

CROWN
of the
CONTINENT
and the
GREATER
YELLOWSTONE

MAGAZINE

UNIVERSITY OF
MONTANA

Winter/Spring 2018

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CROWN of the CONTINENT and the GREATER YELLOWSTONE

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Front cover: **The beginnings of winter, the Garden Wall, Glacier National Park.** John Lambing

Above: **Henry Lilly braves the beautiful, but icy waters of Glacier National Park's Bowman Lake.** Ed Lilly



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

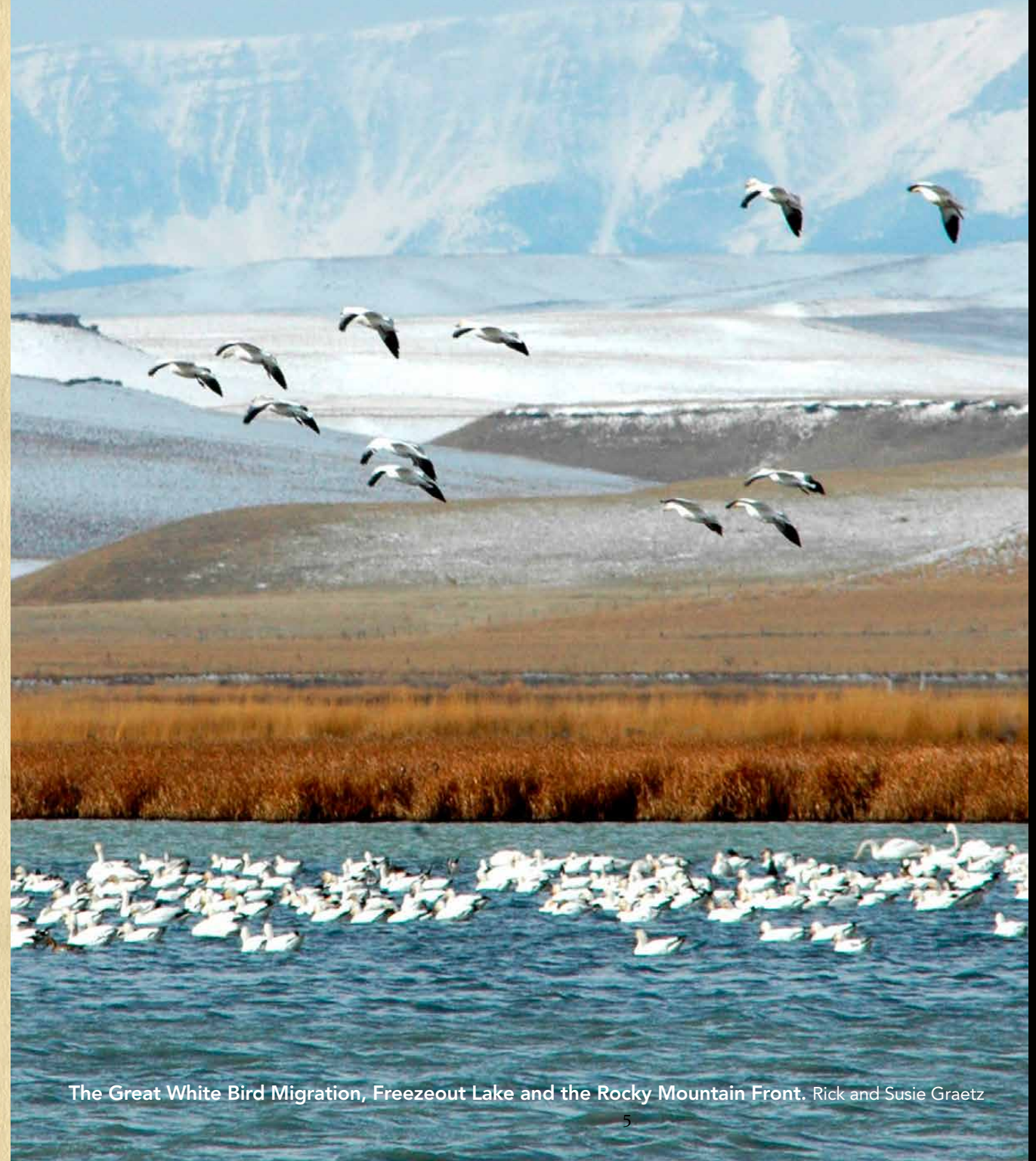


Photos by
Todd Goodrich, Will Klaczynski,
Rick and Susie Graetz



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

CC
CROWN OF THE CONTINENT



The Great White Bird Migration, Freezeout Lake and the Rocky Mountain Front. Rick and Susie Graetz

A fight breaks out in the Logan
Pass parking lot over popcorn left
by a tourist. Christine Haines



Questions, Answers, Solution

by Susie Graetz

In 2013, Glacier National Park natural resources program manager Mark Biel, along with University of Montana wildlife conservation professor Joel Berger, and then UM master's student Wesley Sarmiento (now a bear management specialist with Montana Fish, Wildlife and Parks) studied the behavior mainly of mountain goats, but also of bighorn sheep at Logan Pass. Our 2014 Issue I of CC/GY magazine contained an article about their study titled QUESTIONS... BUT NO ANSWERS YET Studying Icons In A Perilous Land – Glacier's Goats.

Questions

1. What differences, if any, were there between backcountry goats and those used to human interaction?
2. What attracted the animals to the Logan Pass area?
3. What kept them in the area?
4. Is the close proximity to people harmful to the well-being of the wildlife?

Answers

1. To monitor movements and patterns, twenty-four goats were collared with GPS and VHF radio collars that record their location every two hours, and several bighorn sheep were marked with temporary paint. Additional tools were physical observation and the use of remote cameras. Surveillance studies showed it was evident that the backcountry goats, which rarely had contact with humans, maintained a natural and constant awareness to their surroundings, used rock walls and cliffs as protection, and continued their traditional migrations to the Park's various mineral salt licks. On the other hand, for the most part, the Logan Pass Gang (LPG) preferred the easy living the crowds of up to more than several thousand folks in a day afforded them. This was a troubling finding.
2. Salt, snacks, and sweet tasting liquids were the attractant, tourists were the suppliers, goats and

bighorn sheep became the addicts. A luscious free buffet of antifreeze dripped from parked cars, popcorn spilled on the ground, a forgotten sandwich, chips tossed away, and sweat and urine were all tough for the animals to ignore.

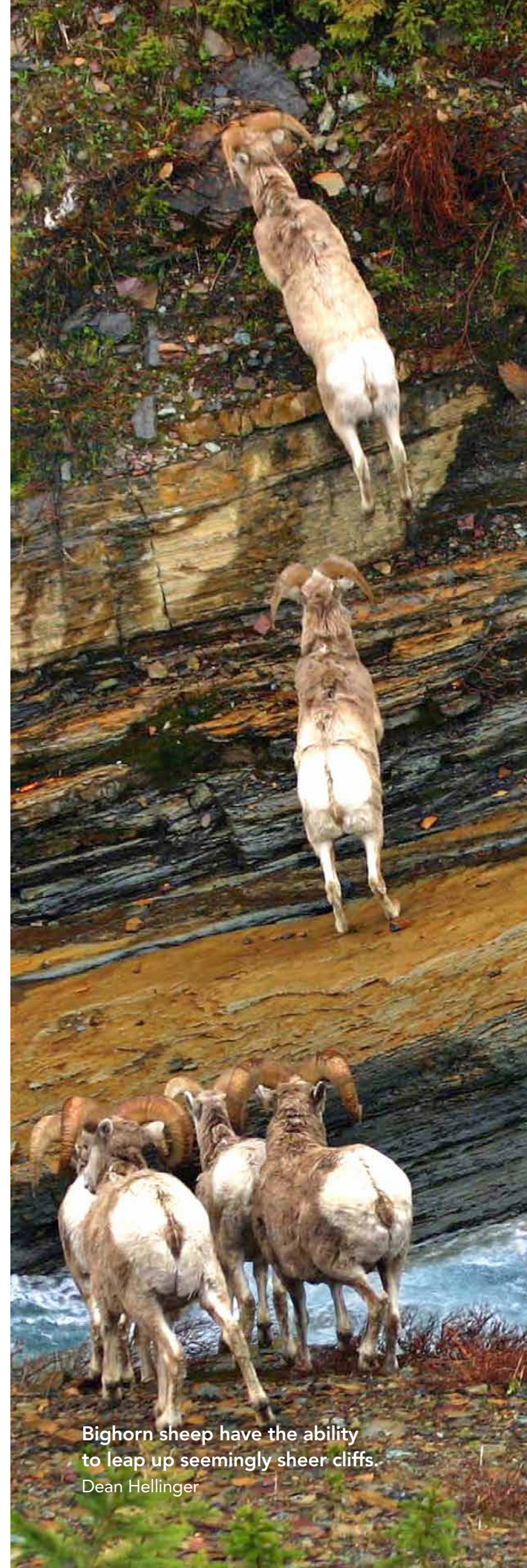
Human urine is rich in salt, nitrogen, potassium, and phosphorus and our sweat contains zinc, magnesium, calcium, sodium, and potassium. Goats need salt and minerals to aid bone and horn growth and digestion, and will go to great lengths to get it. The plants they graze on don't contain enough of the minerals their bodies require, this pertains particularly to females with nursing kids.

Like groupies following their favorite rock band, the LPG gave up their old ways to hang out near their idols.

3. In 2015, a raging wild fire near East Glacier closed Logan Pass. No more cars in the parking lot, no tourists making noise and milling around, no rangers around to haze bears away, but the GPS data and remote cameras continued their work. The cameras disclosed that the grizzlies came out in force, the collars reported the goats and sheep deserted the plentiful salt source and fled to the safety of the precipitous high country. As soon as the road to the Pass reopened, the visitors returned and so did the runaways. Conclusion: safety first (from their natural predators), salt second... was what kept the animals at Logan Pass.

4. Whether near Logan Pass or bushwhacking the cliffs, snowfields, forests, and mountain valleys, Wesley Sarmiento spent more than 2,000 hours on the ground patiently and deliberately documenting the way both backcountry and habituated goats and sheep reacted to three intruders with varying levels of risk... human, "ungulate," and "bear."

The "ungulate" in 2014 wore a Styrofoam bighorn sheep head and all beige clothing, in 2015, a cardboard cut out of a deer with was used. In 2014 and 2015, the "grizzly" wore a bear mask and a long dark brown covering and acted like a bear doing what bears do. Ignoring the goats, the imposter moseyed around looking for anthills and overturning rocks.



Bighorn sheep have the ability to leap up seemingly sheer cliffs.
Dean Hellinger

In each instance, the experiment was the same as explained in Sarmiento's graduate thesis,

We approached sites quietly through the forest so goats would not perceive our presence. Additionally, experiments were presented downwind of subjects to prevent olfactory detection. Treatments were conducted broadside to prevent an over-threatening direct approach. Experiments were not conducted between a subject and escape terrain.

The results showed a significant change in the Logan Pass Gang's behavior.

1. Human (low risk):
 - A. Backcountry – ran away an average of 330 feet
 - B. Logan Pass – continued what they were doing, but observant
2. Ungulate (low Risk):
 - A. Backcountry – ignored
 - B. Logan Pass – ignored
3. Bear (potential danger):
 - A. Backcountry – ran an average of 660 feet
 - B. Logan Pass – ran an average of 225 feet

Another behavior deviant found was, following tradition and leaving the security of the remote and jagged rocky cliffs, backcountry goats travel miles across the landscape to natural salt licks and springs. This hazardous endeavor leaves the trekkers vulnerable to predators. Ignoring these long-taught habits, the LPGs forego the perilous trip in preference to the safety from predators the crowds provide.

A dangerous component to this adulterated behavior is: while it is a Park rule that visitors are to get no closer than 25 yards to goats and deer and sheep, the habituated critters do not respect Park rules and wander where they wish often coming in close contact with humans. Since they seem tame and harmless, folks have been known to pet and hand feed them, and take selfies with them. These are wild animals and have been known to injure and in one instance kill a tourist in Olympic National Park.

In his thesis, Sarmento states,

Habituated goats reduced group size, vigilance, and use of cliffs. Such patterns were quickly reversible when human presence was excluded. Our findings hold conservation relevance at three levels. First, human visitation to protected areas is altering species interactions and causing - in this case - the loss of seasonal goat migrations for minerals. Second, habituated animals, including goats, have killed and injured visitors. Third, while protected areas offer baselines for both scientists and visitors, redistribution of species and associated ecological changes means precaution will be needed in what we perceive as pristine and what is anthropogenically altered.



Thou shalt not pass. NPS/Tim Raines

Solution

Meet Gracie... a cute, furry, uniform-wearing pooch you want to get right down and pet. To her handler, Mark Biel, she's a highly trained working dog; to the goats and sheep, she resembles a predator with sharp teeth and a predisposition to biting.

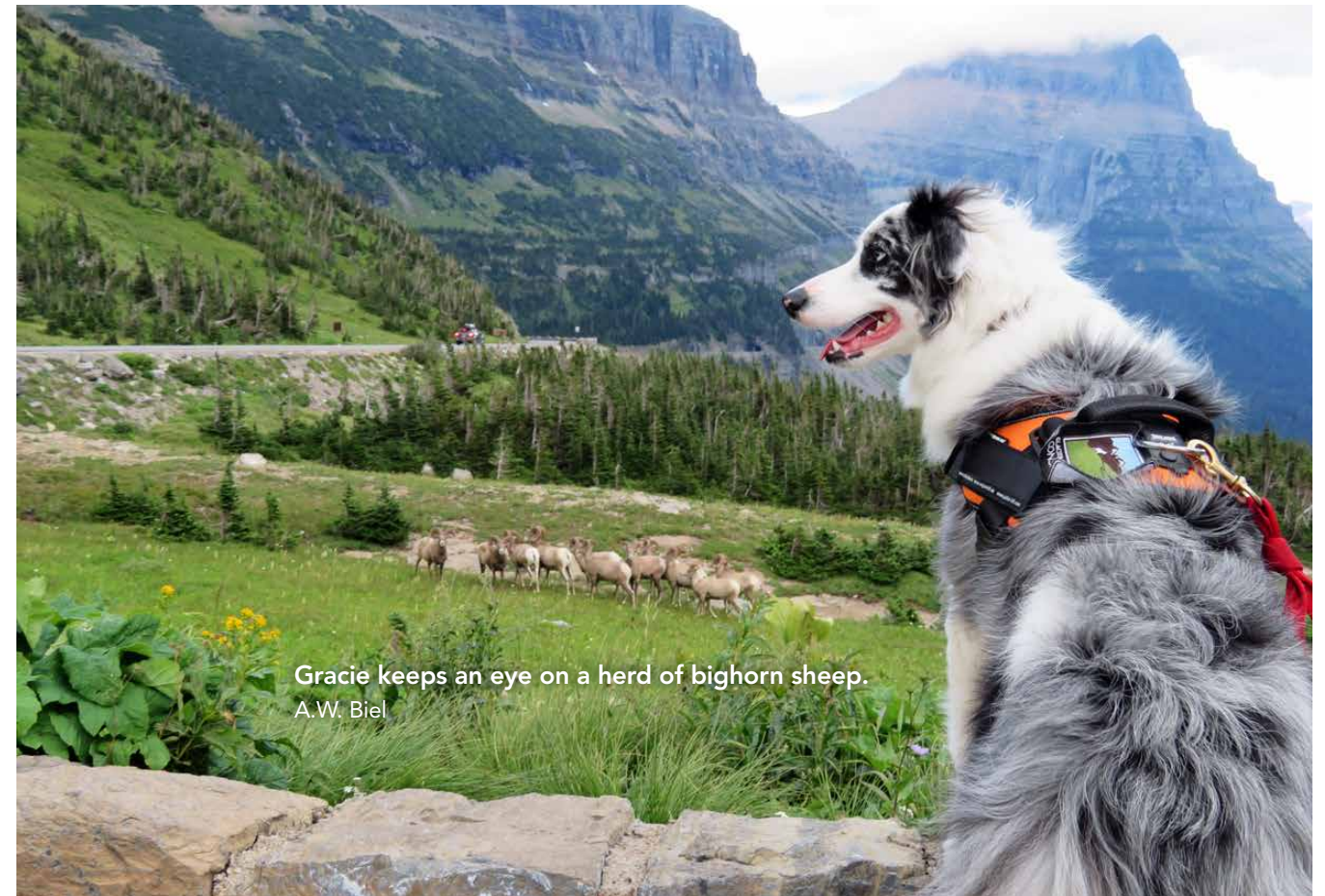
Schooled at the renowned Wind River Bear Institute in Florence, Montana, she is trained to teach the wild animals boundaries. Gracie will never chase or make physical contact with any Park wildlife, only shepherd them a safe distance away from tourists and parking lots. Once she has created a reasonable expanse, she will be put in a "down-stay," thus letting the animals know it is ok where they are. The site visitation times and days will be varied so the goats and sheep won't know when or what to expect.

