upon an unwary rodent, and ran back up the rocks. Gone.

Only later did I find out that wolverines, too, may disappear from the park if the warming continues. They dig burrows deep into snow to create dens, where mothers give birth and raise their young. As winters shorten and snow lessens, the places to den shrink as well.

I'm not sure I'd have wanted to hear that sad piece of news on a day of revelation. And, indeed, that's another challenge to telling the global warming story to vacationers who want to simply enjoy the park's wonders.

Matt Graves, West Lakes District interpreter for the park, and I discussed this challenge of addressing climate change to people from wide-ranging backgrounds, without preachiness or as a doom and gloom scenario.

"Climate change is the issue of our age," Graves says. "If we only have 10 to 15 years to do something, there is a sense of urgency. People need to be aware that there are threats to their national heritage."

For a full report on climate change and national parks, go to **National Parks Conservation Association,** www.npca.org.

LEFT: Ice cave on Boulder Glacier, Glacier National Park. This pairing of photos from the flank of Boulder Glacier reveals a dramatic change in the 56 years between the photos. Pack trips to Boulder Glacier used to include exploration of the glacier's ice cave. The cave has long since disappeared as the glacier receded beyond this point.

That's where the historic and modern comparative photographs come in. There's nothing preachy or debatable about the clear depiction of accelerating melting. The photographs become a launching point to help people connect a disappearing glacier to the loss of wildflower meadows, to less water and more fires, and finally, to people's own homes and lifestyles.

It's easy to get depressed. But when I think about Glacier National Park and that autumn day of the wolverine, it's like dipping into the refreshing spray of the Weeping Wall. I'm energized. There's something about the uplifting beauty of this park, this "Backbone of the World" long revered by the Blackfeet people, that gives me the backbone I need to do my own little part. Perhaps, like the photographers who trekked up hills with their camera burdens, we may not know yet just what action might become the powerful one a hundred years from now.

Deborah Richie Oberbillig makes her living as an interpretive writer and wildlife viewing consultant in Missoula, Montana. For more, please see www.deborahrichie.com.

Photo courtesy Yellowstone National Park, Jim Peaco

Altered State

Scientists chart impacts of rising temperatures

By Caroline Kurtz

No one can say how, exactly, the effects of climate change are going to play out on the Montana landscape in the coming decades, but changes, indeed, are happening. The familiar places of today – from the peaks of Glacier and Yellowstone National Parks to the prairies of Big Sky Country and all the variety of habitats in between – may look substantially different in another 50 years. The blink of an eye on nature's timescale.

A few trends are clear: around the state conditions may get a bit drier or wetter, but they will definitely get warmer. According to Steven Running, climate scientist and University of Montana professor, we are starting to see vivid evidence locally of an accelerated global warming trend that started about 30 years ago. As a result, the Pacific Northwest in general and Montana in particular are experiencing shorter, milder winters with less snowfall, earlier springs, and longer, hotter summers.

Running, who is being asked to give public talks about climate trends in Montana more and more often, says that temperature records show a one to two degree Fahrenheit increase statewide in average temperatures since 1970. Fifty years ago, peak snowpack was about April 1; now it's about March 1, with April snowpacks about 30 to 50 percent lower than they used to be. Streamflow also reflects this: peak runoff is happening about three weeks earlier than 50 years ago.

The reason, he says, is due to the spike in March temperatures. While regionally temperatures average one or two degrees higher than 50 years ago, mean March temperatures in Montana have increased at least five degrees.

"When earth's surface is bright, the sun's energy is reflected. Dark surfaces absorb heat energy, causing temperatures to rise more quickly in the early spring than the rest of the year," he explains. So melting snow creates a darker surface, which heats faster, which causes more melting.

In another 50 or 60 years, models predict no appreciable snow in Missoula at all; just rain. And even if rainfall increases somewhat in parts of the state, Running estimates we would need another two to three inches of rainfall to balance increased evaporation due to a hotter, longer summer season.

What will happen to ecosystems when water is no longer stored for long periods in the form of snow? Snowpack affects major areas of Montana's economy: agriculture and recreation, hydroelectric power

Aerial photo of 1988 fires in Yellowstone National Park

Steven Running is a terrestrial climate ecologist, who has studied global warming for nearly 30 years and published more than 240 peer-reviewed scientific articles. As lead author of the North American chapter in the most recent report of the Intergovernmental Panel on Climate Change, he is an authority on current levels of scientific consensus, as well as uncertainties, that surround global warming and its effects.

Photo courtesy Steve Running

generation, forest and range health, aquatic ecosystems and wildlife in general. Running predicts that instead of low flows all winter, with a strong peak of spring runoff, we will begin to see progressively more wintertime streamflow, with earlier and not as strong runoff, and less flow through late spring and summer.

