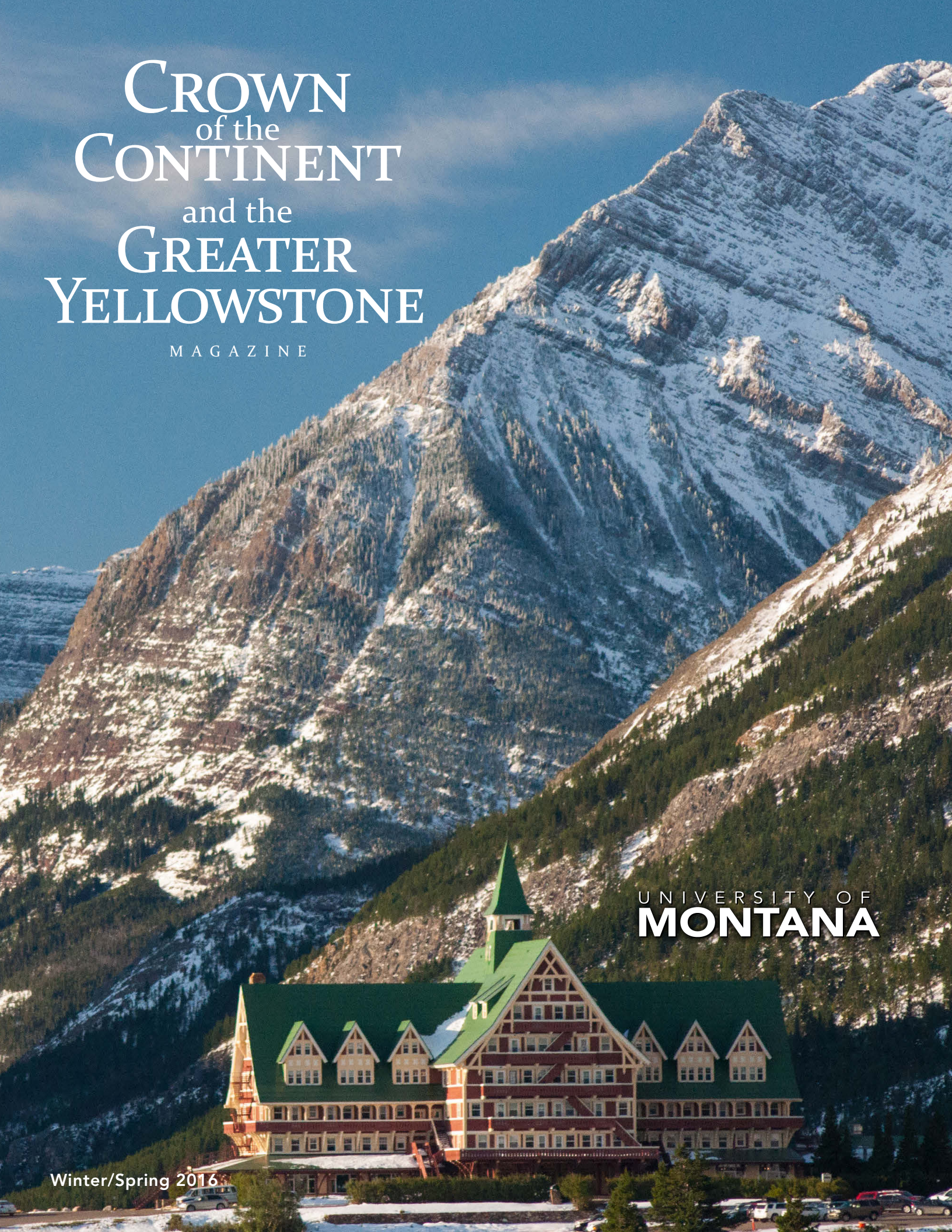
Crown of the Continent and the Greater Yellowstone

MAGAZINE



UNIVERSITY OF MONTANA

Winter/Spring 2016

Will Klaczynski

Crown of the Continent and the Greater Yellowstone

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Cover photo: **Prince of Wales Hotel, Waterton National Park.** Rick and Susie Graetz

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UM and BYU-Idaho Wolf Study Field Course, YNP

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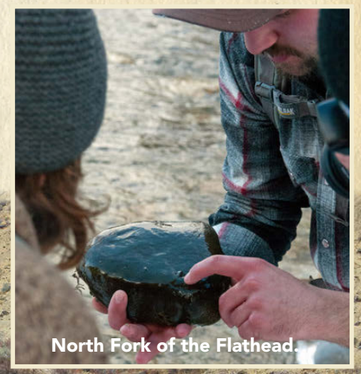


North Fork of the Flathead.

Our mission

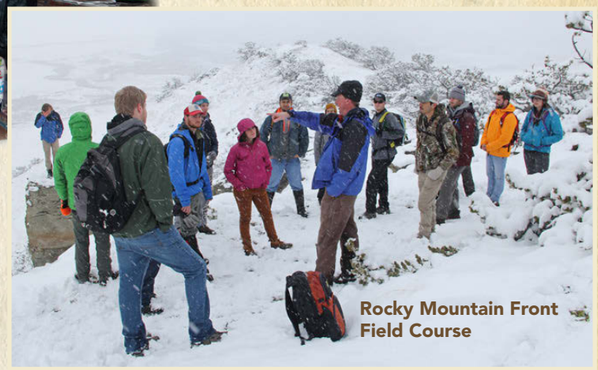
is to inform the public about what is happening in the Crown of the Continent and Greater Yellowstone ecosystems.

UM and Lone Peak High School Experience-Based Learning

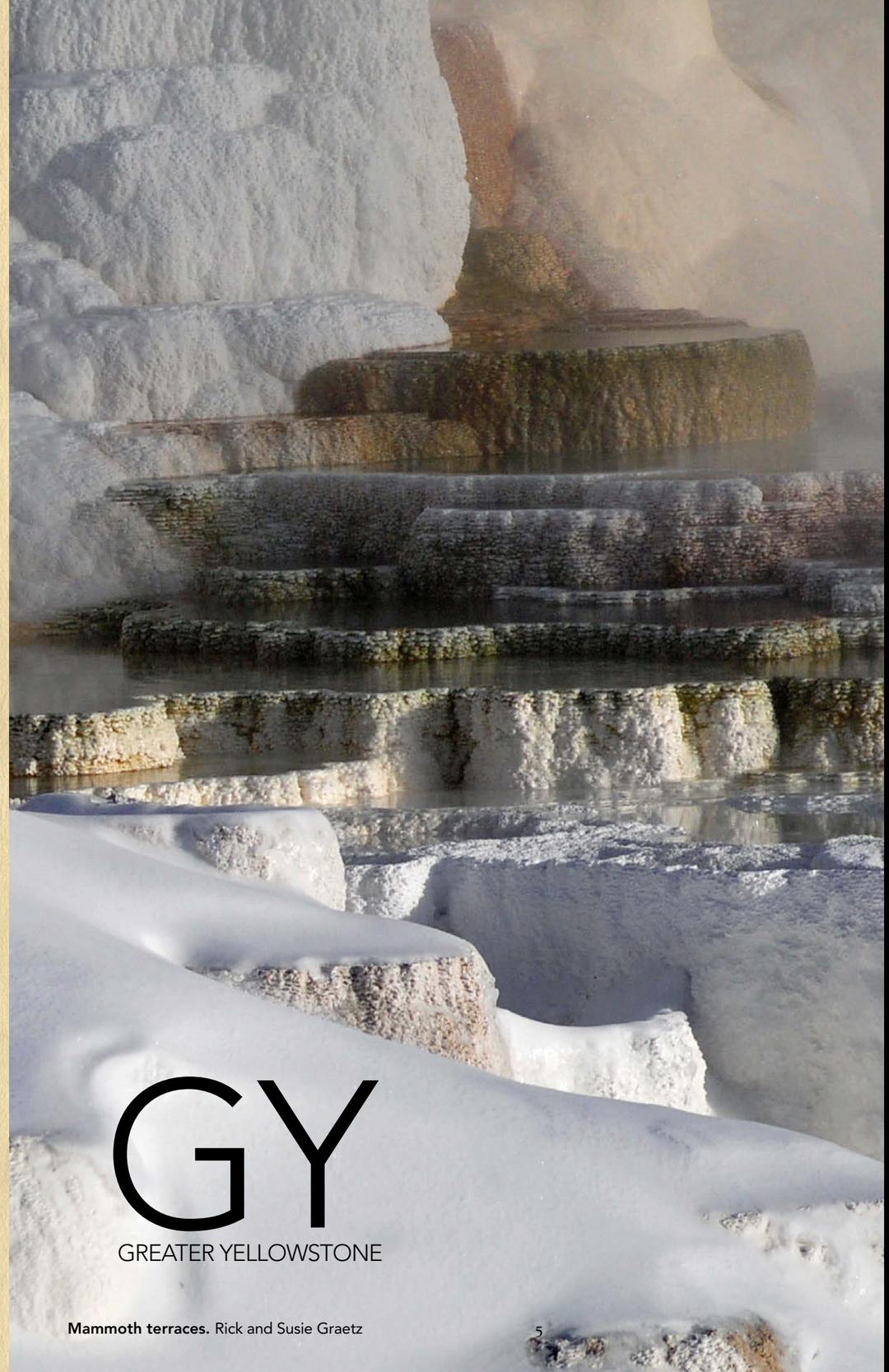
Mountains Ecology Field Course lecture, Polebridge, MT

Photos by
Will Klaczynski, Rick and Susie Graetz

We do this through our publications, with presentations in communities, and by holding classes on campus and off.



Rocky Mountain Front Field Course



SECTION ONE

GY
GREATER YELLOWSTONE

Mammoth terraces. Rick and Susie Graetz

Brad Orsted

WELL HELLO, KITTY...

Since their return in the 1980s, cougars (Puma concolor) have thrived in the northern portion of Yellowstone National Park and nearby areas of Montana. These large cats co-exist and compete year-round with gray wolves and seasonally with grizzly bears and black bears for both food and space. Following an eight-year gap in research (2006 – 2014), a new study is in place to evaluate the current abundance, distribution, and ecological influence of Yellowstone's charismatic and secretive big cat.

As predators, cougars play an important role in the structure and function of ecosystems. Knowledge of their abundance and distribution is fundamental for evaluating the consequences of their presence on the landscape. Without intensive marking and radio-collaring efforts, monitoring their population size and trends in a given area has proven challenging. Telemetry efforts are informative, but often labor intensive and expensive, and other methods proved poor predictors of cougar population size. Non-invasive genetic sampling methods are growing in application as a way to (1) identify species, sex, and individuals, (2) estimate abundance and population growth rates, (3) quantify distribution, and (4) examine patterns of genetic population structure of various carnivores. Further, developments in molecular technology provide genetic information that can be used to determine behavioral parameters such as home range size, individual habitat preferences, and even some forms of social interactions.

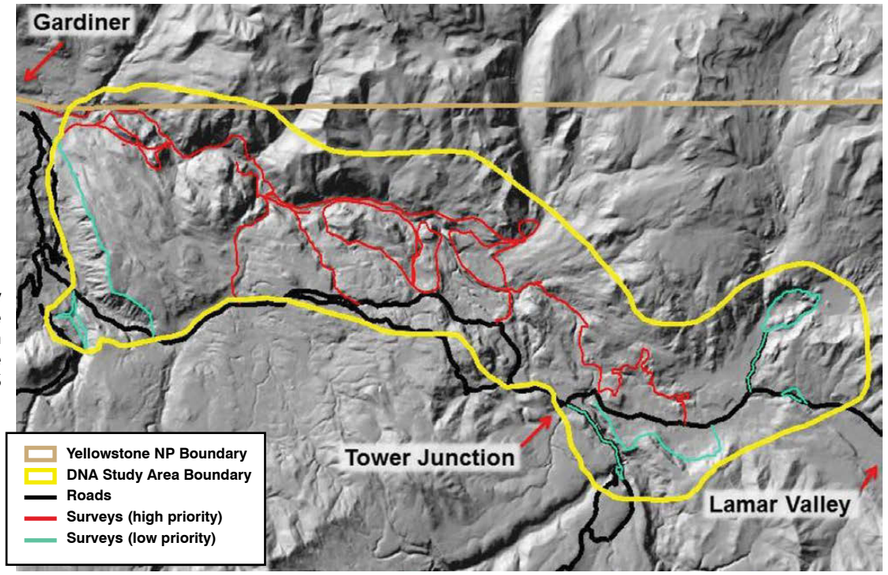
Intensive research occurred between 1987 and 2006 and provided a broad understanding of cougar ecology, predation, and population dynamics prior to and after wolf reintroduction in 1995 and 1996. By radio collaring individuals and conducting snow-tracking surveys in northern Yellowstone, these studies estimated the minimum number of cougars known alive prior to wolf reintroduction (1987-1993) to be 15 to 22, and 26 to 42 cougars after wolf establishment.

Beginning in January 2014, a new phase of cougar research, designed to build off of previous efforts to help address two important needs for understanding cougar ecology, was initiated. First, to estimate population size so that cougar population dynamics and kill rates could be incorporated when assessing the combined effects of large carnivores (wolves, bears, and cougars) in limiting or regulating the northern Yellowstone elk population, as well as other ungulates residing in and near the Park. Second, since northern Yellowstone serves

Field technicians Wes Binder and Kira Powell document a shallow depression (scrape) a cougar made to deposit urine and/or scat. This is thought to be a means of communication with other cougars. D. Stahler/NPS

Mountain lion sounds
Unlike lions and tigers, cougars are unable to roar, but they do communicate using a diverse array of vocalizations including growls, screams, and chirps

https://youtu.beoVZCAQP6eQM



Map of survey routes in the northern portion of Yellowstone National Park. NPS

as a valuable source for cougars emigrating to other areas in the Greater Yellowstone Ecosystem, biologists and managers would be able to examine important demographic and genetic population parameters within the ecosystem.