Video of Gracie holding incoming bighorn sheep at bay. <https://www.instagram.com/p/BWrS6fFuDV/?taken-by=barkrangernps>

So far, Gracie has had more success than the previous methods of horns, yelling, shooing, and waving flags, which usually resulted in a short retreat and then a fast



GNP ranger Mark Biel and Gracie. A.W. Biel



Gracie keeps an eye on a herd of bighorn sheep.
A.W. Biel



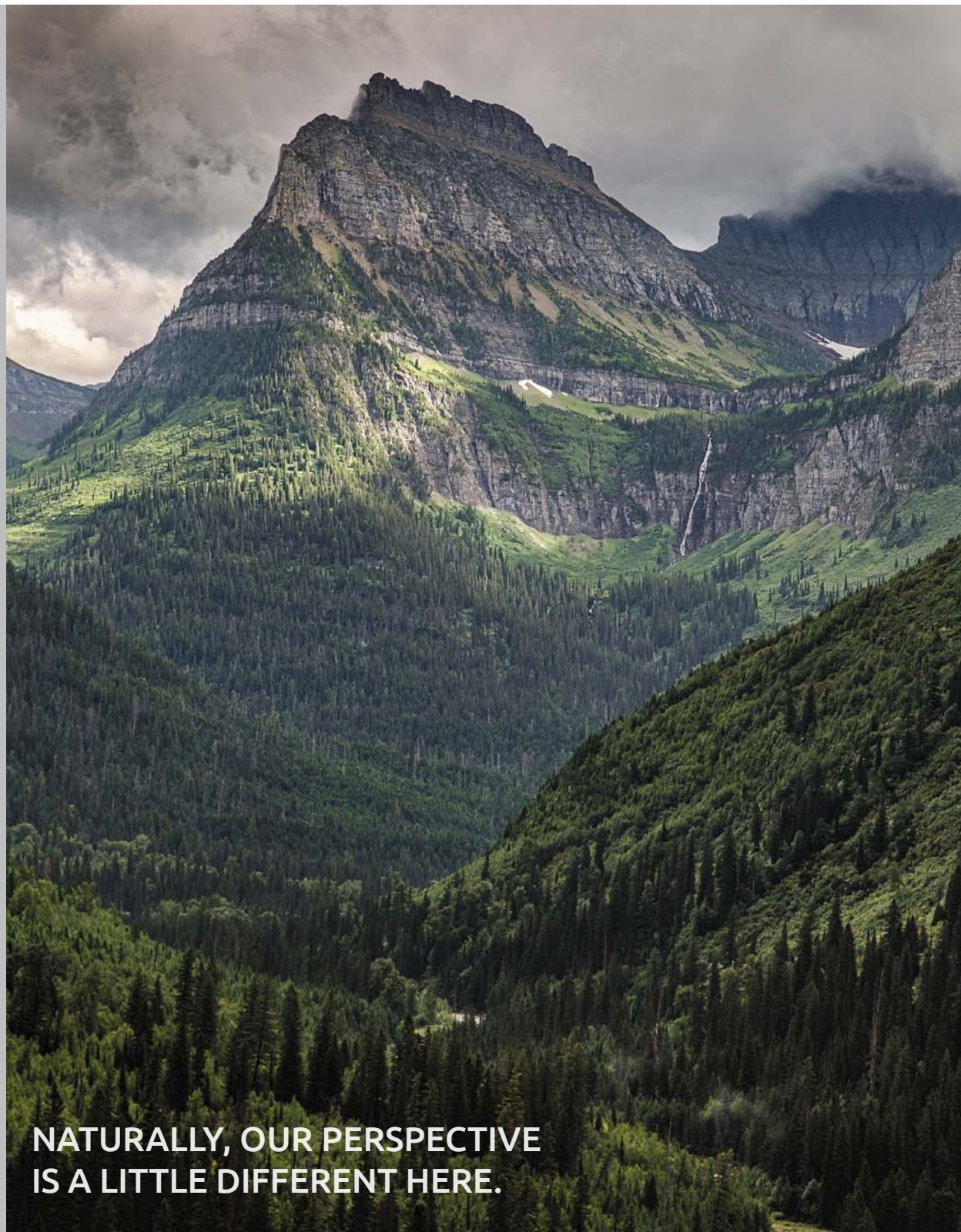
Crowded Logan Pass parking lot. Dean Hellinger

return as soon as the ranger's back was turned. Now, the animals stay farther away and for nearly a couple of hours.

On duty and wearing her official uniform, Gracie elicits questions from curious folks and this gives Biel the opening he needs to explain what the barkranger's job is. While the public believes Mark and Gracie are training the wildlife to keep a distance, it's really the visitors they are educating and training to respect the wildlife and the land.

There is a fine line between preserving the natural behaviors of the wildlife, maintaining safe visitation practices, and providing a positive experience for the public.

Popular with all who meet her, Gracie has become somewhat of a star. And appropriately as the first canine wildlife manager in the National Park Service, Gracie the Bark Ranger has her own Instagram account [@barkrangernps](https://www.instagram.com/barkrangernps).

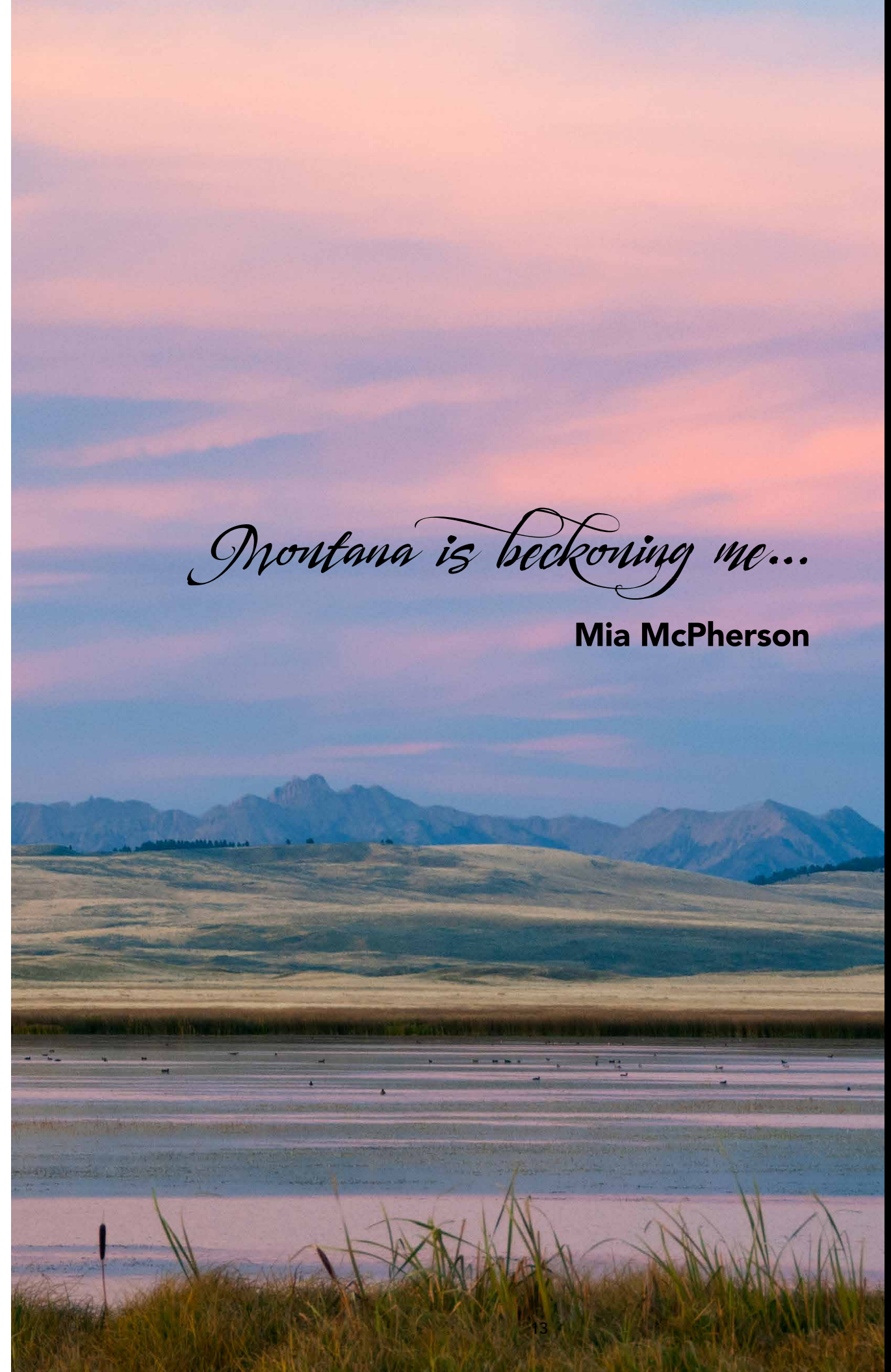


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Montana is beckoning me...

Mia McPherson

ART



Spring 2017

As the weather warms up, I admit that I'm itching to hit the road to go camping, to get away from the city, the news, and to immerse myself in natural surroundings.

One of my favorite avian photography locations is Red Rock Lakes National Wildlife Refuge in the Centennial Valley of southwestern Montana, which was established in 1933 to help save and restore trumpeter swans.

There are some that say the state can better care for these lands. I'd call them fools, but we humans are all distant cousins, so I'll tame that down a bit and call them misled instead... intentionally and deliberately misled.

I eagerly await returning to this wild and lovely place. It is yet another location where I feel at "home." As crazy as it may sound, every time I visit the state of Montana I feel taller. I can't explain why I feel that way, I just do. Perhaps it is because of the "Big Sky" Montana is so well known for. I won't spend much time trying to figure that out while I am here though, because I'd much rather use my time to savor and photograph the incredible beauty found within and outside of the Refuge.



Pronghorn lead the way to Red Rock Lakes. NWR

From I-15 at the tiny town of Monida, you enter the Centennial Valley. Getting to the Refuge can be quite an adventure when the 29-mile gravel road is dry; but when it has rained, the road can be nerve wracking, slippery, and will seem twice as long.

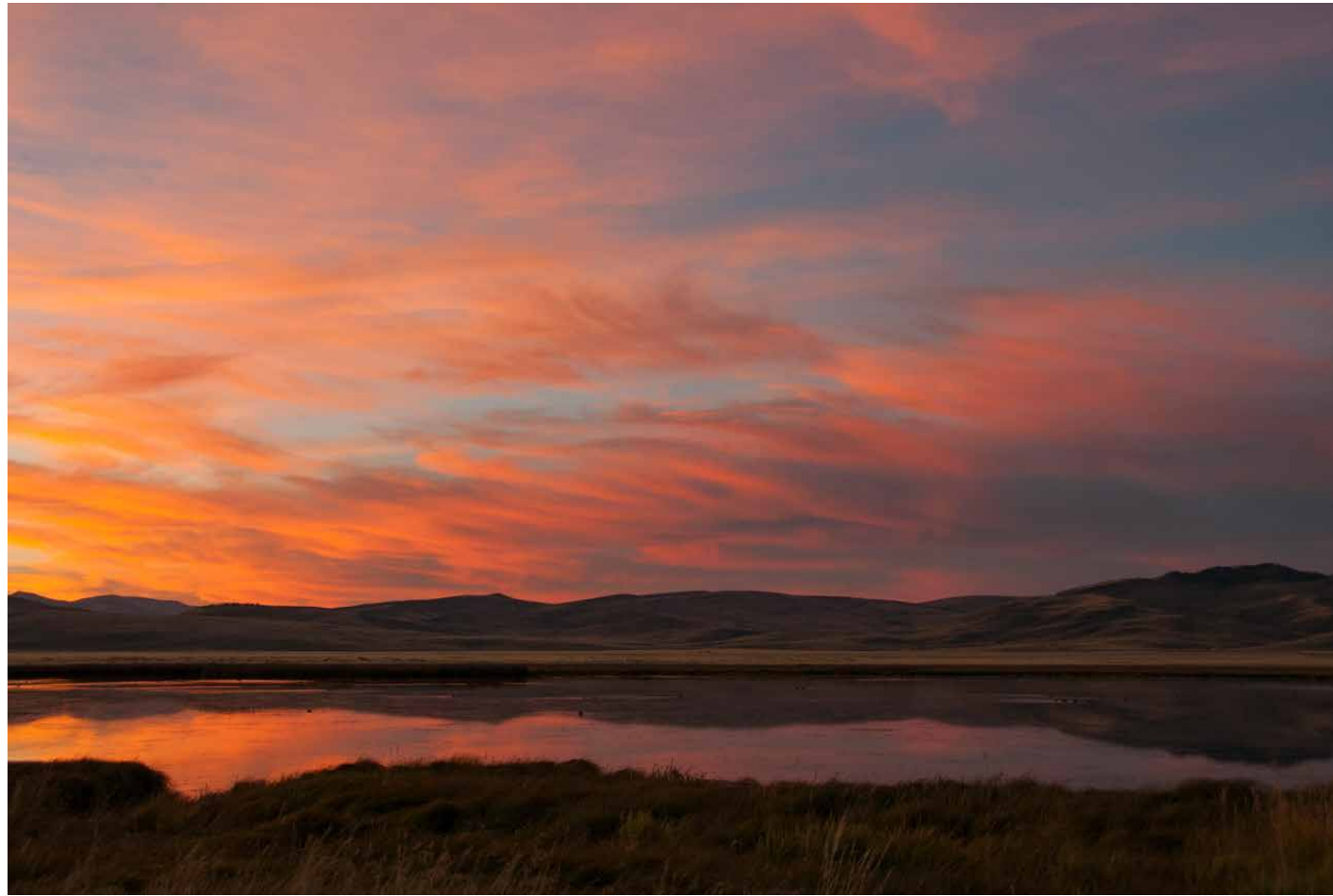


For flora photographers, springtime is great: lupines are just one of the flowers that seem abundant. At the Lower Lake Campground, I was delighted to see shooting star flowers in large numbers, sunny dandelions' heads, and more.