"Fire and water, that's the Montana story of climate change," says Bruce Farling, director of Montana Trout Unlimited. As far as water goes, he says, trout and salmon survival becomes iffy once river temperatures reach the upper 70s. Some models indicate habitat for Montana's coldwater fish – trout, grayling and whitefish – could decline by 5-30 percent by 2090, but that's if you only account for higher water temperatures. Losses likely will be greater when larger ecosystem changes are factored in. Farling cites a recent report by fishery scientists in the Northwest region that suggests climate warming could shrink habitat for bull trout by 90 percent by the end of the century. In the short term, increasingly higher stream temperatures mean earlier and more fishing closures, as we have seen this year.

The connection between higher temperatures and more and larger wildfires is even stronger. There is a clear correspondence between years of early snow melt and big fire years throughout the west, says Running. "Our fire season now is about 70 days longer than it used to be. Fires are burning about nine months out of the year, country-wide."

The biggest change in Montana is the increase in forest fires above 6,000 feet. These high-elevation forests of spruce and fir used to be protected by late-season snowpack, but they are becoming increasingly vulnerable.

What concerns Running are the policies and planning that assume a stable climate.

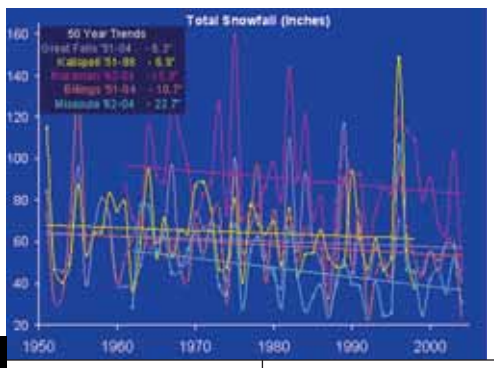
"I have no reason to believe that the trends we've been seeing will slow down," he says. "We'll be lucky if they stay flat, but I expect to see even faster change if nothing is done [to change the course of atmospheric greenhouse gas levels].

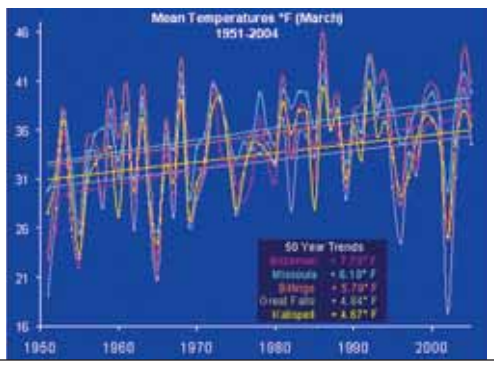
It's one thing to chart the course of climate change, another to know what action to take. To paraphrase Mark Twain, as Missoula Mayor John Engen did at a June public meeting on climate change consequences: Everybody talks about the weather but nobody does anything about it.

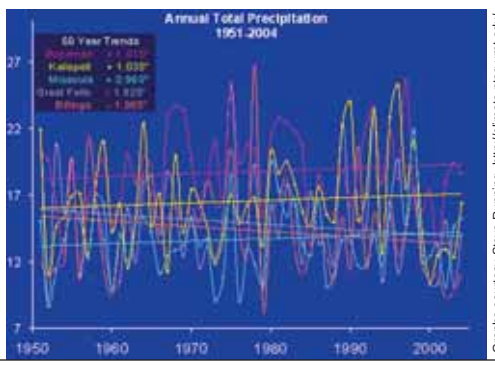
Yet, said, Engen, a change in attitude can be powerful. Missoulians used to regard the Clark Fork River as a handy dump. "Now we see it as a valuable natural resource."

To learn more about Montana Climate Change initiatives, go to:
www.mtclimatechange.us
www.climatestrategies.us

Some other potential impacts of a warming climate could include: longer agricultural growing seasons and increased grassland productivity, offset by more invasive weeds, bug infestations and other disease increase. While it may cost less to heat homes in the winter, cold snaps serve an important ecosystem function by killing off organisms that carry diseases that can affect animals, including humans, and by killing the insects and other pests that, without environmental checks, can decimate plant communities.







Graphs courtesy Steve Running, http://climate.ntsg.umt.edu/

Photos courtesy Paul Alaback

Along the Trail

Noting changes with Paul Alaback

On a cool-ish July morning, Professor Paul Alaback grabs notebook and pencil, dons a brimmed hat and hits the trail for perhaps the 1,000 time – literally.

His route, which he has traveled two or three times a week for the past 10 years, takes him up the western facing slope of Mount Sentinel through dense shrubby thickets, past rocky outcrops, across open grassland to a lush pocket of forest and back. It spans about two miles and 1,500 feet in elevation. Some 210 different plant

species have been documented within three feet of the trail on either side.

Alaback's routine is an exercise in, well, exercise, but it's also a chance to find out what can be learned from long-term, repeated observation. Every time he makes the trip, he jots down the changes he sees in familiar plant faces – when, where and for what species the first leaves appear, first buds emerge, first flowers, first fruit, first color change and more. It seems part game, part serious work.