STUDY AREA

Steep, rocky slopes along both sides of the Yellowstone River corridor characterize the landscape surveyed. Due to snow accumulation and cougar habitat use, most surveys were limited to elevations between 5,300 and 7,200 feet. Vegetation consists primarily of grasslands interspersed with patches of Douglas fir and juniper. This region experiences cold, dry winters and provides critical winter range for many of the park's ungulates, including elk, mule deer and bison.

NON-INVASIVE SAMPLING METHODS

Based on long-term knowledge of their habitat use, we conducted snow-tracking surveys from January through March 2014 along 16 survey routes designed to increase the probability of encountering cougar sign. When cat tracks were detected, we followed them as long as feasible until discovering hair, scat, or urine as a potential DNA source. Hair was primarily collected from bed sites or caught on natural hair snags (e.g., thorns, branches, rocks), while fecal and/or urine samples were collected at scent-mark scrapes, from cougar latrines at ungulate carcasses, or opportunistically in the snow. We recorded signs (tracks, scat, visuals, etc.) of bears and wolves along each survey route, and classified the presence of ungulates (species, group size, age/sex class) observed within 0.5 km of the transect. Presence and abundance indices for these species will be used to evaluate the potential competitive environment that cougars face from other large carnivores, as well as the availability of prey within their home ranges.

We documented 14 carcasses of ungulates that were definitely or probably killed by cougars. Kills were determined by the presence of cougar tracks, chase tracks with a blood trail, latrines with cougar scat, and/or evidence of caching. Cougars cache their kills by covering them with snow, vegetative debris, and/or hair pulled from the prey in an effort to hide carcasses from scavengers and lessen the effects of freezing or decomposition of the meat.

There were 128 instances of wolf sign and 14 instances of bear sign (mostly rub trees until mid-March when bears emerged from winter dens and we were able to find fresh tracks and beds). Also, we classified 273 groups of ungulates during February 11 to March 29, counting 2,622 animals from seven different species.

DISCUSSION

After an eight-year lapse in cougar research, the 2014 field season provided preliminary information on cougar occupancy and distribution throughout the northern portion of Yellowstone National Park. Since previous research ceased in 2006, ecological dynamics in this region have transitioned to a system with fewer wolves, fewer elk, more bison, fewer deer, and continued prevalence of grizzly and black bears. Although it's too early to understand how these changes have impacted cougar ecology, our preliminary findings indicate that northern Yellowstone still serves as important habitat to a seemingly robust population of resident cougars and their offspring. Throughout our field season, we documented a wide distribution of age- and sex-specific

Dan Stahler finishes the field examination of the newly GPS-collared adult male M198 before reversing the immobilization drug from which the cat got up and walked away. W. Binder

National Geographic photographer and collaborator Drew Rush sets up a remote camera trap. The devices have yielded hundreds of videos of cougars traveling past, bedding, or scent-marking, along with cameos by grizzlies, wolves, bighorn sheep, and numerous other species. D. Stahler/NPS

Ledges, steep slopes, and deep watershed ravines are common habitat preferences for cougars in northern Yellowstone, and males can have ranges up to 150 miles. Researchers use snow-tracking surveys along 18 routes looking for signs of cougars. D. Stahler/NPS

track measurements, multiple family groups, and photographs and video footage of seemingly different individuals throughout the study area. Until genetic results are in and appropriate methods to estimate population size are used, however, we will refrain from providing even approximate numbers of individuals within the study area.

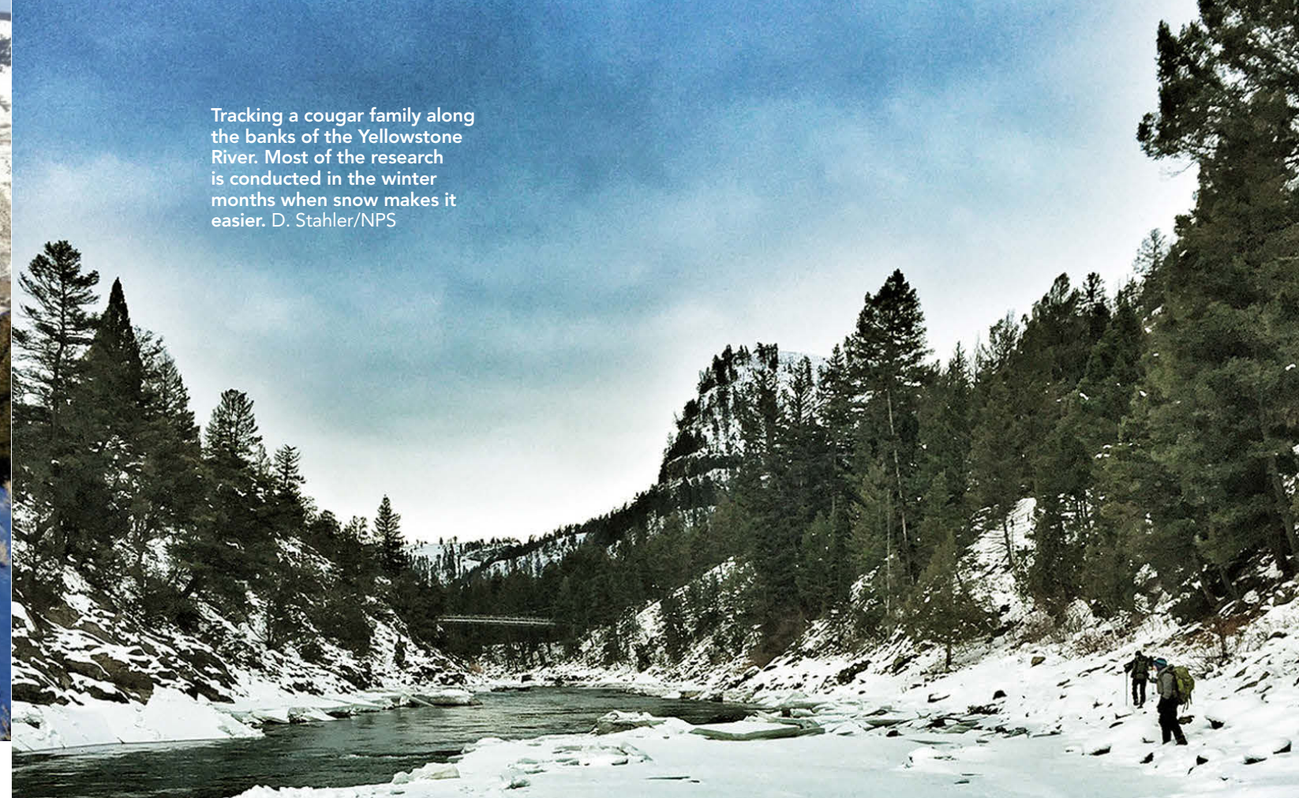
Heading forward, depending on the success rate of our DNA sampling effort, we will refine our methods, as well as expand our survey coverage. With additional years of data collection scheduled through 2016, a DNA-based spatial capture-recapture approach will be used to more precisely estimate cougar abundance throughout the study area.

Previous studies of prey selection by cougars in northern Yellowstone indicated a preference for elk calves during winter. In 2014, however, we found selection was greater for mule deer. Although our sample size was small, this finding may reflect changes in availability and abundance of prey species. We will redouble our effort to document predation patterns in the coming years to make more accurate comparisons with previous cougar research in the area.

FUTURE OBJECTIVES

The current plan is to increase and advance our non-invasive sampling techniques for the next two winters. Additionally, the team is considering future plans to capture and GPS-collar individual male and female adults to aid in: 1) quantification of detection probabilities for capture-mark-recapture estimates; 2) the creation and validation of predation risk models to locate kills; 3) assessment of changes in predation rates of adults compared to previous estimates; and 4) compare feasibility and application of non-invasive sampling methods to traditional radio collaring approaches to evaluate general demographic, behavioral, and ecological questions. Moreover, we plan to correlate this collar data with the movement and behavioral information from collared wolves, grizzly bears, and elk.

A less glamorous part of the job… collecting scat for DNA testing. D. Stahler/NPS



Tracking a cougar family along the banks of the Yellowstone River. Most of the research is conducted in the winter months when snow makes it easier. D. Stahler/NPS

THE YELLOWSTONE COUGAR PROJECT

The 2014 field season was made possible through financial support from the National Park Service, National Park Foundation, and Yellowstone Park Foundation.

This article was previously published in the 2014 Yellowstone Park Foundation Annual Report

To view the newly published 2015 report, go to:
ypf.org/CougarProjectReport2015

SOME LIKE IT HOT

by **Chad Dundas**

Streaks of brilliant orange thermophiles frame Grand Prismatic Spring. NPS

You can tell Scott Miller is used to the question.

"What do you do?" he repeats, like he's heard this one a million times before. "What *exactly* do you do?"

Such is life for a microbiologist, a guy who has devoted his career to studying creatures the naked eye can't see – organisms some people are unaware even exist.

Miller's research into photosynthetic bacterial life in the hot pools of Yellowstone National Park isn't the kind of thing that's necessarily easy to explain at cocktail parties. Yet there is magic in Miller's work.

For nearly 20 years, the affable associate professor at UM has, among other things, dedicated himself to rooting out the inner life of *Synechococcus*, a cyanobacterium (or what the layperson might call a "blue-green alga") that holds the record for temperature tolerance by a photosynthetic organism. In an attempt to understand how these microorganisms are able to not only survive but also thrive in hot springs at temperatures up to 165-degrees Fahrenheit, Miller and his research team are chipping away at some of evolutionary biology's enduring and fundamental puzzles.

"We're specifically looking at adaptation to extreme environments," he says. "But the thing that really motivates me and drives me is trying to answer some very general but longstanding questions about evolution. What is the stuff of adaptation? Is it new mutations? Is there a pre-existing variation out in the environment that gets co-opted and harnessed for adaptation? Does adaptation to higher temperatures come with a cost?"

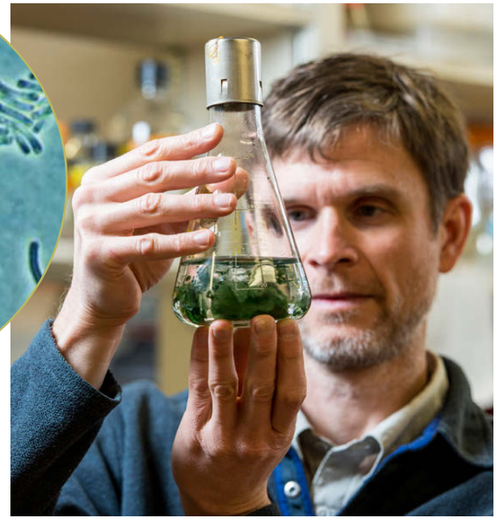
In his sparse office, the desktop of Miller's computer displays a well-known aerial photo of Yellowstone's Grand Prismatic Hot Spring. At first glance it looks like something out of a science fiction movie – a lake with an electric blue center that fades to shades of yellow, orange and black as it reaches the edges. Miller runs his finger around the outside rim of the hot pool, explaining that its rainbow assortment of colors are primarily produced by cyanobacteria, and that different varieties – or genetic variants – of *Synechococcus* can be found within different hues, with the yellow ring representing the "metaphorical tree line for photosynthesis as a way of making a living."

Miller's research seeks to shed light on numerous questions about how and why these specific cyanobacteria have been able to adapt to life in extreme environments, as well as why there are so many different varieties of *Synechococcus* living at different temperatures. It's work that could inform not only our understanding of the evolutionary process but could also someday have biotechnological applications.

Miller says that before he came to UM a decade ago, more of his work was conducted in the field, traveling to hot springs in Yellowstone and Oregon to collect study samples in order to piece together how different *Synechococcus* function and to reconstruct their evolutionary history. In order to really do evolutionary biology, he says, and to understand the path evolution has taken, scientists first need to have a fundamental understanding of how their study organisms are related to one another. Much of his work has involved putting that puzzle together one piece at a time.

"Early on there was a lot of fieldwork, growth studies in the lab, and building of family trees because we didn't have a good feel for how these otherwise

The extreme heat tolerant *Synechococcus.* Todd Goodrich/UM



UM microbiologist Scott Miller investigates the evolutionary mechanisms used by cyanobacterium to adapt to extreme environments. Todd Goodrich/UM

morphologically identical rods were related to one another or how they differed functionally," he says. "Nowadays, it's a very integrated research program. It spans everything from fieldwork to biochemistry and now to genomics. We're not just sequencing single genes and building evolutionary trees, we're getting entire genomes and using that to understand the history and mechanisms of diversification."

Recently the work has involved purifying proteins and using what Miller calls "tricks of molecular biology" to alter genes and make ancestral versions of various enzymes. One such enzyme, RuBisCO (or Ribulose-1, 5-bisphosphate carboxylase oxygenase, if you're scoring at home), is a common enzyme that exists in both plants and cyanobacteria and is involved in the first step of carbon fixation – the process by which photosynthetic organisms turn carbon dioxide gas into sugar ("The process that built the biosphere," Miller says).

Using a technique called circular dichroism, Miller's team determined that the RuBisCO enzyme of the most thermotolerant *Synechococcus* is more stable than those of other varieties, or of ancestral enzymes they were able to synthesize in the lab. In addition, they were able to determine the specific genetic changes that made this RuBisCO better suited to withstand higher temperatures than its peers. The results yielded fresh insights on our understanding of the process of "niche differentiation and ecosystem function."

Miller says. "We're trying to figure out whether there are any general mechanisms for evolving environmental tolerance using not just *Synechococcus* but other cyanobacteria that occupy these extreme environments."

It is precisely the fact that so little is known about microscopic life in hot springs that drew Miller to the field in the first place. While pursuing a graduate degree at the University of Oregon, he was leaning toward a career in freshwater ecology until he took the weekend field trip that changed his life.

During his first quarter at UO, Miller's freshwater ecology class visited Hunter's Hot Springs near the Oregon-California border. "That was the first time I ever saw a hot spring," he says. "Something about it just clicked. We got there, and the professor started talking about all the things we know about this place, but then it gradually came out that we didn't know all that much after all."