Spring comes later here than it does in my home state of Utah. It's June, the Refuge is a riot of color from wildflowers, the grasses form lush carpets of green that encroach on the shorelines of the lakes, and the willows must be tasty, as you can observe moose browsing along the creeks.



This is when the young of many animals can be seen. One of my favorites is the pronghorns, which appear to be delicate, though they can run like the wind to keep up with the adults and to escape predators.



There are times when I feel that the sunset paints the sky with vibrant colors; and, although the earth seems muted at twilight, it still anchors me.

A female short-eared owl has her nest under the sagebrush near the Lower Lake Campground. The sagebrush camouflages her chicks well.



This male short-eared owl hunted for voles to feed the chicks. Flying onto a perch with the food grasped in his talons, he transferred the prey to his beak, and flew to the nest to hand it off to the female.

In the 1930s, trumpeter swans were thought to be extinct due to overharvesting for food, the use of their skins for ladies powder puffs, and their feathers for use in millinery. These huge birds nearly went the way of the passenger pigeon, Carolina parakeet, and the dodo.



From the Lower Lake Campground to the Refuge headquarters, I look for mountain bluebirds. They are very numerous, but challenging to photograph because they are skittish.



Fall 2017

Mornings are made even more spectacular by the sounds of calling coyotes. There may be people who don't like that sound, but I love it.

The sight of a western tanager will always put a smile on my face, and catching a glimpse of American kestrels hovering overhead in search of prey, or perhaps hearing the cry of a bald or golden eagle, or spotting red-tailed hawks soaring directly above will take my breath away.



Baldy Mountain overlooks the Refuge.



On the narrow road to MacDonald Pond, chipmunks scurry alongside, sit on lichen-covered rocks, and peer out from behind sagebrush leaves. You might see a Swainson's hawk gazing over the valley floor.



I am a part of the wild things. Even though my outsides might be adorned with the trappings of civilization, my heartbeat still tells me I am wild.



American avocets in a driving rain.

The air is crisp, everything is changing color, and the Aspen leaves are turning golden. As I went to sleep last night I could see the stars twinkling in the dark velvety sky.

Yesterday was bright and sunny and after hearing this white-crowned sparrow singing, I felt like breaking out in song too.



I almost always hear cedar waxwings before I see them, which isn't to say they are loud; in fact their calls are more of a soft whistle.

If you have never been to Red Rock Lakes NWR and decide to go, whether you are a photographer, a bird watcher, or a nature lover, you will lose a bit of your heart to this incredibly wonderful place. I know... I did.

Mia

All photos by Mia McPherson of onthewingphotography.com

Mia McPherson is a nature lover, wildlife watcher and bird photographer. Self-taught, she prefers to leave her images as close as possible to what they looked like as created, using only minimal contrast, saturation, levels adjustments, and sharpening. She doesn't believe in baiting or calling and prefers photographing "birds doing what birds do and where they want to do it."

We recommend that you visit Mia's blog onthewingphotography.com for more photos, quotes, and photography tips for shooting wildlife.

BOOK REVIEW



Mountaineer Books, through their imprint Braided River, is the publisher of this important work. It is a horizontal hard-cover format book holding 176 pages, 106 color photos, and five color maps.

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YELLOWSTONE MIGRATIONS

reviewed by Rick Graetz

Simply put, this book is a gem. My work as a University of Montana geography professor focuses on the Crown of the Continent and Greater Yellowstone ecosystems. Yellowstone Country, especially, witnesses dynamic wildlife movement—a key subject in my courses. Other works have been published that have helped my teachings, but none like this one. For anyone with an interest in wild country and wildlife migration, it's all here.

Learning about the movements of the wild inhabitants of this 20-million-acre landscape of the Greater Yellowstone, is a fascinating experience. Filled with magnificent photographs and great information, *Yellowstone Migrations* by Joe Riis will open your eyes to ages-old travel patterns as well as to issues that could adversely affect them.

Six wild, native ungulate species... pronghorn, mule deer, elk, bison, moose, and bighorn sheep, all journey through the Greater Yellowstone natural system to take advantage of lush high-elevation forage in the summer and in winter they escape deep snow by fleeing to lower elevations. If not for their ability to reach places where they can attain the nutrition and fat needed to withstand the long-harsh winters, the herds would die.

A wildlife biologist and photojournalist, Joe Riis has spent nearly a decade documenting the migrations that tourists and even local residents rarely get to see. He originally captured his awe-inspiring images through a series of expeditions and assignments for National Geographic.

Wyoming author Gretel Ehrlich writes in her introduction to the book, "Looking at Joe's images, I feel as if I'm walking with every animal in every season." Ehrlich and Riis are not the only writers. *Yellowstone Migrations* also features thoughts by others on topics such as "The Scientific Study of Migration Corridors and A New Vision for Yellowstone - An Ecosystem Defined by Migration and Sustaining Migrations in the Modern West."

Riis's impressive images bring to life the animals' persistent struggle to follow paths that are fundamental to their existence... crossing swollen rivers, trudging up mountainsides, racing across remote wind-swept plateaus, and navigating other challenges such as man-made barriers... major highways, barbed wire fences, rural and urban developments, and now, a changing climate, which all put a strain on them.

With this publication, Riis says, "what I hope to do is to encourage people to see the landscape from the animal's point of view. Animals don't see boundaries or borders. Their quest for food and shelter is instinctual and I hope my images help people to understand and experience that."

Rick Graetz is a geography professor at the University of Montana.

The Swan Range

by Rick and Susie Graetz

They are what mountains should look like, this Swan Range of western Montana.

A formidable barrier, their sheer west face climbs above the Swan Valley, dense timber colors their lower ramparts and then, exhausted by altitude, the green gives away to pale gray limestone rock. Through much of the year a crisp, white mantle of snow crowns the upper reaches.

Twice a year, these peaks of the Northern Rocky Mountains celebrate the seasons in special dress – framed by a deep blue sky, in autumn, the stately larch trees that dominate the forests take on a brilliant orange hue and contrast sharply with newly fallen snow. Then, after resting all winter under a thick snow blanket, the promise of the spring equinox signals the larch to bring

forth their needles for the summer ahead. The delicate mint green to lime color makes them stand out amongst the dark green conifers and the heavy snow load of the summits. Certainly, this massif would have to be considered one of the most beautiful in Montana.

The Swan Range was raised up as a single block along the Swan fault and then tilted downward to the east. The rocks here are amongst the oldest found – pre-Cambrian sediments – and are of the Belt series. Various ice ages preformed their artistry in fine fashion on this uplift. Cirques, tarns and arêtes, all structures created by nature's plow – moving masses of ice – adorn the alpine heights, and a few glaciers still cling to north facing walls and depressions.

This splendor provides a grandiose western boundary for the revered and legendary Bob



Rick and
Susie Graetz



From Polson, Flathead Lake. Rick and Susie Graetz

Spring



Summer

Beloved hiking area, Jewel Basin, near Big Fork. Douglass Dye

Marshall Wilderness Country that extends from the Swan crest for more than 60 miles toward the sunrise and the Rocky Mountain Front. And while the west face of the range is not part of the designated wilderness, it is unroaded, wild country deserving of wilderness status and indeed part of this entire wilderness eco-system.

In defining the Swan Range as a region within the Bob Marshall Country, one can consider it to stretch from 7,234-foot Columbia Mountain on the north, a peak just south of the town of Columbia Falls, for approximately 130 miles to 8,062-foot Danaher Mountain and the start of the drainage of the South Fork of the Flathead River. This distance is measured along the apex of the range.

Its northern 50 miles are not within the wilderness area. Parts of it, especially the east slopes coming out of Hungry Horse Lake, were at one time heavily logged.

Out of Columbia Falls, trails run south along the top of the range and reach some fun backcountry. Above Echo Lake and near the Big Fork area is an island of wild country, the Jewel Basin Hiking Area, and what a gem it is. Accessible from the Echo Lake region in the Swan Valley, or from the Hungry Horse Lake side, there are at least 28 beautiful lakes to explore within the 15,349 acres of high mountain country. The Jewel Basin Hiking Area is a specially designated Backcountry Use Area – foot traffic only. Elevations range from 7,530-foot Mount Aeneas, to a low point of 4,240 feet at Graves Creek. Here we have an example of low mountains with great relief. Special maps of the Jewel Basin area are available through the Forest Service.

Overall, the west side of the Swan Range, because of its steepness and unstable soils, has fewer roads. Some do approach the face and lead to trails that climb through gaps to the wilderness.

From the southern end of Swan Lake, and from Swan Village, a trail leads to 7,406-foot Sixmile Mountain on the Swan Divide. From here, it follows the crest south to Inspiration Point and Pass, the border of the Bob Marshall Wilderness. Roads, visible on Forest Service maps, also lead to paths that eventually reach this divide route. Inspiration Pass is a major route into the northern sectors of the Bob Marshall Wilderness. From Inspiration Point south, the range becomes more spectacular and much wilder. The canyons become



Swan Range reflection, near Condon. John Lambing

very steep and restricted with raging torrents of water flowing through them in the spring. Just south of Inspiration Pass, 9,289-foot Swan Peak, one of the major sentinels of the Swan Range, rises. Swan is one of the few summits in the Bob Marshall country holding an active glacier. This field of ice – Sunburst Glacier, found along the east and north sides of the peak – is kept alive by very heavy winter snows. Nestled far below Swan Peak is Sunburst Lake, a high cirque treasure.

South of Swan Peak, Lion Creek Pass offers another important route into the Bob by way of Palisades and Little Salmon creeks. The route up the Swan-face side goes through some beautiful stands of giant cedars. Farther down range, Smith Creek Pass is another course to the Swan summits and eventually into the South Fork country. The trail joins up with the one coming over Lions Creek Pass to Little Salmon Creek.

Just east of Condon, the second highest pinnacle in the Bob Marshall country, 9,356-foot Holland Peak, reaches to the clouds. Considered by many

of Holland Peak, are no more than persistent snowfields that even disappear some years.

Holland Peak, like many other points along the Swan Range, requires a good deal of physical effort to gain the top. The relief here ranges upwards of 5,500 feet, and much of it is darned vertical. South of Holland Peak, extending for many miles, are beautiful basins holding high cirque lakes; such as Terrace, Woodward, Lick, Pendant, Upper Holland, Koessler, Doctor, George, and Necklace lakes, to name a few. To the people of the Swan Valley this is Montana at its best.

The trails out of Holland Lake, favorites of horse packers, are steep and get one into the backcountry in a hurry. The two major ways are over Gordon Pass from Upper Holland Lake and down Gordon Creek into the South Fork of the Flathead, or via the Pendant or Necklace lakes to Big Salmon Creek and Big Salmon Lake. The distances from Holland Lake into the deep backcountry are great, and most people would rather use horses.

We have hiked across the Bob Marshall and prefer to take it from east to west, coming out at Holland Lake.

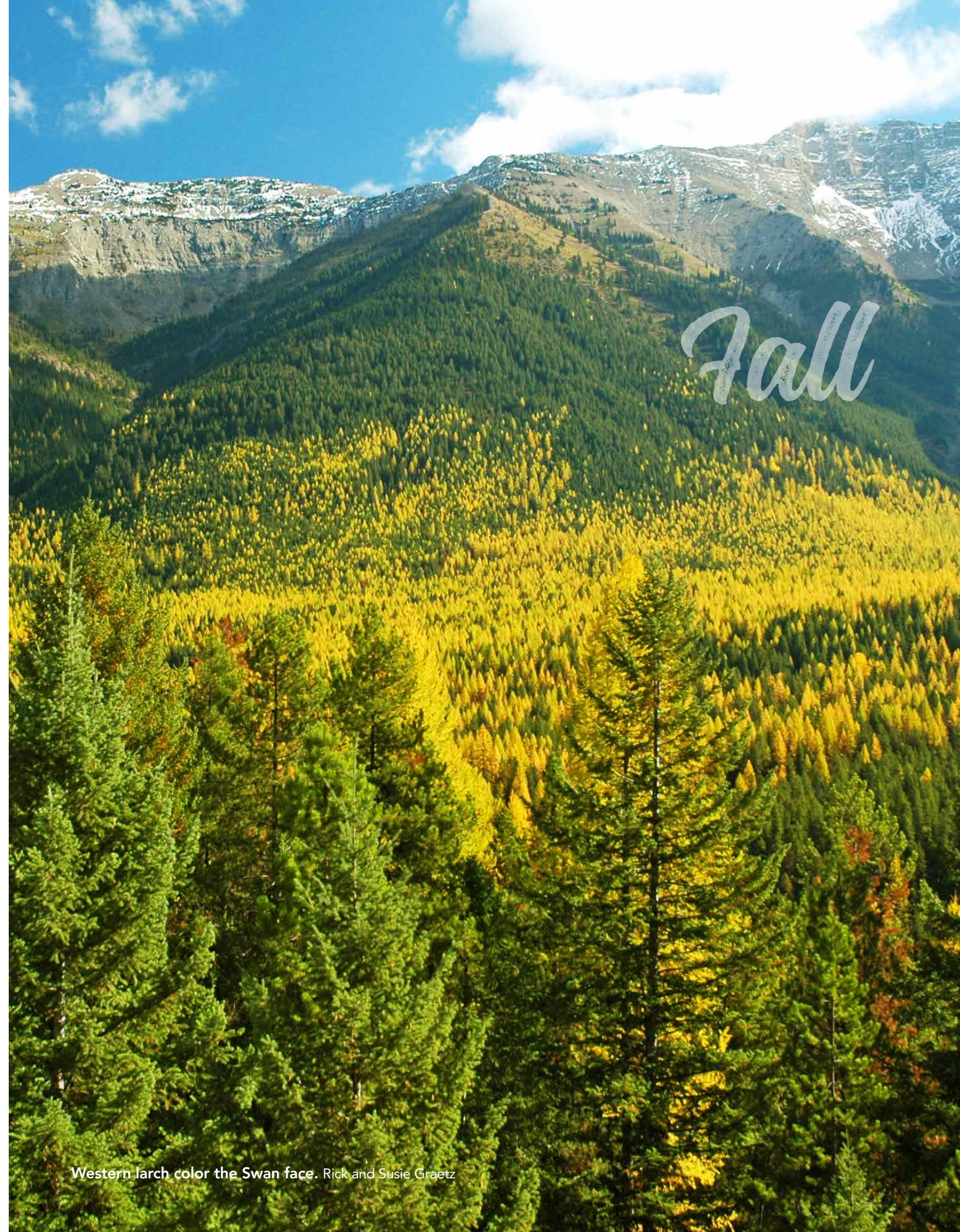
to be the most spectacular summit in the Swan Range, it sits amidst a jumble of other towering mountains, and is characterized by two huge waterfalls emanating from the Upper and Lower Rumble Creek lakes just below its west face.