"It's funny," Alaback says, "but we live in this community and go jogging or whatever and yet we don't know much about what's really going on right around us."

A professor of forest ecology with many research interests, Alaback is, at heart, a naturalist with a deep appreciation for phenology, or the study of observable events in the natural world. Phenologists study the cyclic changes that perhaps we are all so familiar with we don't always pay attention to. But beside the inherent value of tracking such events – something that farmers and gardeners have done throughout history – there is an even more pressing reason: understanding climate change.

Phenological events – like the location and timing of first flower, when the first migratory species arrive or leave an area, first snowfall or first ice out – when compiled over time can show how climate has changed, predict future trends and suggest what these changes might mean for plants, animals and people.

On this day, Alaback notes that many plants he sees are as much as four or five weeks ahead of their normal schedule. Plants like white aster and wild tarragon, which he would expect to see blooming in late August or September, are flowering now, in July. And all kinds of berries are ripe as well, at least three or four weeks early.

This departure from established patterns has an impact on migrating birds and other animal behavior, Alaback says. "Many naturalists and scientists worry about this breakdown of synchrony – or timing – in the natural world as a result of rapid climate change," he says. "Birds that begin to migrate through in late August may miss their traditional food sources."

By keeping faithful records of plant phenology on Mount Sentinel, Alaback is providing a baseline of information for monitoring the continuing effects of climate change in our region.

"Plants and animals move around in different ways [in response to changes in their environment]," he says. "Some will be able to cope with a rapidly changing climate and some won't." – *C.K.*

MNHC Photo

Find Your Own Path

Keeping Track

Join Project BudBurst

If you're interested in starting your own phenology journal or contributing to the growing worldwide citizen-science effort to provide consistent, ongoing observations about natural events for scientists to use in models of climate change, you can start with Project BudBurst.

This online initiative is a collaboration of several sponsors, including The University of Montana.

Spring 2007 observations have been analyzed and the results posted at www.budburst.org. You can join the 2008 effort, either as an individual or part of a class, by helping collect important information on the timing of leafing and flowering of native trees and flowers in your area.

Special Pull-Out Section: pull out and post these pages for handy reference.

get outside calendar

September 8 **Saturday Kids' Activity.** Bears and Berries, 2:00 p.m. Hour-long program with stories, craft project and other learning experiences.

September 15 **Visiting Naturalist in the Schools Field Trip Training,** 10:00 a.m.-3:00 p.m. Join us to learn about local plants, birds and other wildlife as we prepare for our fall school field trips. Volunteers participating in the training are asked to help teach field trips in October. Registration required.

September 22 **Saturday Discovery Day.** Extreme Trees: The Whitebark Pine of Morrell Peak, 9:00 a.m.-5:00 p.m. Field trip with forest ecologist Steve Arno. Meet at MNHC and carpool to picnic spot near site, walk about a mile to trees. Wear sturdy walking shoes and bring warm clothes/wind breaker, bag lunch and water. Call 327-0405 to register; $15/$10 MNHC members.

September 26 **Volunteer Open House,** 6:00-7:00 p.m. MNHC welcomes prospective volunteers for light refreshments and to learn about unique opportunities to share your time and energy – and gain new skills – with our Visiting Naturalist Program, or with general activities at the nature center. No specialized background required.

September 26 **Special Evening Presentation.** Whitebark Pine: Keystone Species under Threat, Diana Tomback, 7:00 p.m. University of Colorado/Denver Professor speaks about the whitebark pine ecosystem, threats that face it and possible restoration strategies.

September 29 **Saturday Kids' Activity.** Winged Wonders, 2:00 p.m. Learn about bird migration, do an art project and more.

September 29 **Prairie Keepers National Public Lands Day,** 1:00 p.m. Show your appreciation for our public areas by helping restore the fragile native prairies along the M trail. Pull knapweed, scatter seeds and cover up eroding trails. Bring work gloves and water. Meet at the M trailhead.

October, date TBA **Special Evening Presentation.** Osprey, Erick Greene, 7:00 p.m.

October 6 **Saturday Discovery Day.** The Elk of Grant Creek, 8:00 a.m.-11:00 a.m. Local elk enthusiast Bert Lindler leads a bus tour, with some hiking, to learn about Missoula's urban elk herds, weed management and elk ecology. Call 327-0405 to register.

October 13 **Saturday Kids' Activity.** Garbage Art, 2:00 p.m. Fun things to do with recyclables.

October 17 **Special Evening Presentation.** The Elusive Wolverine, Jeff Copeland, 7:00 p.m.

October 19 **Montana Educators Association conference,** Belgrade, MT.