For an aspiring scientist, that was pretty much all Miller needed to hear.

Ten years later, Miller and his wife, plant evolutionary geneticist Lila Fishman, moved from their positions in the Research Triangle of North Carolina to UM. Though Miller remains chiefly interested in the pure science of his work, because the proteins he works on are of economic interest and heat stability is a desirable property in many industrial processes, he admits there might be "serendipitous" biotechnological applications that

Many of the organisms Scott Miller studies abide in colorful hot spring runoffs like this. Rick and Susie Graetz

WE'RE NOT JUST SEQUENCING SINGLE GENES AND BUILDING EVOLUTIONARY TREES. WE'RE GETTING ENTIRE GENOMES AND USING THAT TO UNDERSTAND THE HISTORY AND MECHANISMS OF DIVERSIFICATION.

come along with the discoveries.

"It may sound a bit strange to say this about the most abundant protein on the planet, but it's actually pretty lousy at its job." RuBisCO is among the slowest enzymes known and has trouble discriminating between carbon dioxide - its intended substrate - and oxygen. "When RuBisCO reacts with oxygen instead of carbon dioxide, a plant wastes energy and produces no sugar. There is therefore a lot of interest within the plant bioengineering community to potentially improve agricultural yields by building a RuBisCO that is both faster and better able to recognize carbon dioxide," Miller says.

By revealing the novel ways that these extremophilic bacteria have altered RuBisCO structure and function, the lab's work could provide new avenues for exploring how to modify the more familiar versions of the enzyme used by plants.

Ask him about the progress of his research program, and the accommodating grin returns, now with an unmistakable undercurrent of modesty lighting his eyes.

"The students do all the work," he says. "I sit behind a desk, mostly. They try to keep me out of the lab. I had pretty good hands once, but now I might be more likely to break some glassware or something whenever I'm allowed to run amok in there. It's a huge team effort. Excellent people make all this possible."

A native Montanan, ***Chad Dundas*** *earned a bachelor's degree in journalism and an M.F.A. in English-creative writing, both from UM. He covers mixed martial arts for ESPN.com and lives in Missoula.*

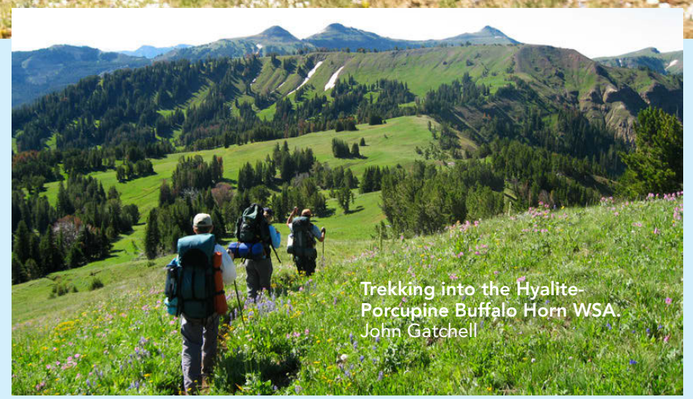
This article is reprinted courtesy of *Vision* magazine.

WHY protect the Greater Yellowstone?

by **Caroline Byrd**

From the Gallatin/Yellowstone divide, hikers and horseback riders share the view west across the GYE toward the Madison Range. Rick and Susie Graetz

Lunch time. NPS



Trekking into the Hyalite-Porcupine Buffalo Horn WSA. John Gatchell

In the heart of Yellowstone National Park, a mother grizzly and her three cubs maneuver their way onto a bull bison carcass vying for a meal. Fattening up for the winter seems the only thing of importance. Equally interested in surviving, a male grizzly looms, determined to claim the feast for himself. He is not excited to see the interlopers. Baring his teeth, he challenges the mother. Standing her ground, she will have none of it.

No doubt, the courage of the mother grizzly amazed those who observed this event in Yellowstone's Lamar Valley. Her story helps prove the 20 million-acre ecosystem is working as it should. A bison carcass becomes a community experience for omnivores, predators, birds, smaller species, insects, and micro- organisms of the ecosystem, all playing their role in the cycle of life.

The Greater Yellowstone Ecosystem (GYE) is truly remarkable. It is also sadly unique because it is one of the last remaining intact ecosystems on Earth; one of the last places on the planet that still has all of its wildlife species. It is the only place on the planet where grizzly bears and wolves compete over the carcass of a wild bison. It is where nature works as it should.

The grandeur of Greater Yellowstone is the result of more than a hundred years of courageous collaboration and conservation efforts. Without the foresight of our elders who created Public Lands, National Parks, Wilderness, and, closer to home, the GYE, the mother grizzly and her cubs would be left to us in history books and oil paintings. Instead, when we visit the wild lands of Greater Yellowstone, recorded on mobile devices and cameras, featured on websites and on-line video services, and exulted in movies and mass media.

The Greater Yellowstone Coalition (GYC) needs to be effective and successful on many fronts. However, two areas of special concern are: 1. How public lands are managed on the Custer Gallatin National Forest 2. Grizzly/human contact.

How Do You Measure Wildness?

The US Forest Service recently launched a public process to update its management plan for the Custer Gallatin National Forest, including the Gallatin Range, the largest unprotected roadless mountain range that shares a boundary with Yellowstone National Park. Today, the Gallatin Range is not permanently protected from potential natural resource development, whether it be logging, mining, or other incursions.

So, how can the managers of the Custer Gallatin National Forest make informed decisions regarding what is right for the lands under their care? How about with some tangible, hard to get, actionable data about "wildness" within the Gallatin Range?

During the summer of 2014, GYC staff and 57 volunteers, including a group of students from Montana State University (MSU), spent the summer collecting data on how "wild" these mountains really are.

What they found is that the Gallatin Range is one of Greater Yellowstone's wildest places. Stretching from the Yellowstone River to the Gallatin River and from Yellowstone National Park north to the Gallatin Valley, its mountains, basins, and drainages are rich with all of Yellowstone's famous wildlife. With craggy 10,000--foot peaks, rolling foothills, clean waters, and the Hyalite-Porcupine-Buffalo Horn Wilderness Study Area (WSA) at its heart, the Gallatin Range embodies the wildness we work so hard to protect.


Clean water, a by-product of wildlands, pours out of the Gallatin Range high country. David Pilarczyk


A YNP volunteer quality-control employee at work. Jim Peaco/NPS

The volunteers hiked over towering Hyalite Peak and dropped into a remote basin. For many, this was their first time backpacking, and they learned to hang their food high off the ground to stay safe in grizzly bear country. There were more signs of wildlife than people, though a few fire rings demonstrated that others had enjoyed the same solitude.

So, how does one measure "wildness?"

Our effort considered campsite conditions, noxious weeds, signs of or encounters with wildlife, trail conditions, and the number of other people encountered while hiking and trekking. These attributes reflect the natural, undeveloped, and untrammeled qualities, which many love about wilderness areas. The information collected by GYC and our volunteers has been compiled into a report for the US Forest Service and Gallatin Community Collaborative to help make the case for protecting the wild Gallatin Range.

No More "Free Lunch"

The GYC has been advocating on behalf of grizzly bears for over 30 years and will continue to do so. Our advocacy will focus on three areas of critical need: reducing conflicts, promoting connectivity, and protecting core habitat.

In so far as reducing conflicts, in the fall of 2014, we formed a partnership with the US Forest Service to provide bear-safe bins across the GYE with the goal of keeping both bears and people safe. This project began when a series of tragic events involving human fatalities occurred in 2011 and 2012. At the time, the Forest Service began analyzing human-bear safety at campgrounds across the ecosystem. Their assessment identified priority locations in need of bear-safe garbage bins, food storage containers, better signage, and campsites that needed to be closed or relocated due to persistent encounters with grizzlies. Understanding that "a fed bear is a dead bear," we were already considering enhancing our existing program of providing bear-proof bins to communities that were experiencing repeated human-bear conflicts, but now, we knew we had to do more. This meant looking at the entire 20 million acres, five national forests, and 164 developed campgrounds. In all, the project would require thousands of bear-safe containers.

In the first two years of the partnership, over $500,000 of the estimated $900,000 needed to purchase and install campground bear-resistant storage boxes and interpretive materials to aid the public to be more bear aware was raised. Also important is that most of the containers will be built here in the ecosystem, providing jobs and contributing to the economies of the local communities.

This past October, the Greater Yellowstone Coalition and Caribou-Targhee National Forest were honored when they received the Forest Service Intermountain Region's Annual Partnership Award, "For the outstanding work in assessing and reducing potential human/bear conflicts in campgrounds on the five National Forests in the Greater Yellowstone Ecosystem."

***Caroline Byrd** is the Executive Director of the Greater Yellowstone Coalition.* **greateryellowstone.org**

THE YELLOWSTONE RIVER PART IV

Through the Paradise Valley

by **Rick and Susie Graetz**

The handle "Yellowstone" comes from history's somewhat fuzzy recollection of the name the first known white intruders gave this waterway. For whatever reason, the national park took on the river's title. In the 1740s French Canadian trappers made a foray into what is now Montana and traveled an unknown distance up the lower Yellowstone. Noticing yellow colored stones in and along the river channel, they called it R. des Roche Jaune (spelling as appearing on 1790s maps) or in English "River of the Yellow Rock." William Clark's journal entries in 1806 referred to it as "rochejaune." According to Crow Tribal elder and historian Joe Medicine Crow, long before the whites decided on a name, the Crow Indians called it "Elk River," as they often hunted the majestic animal along the river's banks.

Taking leave of Wyoming and the Park, the river now enters human environment, sometimes sparsely inhabited and other times a bit crowded. The wilderness of its birth and the phenomenal natural wonders of the nation's oldest national park that it has been an intricate part of are left behind, but more adventures, wild country and beauty in view of the river lies ahead.

At this point, before the Park is no longer in sight, it is interesting to note the first superintendent Nathaniel Langford implied the Park should belong to Montana when he stated, "...the park is only accessible from Montana. It is impossible to enter it from Wyoming ... those Wyoming mountains would make the park useless to that territory."

THE PARADISE VALLEY

Straddling the Yellowstone River, Gardiner serves as the northern entrance to Yellowstone National Park and host to a myriad of tourists in search of food, lodging and trinkets. On the west edge of town, the imposing basalt arch dedicated in 1903 by President Teddy Roosevelt is a symbolic gateway welcoming all to the Park. Currently undergoing renovation, the redesigned entrance will reduce traffic congestion and increase pedestrian safety.

The Roosevelt Arch and Electric Peak have welcomed Park visitors since 1903.
Rick and Susie Graetz

Above: **Emigrant Peak and the Yellowstone River.**
Rick and Susie Graetz

As the Yellowstone makes its way through the Paradise Valley, peaks of the Absaroka Range rise from ancient river terraces. Will Klaczynski

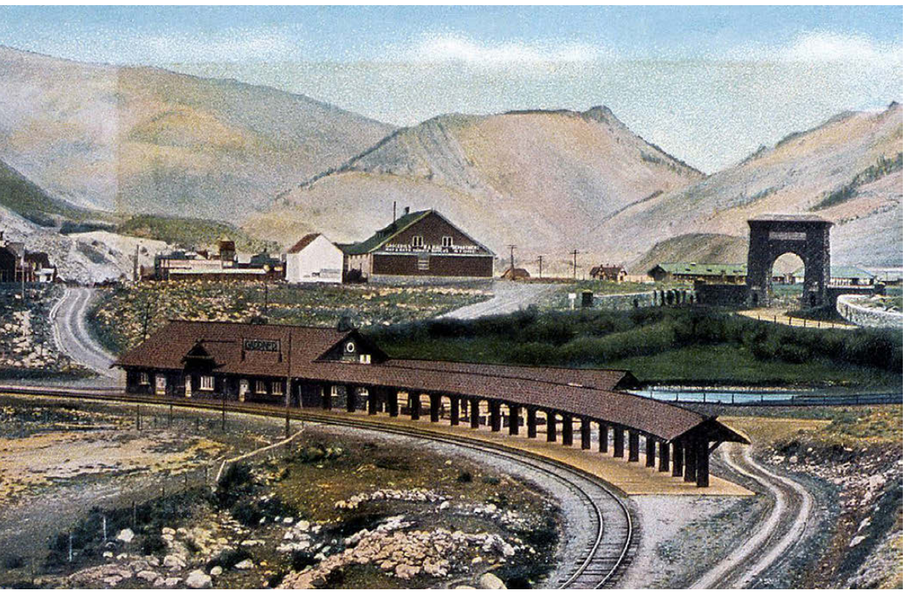
Johnston Gardiner, an old trapper in the Upper Yellowstone during the 1830s, is the settlement's namesake. By 1883, a spur line of the Northern Pacific Railroad extended from Livingston to Cinnibar just four miles short of Gardiner. A lengthy dispute between prospector "Buckskin" Cutler and Postmaster Jim McCartney over townsite ownership held up progress for nearly 20 years. In 1902, the steel road bringing visitors to the park finally made it into town. The line was abandoned and the tracks removed in 1970.

Gardiner is a town divided. Not only by the Yellowstone River, but the southwest side of Park Street is the National Park boundary; hence the unusual setting of commercial buildings on only one side of a downtown street and an open field on the other.

West of this small burg rises the massive 10,969-foot Electric Peak. A member of the Hayden Survey party, while nearing the top, apparently encountered a lightning storm that caused his hair to stand on end, consequently the name.

Above the river's embankment, five miles to the north of Gardiner, an unusual geologic formation makes its presence known. Called the Devil's Slide, it is best described in the journal of an 1869 explorer.

ENTERING THE APPROPRIATELY NAMED PARADISE VALLEY, THE JAGGED PEAKS OF THE ABSAROKA MOUNTAINS... STAND GUARD TO THE EAST, WHILE THE SUMMITS OF THE GALLATIN RANGE ARE THE BACKDROP TO THE WEST.