The east side of this massif features several active glaciers; however, Forest Service maps depict more glaciers than actually exist. For instance, those shown in Albino Basin, just to the north

From the Seeley Lake area, Pyramid Pass offers access to the upper reaches of the South Fork of the Flathead drainage. Trails from here lead to Young's Creek. Other less-used passes are in the vicinity of Monture Mountain. Young's Pass is another popular trail and also leads to Young's Creek. Hahn Creek Pass, out of the Monture Creek country on the southern end of the range in the Blackfoot Valley, is another well-used horse route



From Rainey Lake. Rick and Susie Graetz



Western larch color the Swan face. Rick and Susie Graetz

into the upper stretches of the South Fork of the Flathead country.

Because of the terrain, the eastern flank of the Bob Marshall offers more road access to the wilderness boundary than does the Swan side. However, there is ample access in the lower reaches of the Swan Valley to enable motorized vehicle enthusiasts to get a closer look at some of the steep slopes and high peaks of the Swan Range. There are loop-logging roads off of the Swan Highway that rise to elevated ridgelines and open to excellent views. The Swan Range, then, just like the Rocky Mountain Front on the other side of the Bob, offers something for everyone.

All of the Bob Marshall Country – the contiguous 1.5 million acres of the Bob Marshall, Scapegoat and Great Bear wilderness areas plus about 1 million acres of de-facto wilderness – has been “sacred ground” to backcountry travelers since at least the first years of the 18th century. Trails were initially blazed by the great Native American nations as they crossed the Swan Range on their way to the prairie to hunt bison. Later, trappers, hunters, and early-day Forest Rangers

followed these initial wilderness “highways” and created some of their own.

This gathering of mountains, creeks, rivers, lakes and valleys was so special to so many, that long before wilderness designation was on the public mind, the US Forest Service set asides, the agency linked all 3 together, The South Fork, 1931; The Pentagon, 1933; and The Sun River, 1934. And in August 1940, in honor of Bob Marshall who died in November 1939, and as a ranking Forest Service official worked hard to establish wilderness set asides, the agency linked them together, added some additional land and established the 950,000-acre Bob Wilderness.

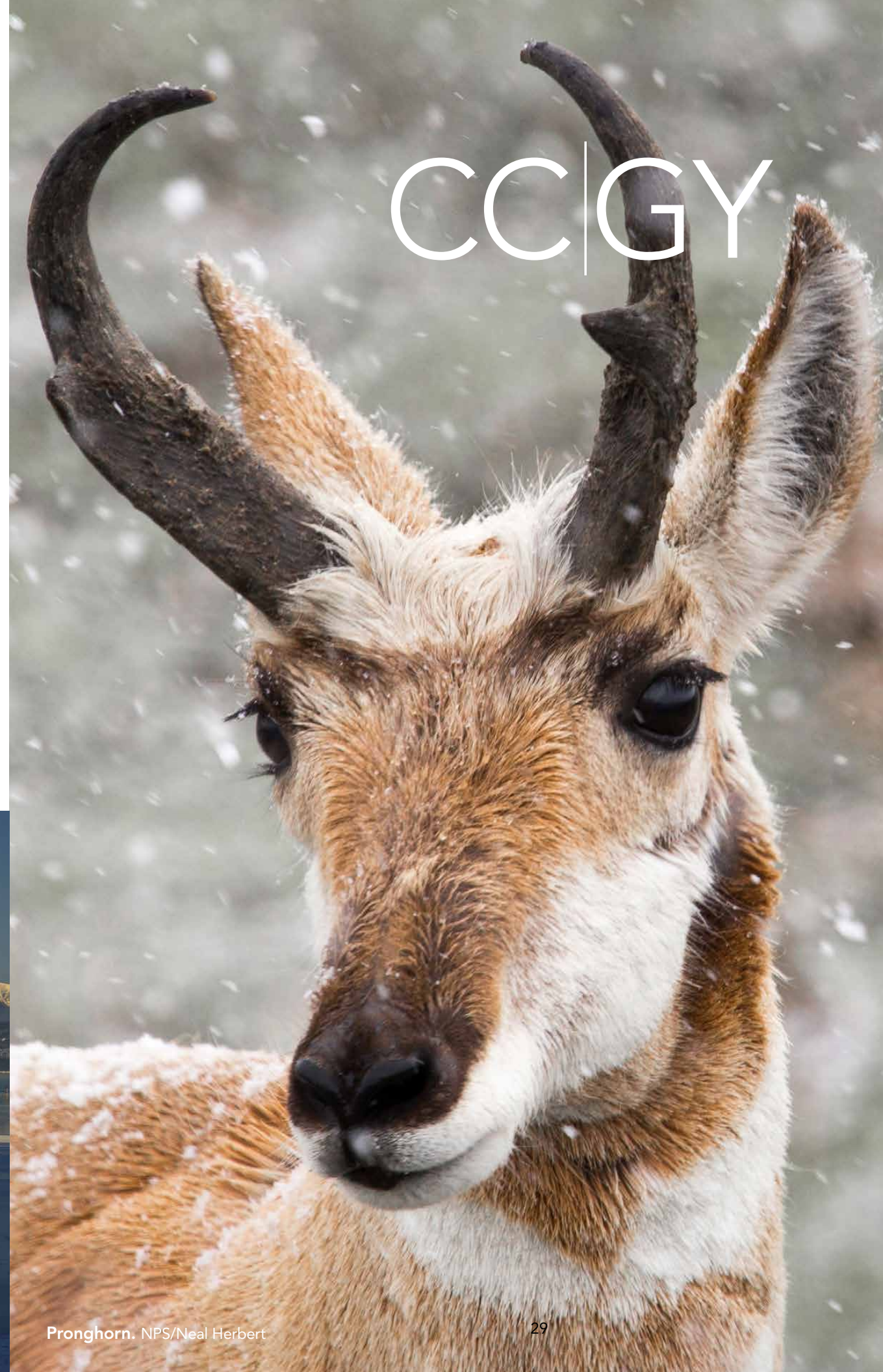
The spirits of the first mountain travelers are felt in the cathedral hush of this now protected wild land. Entering it through the historic passages below the pinnacles of the Swan Range is an appropriate ritual. Before ascending into the forests sloping east, give thanks to those who came before you and assured that this western flank of the country of the Bob you are about to trek would remain forever wild.

CC|GY

From Sommers Bay, Flathead Lake. Rick and Susie Graetz



Winter



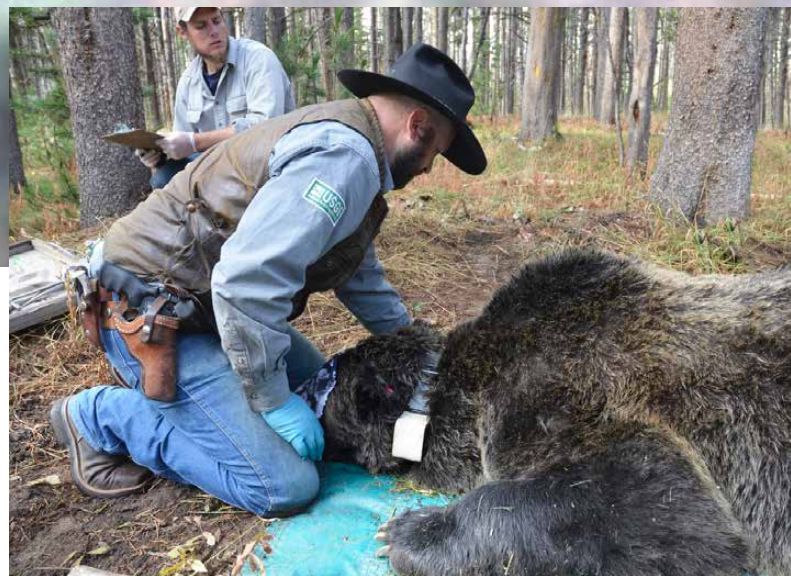
Pronghorn. NPS/Neal Herbert

68 MILES OF SEPARATION

by Liza Lester
esa.org
October 23, 2017



Lisa Landenburger/USGS-IGBT



A remote camera documented this male grizzly bear in Beaverhead-Deerlodge National Forest in Montana on July 18 2014. The site is within the northwestern lobe of the Greater Yellowstone Ecosystem, the Yellowstone bears' occupied range. Remote camera traps are one way to verify sightings of grizzly bears exploring new landscapes outside of the occupied range. USGS-IGBST

In the summer of 2017, biologists from Montana Fish, Wildlife and Parks confirmed sightings of a grizzly bear in the Big Belt Mountains northeast of Helena, Montana. The bear, an adventurous vanguard from its home range in the Northern Continental Divide Ecosystem of northwestern Montana, could be an unwitting pioneer on a path that may one day bring grizzlies from the Northern Continental Divide face to face with cousins long isolated in Yellowstone, say an interagency team of Montana and Wyoming biologists.

They reported their results in the Ecological Society of America's open access journal *Ecosphere*. Drawing from rich data on the movements of male bears in



"We let the male bears tell us where they would be most likely to go..."

NPS/Jim Peaco

both grizzly populations, the researchers projected the rambles that future bears might take to pass through (or bypass) human occupied territory around Helena, Butte, and Bozeman, hopping between islands of wildlands in developed farm and rangeland. The bears' best options may be the longest routes, the researchers say, traversing state and federally owned wildlands in a westward arc around the more developed Interstate 90 corridor.

"We let the male bears tell us where they would be most likely to go, by looking at their movement characteristics. We had the luxury of huge sets of location data from both populations. We could be very picky about our data selection," said Frank van Manen, team leader for the Interagency Grizzly Bear Study Team. He co-authored the study with seven colleagues from

Montana Fish, Wildlife and Parks, Wyoming Game and Fish, and his own home agency, the US Geological Survey (USGS).

Increasing public interest in a reunion of the Yellowstone and Northern Continental bear families motivated van Manen and colleagues to look at the possible paths the bears might take. An influx of genetic diversity through breeding with outsiders could give the Yellowstone grizzly population greater resiliency to changing environmental conditions.

"We've been asked for this information by many groups invested in grizzlies. Organizations involved in land conservation want to know where land purchases will be most useful. Government agencies need to know where to put in place education efforts," said co-author

Cecily Costello, a research wildlife biologist at Montana Fish, Wildlife and Parks in Kalispell.

“There were routes that were not obvious before we started, and a lot more alternatives than we thought initially,” van Manen said. The predicted routes matched well with 21 verified sightings of grizzly bears outside

mortality,” van Manen said. But any crossing would likely take several years to complete, he said.

Long term monitoring of the Yellowstone and Northern Continental grizzlies provided the researchers with a wealth of data on bear movements. They trained their model on data from 124 males carrying



USGS Interagency Grizzly Bear Study Team member Chad Dickinson, fits a GPS collar on a male grizzly bear in Yellowstone National Park. Christopher Peck and colleagues used GPS telemetry data from males like this one to predict the behavior and habitat selection of bears exploring landscapes outside the Greater Yellowstone Ecosystem, on journeys that could bring them into contact with breeding grizzly populations in the Northern Continental Divide Ecosystem, and vice versa. Frank van Manen

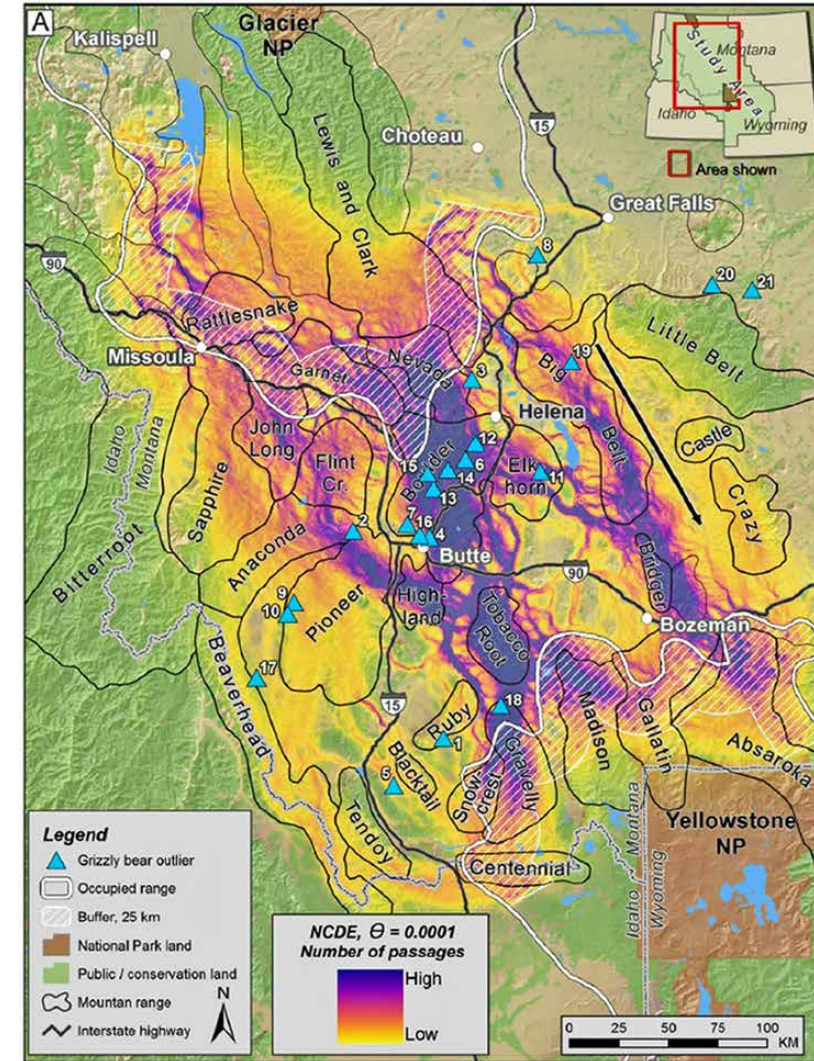
their usual ranges, like the bear seen in the Big Belts this summer (number 19 on map A). Sightings extend back to 1998, but most occurred in the last two years.