MNHC Hours: Tuesday-Friday, noon - 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
26	27	28	29	30	31	1
September				*Waxwings change diet from insects to berries*		**Saturday Kids' Activity.** Bears and Berries, 2:00 p.m.
2	3	4	5	6	7	8
9	*Pronghorn breed* 10				14	**Visiting Naturalist in the Schools Field Trip Training,** 10:00 a.m.-3:00 p.m. 15
16	17				Photo courtesy Eugene Beckes 21	**Saturday Discovery Day.** Extreme Trees: The Whitebark Pine of Morrell Peak, 9:00 a.m.-5:00 p.m. 22
Red squirrels cache seeds 23	24	25	**Volunteer Open House,** 6:00-7:00 p.m. **Special Evening Presentation.** Whitebark Pine: Keystone Species under Threat, 7:00 p.m. 26	27	28	**Prairie Keepers National Public Lands Day,** 1:00 p.m. **Saturday Kids' Activity.** Winged Wonders, 2:00 p.m. 29
30	**October** 1	2	3	4	*Weasels grow white winter coats* 5	**Saturday Discovery Day.** The Elk of Grant Creek, 8:00 a.m.-11:00 a.m. 6
 istockphoto.com, Alistair Scott	9	10	11	12		**Saturday Kids' Activity.** Garbage Art, 2:00 p.m. 13
	Big Dipper lies low on the horizon 16	**Special Evening Presentation.** The Elusive Wolverine, 7:00 p.m. 17	18	**Montana Educators Association conference,** Belgrade, MT. 19		**Saturday Kids' Activity.** All about Bats, 2:00 p.m. 20
Grizzlies may start to hibernate 21	22	23	24	25	26	**With You We Grow.** MNHC 11th Annual Dinner and Auction, 6:00 p.m., Missoula Harley-Davidson. 27

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

November

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
28	29	30	31	1 **Visiting Naturalist in the Schools Volunteer Training:** The Reason for the Seasons, 4:00-5:00 p.m.	2	3 **Saturday Kids' Activity.** Rad Reptiles, 2:00 p.m.
		*Snowshoe hares change from brown to white* 6	7	8	9	10 **Saturday Discovery Day.** Introduction to Amateur Wildlife Photography.
	www.clipart.com	13	14 **Special Evening Presentation.** Alaskan Brown Bears of the McNeil River Wildlife Sanctuary, 7:00 p.m.	15	*Whitetail deer in rut* 16	17 **Saturday Kids' Activity.** Terrific Turkeys, 2:00 p.m
18	19	20	21	22 **Closed for Holiday**	23	24
25	26	27	28	29	30	1 **Saturday Kids' Activity.** Animals in Winter, 2:00 p.m.

December

2	3 **Visiting Naturalist in the Schools Volunteer Training:** Weather 4:00-5:00 p.m.	4	5 **Special Evening Presentation.** Sage Grouse, Dave Naugle, 7:00 p.m.	*Otters leave sled marks on snowy river banks* 6		
9	10	11	12	13	Photo courtesy Yellowstone National Park, Bill Wise	
16	*Spruce trees shelter owls, snowshoe hares, grouse* 17	 18		20	21	22
23	24		www.clipart.com	27	28	29

get outside calendar

October 20 **Saturday Kids' Activity.** All about Bats, 2:00 p.m. Hour-long educational program with stories, crafts and more.

October 27 **With You We Grow.** MNHC 11th Annual Dinner and Auction, 6:00 p.m., Missoula Harley-Davidson. Tickets are $45 per person for MNHC members/$50 per person for non-members. Call 327-0405 for reservations.

November 1 **Visiting Naturalist in the Schools Volunteer Training:** The Reason for the Seasons, 4:00-5:00 p.m. Work with our Visiting Naturalist in the Schools 4th and 5th grade program. Training will prepare you for November class visits and provide an opportunity to learn more about seasonal change and weather.

November 3 **Saturday Kids' Activity.** Rad Reptiles, 2:00 p.m. Find out about our scaly friends.

November 10 **Saturday Discovery Day.** Introduction to Amateur Wildlife Photography. Registration required. Call 327-0405 for details.

November 14 **Special Evening Presentation.** Alaskan Brown Bears of the McNeil River Wildlife Sanctuary, Larry Aumiller, 7:00 p.m. The McNeil Sanctuary hosts the world's largest seasonal concentration of brown bears. Join our speaker as he recounts stories from 34 years spent with Alaska Fish and Game studying bears at McNeil River.

November 17 **Saturday Kids' Activity.** Terrific Turkeys, 2:00 p.m. Hour-long educational program with stories, crafts and more.

December 1 **Saturday Kids' Activity.** Animals in Winter, 2:00 p.m. Learn how animals survive and thrive in winter.

December 3 **Visiting Naturalist in the Schools Volunteer Training:** Weather, 4:00-5:00 p.m. Work with our Visiting Naturalist in the Schools 4th and 5th grade program. Training will prepare you for December class visits and give you everything you need to know to teach about weather.

December 5 **Special Evening Presentation.** Sage Grouse, Dave Naugle, 7:00 p.m.

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

- **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.

Dominoes

Why is phenology so important now?