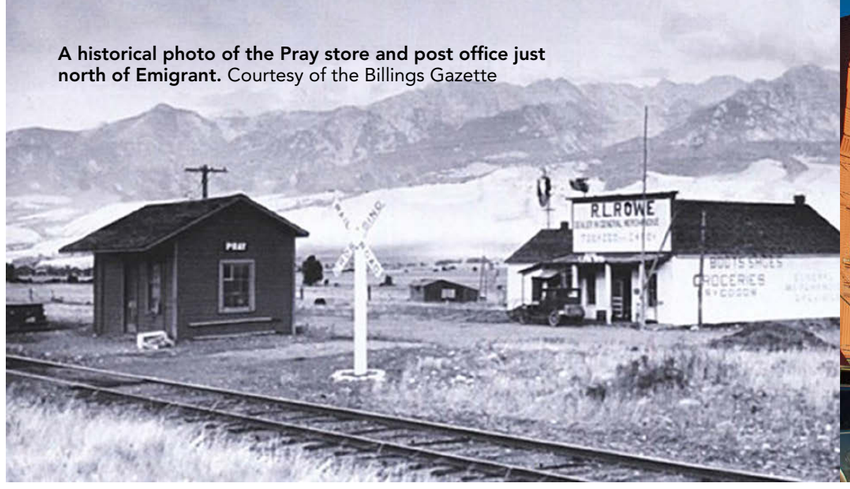
Northern Pacific depot in Gardiner. Frank J. Haynes. NPS Archives

The original Northern Pacific depot in Gardiner.
The Montana Historical Museum

"At one place we noticed a slate formation having a vertical dip...It pushed through a hill, which in wearing away, had left two smooth, unbroken walls, twenty feet thick, and from 20 to 80 feet in height. They were about 60 feet apart and ran parallel to each other from the bottom to the top of the hill; the space between them presented the appearance of a well traveled road." To most folks looking at it today, this configuration at the base of Cinnabar Mountain looks like a giant, red tinted playground slide. The distinct color is probably the oxidation of iron in the rock.

Before heading north into Montana's serene Paradise Valley, the Yellowstone squeezes and negotiates its way through Yankee Jim Canyon for four wild, roller coaster miles. This is the river's last major whitewater event.

"Yankee Jim" was Jim George, who in 1872 blasted a path through the canyon's west side, opening the first road to YNP. He charged a fee to those who used it and provided a roadhouse for the visitors. In 1883, the new



A historical photo of the Pray store and post office just north of Emigrant. Courtesy of the Billings Gazette

Livingston Montana was the first gateway to the Yellowstone Country. Rick and Susie Graetz

railroad ended his toll business. Although the Northern Pacific bought the right of way from him and used the road to lay tracks, he despised the company and was known to shake a fist at the passing trains. Some historical notes claim the NP, as part of the deal, had to build Jim a new road higher up on the hillside. The initial road and rail bed is still very clear (marked abandoned on maps) and there are signs of a crude route farther up the slope. The canyon terminates where Tom Miner Creek and Basin, on the west, add runoff to the river.

Entering the appropriately named Paradise Valley, the jagged peaks of the Absaroka Mountains, part of the Absaroka-Beartooth Wilderness Area, stand guard to the east, while the summits of the Gallatin Range are the backdrop to the west. The Yellowstone River gathers water from both. Courtesy of these high country borders, glaciers once inched their way down from cirques and covered the valley. Many canyons in both ranges are blocked by moraines from ice that never quite made it to the valley bottom.

Sixty miles in length, the Gallatin Range, with tops over 10,000 feet, extends into the National Park. Considered by wildlife managers to be some of America's best elk country, it is essential wintering and calving range for the large northern Yellowstone elk herd.

The Absarokas are part of a wildland made up of the Absaroka and Beartooth Ranges that stretches eastward to the plains. Like their Wyoming relations, they were first called the Yellowstone Range until 1879, when the name for the Crow Indians was given to them. From this range, the valley's most impressive landmark, 10,921-foot Emigrant Peak, holds court.

In late August 1864, a group of emigrants heading west missed Bozeman Pass and instead turned south into the Paradise. They made their way toward the peak and well into Emigrant Gulch and Creek and found placer gold.

The gulch climbs a grade in the tight canyon between the steep east face of Emigrant Peak and the west flank of 10,195-foot Chico Peak. Winter, which shows early here, eventually forced them to locate lower in the canyon; Yellowstone City, a short-lived camp of 300 people was born, becoming the first settlement in the Yellowstone Basin. The gold played out in three years and the miners and their families moved on.

At the mouth of Emigrant Gulch, Old Chico, another mining camp with its nearby hot springs, was built. Jim Bridger, along with a band of Crow Indians, wintered here in 1844. Today, the springs are the renowned Chico Hot Springs Resort that grew from the original 1900 development.

Nelson Story, a prominent early day Montanan, drove Texas cattle into the valley in 1867 and established a sizable ranch, selling beef to the miners and other settlers. Known for its grand scenery, numerous spring creeks and some of the nation's best trout fishing, it was probably Story, or one of the other first settlers to make it here, who came up with the title Paradise for this portion of the Yellowstone's way.

In its route to this point, the river has picked up clean flow mostly from wilderness and untrammeled topography. The clear, sparkling green water is of a better quality than most other blue ribbon trout streams. The late Ray Hurley, a Livingston guide, proclaimed, "the Yellowstone in this area is the Yankee Stadium of trout fishing." True native cutthroat trout frequent the river's deep pools and wildlife is plentiful. Geese and ducks, along with deer and other critters, populate the riverbanks, and eagles and hawks claim the sky. As a mother takes care of her young, so too does the Yellowstone nourish and give shelter to nature.

On the north end of the valley, the river constricts through Allenspur, an abandoned railroad branch that separates the Paradise Valley from the Yellowstone Valley. Engineers, oblivious to the wonders of a free flowing river, more than once had the audacity to propose this locale with its high rock walls as a dam site. Their plan was to contain the Yellowstone River and flood the Paradise Valley. More rational minds have prevailed and it is extremely doubtful the scheme will ever come to fruition.

A few miles downstream at the "Big Bend," the river introduces itself to Livingston, a former frontier/railroad town and now a prominent approach to Yellowstone National Park. Our "Grande Dame" of the high country now makes an abrupt turn toward the east and faces the morning sun.

Tom Miner Basin. Rick and Susie Graetz

KNOWN FOR ITS GRAND SCENERY, NUMEROUS SPRING CREEKS AND SOME OF THE NATION'S BEST TROUT FISHING, IT WAS PROBABLY STORY, OR ONE OF THE OTHER FIRST SETTLERS TO MAKE IT HERE, WHO CAME UP WITH THE TITLE PARADISE FOR THIS PORTION OF THE YELLOWSTONE'S WAY.

High drama by Mother Nature. NPS

ART

YELLOWSTONE NATIONAL PARK IN WINTER WHITE by Bill Voxman

Yellowstone #3

Yellowstone #5

Yellowstone #6

Yellowstone #1

Yellowstone #4

Bill Voxman is a retired professor of Mathematics at the University of Idaho. His black and white/silver images are found in art galleries in the Northwest and Midwest, as well as numerous private collections. An avid outdoorsman, his photography has taken him to Glacier and Yellowstone National Parks and to far off South America, Europe, New Zealand, and Asia—usually while hiking, trekking, or exploring. His photos of Indian elders from the Coeur d'Alene and Flathead tribes were a prominent part of the world-class traveling exposition, Sacred Encounters, which was exhibited in leading museums from Los Angeles to Montreal (including the Museum of the Rockies in Bozeman), and is now on permanent display at the Old Mission State Park in Cataldo, Idaho. Using a medium format camera for most of his pictures, and working solely in black and white, Voxman processes all of his images in his darkroom and studio in Moscow, Idaho. A portfolio of his work is found at **billvoxman.com**.

Yellowstone #2

WINTERKEEPERS

Beauty and the beast. Steve Fuller

CANYON VILLAGE

by **Todd Wilkinson**

Steve Fuller attempts to tame a massive wind-carved cornice. Courtesy of Steve Fuller

In Steven Fuller's neighborhood, there are a few sacred, unspoken rules his guests are expected to abide by: 1) Don't deface the landscape, especially when it glitters with a patina of pure virgin snow. Carving artless ski tracks through its middle is almost considered an act of vandalism. 2) Don't intrude into the space of other animals. 3) Listen more than you speak. 4) Bundle up and wear plenty of layers, because even in an age of global warming, it still gets damn cold.

Fuller sets these rules because he has a deeply evolved understanding of and appreciation for his habitat: the remote hinters of Yellowstone National Park. The front stoop of his pine-shingled cottage overlooks the Lower Falls of the Grand Canyon of the Yellowstone River. His wild neighbors, which vastly outnumber those on two legs, include elk, moose, bison, and grizzly. Winter temperatures often dip well below zero, and upwards of ten feet of snow can bury his front yard.

As far as anyone knows, no human has lived continuously and year-round in Yellowstone longer than Fuller. That includes, some historians say, Native Americans. This is Fuller's 43rd consecutive season as a winterkeeper, a job—an existence—that is hermetic, to put it mildly.

"Winterkeeper" is an official job in Yellowstone. In 1973, Fuller was hired, like winterkeepers

Mother Nature's winter artistry frames one of her Yellowstone wonders. Steve Fuller

before him, to clear, by hand and using only shovels and saws, the accumulated mountains of snow that threaten to collapse the roofs of hundreds of cabins used by tourists come summer (and also to watch that pipes don't freeze or break). Keeping up with the icebox conditions may be one of the most difficult jobs in the National Park Service. Yellowstone gets an average of three hundred inches of frozen precipitation annually, and average winter temperatures are close to zero degrees. The roof of one of Canyon's larger buildings has taken upwards of 70 days to clear. For a person doing the work solo, there's also the isolation. In Fuller's case, he calls it "splendid solitude."

Looking back across four decades, it's maybe no surprise that when Fuller and his then-wife, Angela, expressed naive interest in the Canyon Village winterkeeper job, they were hired on the spot. They were the only applicants. The couple's salary was a few thousand dollars, justified in part because where they were living there was no need for material luxuries.

As Fuller and Angela were taken to Canyon for that first season, they were essentially told to get lost. Superiors made it clear they didn't want to see or hear from the two until the plows pushed through in April. Considering the Fullers were a 40-mile snowmobile ride from both civilization and brusque bosses, this was not a difficult directive to follow. If they were to run out of provisions, an old-timer persuaded them they could always poach a deer or elk. Fortunately, that proved unnecessary, though in the early years, they did wonder where they fit into the food chain.

Grizzly bears broke the kitchen window and tried to climb in. The only news came from short-wave BBC radio broadcasts. Still, for the most part, the two thought it an idyllic existence. Steve and Angela raised and homeschooled two daughters, both now grown. And, as his own way of interpreting what he saw, Fuller, a lifelong photographer, took pictures. His eye and technical skill first gained national attention when his pictures appeared in a National Geographic feature, "Winterkeeping in Yellowstone," in 1978.

At age 69, Fuller's short-cropped albescent locks now mirror the winter fur of the ermines living around his cottage. The stout house, which he has lived in since his first winter in the park, dates to at least 1910. The misty Grand Canyon of the Yellowstone, and the thunder of water roaring through the chasm is always in the air, accented often by wind and the calls of wildlife.

"You live here, stuff can happen, you accept it, but is it any different, really, from anywhere else?" he asks, saying he prefers his perils—avalanches, hypothermia, being eaten by a bear, getting stomped by a bison—to being run over by a truck while crossing an urban street or dying of a heart attack in an office cubicle.

In his four decades in Yellowstone, Fuller has had countless close calls with lightning, with wildfire, and with blizzards that forced him to bivouac miles from the nearest human. During Yellowstone's 1988 fires, trees burned to within feet of his cabin door. He has busted skis and had snowmobiles break down when he's been miles from safety and shelter and temperatures are 50 degrees below zero.

Fuller himself could retire and no longer worry about startling grizzly bears, broken-down snow machines, and falling off roofs 25 feet above the ground. The thought of retiring to the so-called real, outside world is, at best, an illogical, bizarre abstraction to Fuller, though. He asks, "Where could I possibly go on Earth that would be more spectacularly special than this place?"

He knows the answer. There is no other place like his Yellowstone home.

***Todd Wilkinson**, who lives in Bozeman, has been an environmental journalist for nearly 30 years and is author of the critically-acclaimed "Grizzlies of Pilgrim Creek, An Intimate Portrait of 399, the Most Famous Bear of Greater Yellowstone," featuring 150 breathtaking photographs by Thomas D. Mangelsen. It is only available at:* **mangelsen.com/grizzly**

This article previously appeared in a longer version in the *Jackson Hole News and Guide*. **Jhnewsandguide.com**

Keeping up with the snow load on the roofs is a never-ending, monumental task. Courtesy of Steve Fuller

Many Glacier

by **Rob Chaney**

Six months ago, David and Rebecca Wilson would have been on the wait list to get a room at Many Glacier Hotel.

Today when they show up, gray jays and bighorn sheep come out to greet them. The black bear under the employee dormitory doesn't bother to wake. They still struggle to get in, but now it's snowdrifts and 70 mph winds blocking the way instead of throngs of tourists.

Last January, a snowdrift completely covered the back door of their chalet, just across the Swiftcurrent Lake Bridge from the hotel. Every Monday, David takes a shovel and barrel inside the hotel and goes room to room, removing the snow that blasts in from every window and doorframe.

Fifty mph gusts at the end of November stripped all the snow off possible snowboarding slopes around the hotel, leaving it in whale-hump drifts elsewhere. Stretches of the entry road to the Many Glacier Valley got blown clean to the pavement, while other parts got buried.

Rebecca and David wear full-body protection when they go outside, including goggles, storm jackets and often avalanche beacons. A major slide chute aims right at the road between Many Glacier Hotel and Swiftcurrent Motor Inn. Fortunately, the foot of ice now covering Swiftcurrent Lake means they don't have to risk the road too often.