But trekking south toward Yellowstone through the Big Belts could be a relatively constrained and precarious route for bears, hemmed in by private land in low-lying valleys harboring highways, ranches, farms, and urban centers. Map visualizations of the models emphasize where corridors for the bears are narrowest. Overlapping predictions from the model indicate a tight squeeze for the bears, with few optimal paths. A scattered proliferation of paths through a region suggests that it offers more continuous habitat.

“On the western edge there is more natural habitat, fewer humans. Paths are more diffuse, and longer, but those routes are much more secure. If bears were to go in those directions they would be much less vulnerable to

GPS transmitters, collected from 2000 to 2015 (199 bear-years), tracking how bears move, how far and how quickly they travel, the habitats and physical features they favor, and how they exploit and explore the landscape. Female bears typically set a home range near their mothers. The researchers looked only at the movements of male bears, which range more widely than females and are more likely to make the crossing of no-bears-land.

“The sightings data validated the models. Also interesting, looking at the pattern of bear observations, is that most were likely from bears that originated in the Northern Continental Divide Ecosystem. Based on the data from both observations and modeling, it seems that an immigrant coming from the north is the more likely scenario, which is good, because that is what we want. That is what is needed,” van Manen said.



A map juxtaposes predicted paths for male grizzlies from the Northern Continental Divide Ecosystem to the Greater Yellowstone Ecosystem, generated by a randomized shortest path algorithm based on data from GPS-collared males monitored from 2000 to 2015. Factors that may predict bear movements include vegetation type, density of houses, ruggedness of terrain, and distance to forest edges, roadways, and rivers. Overlapping predictions from the algorithm (purple) indicate a tight squeeze for the bears, with few optimal paths. A scattered proliferation of paths (yellow) through a region suggests that it offers more continuous grizzly habitat. Blue triangles mark verified sightings of grizzlies outside their occupied ranges (Number 19 marks the bear seen twice in the Big Belts in the summer of 2017). Ecological Society of America

Establishing a natural genetic exchange between the populations, without resort to relocation of animals, is a top priority for many people invested in the recovery of grizzly bears, and a long-term management goal for the state of Montana.

But expansion will take the bears onto private land, and lead to encounters with dangerous highways. With more human dominated landscapes comes the potential for conflicts with people. “The dispersing males, they are the ones that get in trouble, that get into the garbage, that roam into town, because they are more exploratory,” van Manen said.

Preparing people to co-exist with bears may be as important as securing conservation easements, said van Manen and Costello. Bear-proof garbage storage systems and electric fences around beehives can minimize conflicts with people and go a long way toward securing a safe path for the bears. Costello would like to look at potential highway crossings, to investigate ways to mitigate collisions with vehicles. But she emphasizes that the models represent movement corridors. The projected paths, particularly where they cross more developed low country, do not necessarily indicate where bears would set up permanent residence.

Grizzly bears generally prefer to be where people are not. Though they are adaptable to a wide variety of habitats and diets, they need a lot of undeveloped space. The domestication of the West during the twentieth century pushed grizzlies out of most of the lower 48 states, isolating a small population of bears in the haven of Yellowstone, the United States’ first national park, and in the remote northwest corner of Montana. The Yellowstone bears were among the first animal populations protected by the Endangered Species Act, in 1975. They thrived under the act’s



Roads are just one of the many obstacles that hinder grizzly bear movement. NPS/Kimberly Shields

protection, expanding from a group of perhaps fewer than 250 bears in the early 1980s to over 700 today, and spilling outside the park into adjacent federal forested lands. The grizzlies now roam over 65,000 square kilometers (25,000 square miles) of the GYE, with only about a fifth of the population inside the national park at its core.

The US Fish and Wildlife Service removed the Yellowstone grizzlies from threatened species protection under the Endangered Species Act in June, 2017.

The bear population in the Northern Continental Divide, still listed as threatened, has grown on a similar trajectory. This group, which is about 1,000 bears strong, inhabits Glacier National Park and adjacent National Forests, connecting northward to grizzly populations in Canada. At the outermost edges of its range, only 68 miles separate it from the Yellowstone population.

“Sixty-eight miles is right on the cusp of what we might see in the dispersal patterns of males. We are within the realm of immigration events happening naturally,” van Manen said.

Liza Lester is the public information manager for the Ecological Society of America. She is also a science writer for the organization.

The Ecological Society of America (ESA) is a professional organization of ecological scientists. Based in the US, its suite of publications range from peer-reviewed journals to newsletters, fact sheets, and teaching resources. ESA is engaged in public policy, science, and education, and diversity issues. Its 10,000 members are researchers, educators, natural resource managers, and students in over 90 countries.

The results of the study are at esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/ecs2.1969

The Water Warriors

World-class scientists at UM’s Flathead Lake Biological Station defend against harmful invasive mussels



by Dillon Tabish
medium.com/vision-2018

Call it good timing. Jim Elser arrived at the shores of Yellow Bay in the spring of 2016 as the new director of the Flathead Lake Biological Station, the University of Montana’s storied and world-renowned research facility.

Elser brought with him a lengthy resumé as a distinguished scientist and one of the world’s foremost experts in freshwater ecology. He also came with a colleague: Cody Youngbull, a physicist and entrepreneur with a Ph.D. in condensed matter physics who was developing state-of-the-art robotic sensor technology that could be used in water environments.

A few months after their arrival, the first detection of destructive aquatic invasive mussels occurred in Montana.

The discovery—first in Tiber Reservoir in north-central Montana and then in Canyon Ferry Reservoir near Helena—prompted a feverish reaction as Montanans began coming to terms with the potential for a dire scenario in one of the last places without infested waters.

The minuscule mussels, which cling to boats and other watercraft, can colonize rapidly and threaten to unleash ecological and economic consequences in Montana’s bodies of water. Many other lakes across the U.S., including the Great Lakes and Lake Mead, have fallen victim to mussel infestation. Most noticeably, mussels promote the growth and spread of deadly algae blooms and crash fish populations.

Once zebra and quagga mussels become established in a water body, they are nearly impossible to eradicate. Luckily, they haven’t yet been found in Flathead Lake or its tributaries.

In the wake of the Tiber Reservoir discovery, state agencies scrambled to set up protocols and procedures to combat the spread of these invading mussels while also trying to figure out how many other areas across Montana were affected.

That’s when Elser and his team of scientists rose to the forefront of Montana’s mussel defense.

The Flathead Lake Biological Station, one of the

oldest and most respected field stations in the country, already was well equipped to address the new invasive threat, boasting some of the best scientific minds when it comes to tracking and identifying invasive species and studying landscape connectivity.

But with Elser and Youngbull now in the mix, this corner of Montana is now home to a Dream Team of scientists and innovators at the most opportune and pivotal time.



Jim Elser, Flathead Lake Biological Station director, holds a display of a pipe coated with invasive mussels.

To properly understand the Flathead Lake Biological Station's leading—and comprehensive—role in helping detect and prevent the spread of invasive mussels across Montana, it requires an in-depth look at all of the work being conducted at the Yellow Bay facility.

Start with Shawn Devlin and Phil Matson, equally esteemed FLBS faculty members and scientists who are experts at sampling for what's called environmental DNA, or eDNA, which includes bits and pieces of genes that can be traced in the environment, including in water.

Using a research vessel on Flathead Lake, Devlin and Matson can drop fine-mesh nets underwater and collect everything from feces to scales and even microscopic cells from all types of aquatic species. Once the nets gather samples from across a body of water, the scientists take the particulates and insert them into a machine at the biological station. This machine—a revolutionary tool that is at the forefront of mussel defense strategies—has mapped out invasive mussel

DNA, and this provides scientists a chance at identifying matches with particulates collected in the lake.

The machine can detect an organism at any life stage. In the case of mussels, this complex procedure helps scientists identify locations where potential colonies could exist and halt their spread before spawning.

The extent of the team's resources even includes scuba equipment and divers, all helping to detect potential threats as soon as possible.

"It's like cancer. The earlier you detect it, the more likely you are to remove it and prevent it from spreading," says Gordon Luikart, an FLBS professor of



A plankton tow net sample taken from Montana's Flathead Lake

conservation ecology and genetics. If there's anyone in the world who understands the power of eDNA research and its potential game-changing ability in slowing the spread of invasive species, it's Luikart.

Luikart first discovered the potential harm of invasive species as a student earning his doctorate at UM in the late 1990s. His lab, under the direction of Fred Allendorf, was involved in one of the first research projects in the nation that involved collecting DNA out of the water.

"I knew about the tool and the exciting novelty of being able to gain info without even seeing organisms in water but you can detect their presence," he says.

He brought his expertise to the FLBS nearly a decade ago and continued his work studying all the ways that DNA identification could help solve significant questions on the landscape or riverscape, such as the status of endangered fish and wildlife populations.

Luikart's pioneering DNA-based research to understand the ecology and conservation of native

fish and wildlife species has earned him uncommon praise and placed him in some of the most respected publications and journals in his field. He was listed as one of the "highly cited researchers" in the 2015 and 2016 editions of "The World's Most Influential Scientific Minds," an honor that highlights researchers who have produced work that is most frequently acknowledged by peers. Highly cited papers rank in the top 1 percent by citations for their field and year of publication.

As Elser describes it, Luikart's eDNA detection system is one of the most important tools in the fight against invasive mussels.

"We don't think there's any other way to do early detection that's practical," Elser says. "It's the only hope."

Yet a significant challenge still remains with underwater detection, and that's where Youngbull's emergence is equally fateful and potentially revolutionary in its own right.

"The biggest challenge is collecting and processing lots of samples and being able to get the numbers and frequency you need to have a high probability of detection," Luikart says.

In other words, to collect the eDNA for analysis, scientists still need to conduct old-fashioned blue-collar work by dragging nets across the lake. It requires a lot of time-consuming work and a period of waiting until results are analyzed in a lab.

Enter Youngbull.

He is developing a sensor device that can detect past and present signs of life in the depth of the lake, as well as study eDNA in the water. Youngbull has been developing this novel technology for the past decade and was putting the finishing touches on the newest prototypes in fall 2017. These sensor devices can be rigged to a buoy or other platform and collect samples from the water. The devices break down the samples into thousands of microscopic droplets that contain DNA information that can be shared on a network in real time.

In other words, no need to float around the lake with nets anymore and wait for lengthy analysis.

"The whole field of eDNA is simply exploding. That time is coming, and this instrument will play a key role in that," Youngbull says.



Researcher Cody Youngbull has developed new technology to detect invasive mussel DNA in bodies of water. Photo by Zane Lindstrom

types of researchers, students and entrepreneurs who hope to create innovative sensor technology. Youngbull and his team also could contract out their work to private companies seeking to develop their own sensor technology, creating a new revenue stream for the biological station, which is always seeking funding mechanisms that can keep the facility at the forefront of discovery and innovation.

All of this is exciting, but the fact remains that Montana is under siege, and the team of scientists at the biological station is well aware of the looming threat.

If mussels were detected in a lake like Flathead, it would not necessarily spell disaster, but it would require an immediate and comprehensive response. And that's where and when the FLBS team would prove itself priceless.

"If we detect mussels early, eradication is possible," Luikart said. "For example, it's possible they would be attached only on a boat or on a floating dock that can be removed from the water and decontaminated."

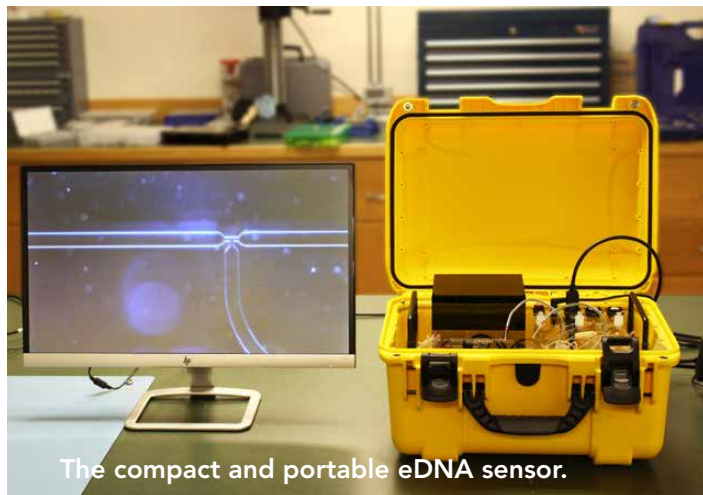
There are some chemical treatments that can be used to eliminate small mussel colonies. There's also the onerous task of physically removing mussels and de-watering areas where small colonies have established. Also, small populations can be susceptible to simple extinction due to water and weather conditions. Montana's state and tribal agencies are responsible for responding to detections and eradicating any populations, but the FLBS is ready to help at a moment's notice.

Luikart says the station could assist with an infestation using its scuba divers, boats, equipment and detection technologies to pinpoint mussel locations. FLBS also could provide underwater videos to monitor and localize mussel colonists.

Funding remains a significant challenge statewide as Montana tries to mount its best mussel defense and convince residents it is worth taking the threat seriously. Many experts say the cost of prevention is wholly minor compared to the future impacts from mussel infestation, which can range in the tens of millions of dollars annually, in the Flathead area alone.

There is urgency, but there is hope, thanks to the passionate scientists living and working in Yellow Bay.

"With mussels, it is depressing. A lot of people think



The compact and portable eDNA sensor.

This technology, when it's fully rolled out, will revolutionize the defense against invasive mussels. It also will lead to an array of other innovations, all based at the Flathead Lake Biological Station. Station members are hoping to build a space that will be solely dedicated to the sensor technology and welcome all



we have an inevitably gloomy view. They may get here eventually, but what does 'eventually' mean? Thirty years? Well, that's worth fighting for," Elser says.

As Elser knows, preventing every single miniscule mussel from entering Montana's waters is essentially impossible. It's a challenging effort as check stations across the state try to inspect each and every boat. In 2016, the check stations conducted 37,000 inspections and turned up five boats contaminated with zebra or quagga mussels.

Mother Nature has a way of defending itself, but assisting her in every way possible definitely helps, Elser says.

"I'm convinced that we can hold it off for quite some time, hopefully in our lifetime and our children's lifetimes. I'm willing to fight for that and spend money for that, and I hope others will be, too."

Threats

As filter feeders, mussels remove food and nutrients from the water column very efficiently, leaving little or nothing for native aquatic species, including fish. They can devastate native species by stripping the food web of plankton, which has a cascading effect throughout the ecosystem. Lack of food has caused populations of salmon, whitefish and other species to plummet.

Mussels quickly clog pipes, ruin boat motors and damage aquatic recreational equipment. They also cover boat docks and rocky beaches; their razor-sharp shells

cover entire shorelines, creating hazardous conditions for swimmers, boaters, beachgoers and other users.

Mussels are having devastating economic effects on municipal and residential drinking water delivery systems, power plant intakes and industrial facilities that use raw surface water across the U.S. The U.S. Fish and Wildlife Service estimates that if mussels invaded the Columbia River, they could cost hydroelectric facilities alone up to \$250 million to \$300 million annually. This does not include costs associated with environmental damages or increased operating expenses to hatcheries and water diversions.