Because plants are at the base of food chains, anything that affects them sends ripples through the rest of an ecosystem. Many animals rely on leaves, buds, flowers and fruit for food. If the timing of these changes greatly, fewer seeds and insects may be available, which impacts animals that depend on them for food.

For example, some mice eat both insects and seeds. If plants bloom early, they may be finished flowering by the time their pollinators (insects like bees or butterflies) are mature enough to do their job. This reduces two of the mouse's food sources: if flowers aren't pollinated, there are no seeds; if the insects don't have their flower food source, there are no insects. With less food, fewer mice survive, so predators like snakes and hawks, which prey on mice, also go hungry.

Nature does not operate on a strict time table. Phenological events can vary from year to year, and ecosystems can cope with variations between years. But when these changes happen consistently over many years, the timing of leafing, flowering, migration and insect emergence can impact how plants and animals are able to thrive in their environments.

Phenology Resources

National Phenology Network
www.uwm.edu/Dept/Geography/npn/
Journey North
www.learner.org/jnorth

Climate Change Resources

For Kids

National Wildlife Federation Climate Classroom
www.climateclassroom.org
EcoHealth www.ecohealth101.org
Climate Change: Kids' Site
www.epa.gov/climatechange/kids
University Corporation for Atmospheric Research/Office of Education and Outreach
www.eo.ucar.edu/kids

For Parents

RealClimate www.realclimate.org
National Wildlife Federation
www.nwf.org/globalwarming

For Teachers

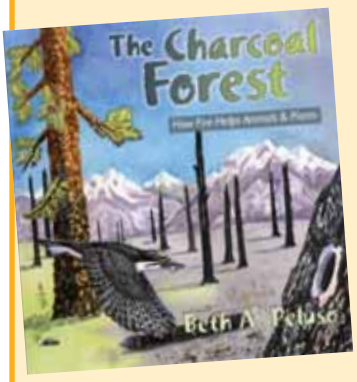
RealClimate www.realclimate.org
Educational Resources
www.usgcrp.gov/usgcrp/education
Earthguide
http://earthguide.ucsd.edu
Global Change Master Directory
http://globalchange.nasa.gov/resources
Global Change and Environmental Education Resources www.gcrio.org
Green Schools Program
www.ase.org

Book Review

Who needs fire?

The Charcoal Forest has answers

Reading *The Charcoal Forest: How Fire Helps Animals and Plants*, by Beth Peluso, is almost as much fun as being outdoors, discovering for yourself the vibrancy of life in a recent burn. In this book about the plants and animals that live



and thrive in recent burns, Peluso captures the strange beauty and complex networks formed by the living things that follow fire.

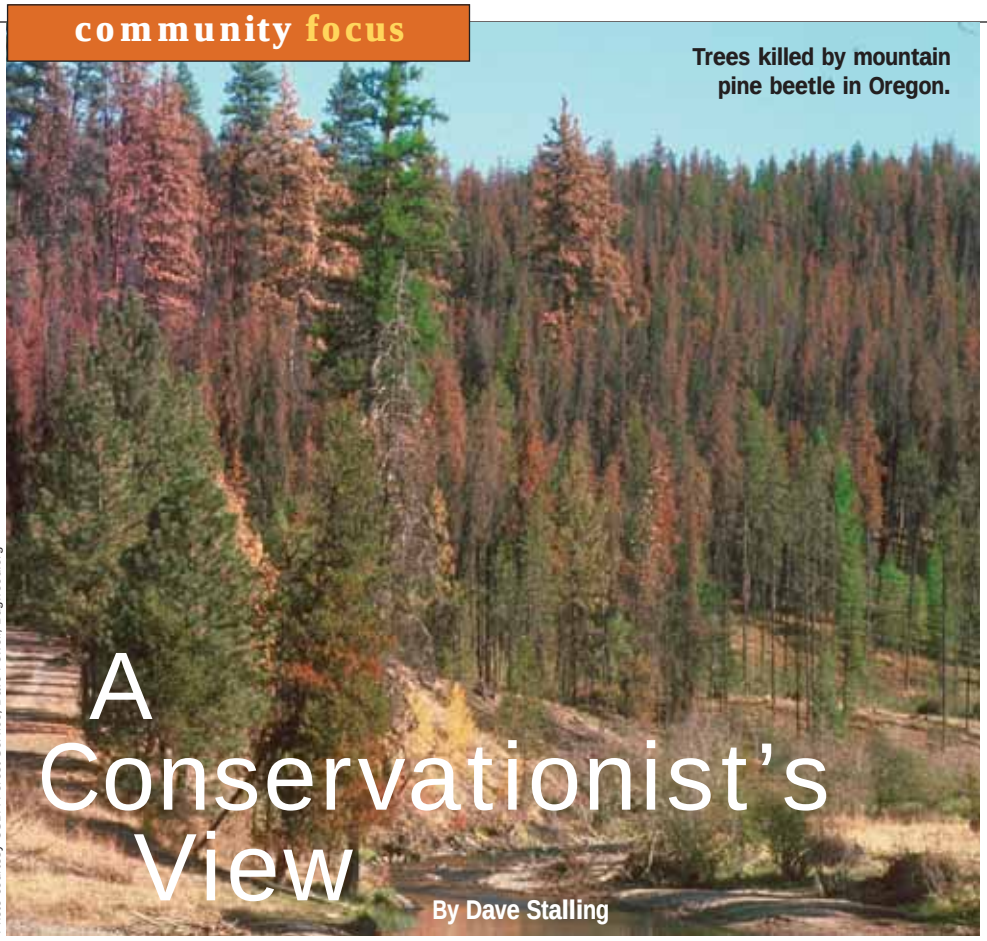
Written for ages 8 and up (including adults), Peluso's book walks us through the forests of the northern Rocky Mountains in the first hours, months and years after fire, examining one living thing at a time and exploring each one's relationship with fire. Who uses infrared sensors to find smoldering trees? How do liverworts spread across ash-covered soil? How can millions of aspen sprouts come up the year after a fire? Peluso answers these questions in 20 small natural-history stories, illustrating each with a full-page watercolor and smaller technical illustrations. With meticulous attention to detail in both text and art, she captures the many ways in which plants and animals rely on fire to provide for their needs. The black-backed woodpecker provides the theme connecting all of her stories. This bird rarely occurs outside burned areas, and Peluso shows how it shares the burned forest with every other creature in the book.