Glacier Park sometimes treats the 102-year-old hotel like a mosquito it's trying to swat. Unrelenting winds have literally pushed the Many Glacier Hotel slightly off its foundation, causing some parts of the building to lean toward Swiftcurrent Lake.

"When it's really windy, you can stand in the lobby and hear it pop from floor to floor," David said. "You can go in the crow's nest and shut your eyes and feel the building move. I've got a huge list of drywall work to get done."

The drywall competes with the plumbing. One of David's first tasks was to drain all the pipes in the hotel's fire sprinkler system before the water could freeze and burst.

The massively grand Many Glacier Hotel settles in for a long, harsh winter. David and Rebecca Wilson

"We went over to the hotel to shovel out the rooms and make sure the doors hadn't blown open." David and Rebecca Wilson

"One season, a ram took out three windows in the breezeway. They see their own reflection in the glass and – bam." Sandi Sisti/Flickr

"The snow blows in the smallest cracks and under doors." David and Rebecca Wilson

In December, it was so cold inside the hotel he had to put his pipe wrenches by a space heater before he could handle them.

David took his first Glacier Park job in 2008 as a maintenance man. Two years ago, he and Rebecca got married, and they decided to spend a full year in the park.

So, on November 1, his job title officially switched to winter keeper. It's a post he'll keep until April, when a snowplow might finally reach the hotel and let the couple have a brief vacation before starting tourist season work.

Every hotel employee at Many Glacier at some point gets introduced to the legend of Stephen King, who supposedly wrote his horror masterpiece "The Shining" in the lobby.

King actually wrote it at the Stanley Hotel by Colorado's Rocky Mountain National Park, but the parallels are still spooky. Stanley Kubrick filmed some of "The Shining" movie version on Glacier's Going-to-the-Sun Road, although he used a Colorado hotel for the exterior shots.

On Halloween, David couldn't resist copying a famous bit from the movie, posting "All work and no play make Jack a dull boy" over and over in honor of actor Jack Nicholson's crack-up at the writing desk.

Then there are the unexpected visitors, like the black bear sow and cubs that decided to hibernate beneath the employee dorm. Or the sex-crazed bighorn ram David had to chase away from the dining room window.

"One season, a ram took out three windows in the breezeway," David wrote. "They see their own reflection in the glass and – bam."

Other critters on occasional display include a couple of moose, a snowshoe hare, a beaver and lots of birds. Mid-January, the Wilsons reported a flock of gray jays following them all the way up and down a hillside hike on Mount Altyn in zero-degree sunshine.

You know when the job comes with three freezers for food storage, you're in for the long haul. Stacks of books and DVDs help, too. Phone service is sketchy, although there is cable TV.

"You've got to really prepare for this job," David said. "It's not something you can walk into. And you want to be an outdoors person if you want to work here. Don't just sit in the cabin all day. If you feel gloomy, just walk outside and look around. The sun only comes out for two hours in the middle of the day. It comes up from behind Allen Mountain, creeps across Mount Gould, and goes down behind the Garden Wall before you know it."

Rob Chaney *covers the outdoors, environment and science for the* Missoulian *and is a frequent contributor to our e-Magazine*

This article has been reprinted courtesy of the *Missoulian*.

CC

CROWN OF THE CONTINENT

Haystack Butte and furry mules on the Rocky Mountain Front.
Rick and Susie Graetz

BEAVERS...

An Ally or an Inconvenient Species?

The beaver is quite a package: it swims like a fish, cuts like a chain saw, moves materials like a front end loader, is the first water engineer and the first logger, and transforms landscapes at a scale that rivals humans. Some might consider them an inconvenient species.

Above: **Savior or culprit?** Tim Lumley, Nashville TN

As the Canadian national symbol, the beaver is equally loved, hated and universally misunderstood. Figuratively speaking, they can come with horns or halos. When they flood roads and property, cut favorite trees or inconvenience us in other ways they can seem the evil incarnate. To the myriad of plant, insect, fish and wildlife species beavers create habitat for and, to those that appreciate biodiversity, beavers are divinely inspired. In that balance beavers are seriously underrated as a species that can help us weather the storm of climate change.

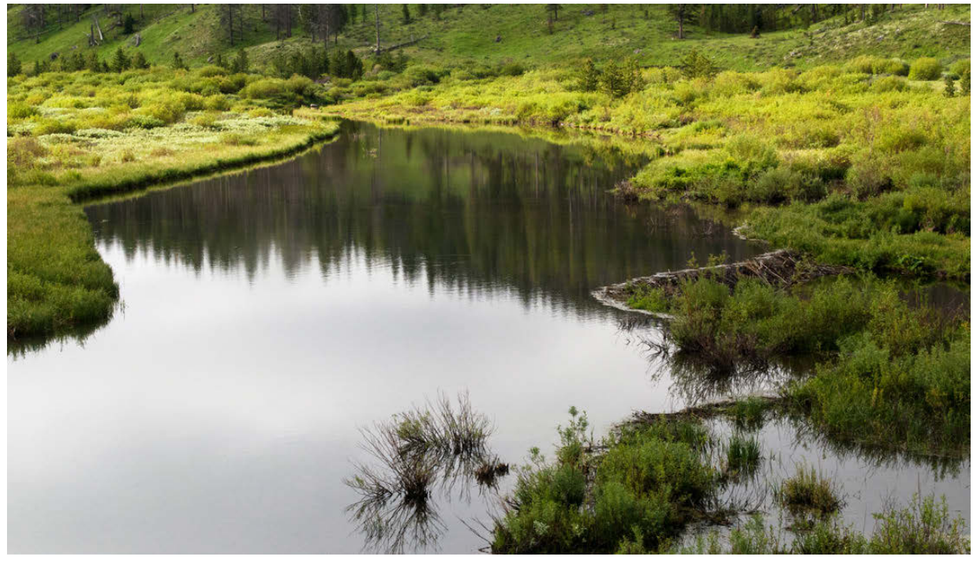
The essence of climate change is greater variability in our weather. For many landscapes the trend is towards warmer and drier conditions. It may also mean more violent storms that dump massive amounts of rain in a short time period. It's a conundrum of generally less precipitation overall, but delivery faster than the landscape can absorb. In a perverse way it means increased drought and flood conditions, often within the same year.

What beavers do, and have done for centuries, can mitigate some of this increased variability. We may have overlooked a natural ally in our efforts to conserve and manage water.

When a beaver hears running water it clicks the switch into dam building mode. Deeper water is a safer home for beavers. Beaver dams create impoundments of stored water, often of significant volume. Research indicates that beaver activity can increase the amount of open water in a watershed by nearly 10%. But, that's only the water we can see. Beneath the ponds and adjacent areas is a much more profound story. Multiply the volume of surface water by 5-10 times to get a picture of the amount of hidden ground water storage.

Beaver ponds both store and deliver water. By slowing water down, allowing it to seep into the ground to shallow aquifers, downstream flows are enhanced from two to 10 times over streams without beavers. Most important, that water is delivered later in the season, when flows are normally low (and in drought, very low), helping fish survive and providing essential supplies to us downstream water drinkers.

On another front, beaver dams function as speed bumps for streams, slowing down the velocity of moving water. Moving water has incredible power, especially during floods and can be extremely destructive. An array



Beaver dam. Rick and Susie Graetz

Putting Beavers to Work

PROJECT UPDATE:

With the support of the Adaptive Management Initiative, Cows and Fish, the Miistakis Institute and the Clark Fork Coalition partnered to host a transboundary workshop on beavers and climate change adaptation in the Crown of the Continent Ecosystem in the fall of 2014 in Missoula, MT. The first portion of the workshop included presentations from five speakers and provided attendees with background information on beaver ecology, habitat and examples of the beaver management techniques being implemented across the state of Montana. After these presentations, the group took a fieldtrip to look at several on-the-ground examples of beaver management projects, including a beaver deceiver.

Also through the support of the Adaptive Management Initiative, the Miistakis Institute researched and wrote a report on the barriers to, and opportunities for, beaver reintroduction that exist on both sides of the 49th parallel. The resulting report focuses its recommendations on charting a strategy for pursuing beaver restoration for watershed health in Alberta and will inform future efforts in this arena.

Cows and Fish is in the final stages of preparing a new beaver awareness document written for the people who can most effectively influence watersheds and riparian areas - ranchers, farmers, landowners, municipalities, conservation groups and industry. Riparian management initiatives in Alberta have dealt primarily with livestock grazing, agricultural cropping, recreational use and industrial concerns. The booklet includes information on: beaver biology and ecology; their role in watershed function and health; the interaction of beaver with vegetation, fish and wildlife and livestock; how beavers can help us adapt to climate change, especially flood and drought; the beaver as a watershed restoration tool; and, thoughts on beaver management.

Above: **A family of beavers spends a warm winter morning sunning on a frozen pond.** Pierre Bolduc

Beaver lodge. Will Klaczynski

Logging, beaver style. USFWS

of beaver dams and ponds in a watershed can delay and reduce the flood peak and the energy associated with that quickly moving mass of water.

Beaver dams increase the width of the effective floodplain up to 12 times. Wider floodplains work to slow down water by spreading it out. This reduces the erosive force, allowing water to be captured in surface irregularities and eventually some into shallow aquifers. Much of the sediment carried by floodwaters is dropped in the floodplain, improving water quality. The impact of a flood is dampened, slowed and reduced, which decreases the negative impacts on downstream communities.

Our attempts to mitigate floods and droughts aren't always successful, and are very costly enterprises. Often, engineered structures destroy natural attributes, negatively affect fish and wildlife populations, and visually detract from the natural landscapes.

If watersheds had more beaver dams and ponds that would increase the capability to capture and tame flood flows, mitigate droughts and better manage risk. Integrating beavers into our future flood, drought and watershed plans can reduce costs, impacts and add substantially to benefits. These natural dam builders and water engineers can be aggravating and helpful, costly and beneficial. It is a matter of time and place coupled with a healthy dose of tolerance.

The challenge is what current beaver populations are a fraction of historical numbers. Population recovery has been slow, partly because we have not fully understood and appreciated the many services provided by beavers and the benefits for us. Another look at beavers will show they are a most convenient species to have as an ally as we adjust to water scarcity and periodic water overabundance.

***Lorne Fitch** is a Professional Biologist, a retired Fish and Wildlife Biologist and an Adjunct Professor with the University of Calgary.*

THIS ARTICLE WAS PROVIDED BY OUR PARTNER THE

MIISTAKIS INSTITUTE

Affiliated with Mount Royal University, the Calgary-based Miistakis Institute, is a non-profit educational, research, and conservation organization. Its vision: "a world where communities have genuine access to the science and research they need to make choices that promote healthy landscapes." Its mission: "to study the landscape in order to help people conserve it." And further, staff members "work to make innovative research accessible to communities and decision-makers." Learn more at **rockies.ca**.

CITIZEN SCIENTISTS... IN SEARCH OF THE "CANARY IN THE COAL MINE"

by **Jami Belt**

Tim Rains/NPS

Fascinating creatures lurk beneath the surface of Glacier National Park's waters rivaling the grizzly bears and bighorn sheep found in the mountains above.

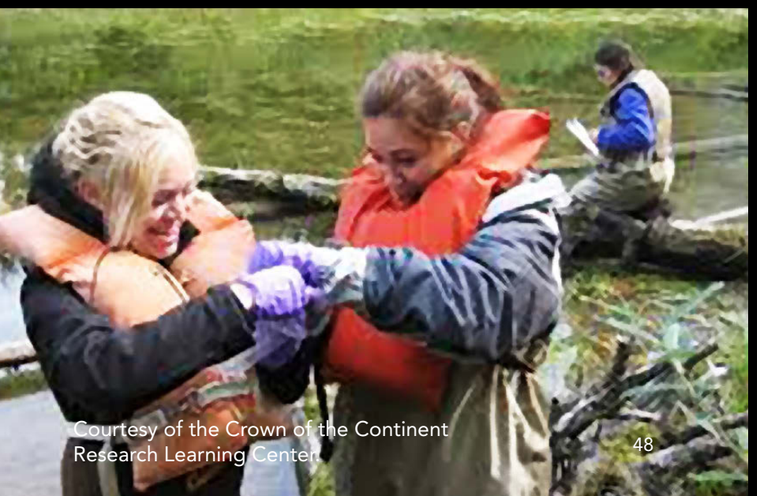
On a crisp September day, high school students, armed with dip nets, wade into these waters to rouse these creatures out of their predatory haunts. We are in search of dragonfly larvae, a voracious predator that also serves as a "canary in a coal mine," alerting us to threats affecting its aquatic home.

Distinguishable by their bulging eyes and toothy lower lips, dragonfly larvae are quickly identified by the students and carefully plucked from nets using gloved fingers. The gloves prevent possible contamination of our precious samples from little bits of human skin or hair and the trace amounts of chemicals they harbor.

The study, a collaborative effort between the National Park Service, United States Geological Survey (USGS), and several universities, engages citizen scientists to collect dragonfly larvae in over 40 national parks. The samples will be sent to labs at the University of Maine, USGS, and Dartmouth College to help shed light on how much mercury these dragonfly bodies contain, and how much risk that poses for food webs throughout our national parks.

Dragonfly larvae spend their first several years at the top of the aquatic-insect food chain, giving them ample time to bio–accumulate mercury, which has found its way into smaller insects that dragonfly larvae prey upon. Mercury, a toxic pollutant that floats on global air currents, is sourced largely from coal-burning power plants and fossil-fuel emissions, and can be found in relatively high concentrations in dragonfly larvae. Fish eat lots of these larvae, meaning mercury concentrations don't just end with dragonflies. Instead, they magnify in intensity the higher up the food chain you look.