According to research conducted in 2014 by UM, Flathead Lake's pristine identity had an estimated \$6 billion to \$8 billion impact on shoreline property values and is worth roughly \$1.6 billion in "nature-based tourism" in Flathead and Lake counties.

Dillon Tabish is the information and education program officer for Montana Fish, Wildlife & Parks. A UM school of journalism graduate, he has had a successful career writing for multiple newspapers and magazines.

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GY

GREATER YELLOWSTONE

The 1.8-mile Roller Coaster Ski Trail around the Grand Canyon of the Yellowstone River, YNP. NPS/Jacob W. Frank



CCC enrollees initially had to be 18 to 25 years old, unmarried, unemployed, and with a family on relief. Yellowstone National Park work crew, 1930s. Wyoming State Archives.

The CCC in the Greater Yellowstone

by Kerry Drake
WyoHistory.org
May 29, 2016

Red Fenwick couldn't believe what he saw in 1933 when he met the train that carried a motley group of Bronx youth to Canyon Junction in Yellowstone National Park.

"It was the sorriest assemblage of humans since Indian treaty days," recalled Fenwick, a foreman assigned to whip into shape the first Civilian Conservation Corps crew assigned to work in the park.

Fenwick, who later became a well-known Denver Post reporter, wrote in a 1965 column that some enrollees were already homesick, while others

were clearly out of control.

"All needed a shower and shave," he remembered. "They looked as though they had walked past an army surplus supply depot after an explosion and had grabbed whatever items of clothing they fancied."

The young men took a truck to their camp where one of Yellowstone's many geysers greeted them, sending an impressive column of steam and hot water high into the sky. Fenwick remembered one young rider who excitedly told his companions, "Hey youse guys!

Lookit dat t'ing squoiting outa d'ground. It's a geezer! Dat's wot it is--a'geezer."

Roosevelt's Tree Army

Throughout Wyoming and across America, thousands of young men were also getting acquainted with their new environments. It was part of President Franklin D. Roosevelt's plan during the Great Depression to provide jobs and educations for millions of unemployed youths while conserving the nation's natural resources.

Roosevelt signed the law officially creating the Emergency Conservation Work (ECW) project on March 30, 1933. It quickly became known as the Civilian Conservation Corps, and also had a popular nickname—the "Tree Army."

By June 1, 300 CCC camps had been created nationwide, and by the

next month they were staffed by a total of more than a quarter-million enrollees. Initially there were 24 camps in Wyoming, each expected to house 200 men.

To join, enrollees had to be 18 to 25 years old, unmarried, unemployed and with a family on relief. The pay was low, even for the Depression. The CCC paid the enrollees \$1 a day, so each earned about \$30 each month. But \$25 was taken from their checks and sent to their families, leaving them only \$5.

"None of the men are going to do any work like that for a dollar a day," predicted Maurice Miller of Chicago, a group leader at the CCC encampment at Fort Hunt, Va.

Most of the new members of the Corps, though, didn't look at it that way. Jobs and money were scarce, and signing up was a way to help their families. Their room and board would be paid for, and they would be sent to areas of the country most had never seen before.

Creation of the CCC

More than 1,000 young men served in the state between 1934 and 1938. During this period age restrictions were lifted so more veterans of World War I could find work, and so was the requirement that enrollees had to be unmarried.

They constructed sewer and water systems, service roads, museums and exhibits, boat docks, phone lines, utility buildings and snowshoe cabins for patrols. They eradicated gophers, eliminated locoweed and dug garbage pits.

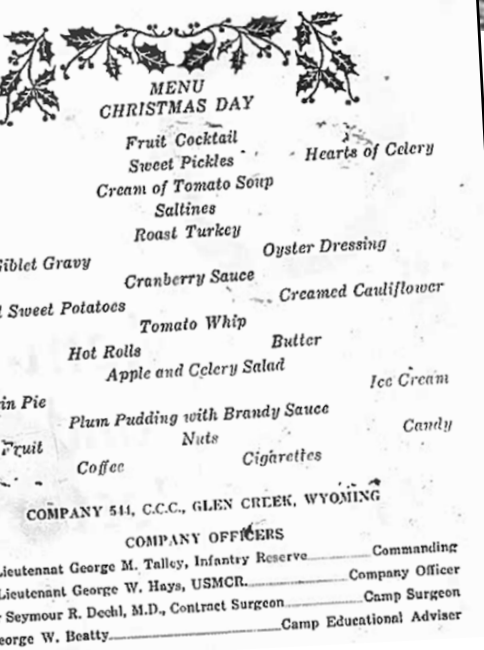
Recruits start up a crap game at the Encampment, Wyo., depot, 1933. 5-33 Lora Webb Nichols Collection AHC UW



Major projects in Wyoming's national forests involved in protecting the Colorado and Missouri River watersheds, developing recreation facilities, and thinning forests. The CCC launched several wildlife protection projects, including preservation of the country's largest elk herds. The young men also transplanted beaver from overstocked areas to more favorable sites.

Crews took censuses of wildlife and studied game ranges, migratory patterns, and feeding habits. In several forest areas, bark beetle control was a constant battle. Blizzard relief was undertaken during the harsh winter of 1936-37. And the men were always on call to fight forest fires, which could quickly turn deadly.

CCC members could serve up to



Company 544, CCC Camp YNP-7 Glen Creek, Yellowstone National Park, Christmas 1938 menu. Mel Tripphahn*

four six-month hitches. Despite the demanding work, more than half re-upped at least once.

Many enrolled in camp educational programs. Camp Miller offered vocational courses like blacksmithing, bulldozer operation, carpentry, woodworking,



Jenny Lake was home to one of the largest CCC camps in Wyoming. GeraldineCurtis flickr.com/photos/geraldinecurtis

cooking, vocational guidance, road construction, tractor operation, and photography. Academic courses included English composition, spelling, business arithmetic, trigonometry, Latin, Spanish, and citizenship.

Enrollees were also given the opportunity to take correspondence studies with the University of Wyoming, including English, mathematics, social science, biology, typing, and shorthand. The University also offered special courses for CCC recruits in auto mechanics, forestry, journalism, and bookkeeping.

Primitive conditions

In the early days of the CCC, living conditions were primitive. The men slept in cheaply made tents until they built their own camps, with the work usually supervised by out-of-work miners and carpenters from

the nearest town. This immediately established good relationships between the CCC and local residents who saw a boost in their economy from both construction and visits from the men to their towns on weekends.

The first wave of CCC enrollees were given hand-me-down US Army surplus uniforms and equipment from World War I. Later, they were outfitted in new spruce green uniforms.



1506 - Spike camp at West Yellowstone, YNP. Elmer E. Boze*

CCC members had to stretch their scarce dollars. They paid for personal items like toothpaste, tobacco products, hair oil, candy and gum, which they bought at the camp's post exchange. The men bought \$2 vouchers, and the money was deducted from their pay.

To make extra money, some used their pre-CCC experience or learned new skills like cooking and took jobs in nearby communities during their off hours.

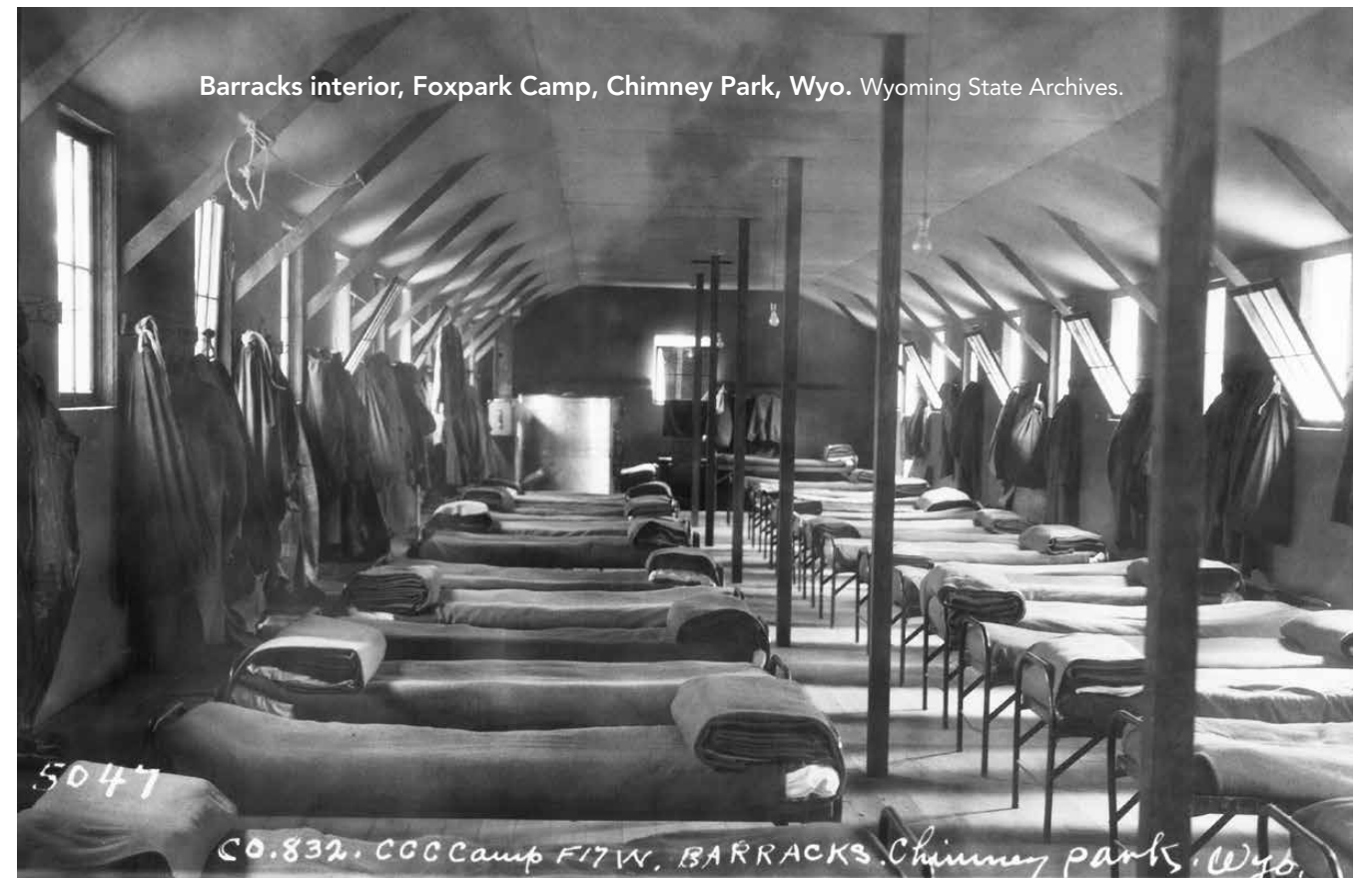
On weekends, camp teams played locals or teams from other CCC camps. J.E. Stimson Collection, Wyoming State Archives



CCC Mammoth Hot Springs baseball team. Albert D. Mancino*

Leo Kimmett, who was stationed at a CCC camp in Yellowstone, asked to borrow a typewriter from the company clerk so he could address a letter. A clerk's six-month hitch in the CCC was nearly over and the camp needed someone who could type and take over his duties. Kimmett was the only one in camp who could type, so he was the obvious replacement. He didn't mind, since the job paid him an extra \$6 per month and he got to work inside, away from the tough labor outdoors. One day Kimmett accidentally told the wrong lieutenant that he was wanted on the telephone, and the officer who should have received the message chewed him out.

After a sleepless night, the next day Kimmett asked to be put back on a work crew. "I decided that to be mentally upset like this was not worth the extra \$6 a month," he recalled.



Barracks interior, Foxpark Camp, Chimney Park, Wyo. Wyoming State Archives.

5047

CO. 832, CCC Camp F17W, BARRACKS, Chimney park, Wyo.



Cook Sarge Barr, the most favorite men in the camps were the cooks.
Michael Rydoz*

The daily routine

BR-10 was operated as a strict military camp, while BR-9 was overseen by a US Bureau of Reclamation superintendent, James Coffman. The work crews at both camps were divided into engineering, agricultural and landscaping units.

The schedule was the same for both—reveille at 6 a.m. sharp and breakfast precisely an hour later. A typical breakfast included bacon or ham, fruit, eggs and cereal.

Lunch was brought to crews working in the field unless they were close enough to walk to camp. The menu for supper was a large portion of roast beef, pork or chicken, potatoes and gravy, vegetables and fruit, bread, butter and jellies.

The men were required to be clean and presentable at all times, which meant clean and combed hair, brushed teeth and a shower at least once a week.

From 7:30 to 9 p.m., men could shop at the post exchange or play cards at the canteen. The recreation center had two pool tables and a ping pong table. The “lights out” order was given promptly at 10 p.m.

Friday night was reserved for entertainment, including talent shows, singing and dancing. Boxing and wrestling matches were also held. People from the local town often came to entertainment night, both as performers and just to see the show.

On weekends the men at Wyoming CCC camps played pick-up baseball, often against local teams or teams from other camps. Hiking, climbing, horseshoes, and basketball on dirt courts were also popular, as were trips to town where sometimes the CCC members were not on their best behavior, especially if the town had a red-light district or ignored Prohibition.

Kimmett recalled that after the June 1933 payday, a half-dozen boys at his Yellowstone camp spent the weekend in Gardiner, Mont. “Returning to camp early Monday morning, about three or four of the boys were rolling in their vomit on the floor of the stake truck,” he wrote. “These unfortunates learned the hard way about the prevalent falsehood that rubbing alcohol became harmless when filtered through a slice of bread.”



Harry T. Hart*

Mammoth Camp The CCC's final days

Roosevelt wanted to make the CCC permanent, but Congress wouldn't go along with him. When World War II started, lawmakers realized it needed the members of the Corps to enter the military. Congress never actually abolished the CCC, but it quit funding the program. On July 1, 1942, it approved \$8 million to liquidate it.

The primary impact of the program on the state and nation was three-fold. First, its \$25 per month benefit for members' families is credited with helping to jump-start



Wood-cutting crew. Albert D. Mancino*

the Depression economy when a spark was desperately needed.

Second, Wyoming has many one-of-a-kind structures that remain well used and popular.

An intangible but vital benefit of the CCC was the positive impact the program had on those who served. It helped thousands of young men learn construction and wildlife preservation skills, gave them an opportunity to continue their formal education and even transformed their appearance and attitude. The program changed their lives and helped make them better citizens when they returned home.

In September 1933, a convoy of CCC men was taken by truck to

meet a train headed out of the park at West Yellowstone. Denver Post columnist Red Fenwick recalled that the crews he supervised were no longer the rag-tag, insubordinate troops who began working that spring. “Uniforms were neat. Neckties were tied. There was order and discipline,” he recalled. “And the men themselves were tougher, browner, heavier, more self-assured, confident, and cooperative.”

Kerry Drake of Casper is a Wyoming journalist who worked for nearly 40 years as a reporter and editor at the Wyoming Tribune Eagle and Casper Star-Tribune. He writes a weekly column for WyoFile.com.