It is tempting to over-simplify technical information when presenting it to a young audience. Peluso does not do so; instead, she highlights and celebrates details such as the underground structure of the black morel and the tough seed coat of the snowbrush. She even addresses variation in fire itself, comparing the different ways in which low- and high-severity fires affect plants and animals. Because of this level of detail, *The Charcoal Forest* is not only a beautiful natural history book but also a good introduction to the science of fire ecology. *The Charcoal Forest* is a joy to read and look at as well as an excellent welcome to the fascinating world of forests after fire.

— *Jane Kapler Smith*

The Charcoal Forest: How Fire Helps Animals and Plants (Mountain Press Publishing, Missoula, MT, 2007).

Jane Kapler Smith is an ecologist with the U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory in Missoula.



Trees killed by mountain pine beetle in Oregon.

Photo courtesy USDA Forest Service, Dave Powell, Bugwood.org

A Conservationist's View

By Dave Stalling

I am not a scientist or a wildlife biologist. However, like many Montanans, I am an avid hunter, fisherman, hiker and backpacker who deeply cherishes the wildlife and wildlands surrounding my home. And, like most Montanans, I am growing increasingly concerned about record-breaking temperatures, unseasonably low, warm rivers and alarmingly dry forests and hillsides.

Two summers ago, I hiked from my front porch in Missoula to Waterton, Alberta. During this eight-week, 800-mile backpack trip, mostly off trail, I only crossed three roads, traveling through the Rattlesnake, Mission Mountains, Bob Marshall, Great Bear and Scapegoat Wilderness Areas, and Glacier National Park. This is some of the wildest, most unique and precious country left in the United States, providing the last strongholds for rare, threatened and endangered species such as grizzlies, wolves, mountain lions, lynx, wolverines and pure strains of westslope cutthroat trout and bull trout.

But even here, in such remote, wild places, I witnessed evidence of what scientists and wildlife biologists have been warning us about for years. Snowpacks, so crucial in Montana for supplying water to our rivers and streams, are rapidly declining. Diminished water flows makes for shallower, warmer streams with less oxygen, making it more difficult for coldwater fish such as trout to survive [see related story on page 7].

On my journey, I also saw large tracts of forest impacted by increased occurrence of mountain pine beetle, which scientists are linking to trees being less resistant to insects and disease because of drier, more stressful conditions. I also walked through large expanses of charred forests burned in recent wildfires. Our western forests evolved with and are well adapted to fire. However, drier conditions and more trees dead from beetle infestations are resulting in more frequent, more damaging fires than historically and naturally have occurred, with serious implications for wildlife.

Toward the end of my adventure, while hiking through Glacier National Park, I was struck by the profound decline in the size of glaciers I have visited in past trips. Many scientists are predicting glaciers in the park will be gone within 20 years [see related story on page 4].

As a grassroots organizer for the National Wildlife Federation, I work with and speak to hunters, anglers, outfitters, guides, farmers and ranchers, land managers, county commissioners, tribal leaders and others throughout Montana and the West, and I hear similar reports and concerns from them about changes on the landscape, and impacts to water, wildlife and our western way of life. What I hear from fellow hunters and anglers is consistent with a recent survey commissioned by the National Wildlife Federation, examining the attitude of hunters and anglers regarding global warming. Among the most salient findings from that survey are that

- Hunters and anglers are witnessing the effects of global warming and believe immediate action is necessary to address it;
- Eighty-five percent believe we have a moral responsibility to confront global warming;
- Eighty percent believe our nation should be a world leader in addressing this issue;
- Seventy-five percent agree that Congress should pass legislation that sets a clear national goal for reducing global warming pollution with mandatory timelines.