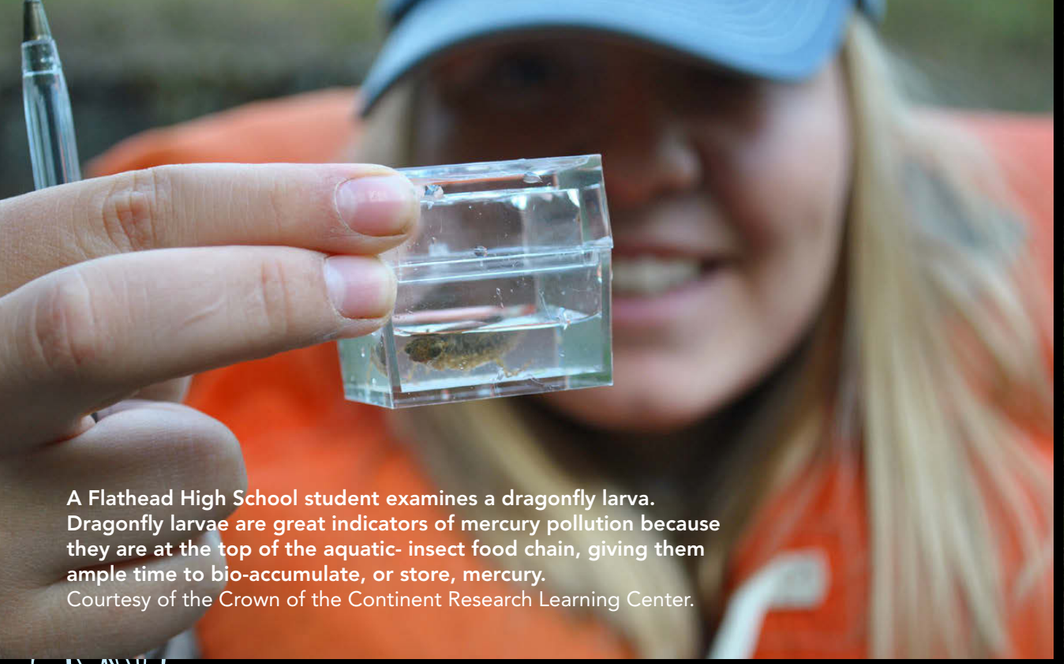
Prior to the field trip, students from Flathead High School's International Baccalaureate program explored the complex, global topic of mercury deposition. As part of Glacier's Youth Exploring Science (Y.E.S.!) citizen science initiative, the students will take the knowledge they have gained during the classroom sessions and the data collected on their field trip, and develop their own hypothesis. This hypothesis can then be tested using both



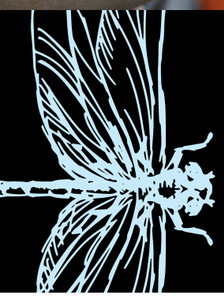
Courtesy of the Crown of the Continent Research Learning Center

A mature dragonfly. greaves_russell/flickr

Dragonfly larvae. Jessica Mounts ksfishgirl@gmail.com



A Flathead High School student examines a dragonfly larva. Dragonfly larvae are great indicators of mercury pollution because they are at the top of the aquatic- insect food chain, giving them ample time to bio-accumulate, or store, mercury. Courtesy of the Crown of the Continent Research Learning Center.



Students exploring mercury biogeochemistry with the Acadia Learning Project noticed that all orders of insects found below a wetland complex had higher mercury than those found higher up the watershed.

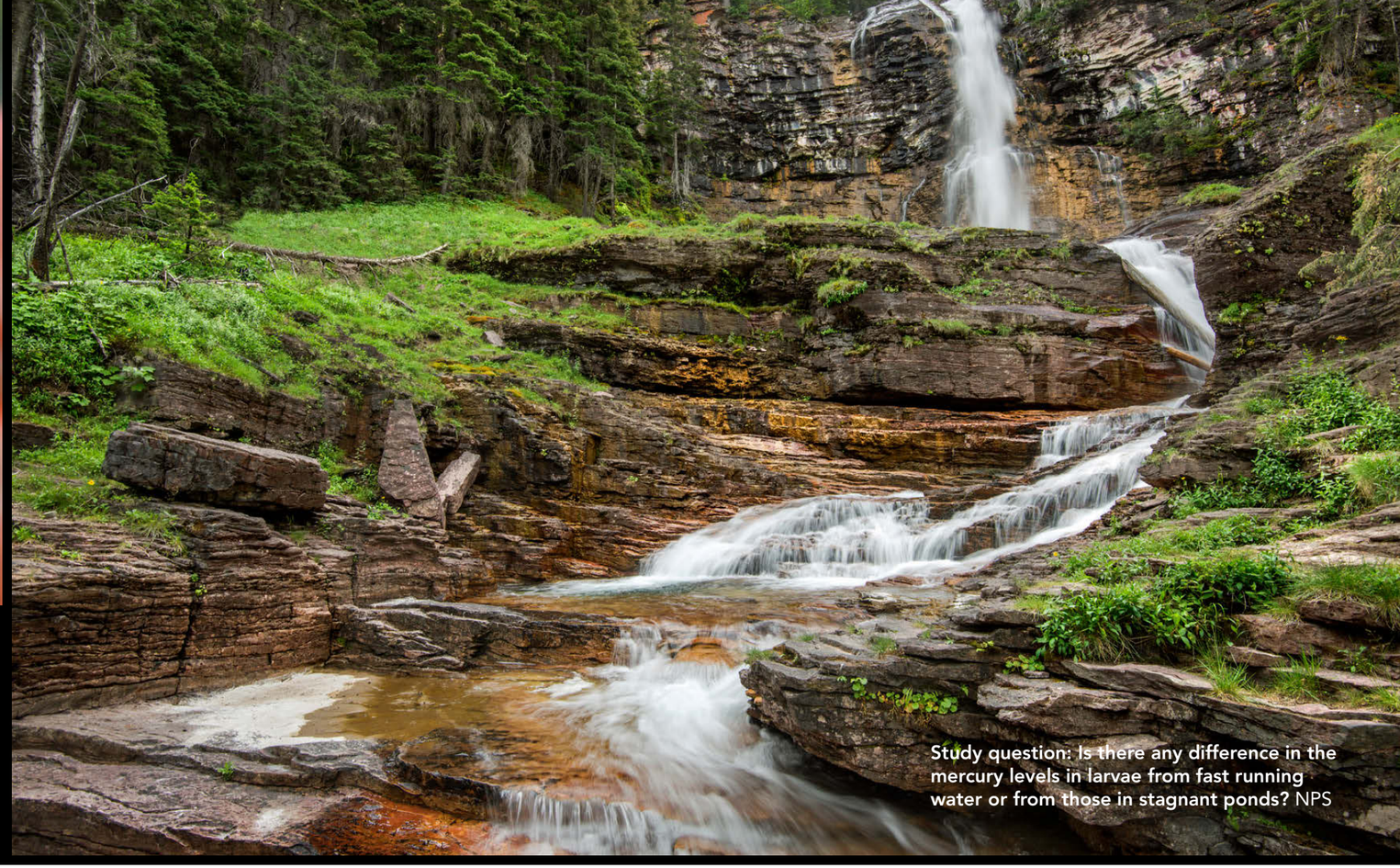
the data they collected and the data gathered at other parks.

Engaging Flathead High School students in this program is a natural fit since the project idea was born out of research conducted by high school students in Maine. Students exploring mercury biogeochemistry with the Acadia Learning Project noticed that all orders of insects found below a wetland complex had higher mercury than those found higher up the watershed. The students wanted to explore their findings more, so they selected the insect order that was found in all of the water bodies they sampled— dragonflies—and began targeting them specifically for further testing.

Typically, fish are tested to gauge mercury risk to humans. This information is used to advise people on how much fish is safe to consume in tested water bodies. But fish are harder and more costly to catch than dragonfly larvae, and not all water bodies at risk for mercury have fish. The work the Maine students pioneered presented scientists with potentially a more simple and cost-efficient way to test for mercury levels in food webs. Scientists ran with it, creating a protocol that is now being tested in national parks across the country.

Students from Flathead High School are furthering this legacy of student-generated research as they develop their own hypotheses about how Glacier's mercury levels will compare to those in more urban-based national parks.

Flathead students wondered whether air currents and precipitation captured by western Montana's mountain ranges make Glacier National Park a beacon for mercury deposition. The students are also investigating questions such as the effect of flow rate on contaminants at our distinct sampling sites. For instance, will dragonflies



Study question: Is there any difference in the mercury levels in larvae from fast running water or from those in stagnant ponds? NPS

from Johns Lake, a stagnant, swampy area surrounded by cedar forest, accumulate more mercury than the clear, fast-flowing waters of Lower McDonald Creek? Several in the group were curious about how the other aquatic species we found, among them the fist-sized giant water bug and a mother leech with her hundreds of babies attached to her underside, would affect the diversity of dragonfly families. The hypotheses that show the most promise for further exploration will be used as a jumping point for students in next year's classes.

The students' new insights are a leap forward from their previous knowledge of mercury pollution. During the first classroom session, I asked the students to answer some basic questions about mercury contamination. Many of them thought mercury was an essential mineral in our diet that came from plants or fish, and not something to be concerned about. By the end of the field trip, the students understood the consequences of mercury pollution and rallied to identify and bag the best samples they could find to ensure they were making their finest contributions to the research. After all, few would argue that humans are at the top of the food chain and ripe for bioaccumulation.

Thanks to dragonflies and the students collecting them, our knowledge of mercury pollution will likely increase and help inform us of what we are eating. As they say, you are what you eat.

***Jami Belt**, former Citizen Science Coordinator at Glacier National Park, is currently serving as the Natural Resource Program Manager at Klondike Gold Rush National Historical Park.*

This article has been reprinted courtesy of the Crown of the Continent Research Learning Center.
crownscience.org/newsletters

THE BADGER TWO-MEDICINE...

Where I Practice my Religion

by **Casey Perkins**

Consider this scenario: One man is hell-bent on drilling for oil through the floor of a church that has stood for generations.

This church is part of the social fabric that ties one generation to the next. Thousands of baptisms, marriages and funerals have occurred there. It teaches charity, forgiveness and other values that bind the community. The church is more than a building; it is also a living thing with a several-thousand-year-old history. Now, look beyond this single community to see an entire people. Trade the church pews for endangered species and the holy water fonts for headwaters, and then you might get a sense of how the people of the Blackfeet Nation feel about Sidney Longwell, an oil developer from Louisiana, who is suing the federal government so he can drill for oil in the Badger-Two Medicine.

The Badger-Two Medicine sits within the Lewis and Clark National Forest in northwestern Montana. It is surrounded by the Blackfeet Reservation, Glacier National Park and the Bob Marshall Wilderness Complex, and is home to grizzlies, wolverines and westslope cutthroat trout. The National Register of Historic Places has listed it as a Traditional Cultural District. In a brief filed on behalf of the oil developer in 2014, however, the Mountain States Legal Foundation simply dismisses that designation, repeatedly referring to it merely as “alleged,” “purported” or even “suspicious.”

A soft sunset accents the sacredness of the Badger-Two-Medicine Valley. Ryan McKee

South Fork of the Two Medicine River. Stephen Legault, stephenlegault.com

Longwell's proposed oil well would be drilled on a small ridge above a tributary of the Two Medicine River, in a landscape the Blackfeet have used for thousands of years. In pooh-poohing the tribe's desire to preserve the area, the developer's lawyers made a bizarre argument: They suggested that the Blackfeet oppose the well only because someday they might want to drill it themselves.

During a series of meetings last summer, Mountain States Legal Foundation lawyer Steven Lechner cited decades of research contained in no less than three ethnographic reports, detailing the uses, sites, ceremonies, stories and language that connect the Blackfeet to the Badger area. He then clearly described Longwell's proposed project, which includes five miles of road, a new bridge wide enough to haul a drill rig over the Two Medicine River, and a well pad. Then he said that all this development could not possibly harm any of the spiritual values outlined in the ethnographic reports.

Longwell, wearing a long-suffering expression, added: "We don't even know where the rock is that's supposed to be religious in order to avoid it." His lawyer rolled his eyes and leaned back in his chair in agreement.

The Blackfeet are not giving in. In a meeting held last October in Browning, Montana, leaders and elders from all four bands of the Blackfoot Confederacy joined leaders from tribes across Montana and Wyoming to sign a proclamation formally demanding that the US government cancel all oil and gas leases in the Badger. The event was well covered by the media, though no one could quite capture the feeling of pride and sense of honor that filled the room as tribal members introduced themselves and spoke about how pleased they were to be together, united in action over such an important cause.