*All starred photos courtesy of CCC in Yellowstone Documentation Project (MSC 180) and YNP Heritage and Research center.

A project of the Wyoming Historical Society, WyoHistory.org offers hundreds of articles on people, places, and events in Wyoming's past.



Home Sweet Home. Richard S. Kramer*



Mammoth Hot Springs CCC Camp. Albert D. Mancino*

Greater Yellowstone's Coming Plague

by Todd Wilkinson
mountainjournal.org



On a map, “Deer Hunt Area 17” is unlikely to ring any bells of geographic recognition, even for residents in hunting-crazed Wyoming.

Located northwest of Gillette in the Powder River Basin—a sweep of rolling, mostly treeless high plains embedded in the largest coal-producing region in America—Hunt Area 17 on Monday, December 19, 2016 became one of the latest in Wyoming to have a publicly-confirmed case of Chronic Wasting Disease.

Like the expanding impacts of human population growth and climate change in the Greater Yellowstone Ecosystem, CWD represents a true test... of whether public and private land managers, elected officials and citizens in the region can really come together to address landscape-level challenges.

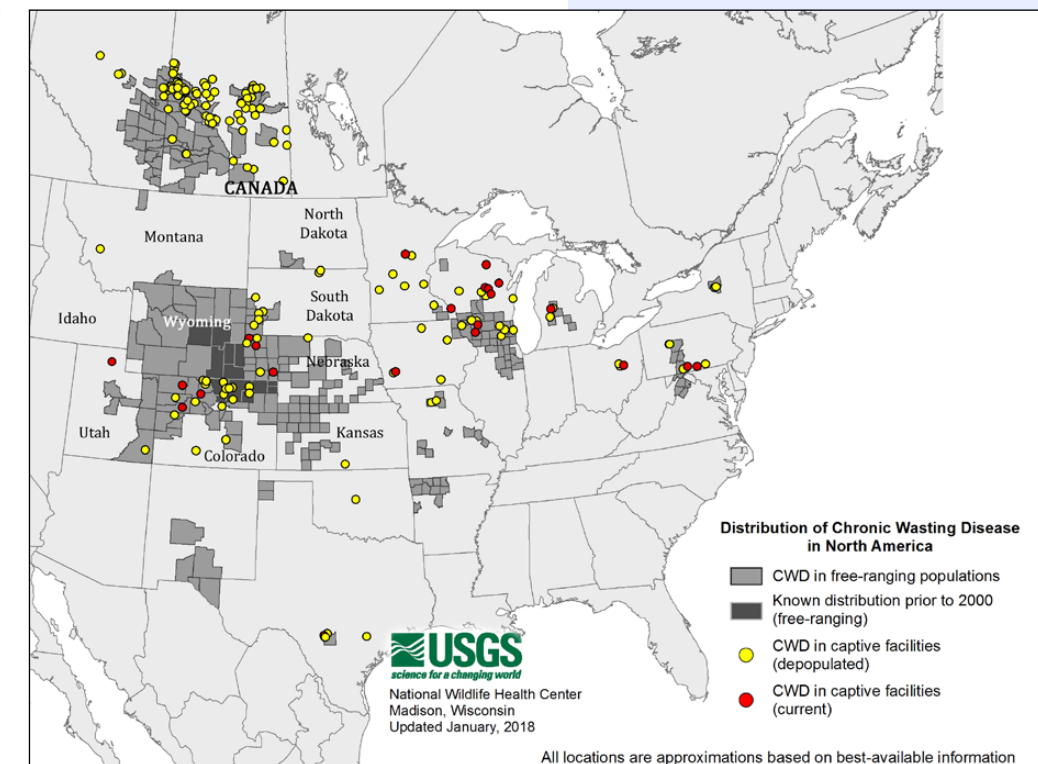
Indeed, the potential menace CWD represents to the persistence of Greater Yellowstone's migratory wildlife has been downplayed and minimized for years in Wyoming.

To readers who don't know, Greater Yellowstone, which overlaps the corners of northwestern Wyoming, southwest Montana and eastern Idaho, is a 22.5 million-acre region that, due to its migratory wildlife, is often compared to the wildlife-rich Serengeti region of eastern Africa. It is the most iconic and still ecologically intact wildland ecosystem in the Lower 48 and one of the best-known in the world.

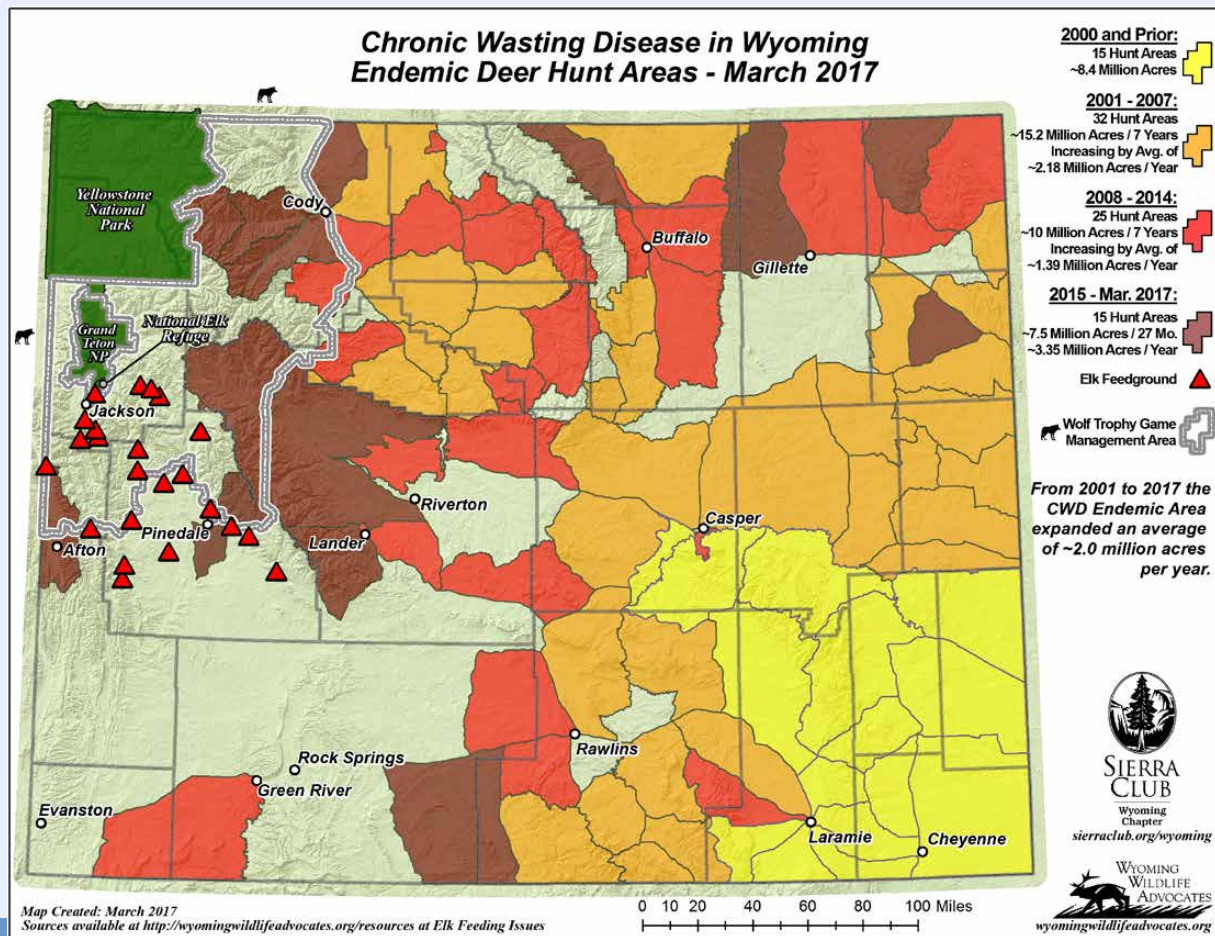
CWD afflicts members of the cervid (deer) family, which, in the Rocky Mountain West, includes mule and white-tailed deer, elk, and moose. Testing to determine if game meat is infected with CWD is made only after an animal is dead, yet living carriers of the contagion can appear normal and asymptomatic even when stricken with the disease that will kill them.

While Wyoming Deer Hunt Areas 17 and 19 are a few hours' drive from Greater Yellowstone, CWD endemic zones already extend figuratively to the doorstep of Yellowstone and Grand Teton national parks, the adjacent National Elk Refuge in Jackson Hole and over half of the ecosystem's national forests—though many hunters and the general public may not be aware. The Powder River Basin, notably, also spills northward across Wyoming's border into Montana.

Early in November 2017, a test confirmed Montana's first-ever case of CWD in a wild cervid. The diagnosis was based on tissue samples taken from a dead mule deer



The Greater Yellowstone Ecosystem, along with Montana and Idaho, are said to be free of Chronic Wasting Disease but for how long? Some scientists say the deadly disease is already here. Map showing the progression of CWD in the US and Canada courtesy US Geological Survey's National Wildlife Health Center



buck harvested near Bridger just north of the Montana-Wyoming state line. Confirmation came ironically on the same day the Montana Fish Wildlife and Parks Department began circulating a draft CWD action plan for public review.

On Nov. 14, 2017, a second dead mule deer buck was confirmed to be CWD-positive. This animal was shot a few miles south of Bridger near Belfry—a tiny town near Red Lodge on the northeastern corner of the Greater Yellowstone Ecosystem.

On November 15, 2017, the Wyoming Game and Fish Department announced that yet another CWD-positive hunt area had been added to its map of CWD-endemic areas that now blanket most of the state. A white-tailed deer buck had turned up positive near Meeteetse on the eastern tier of Greater Yellowstone. “That hunt area and three others recently added are proof that this disease, in terms of landscape it is reaching, continues to expand millions of acres each year,” says Lloyd Dorsey, conservation director for the Wyoming state chapter of the Sierra Club. Dorsey, an elk and deer hunter, added

this, referencing a map (opposite page) showing the progression of the disease in Wyoming that was prepared by the Sierra Club and Wyoming Wildlife Advocates.

To see the map, and what it portends, should be a chastening moment for Montana hunters, notes Glenn Hockett of Bozeman, president of the Gallatin Wildlife Association that has joined other groups in Wyoming in suing to have the Wyoming feedgrounds closed.

**As of fall 2017, a CWD positive animal has not been detected on the Elk Refuge nor on any of Wyoming’s widely ridiculed complex of feedgrounds, but CWD positive deer have been found nearby, and the clock is ticking.

Until the year 2000, CWD was present in 15 Game and Fish hunt areas in the southeast quadrant of the state encompassing about 8.4 million miles. In the next seven years it was in 32 additional hunt areas covering more than 15 million acres on a westward path. Between 2008 and 2014, it added another 25 hunt areas and 10 million acres or about 1.39 million acres annually pushing into the middle of Wyoming.

The ever popular National Elk Refuge’s free smorgasbord.
USFWS/Dave Dunlap NER volunteer



From November 2015 to November 2016—just a single year—the CWD endemic zone grew 3.31 million acres and is now on the verge of reaching Yellowstone, Grand Teton, the Elk Refuge and the state feedgrounds.

The addition of Deer Hunt Area 17 made nine new areas in Wyoming in 2017 whereas the annual average between 2001 and 2015 was four new areas. An emerging hotspot is a hunt area south of Pinedale, Wyoming, on the flanks of the Wind River Mountains and a short jaunt away for a mule deer to the feedgrounds.

Incurable, progressive, often slow to incubate, and except in the rarest of circumstances always-fatal, CWD has been described by epizootologists as “a slow-motion wildlife disaster” in the making; it involves an exotic plague—a cousin to dreaded “Mad Cow Disease”—that, true to its name, “chronically” festers at first in wildlife at low-grade levels, spreading between animals in dribs and drabs.

Ever increasingly, in the rapidly-expanding reaches of the US landscape becoming classified as CWD-endemic areas, huge numbers of outdoorspeople have trepidation about the wholesomeness of big game meat they bring home to the family dinner table.

Before proceeding further here, let us state an important fact that is still true as of November 2017, there has not been a single documented case of a human coming down with CWD or a prion-related disease after eating a CWD-infected deer or elk.

Several experts I interviewed are not optimistic that will always be the case. Given the ability of prion diseases to manifest themselves in different kinds of strains in different mammals, it is likely that eventually the species barrier, currently keeping CWD a deer-family-only disease, will be breached.

Besides being poised to reach Montana and Idaho from infected migratory animals in Wyoming, CWD also is pressing southward toward Montana via infected wildlife from Alberta and Saskatchewan and westward from the Dakotas. At present, there currently are neither vaccines available to stop it nor curative medicines that can be dispensed to hosts having it.

The only hope for potentially dampening its impact, according to leading wildlife authorities, is taking actions that just happen to cut against the fundamental grain of how Wyoming has approached wildlife management for generations. In a nutshell, it means halting century-old public feeding of wildlife and viewing predators, namely wolves, as allies in fighting diseases instead of as scourges that Wyoming would just as soon wipe off the landscape.

Many believe the tipping point moment with CWD has arrived. Are natural resource agencies in Greater Yellowstone adequately prepared to deal with its onset?

The stakes are high. Hundreds of thousands of wild elk, mule and white-tailed deer move in herds or small bands, circulating throughout Greater Yellowstone across jurisdictional boundaries of land management agencies, intermingling seasonally and dispersing again across huge, mind-boggling expanses of terrain. Those animals, in turn, come in contact with other herds up and down the northern Rockies.

CWD infected white tailed deer.
Wisconsin Dept. of Natural Resources



Virginia Department of Game and Inland Fisheries wildlife biologists sample hunter-killed deer and gather brief information from hunters in the active CWD surveillance area. VDGIF

In addition to Greater Yellowstone’s global reputation for hunting, non-lethal wildlife watching in Yellowstone and Grand Teton national parks alone is the anchor to a nature tourism industry estimated to be worth at least \$1 billion annually to local economies. Wildlife watching supports a lot of businesses in every gateway community.

It’s a grave prospect on the minds of Yellowstone Superintendent Dan Wenk and his staff. Wenk, however, admits there is no plan, no coordinated strategy existing between state and federal agencies for how to confront CWD.

The very government entity that was created to formulate regional strategies—the Greater Yellowstone Coordinating Committee—does not have a unified plan.

The agent that causes CWD is not a virus, bacteria, fungi or parasite—not a typical living organism, but misshapen proteins called prions without DNA and RNA structure that become harbored mostly in the brains and central nervous system of deer family victims.

Prions shed through urine, feces, saliva, and possibly in tissue decomposition of dead animals. Even modest attempts at decontamination, paralleling what’s happened at other sites in other states, did not kill them off. Prions are notoriously difficult to destroy.

If scientists were tasked with designing an experiment to create ideal conditions for a pandemic to take hold, involving a transmissible infectious disease in wildlife during winter when they are most stressed by the elements, one example would be the complex of artificial feeding operations identical to those operating today in western Wyoming.