This is not, nor should be, a partisan issue. I know Republicans, Democrats and Independents who all share a concern about global warming, and a desire to see something done about it. We need to band together, and demand that Congress and other leaders take a closer look at the scientific evidence and consensus, to listen to citizens who are witnessing the impacts first hand, set aside partisan politics and various industrial and corporate pressures, and tackle this issue with the sense of urgency required.

Even with immediate and substantial reductions in greenhouse gas emissions, climate trends will continue to affect fish, wildlife and wild places. Therefore, any legislation regarding climate change should include funding specifically dedicated to help states protect, restore and re-connect fish and wildlife habitat so that species will stand a greater chance of being able to adapt to a rapidly changing environment.

Dave Stalling has worked for numerous conservation organizations, including Trout Unlimited and the National Wildlife Federation. You can contact him at stallingd@nwf.org.

Photo courtesy Eugene Beckes

Changing Faces

Goodbye pine siskin, hello cactus wren?

By Caroline Kurtz

It's possible that milder winters and warmer summers could bring about some striking changes within the next 50 to 100 years in the types of birds that are able to survive and thrive in Montana. Familiar faces such as the olive-sided flycatcher, winter wren, sage thrasher, American redstart, red crossbill, pine siskin and evening grosbeak may be replaced by vermillion flycatchers, Bewick's wrens, cactus wrens or painted buntings, according to a 2002 report from the American Bird Conservancy and the National Wildlife Federation. But, as Dan Casey of ABC says, predicting the potential impacts of a changing climate on bird communities is still very speculative at this point.

As the Northern Rockies Bird Conservation Region Coordinator, Casey has spent a lot of time and energy compiling data about past and current population levels for species that breed or spend the year here. He says that he tries to incorporate the most predictable aspects of climate change models as he helps scientists and conservationists set optimal population targets for different species and priorities for habitat conservation.

"In some cases, these [optimal population levels] could be very unrealistic given the changes in habitat that have already occurred [as a result of human use and development], but where can we target meaningful conservation?"

Much depends on how adaptable birds are: can they move upslope to cooler conditions, or are they tied to specific habitats?

The case of the black swift

As primary author of the 2000 Montana Bird Conservation Plan, Casey looked at available habitat for a variety of species, whether populations have been increasing, decreasing or stable, and how much of a birds' entire population is found in Montana.

"With the black swift, and also with the white-tailed ptarmigan, there is a sense of urgency connected to climate change," Casey says. Both these species inhabit higher elevations in wilderness areas. Years ago, he says, "we thought the threat [of habitat loss] to swifts was low because where they live was already protected. But they were poorly

Photo courtesy John Carlson, www.prairieice.blogspot.com

Photo courtesy Bill Schmoker, http://schmoker.org

Photo courtesy NPS, David Restivo

CLOCKWISE FROM TOP: **pine siskin; black swift; Running Eagle Falls, Glacier National Park; vermillion flycatcher.**

OPPOSITE PAGE FROM TOP: **red crossbill, red-winged blackbird, yellow-headed blackbird.**

monitored – it's very difficult to find their nests – and so we really don't have a good handle on their true population size and trends."

Black swifts nest on cliffs behind waterfalls, where it's damp, cool and shady all day. They only have one chick at a time, which has the unusual behavior of going into torpor – a state of lower body temperature, breathing, metabolism – during the day while the parents are away, and reviving in the evening when parents return with food. The adults come and go only at certain times and are not easily observed.

Three summers ago, Casey and Jeff Marks of Montana Audubon had a contract to try to find new black swift nests. He chose to focus on Glacier National Park, which is chock full of waterfalls to monitor. "We found the first new nests identified in Montana in 40 years," he says.

Glacier was predicted to be a good place to look for black swifts since there are so many potential nesting sites, but as waterfalls dry up due to less snowpack and receding glaciers, what might happen? Casey is working with the Park Service to survey more potential nesting sites, and he is joining with researchers in Colorado to track microclimates around nesting sites to see if effects of climate change can be quantified more clearly.

The ptarmigan may warrant a similar approach. As treelines move up in the park and tundra becomes timbered, Casey says, these birds, which are closely tied to the open flat ground for nesting sites, may be squeezed out.

"Clearly species that are generalists fare better in the face of any change than those that are specialists," says Casey. But it's the specialists that often have important ecological roles that could be lost with climate change.

Birds not only pollinate plants, disperse seeds and eat insects, many also are predators of insect pests, such as douglas-fir tussock moths, western spruce budworm, ponderosa pine budworms and mountain pine beetle, that cause major damage to Montana forests. If conditions become such that bird predators are squeezed out of this range, such pests will go unchecked.

Familiar faces

It's not just birds like black swifts and white-tailed ptarmigan that interest Casey. The more mundane yellow-headed and red-winged blackbirds also can be vulnerable to warmer temperatures, although the yellow-head, because of it's more restrictive nesting habits, is predicted to decline sooner.