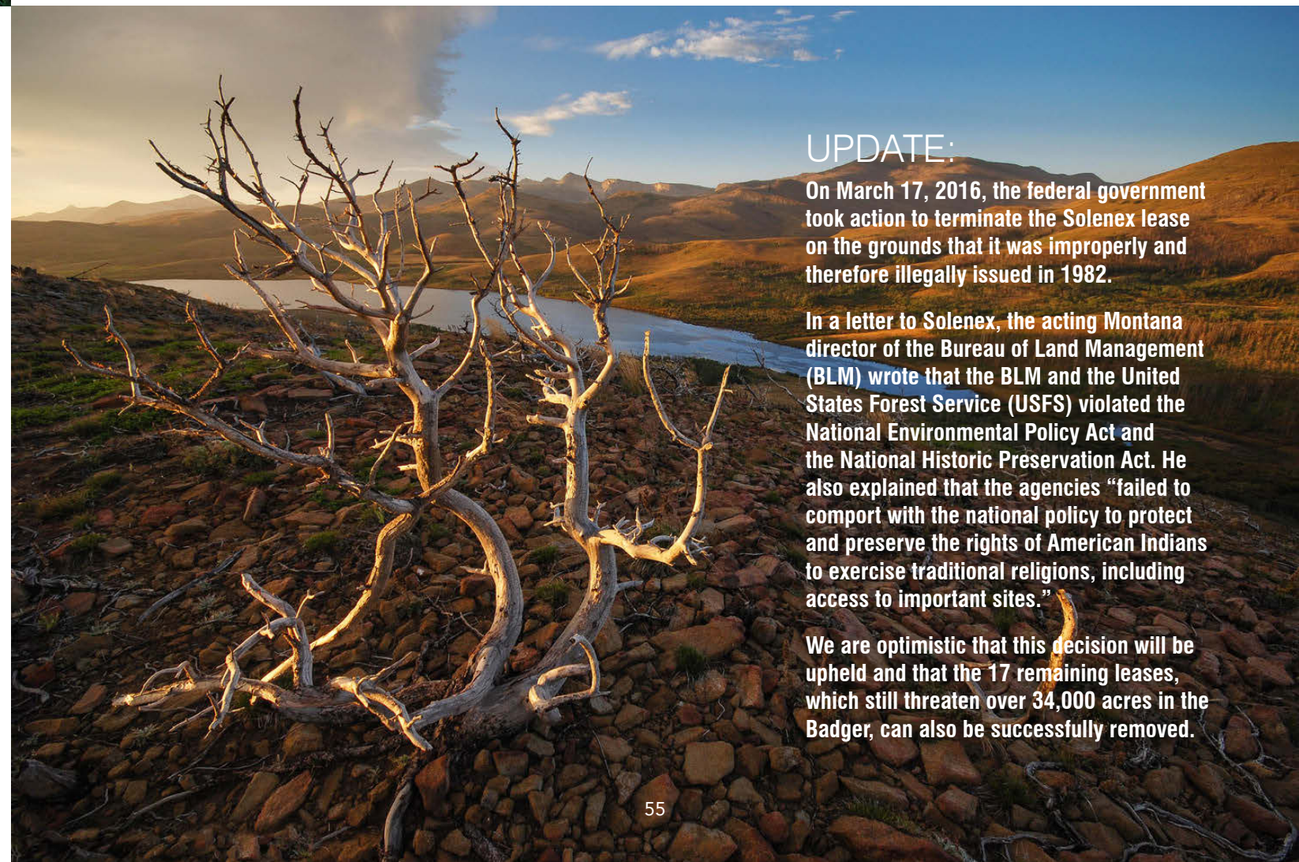
Since last fall, the effort has grown and attracted supporters, including Montana Democratic Sen. Jon Tester, the National Congress of American Indians and the rock band Pearl Jam. A Change.org petition, asking Interior Secretary Sally Jewell and Agriculture Secretary Tom Vilsack to cancel the leases, has collected thousands of signatures.

In April, Chief Earl Old Person, who has led the Blackfeet since 1954, and who has met with every US president since Harry S. Truman, wrote to President Obama, asking for help. "The Blackfeet Nation has been able to successfully contest the legitimacy of these leases and drilling proposals for over three decades," wrote Old Person. "Many responsible oil companies have recognized the sanctity of these cultural headwaters, voluntarily changing their holdings for opportunities on federal lands elsewhere — yet a handful of these leases remain. At this time, I respectfully request that we work together to fully put an end to these remaining leases and stop all threats to our cultural-spiritual heritage."

Sidney Longwell may never understand the profound relationship between people and place that exists in the Badger-Two Medicine. Yet, despite himself, he's accomplished something important. Because he threatens one of the places that are most sacred to the Blackfeet people, the whole of Indian Country has come together in an effort to stop him. People are united, and that is a wonderful thing to see.

***Casey Perkins** is a contributor to* Writers on the Range*, a column service of High Country News. She is a field director for the Montana Wilderness Association based in Choteau, Montana.*

This article is reprinted courtesy of *High Country News*.



UPDATE:

On March 17, 2016, the federal government took action to terminate the Solenex lease on the grounds that it was improperly and therefore illegally issued in 1982.

In a letter to Solenex, the acting Montana director of the Bureau of Land Management (BLM) wrote that the BLM and the United States Forest Service (USFS) violated the National Environmental Policy Act and the National Historic Preservation Act. He also explained that the agencies "failed to comport with the national policy to protect and preserve the rights of American Indians to exercise traditional religions, including access to important sites."

We are optimistic that this decision will be upheld and that the 17 remaining leases, which still threaten over 34,000 acres in the Badger, can also be successfully removed.

The Badger-Two Medicine. Stephen Legault, stephenlegault.com

A Deadly Game of Hide and Seek

by **L. Scott Mills**

Camouflage is one of nature's most marvelous adaptations. It's everywhere, hiding creatures in plain sight. Cryptic coats cloak insects, snakes, birds, mammals, lizards – really, species from any animal group you could imagine. Why? Because, in nature, where every animal kills something to survive, camouflage makes the difference between life and death. Deep study of animal camouflage by naturalists and artists in the late 1800s led to principles that revolutionized military camouflage patterns by World War I. In turn, hunters and nature watchers ever since have benefitted from the rich tapestry of commercial camouflage patterns, ranging from "real-tree" brown to "winter white" patterns.

But unlike humans who have to buy separate brown or white camouflage patterns to fit the occasion, some animals carry a full set of different coat colors in their genes. At least twenty species worldwide undergo seasonal molts where their hair turns from brown in summer to white in winter to match the predictable seasonal passing of snow, making them some of nature's most charismatic creatures: Arctic fox, weasels, hares, and some lemming and hamster species to name a few. Here in the Crown of the Continent, snowshoe hares, white-tailed jackrabbits, and three species of weasels, all undergo seasonal color molts.

I have been studying snowshoe hares continuously since 1998. My questions at the beginning were both basic – understanding the controls on numerical changes and population fluctuations of wild animal species – and also very applied, because the hare is the nearly sole prey of the Canada lynx, a species listed as federally threatened in 2000. My students and I live-trapped, radio-collared, and observed

Caught still wearing winter white after the early onset of snowmelt, a snowshoe hare is easy prey. Sneed B. Collard III

hares across the West year-round, learning where they moved, where they hid, who ate them and how often. We studied them across different forest types and full moons and blizzards and heat waves. Really, what we did, year after year on snowshoes and snowmobiles, up and down steep slopes with mosquitoes in our ears, was to learn – scientifically speaking – the implications of the many ways that hares can die.

Over time, we increasingly saw bright white hares hopping around on a snowless brown forest floor in late October or mid April. We had been studying the ways that predation shaped hare behaviors and population trends, but those mismatched, light bulb bright critters got my mind spinning. Paul Griffin, my PhD student back in 2000, found that hares died more in fall and spring than in deep winter or summer. We wondered: Why? Could it be because they have mismatched coat colors on snowless ground?

A perfect match for winter. Mills Research

First week of June molting stage. Nate Steiner/Flickr

For me, these early musings about the potential costs of coat color mismatch eventually collided with emerging findings from the field of climate science in a reverberating "ah-ha!" moment. Pouring out of climatology labs from around the world (including Steve Running's at the University of Montana) came clear evidence that the duration of seasonal snow cover is decreasing fast. And the thing is, you don't need to believe in any climate model to know this is true. Just go anywhere in the world with seasonal snow (Montana, Maine, Mongolia, Alberta, Scotland, Italy), find a person who has spent a lifetime observing the seasons (perhaps a hunter, birdwatcher, logger, or skier), and ask them if the duration of winter is shorter now, on average, than when they were young. I'll bet 50 bucks they say yes.

With the realization of the globally shortening snow duration, I dug into what was known about seasonal coat color. Lab studies had shown the timing of the coat color molt was, like migration, hibernation, and other seasonal (phenological) traits, driven by changing day length. This makes sense, as day length is a reliable cue, long term, of the comings and goings of snow. Over time, snow has come early or late in different years, but on average, the shortening days of fall indicate that snow will soon arrive, and the lengthening days of spring herald the coming thaw.

What does it mean if the timing of the molt is set by photoperiod, but snow duration is rapidly decreasing? Will coat color mismatch increase in the future? Does mismatch make animals easy targets for predators, and could it lead to the eventual decline of a species? Do animals have tricks (we call it "plasticity") up their furry sleeves that help them deal with mismatch, perhaps by adjusting molt timing year to year or behaving in ways to minimize mismatch or its consequences? Could natural selection change the timing of the molt, prompting "evolutionary rescue" that decreases mismatch fast enough to prevent species declines? In the end, will climate change be likely to send coat color changing species toward oblivion, or will they be able to adapt? These are questions that have yet to be answered for snowshoe hares, or for that matter, any species facing climate change.

By the way, right about here some folks will say: "of course these rabbits will be fine, because they breed like rabbits!" But, hares are *not* rabbits. Hares are born above ground—exposed to predators from birth—and have modest litter sizes compared to rabbits.

Therefore, my research team is throwing everything, including the kitchen sink, at answering the question of whether or not wild animals can locally adapt to rapid climate change. Over the past six years, we have radio-collared more than 300 snowshoe hares so we can find their locations once per week. If they're dead, we figure out who killed them, and where. If they're alive, we record their coat color so we can quantify the timing and speed of the coat color change, and we record snow around each hare to quantify the mismatch between the hare and the ground. We also measure behaviors to test whether or not hares can perceive their own mismatch and act to decrease the chance of becoming someone's next meal.

Out in the field with my graduate students Marketa Zimova and Alex Kumar and dozens of hard-core field helpers and collaborators, we've already learned a lot. The fall molt to white starts with the ears and lower abdomen, then spreads through the body, with the face and back the last to turn white; spring molt is roughly in reverse order, except more splotchy and mottled. The total time from start to finish is about 40 days for both the fall and spring molts. As expected, for a seasonal trait timed to changing day-length, we do not see a chameleon-like ability to adjust the beginning date of the color molt in years when the snow comes late or leaves early. Whether it was the monster long snow year of 2010-2011 or the historically short snow year of 2009-2010, the molt in the western Montana Seeley Lake hares begins like clockwork about October 10 and the spring molt about April 10.

We also find the coat color change is adapted to track local average snowpack. In our Gardiner study site outside Yellowstone National Park—about twice the elevation of our western Montana study site and with much longer snow duration—hares remain white about five weeks longer.

When hares are mismatched, they are indeed more vulnerable to being killed by raptors, lynx, bobcats, foxes, coyotes, and marten that prey on them. Our field

Researchers use telemetry to locate collared hares in the rugged Swan Mountains. Mills Research

studies show that for every week a hare is mismatched, it is seven percent more likely to be killed than other individuals who are matched against their background. As to whether hares can perceive that they are mismatched and then take actions (like hide, or flee, or pick a spot to be better matched), they don't seem to know what's going on.

What happens when we put the cost of mismatch up against the rigorous, locally downscaled climate change projections of shortened winters in the future? Assuming the color molt timing stays as it is now, over the next 50 or so years, the number of days that white hares will be mismatched on a snowless background will be four to eight times more than it is now, and that mismatch will be deadly.

Snowshoe hare education in the field.
Sneed B. Collard III

But wait… we also found that within hare populations, individuals are remarkably variable in their coat color timing and rate of molt—some start earlier, or later than others. This is exactly what you would expect: because snow has always differed in when it comes and goes each year, an inconstancy in coat color timing has allowed the persistence of these populations through those long and short winters. And the within-population variability is mirrored across populations, where we find that molt timing is shaped to local snow conditions like Seeley Lake versus Gardiner.

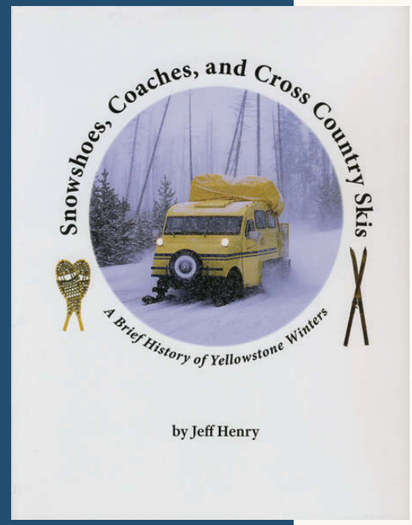
Could evolution rescue species from the rapidly shifting conditions of climate change by altering the timing of the molt to track reduced snow duration? We are pushing hard to answer this question. In addition to the field-based measurements, another key piece includes unravelling the genetic basis of the coat color change. For this part, I am collaborating with Dr. Jeff Good at the University of Montana and Drs. Paulo Alves and Jose Melo-Ferreiro at the University of Portugal. Also, here at North Carolina State University we've built a one-of-a-kind experimental facility where animals can be kept in photoperiod and sub-zero temperature controlled conditions like those found in the north. We have Montana and Washington hares undergoing their normal color molts, allowing us to tease out key questions regarding genetic inheritance, ability for animals to adjust behaviors or molt, and other questions. We're also expanding the project globally, with new coat color change research collaborations underway in the Northeast on weasels, in Scotland and other parts of Europe on mountain hares, and in Sweden on Arctic foxes.

The charismatic poster-child of climate change is mismatched white animals on a brown snowless background. On the one hand, the picture underscores a direct and real consequence of climate change. But on the other, it implies that natural selection may play a powerful role in determining how this story unfolds in the years ahead.

For the good of both humans and non-humans, we clearly must continue to address the underlying causes of climate change. However the potential role of natural selection implies very real steps that could be taken in the meantime to foster evolutionary rescue. Adaptive evolutionary change requires populations to be relatively large, with connectivity across the landscape with other populations, and with reduced stressors coming from other factors (such as land use change, invasive species, and habitat fragmentation). While we fill in the details of the science behind this story, we can say for sure that any actions taken to foster evolutionary response by maintaining large, connected populations will increase the chance for wild animals to persist in the face of rapid climate change. That's the hands-on, hopeful story that the hares have told me.