—Dr. Thomas Roffe, former chief of wildlife health for the U.S. Fish and Wildlife Service



Sleigh rides out into the elk refuge ran constantly from mid-Dec. 2017, to early April. A total of 32,753 riders paid for the experience. USFWS/Lori Iverson

Ground zero for this prima facie argument is the National Elk Refuge home of the Jackson Elk Herd, the most famous wapiti herd in the world. The 24,700-acre Elk Refuge is administered by the Fish and Wildlife Service, long touted as the top wildlife agency on the globe.

Nearby, in western Wyoming are the 22 feedgrounds run by the Wyoming Game and Fish Department. Artificial feeding of wildlife in ways that bunch animals in large numbers is considered a cardinal sin in modern wildlife management because of the ripe conditions it fosters for disease outbreaks.

At the Elk Refuge alone during the winter of 2017, more than 8,800 elk converged around artificial food rations given to them. Combined with the state feedgrounds, upwards of 21,000 wild wapiti are congregated unnaturally together in western Wyoming, leaving them more vulnerable to catching not only CWD

but bovine tuberculosis, Septicemic pasteurellosis and hoof rot. High rates of brucellosis infection among wild elk nourished at feedgrounds prove the point.

Wyoming for a long, long time has justified its refusal to close down feedgrounds by, more or less, portraying CWD as merely a hypothetical risk.

If Wyoming believes it will be able to market its way out of a CWD crisis or deny culpability for a problem it has known is coming, Smith told me recently, then it is in for a rude awakening. This isn't just any region. It is the Greater Yellowstone Ecosystem, with Yellowstone National Park at its wild heart. It has a national constituency. The public will demand answers and accountability; citizens will want to know the names of who was in charge and did little to prevent disaster from happening.

EDITOR'S NOTE: Just a few days after Part One of Mountain Journal's series on Chronic Wasting Disease appeared, the Montana Department of Fish Wildlife and Parks issued a public statement announcing that it was bolstering its surveillance for disease in wildlife, particularly along the state's southern border with Wyoming.



To read the unedited article and future series go to mountainjournal.org

Read Part 1: **Greater Yellowstone's Coming Plague**

Read Part 2: **America's National Elk Refuge: A Miasmatic Zone Of Life-Threatening Diseases**

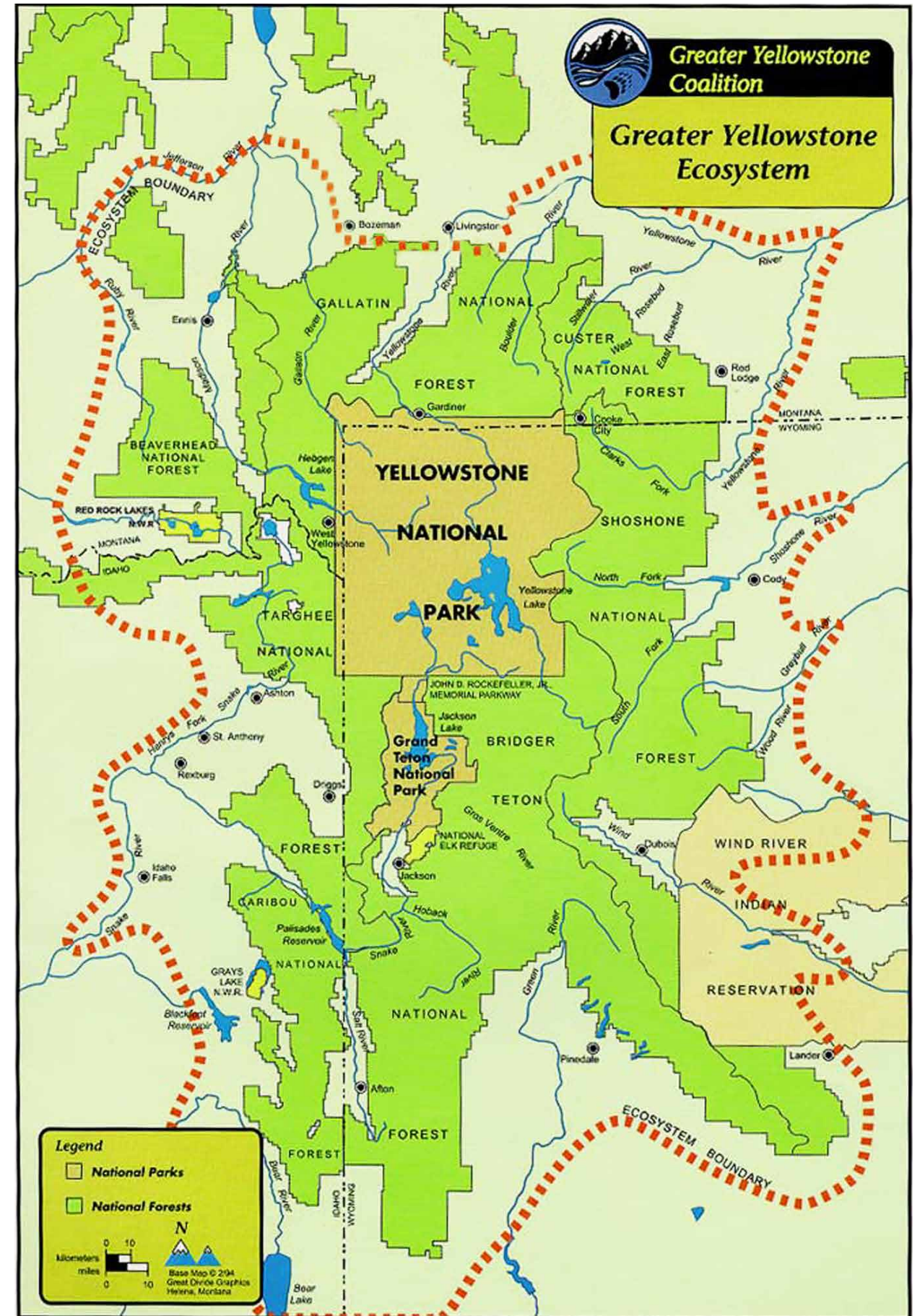
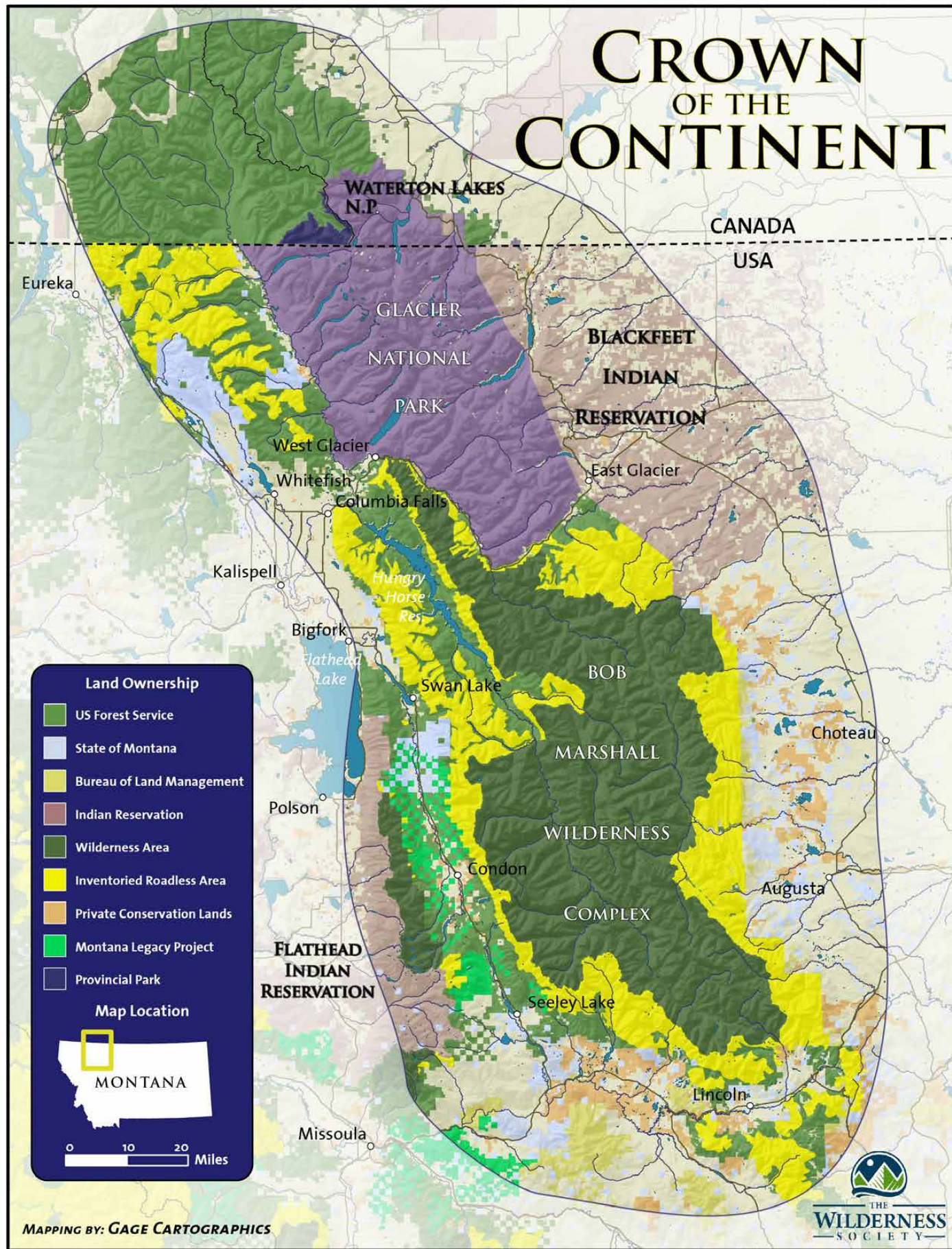
Read Part 3: **Chronic Wasting Disease Strikes Montana And Continues Its March On Yellowstone** has written several books and is the founder of Mountain Journal.

Read Part 4: **The Undeniable Value Of Wolves, Bears, Lions And Coyotes In Battling Disease**

Next Installment: **Disease Experts Converge On Jackson Hole**

Todd Wilkinson is an American journalist and author, proudly trained in the old-school tradition of asking tough questions and pressing for honest answers. He has written several books and is the founder of Mountain Journal.

Mountain Journal is an unprecedented public-interest journalism platform devoted to investigating and exploring the intersection between people and nature in the Greater Yellowstone Ecosystem.



Ermine in winter. ADFG/Tim Mcleod



EVOLUTION IN ACTION

Climate change is already wreaking havoc with many species of birds and animals that depend on seasonally changing color to survive (e.g. hares, weasels, Arctic fox). A recent paper by University of Montana Professor Scott Mills and his team of international scientists published in *Science* magazine brings hope that these species may be saved through adaptive evolution.

Snow is coming later and melting earlier. Genetically preprogrammed to change their brown summer coats to white in late fall now means there is a month where their natural camouflage ability to hide from predators makes them easy prey. Imagine a stark white weasel on a bare dark landscape as spring arrives, the yet to molt white animal is again vulnerable and unable to “blend in.” As the climate has warmed, there has been a noticeable decline in population.

Thorough, rigorous research across the globe has uncovered

polymorphic areas (hot spots) where some of the studied species were already evolving by staying brown longer or even year round. The animals were working to ensure they didn’t become extinct. But they can’t do it alone. We need to do our part to take care of these “hot spots” by cutting back on carbon dioxide emissions.

The world has taken notice of the findings. According to the *Missoulian*, “the BBC covered the paper, the outcome of an analysis of 2,713 samples of winter coat colors from 60 countries. So did the *Atlantic* and *National Geographic*. “*Science*” is considered the leading scientific journal on the planet in terms of circulation and peer review, covering the most relevant research emerging across fields. High praise and validation for the study.”

Congratulations to: Scott Mills, Eugenia Bragina, Alexander Kumar, Marketa Zimova, Diana Lafferty, Jennifer Feltner, Brandon Davis, Klaus Hackländer, Paulo Alves, Jeffrey Good, José Melo-Ferreira, Andreas Dietz, Alexei Abramov, Natalia Lopatina, and Kairsten Fay.

YELLOWSTONE GRIZZLY CASE FAST-TRACKED AHEAD OF HUNT

From the *Missoulian* via *Mountain West News*
March 13, 2018

On Tuesday, in a ruling from the bench in Missoula, US District Judge Dana Christensen ordered, among other things, that all parties put their sprawling arguments into a single set of briefs for a hearing in August. In the process, he panned the federal government for soliciting public comment on how a court decision relating to Great Lakes gray wolves might affect Greater Yellowstone grizzly bears.

FWS delisted the roughly 700 grizzlies in and around Yellowstone National Park on July 31, 2017, while leaving protections in place in five other grizzly recovery zones. The next day, a Washington, DC appeals court overturned the delisting of gray wolves in the Western Great Lakes Region. That case warned FWS that it couldn’t remove Endangered Species Act protections from one distinct population segment without showing how the decision would affect other protected wolf populations.

Four months later, FWS officials published a request in the Federal Register asking for public comment on whether the Great Lakes wolf decision might affect Greater Yellowstone grizzly delisting. Christensen found that confounding.

“How is this public comment period somehow going to shed any light or give any assistance at all with the issues in this lawsuit?” Christensen asked US Department of Justice Attorney Coby Howell. “When we’re talking about the application of a circuit court opinion, that’s a decision I’m going to have to make.

How is public comment going to help me out?”

Howell replied that FWS needed until at least April 30 to analyze the comments and then either add more findings to the existing delisting rule or start the process of withdrawing it. Doing so would ensure the court had a fully prepared agency rule to consider, he said.

But the government’s opponents pounced all over that idea.

Earthjustice attorney Katherine O’Brien called the delay request an opportunity “to cook up justifications to prop up a decision they’ve already made.”

“Meanwhile, Wyoming will be turning 24 grizzly bears into

rugs and wall hangings,” O’Brien said. Wyoming’s Game and Fish Department has proposed allowing hunters to kill up to 24 grizzlies starting in some areas on Sept. 1. Idaho’s Department of Fish and Wildlife has proposed a fall hunting season for one bear. Montana Department of Fish, Wildlife & Parks officials decided not to hold a 2018 grizzly hunt.

Meanwhile...

The first grizzly bear sightings of 2018 occurred in Yellowstone National Park on Tuesday, March 6. Staff observed an 11-year-old male grizzly bear wearing a radio collar in the west-central part of the park. On Wednesday, March 7, employees reported seeing a grizzly bear in the east-central part of the park.

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NPS/Andrew Engelhorn

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Thanks very much!

The editors—Rick Graetz, Susie Graetz, and Jerry Fetz

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CROWN
of the
CONTINENT
and the
GREATER
YELLOWSTONE

MAGAZINE

THE BISTRO
RESTAURANT



OPEN

Looking for spring in
all the wrong places.
Rick and Susie Graetz