"You see these birds eating together alot," Casey says, "but they nest in different niches in wetlands. Yellowheads take the prime spots among bulrushes over deeper water, while redwings nest in cattails near the edges. As wetlands contract, both species will decline as the available room declines, but the yellowhead is predicted to decline sooner because redwings can deal with drier habitats."

…it's the specialists that often have important ecological roles that could be lost with climate change.

Red crossbills are another example of how an adaptation can become a disadvantage when conditions change rapidly and permanently. The bills of these bird are specialized to pry open cones in order to get the seeds. Research indicates there may be as many as six or more species of crossbill, each associated with a different type of tree. If one is particularly adapted to opening larch cones and the distribution of larch changes, what does that mean for that species?

Photo courtesy Dan Casey

Photo courtesy U.S. Fish and Wildlife Service, Dave Menke

Across the state, to the south and east, plant communities are beginning to shift to include drier shrub type vegetation and Casey says there is a significant trend in birds showing up from more southern ranges, poised to take advantage of this expanded habitat. However, current models say that it will be at least 100 years before a cactus wren could call Montana home.

For more information, go to www.abcbirds.org/climatechange/birdwatchersguide.pdf.

Photo courtesy Dan Casey

MNHC Photo

Critical Care

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Helps hunt down information about Montana's animal and plant communities

Natural Heritage Tracker is a newly expanded and revamped database of more than 429,000 Montana bird observation records, and nearly 100,000 observations of other vertebrate and invertebrate animal species, developed by the Montana Natural Heritage Program and available through its website www.mtnhp.org.

The purpose of Tracker is to give users access to maps, photos and up-to-date information about species, communities and habitats for a variety of research and management purposes. For more information about MtNHP or about using Tracker, contact Susan Crispin at (406) 444-3019 or email scrispin@mt.gov.

MNHC Photo

Volunteer Spotlight

In partnership with area elementary schools, MNHC's Visiting Naturalist in the Schools program brings volunteers into 4th and 5th grade classrooms each month to provide activities and discussion about natural history. Volunteers also lead students on twice-yearly, all-day field trips, exploring with them the many facets of local ecology. Students get to see and learn more about nature in their area, and volunteers get to share in the fun of discovery themselves.

"I love the Visiting Naturalist program because it lets me use a lot of the stuff I learned in college," says Kim Birck, a long-time MNHC volunteer. "There's nothing like sharing the outdoors with children."

Birck likes to participate in field days the best, she says, because "the students really seem to enjoy them, and not just because they don't have to be in school!" She often leads wildlife walks and finds that her charges are genuinely excited about what they observe, whether it's an osprey catching fish or a singing song sparrow.

"Once, we flushed a great horned owl and discovered it had two babies in a nest in a snag. We set up a spotting scope so everyone could see them up close. The chaperone was so thrilled that she ran back to where other groups were gathered for lunch and brought everyone for a look. I didn't hear any complaining about postponing lunch!"

Hank Harrington is another regular volunteer, who also gets great satisfaction from watching young students make discoveries in nature, sometimes pushing themselves outside their comfort zones. Once, leading a group in search of aquatic insects, wading in a muddy pond with fine-mesh nets, he noticed one nervous child standing on the bank, screwing up his courage to take the plunge.

"He was telling himself to focus, and after a minute it worked. He went in. And though I didn't have a thing to do with his decision except present the choice in the first place, I was very proud of him and of a program that provides moments like these to children who might otherwise miss out."

Visiting Naturalist volunteers need not have any specialized prior experience, only a desire to learn, share knowledge and be outside. Volunteer training sessions are scheduled throughout the year; see Calendar listings for more information or contact coordinator Lisa (Moore) Bickell at 327-0405.

Photo courtesy USDA Forest Service, Richard Sniezko

Volunteer Open House

On September 26, from 6:00 to 7:00 p.m., MNHC is hosting an open house for prospective volunteers. Come join us for light refreshments and learn about unique opportunities to share your time and energy – and gain new skills – with our Visiting Naturalist Program, or with general activities at the nature center. No specialized background required. Stay for the evening's special presentation on whitebark pine, with Diana Tombeck, at 7:00 p.m.

With You We Grow

Don't miss the fun at MNHC's annual dinner and auction on Saturday, October 27, from 6:00 p.m., at Missoula Harley-Davidson. The evening features a fabulous menu crafted of local ingredients, entertaining auctioneering by Mayor John Engen and a chance to bid on nature excursions, travel packages, artwork and more. Call 327-0405 to reserve tickets. $45 per person for MNHC members; $50 per person for non-members.

Illustration courtesy Nancy Seiler

Mayfly photo by
Jason Neuswanger,
troutnut.com

In somber forest
When the sun was low
I saw from unseen pools a mist of flies
In their quadrillions rise
And animate a ragged patch of glow

Excerpt from "Mayflies" by Richard Wilbur

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