***L. Scott Mills** is a professor in the Program in Global Environmental Change, within the Department of Forestry and Environmental Resources and the Program in Fisheries, Wildlife and Conservation Biology at North Carolina State University. He began his extensive research on snowshoe hares and other animals in the Crown of the Continent while he was a professor in the Wildlife Biology Program at the University of Montana, where he taught for 16 years.*

BOOK REVIEWS



SNOWSHOES, COACHES, AND CROSS COUNTRY SKIS. A BRIEF HISTORY OF YELLOWSTONE WINTERS

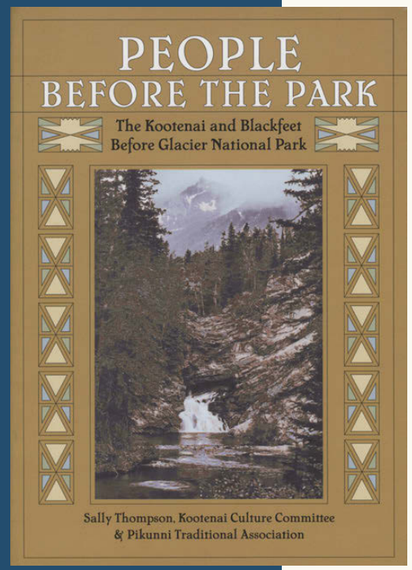
by Jeff Henry. Emigrant, MT: Roche Jaune Pictures, Inc. 2011.

While we were beginning to think about the Winter issue of the magazine, I picked up a copy of this marvelous book in Yellowstone Park, thinking that it looked like a good book to read, and also a possibility for a review. Was I ever right about that! What I stumbled across turned out to be an exceptionally informative, fun, and well-written history of the glories and challenges of Yellowstone in winter, beginning with a short discussion of the pre-historic ice age and the glacial legacy it left behind, moving chronologically through an anthropological and archaeological glance at how "Yellowstone's First Peoples" most likely wandered through and hunted in the area, and ending with the final chapter portraying more contemporary subjects, 20th and early 21st century transportation, construction, "winterkeeping," and the now vast range of winter activities that take place in the park, work-, scientific-, and recreation-related.

The book, obviously born of a love affair and extensive experience with the park by the author, Jeff Henry, a tremendous photographer whose photos, as well as an impressive collection of outstanding art by a large number of artists, add a visual richness that will charm and inspire readers of all kinds. Henry himself has spent over 30 winters in the park where he has been, among other things, a seasonal ranger, wildlife researcher, and "winterkeeper." He has published two earlier books as well: The Yellowstone Winter Guide (revised in 1998) and Yellowstone Winterscapes (2004).

As the title of this book suggests, his focus here is in answering the question "how have people, and how do people, travel in and around the park during the several months of winter?" Yet, as he discusses the use and impact of the various means of transport in and through the wintery land, from early day snowshoes and long wooden skis in the late 19th century to the various (and often controversial) motorized vehicles of the late 20th and early 21st centuries, the reader learns about other pieces of history: about the explorers who "discovered" and mapped it, the early "managers" and protectors (the US Army and those who pioneered the US Park Service here on the ground), those who built the structures that allow visitors and workers not only to move about in winter, but to spend nights and even weeks there, and about the animals that live, roam, and search for food during the challenging winters for which Yellowstone is famous.

If you have ever visited Yellowstone in winter and experienced the special magic of the place in this long season, or are contemplating doing so, this is a book that you should check out of your library, purchase, and both read and browse through over and over. In my most recent visit to Yellowstone this January, having spent time with this book beforehand helped me see and appreciate a lot more in this mostly white landscape than I ever had prior to taking it into my hands. This "Brief History of Yellowstone Winters" is a real gem, and at a price of $24.95, hardback and large format, it's a great bargain!



PEOPLE BEFORE THE PARK. THE KOOTENAI AND BLACKFEET BEFORE GLACIER NATIONAL PARK

by Sally Thompson, Kootenai Culture Committee & Pikunni Traditional Association.

Historical Society, 2015. Paperback: $19.95.

The idea for this especially well-written and informative book—a collaboration among archaeologist, ethnographer, and ethnohistorian Sally Thompson and the Kootenai Culture Committee, as well as the Pikunni (Blackfeet) Traditional Association—came from officials at Glacier National Park. The book shines in part because of its clear and accessible text, the many historic photos and drawings, and the Tribal stories. The timeline of the narrative is specifically the 19th and early 20th centuries, but all three of the "authors" reach back and look forward from those hundred or so years to offer insights into the lives of the "people" who lived in and near the part of the Crown of the Continent that became, in 1910, Glacier National Park.

In the initial three chapters, Thompson, working in partnership with the two tribal organizations, provides a background and context for the last two chapters, one from the Kootenai on the west side of what is now Glacier National Park, the other from the Blackfeet (Pikunni) on the east side. Especially her portrayal of the history of these two tribes in their home places, in their interactions with the land they lived in as their world, as well as their interactions with each other and intruders of various kinds (other tribes, explorers, fur traders, settlers, and the US government) lays an excellent foundation for understanding better the stories, based on their oral traditions, told by the Kootenai and Pikunni. Thompson's final chapter discusses how all of this is continued, and challenged, in the 21st century.

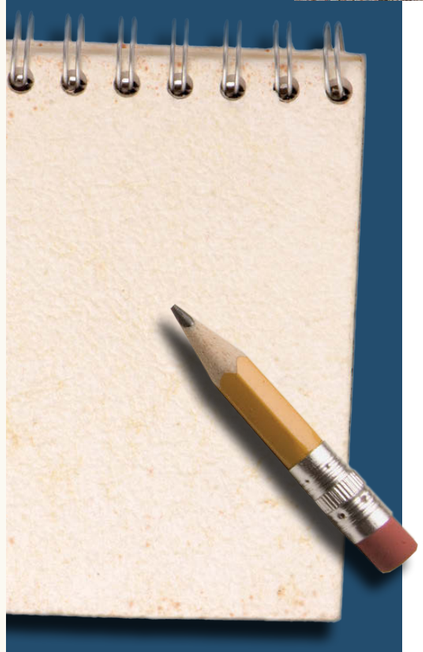
Chapters 5: The Kootenai Worldview; and 6: The Pikunni Worldview, constituting approximately two-thirds of the book, invite readers to see up close what were and what shaped the similar yet often differing worldviews of these two tribes. One reads their creation stories and ways of organizing their lives in tune with the weather, the seasons, the land, and their rituals. It becomes clear that as they lived in and with this land and the creatures and vegetation that inhabited it, all was regarded as sacred. Few readers will finish this book without gaining a greater understanding of what our now majority culture would term their "conservation ethic," and where and why it originated. I can guarantee that readers will be engaged, informed, and often amazed at what is contained between the two covers of a remarkable book. Check it out from your library, or better yet, buy a copy, perhaps two (and give one to a friend or relative). At $19.85 it's a steal!

Reviews by Initiative co-director Jerry Fetz

COURT OVERTURNS GOVERNMENT REFUSAL TO PROTECT WOLVERINE

Describing the wolverine as a "snow-dependent species standing squarely in the path of global climate change," a federal judge today overturned an August 2014 decision by the US Fish and Wildlife Service refusing to grant this rare and elusive species any protection under the Endangered Species Act (ESA).


NPS



The ruling by US District Court Judge Dana Christensen rejected the Service's determinations that climate change, an extremely small population size—there are only approximately 300 wolverines left in the northern Rockies and north Cascades—and genetic isolation do not threaten the wolverine's survival in the lower-48 states.

"This decision gives the wolverine a fighting chance at survival," said Earthjustice attorney Timothy Preso, who represented eight conservation groups in the case before Judge Christensen. "There is now hope for this icon of our remaining wilderness."

Today's ruling passes a harsh judgment on the Fish and Wildlife Service for an eleventh-hour reversal in considering new legal protections for the wolverine. In February 2013 the Fish and Wildlife Service proposed to list the wolverine as a threatened species under the ESA after the agency's biologists concluded global warming was reducing the deep spring snowpack pregnant females require for denning. But state wildlife managers in Montana, Idaho and Wyoming objected, arguing that computer models about climate change impact are too uncertain to justify the proposed listing. Then, in May 2014 the Service's Regional Director Noreen Walsh ordered her agency to withdraw the listing, ignoring the recommendations of her own scientists. The agency formalized that withdrawal in a final decision issued in August 2014.

In today's ruling, Judge Christensen addressed the question of why the Service flip-flopped on this key conservation issue: "[T]he Court suspects that a possible answer to this question can be found in the immense political pressure that was brought to bear on this issue, particularly by a handful of western states. The listing decision in this case involves climate science, and climate science evokes strong reactions."

The judge also directed the Service to act promptly to correct its erroneous findings: "It has taken us twenty years to get to this point. It is the undersigned's view that if there is one thing required of the Service under the ESA, it is to take action

at the earliest possible, defensible point in time to protect against the loss of biodiversity within our reach as a nation. For the wolverine, that time is now."

"Today's decision restores scientific integrity to wolverine management," said Caroline Byrd, Executive Director of Greater Yellowstone Coalition. "This increasingly rare and elusive animal represents the wildness that is still found today in Greater Yellowstone and we are committed to ensuring wolverines receive the protections they deserve."

The wolverine, the largest land-dwelling member of the weasel family, once roamed across the northern tier of the United States and as far south as New Mexico in the Rockies and Southern California in the Sierra Nevada range. After more than a century of trapping and habitat loss, wolverines in the lower 48 have been reduced to small, fragmented populations in Idaho, Montana, Washington, Wyoming and northeast Oregon.

Wolverines depend on areas that maintain deep snow through late spring, when pregnant females dig their dens into the snowpack to birth and raise their young. Snowpack is already in decline in the western mountains, a trend that is predicted to worsen. Wolverine populations are also threatened by trapping, human disturbance, low genetic diversity, and fragmentation of habitat.

This article was provided courtesy of the Greater Yellowstone Coalition

MUSSEL-FOULED BOATS FOUND AT PABLO INSPECTION STATION


Courtesy of the Missoulian

by Vince Devlin of the Missoulian

Just two days after a watercraft inspection station opened here, authorities found two mussel-fouled boats headed for Flathead Lake. They're the first contaminated boats found in Montana this year.

Aquatic invasive species inspectors Ky Zimmerman and Joshua Cruz found the mussels Friday on a 15-foot aluminum fishing boat and a 20-foot pontoon boat.

Both boats had been decontaminated by the Arizona Game and Fish Department prior to heading north, but Erik Hanson, a consultant for the Flathead Aquatic Invasive Species Work Group, noted that "decontamination is not always 100 percent. It is critical for boats to be held after decontamination to ensure that they are actually mussel-free."

Arizona authorities had notified Montana officials that mussels still might be present on the hulls or engines of the boats. Both boats had spent two to three months on Lake Havasu. "We often hear from boaters that the problem is the out-of-state boat owners," said Zimmerman, one of the inspectors. "Yet in this case, both boat owners were Montana residents, showing that we all must be vigilant." Both owners were "extremely" cooperative, authorities said.

Inspection stations in Idaho, Oregon and Alberta have also already intercepted mussel-fouled boats.

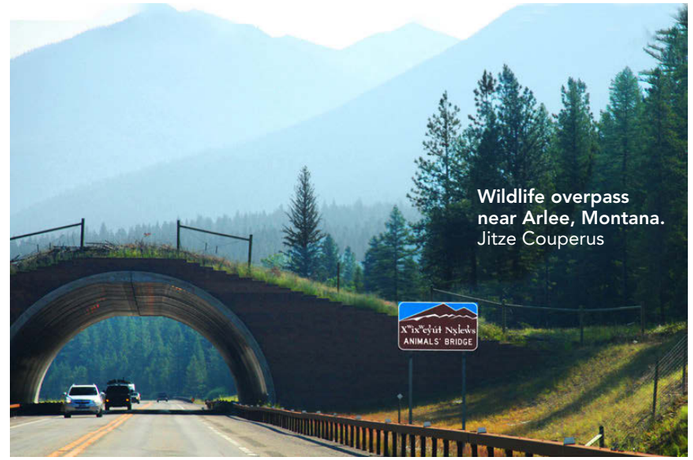
Once quagga or zebra mussels are introduced to a body of water, they rapidly blanket all hard surfaces, from shorelines to man-made infrastructure. Invasive mussels foul beaches, clog boat motors and dams, drive up utility rates and adversely affect fish and wildlife. When they attach themselves to boats and the boats are transported from one body of water to another, the mussels can establish new colonies. Once they've invaded a new body of water, it's virtually impossible to eliminate them.

Montana Fish, Wildlife and Parks typically opens inspection stations over Memorial Day weekend, but the Flathead Basin Commission has worked hard to fund earlier station openings in Browning, Clearwater Junction and Pablo, citing research that shows the majority of boats being transported from areas already infected are moved prior to the holiday weekend.

The Pablo station was the last to open, thanks to help and funding from the Confederated Salish and Kootenai Tribes and the Burlington Northern Santa Fe Foundation. It has already inspected 105 boats, Miske said, including four considered high-risk.

***Vince Devlin** is the Missoulian's reporter for the Northwest portion of Montana.*

Y2Y RECOGNIZES CSKT'S CONSERVATION EXCELLENCE



Wildlife overpass near Arlee, Montana.
Jitze Couperus

In 2014, Y2Y established the annual Ted Smith Award for Conservation Collaboration to be granted to individuals or groups that collaboratively contribute to long-term conservation in the Yellowstone to Yukon region. The inaugural award was presented to representatives of the Confederated Salish and Kootenai Tribes, for their extensive and collaborative conservation efforts in their traditional homeland.

The award honors the Tribes' conservation efforts, such as creating the first tribally-established wilderness in the US, which includes a grizzly bear conservation area in the Mission Mountains.

The award also recognizes CSKT's work in designing and building extensive wildlife crossings on highways across the Flathead Reservation, especially on Montana's Hwy 93, as well as their success in re-introducing trumpeter swans to the region.

"By committing to collective action, CSKT has championed the spirit of collaboration that epitomized Ted Smith's life and work," said Y2Y Interim President Wendy Francis. "They have shown just how much we can accomplish if they share a common overarching vision and work together collectively to make it happen."

y2y.net

Crown of the Continent and the Greater Yellowstone

MAGAZINE

Rick and Susie Graetz