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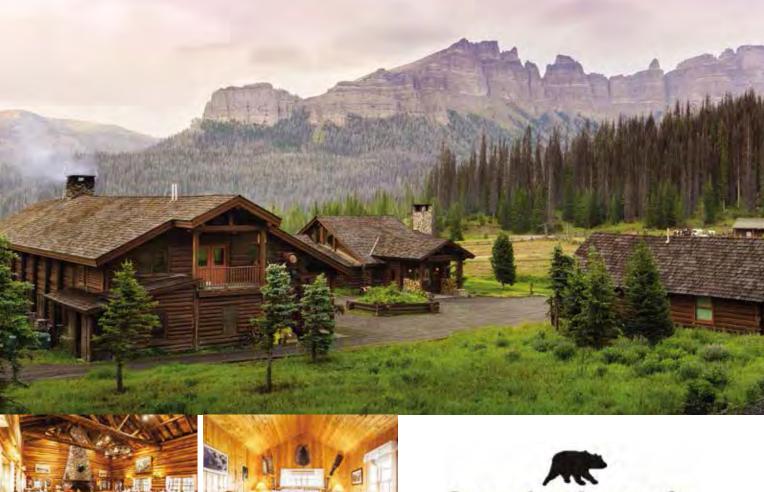
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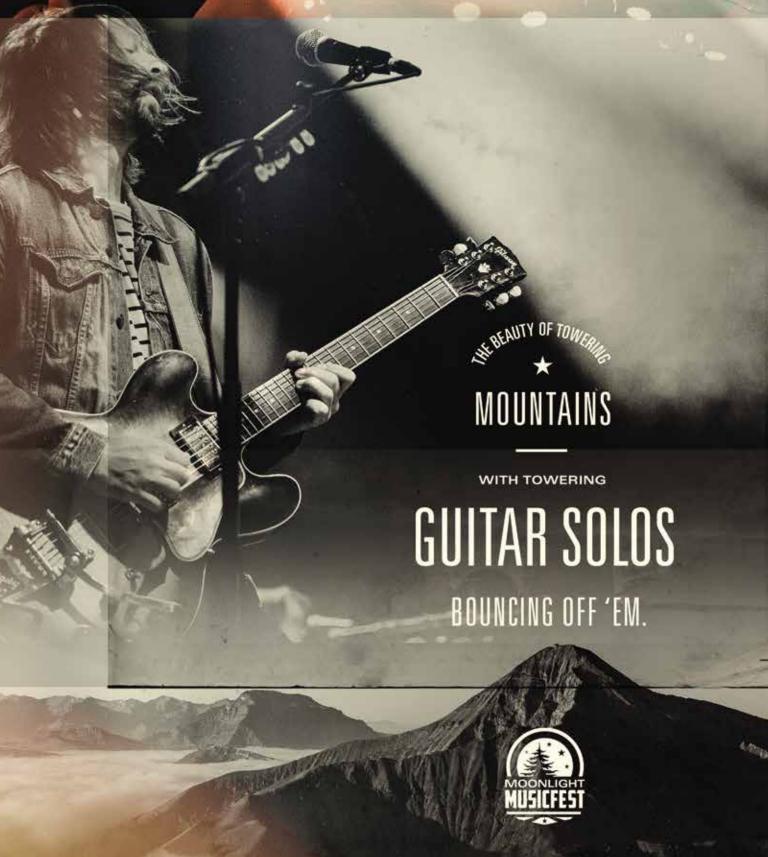
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Tellowstone

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On the cover: Bull bison graze along an ephemeral pool in Lamar Valley. PHOTO BY JACOB W. FRANK / NPS

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THURSDAY JULY. 25

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Live Auction | Sunday, July 21

Arena Tent | www.bigskyartauction.com

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WEDNESDAY JULY 24

Big Sky PBR Golf Tournament

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The Reserve at Moonlight Basin Registration at 9am | Shotgun Start at 11am

Buy a team and be paired with a cowboy. 18 teams of 4 plus a PBR cowboy will play a 18-hole, 5-person team scramble. All proceeds from the tournament will go to the Western Sports Foundation, whose mission is to support total athlete wellness for

those competing in Western lifestyle sports by providing resources for life.

FRIDAY JULY 26

Big Sky PBR Bull Riding Night 2 | PBR Arena

12:00pm - Will Call opens for ticket pickup

4:30pm - Golden Buckle gates open

5:00pm - Calcutta Auction in the Golden Buckle tent

5:30pm - General Admission gates open

6:30pm - Bull Riding event starts 8:30pm - Concert to follow

PBR's Touring Pro Division continues to light up Big Sky Town Center with 40 of the world's best cowboys going head to head with world-class bulls

Big Sky PBR After Party & Music

Featuring Jamie McLean

SAV Stage | 8:30pm Concert access included with Big Sky PBR tickets. Music-only tickets available at bigskypbr.com.

THURSDAY JULY 25

Big Sky PBR Bull Riding Night 1 | PBR Arena

4:30pm - Gates Open | 5:30pm - Bull Riding Begins

PBR's Touring Pro Division kicks off three nights of bull riding in Big Sky with 40 of the world's best cowboys going head to head with world-class bulls.

Music in the Mountains

PBR Kick-Off Concert with Hayes Carll

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Town Center Park | FREE 6pm - Park opens

7:15pm - Opening act

8:30pm - Hayes Carll

SATURDAY JULY 27

Big Sky PBR Bull Riding Night 3 | PBR Arena

12:00pm - Will Call opens for ticket pickup

4:30pm - Golden Buckle gates open

5:00pm - Calcutta Auction in the Golden Buckle tent

5:30pm - General Admission gates open

6:30pm - Bull Riding event starts

8:30pm - Concert to follow

PBR's Touring Pro Division wraps up after three epic nights of bull riding in Big Sky. One cowboy will be named the champion and will take home the Western bronze, the check, the guitar and the buckle.

Big Sky PBR After Party & Music Featuring Hell's Belles

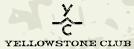
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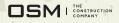






























































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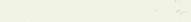


















YARROW



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Cherishing the moment in Yellowstone

The first time I visited Yellowstone National Park I was about 3 years old. We stayed at a campground in our 1980s-era camper and my dad enjoyed the fishing though the mosquitoes were fierce. The highlight for me was playing with my mom amid the tall trees, native grasses and nearby burbling stream.

The funny thing though? I don't have any recollection of this trip; it wasn't until years later that my parents told me the stories.

My first memory of Yellowstone was several years later: a stay at the Old Faithful Inn. I remember being so eager to reach the Upper Geyser Basin, I rolled down the car window to see if I could detect that sulfur smell as far back as West Yellowstone, still an hour away.

You see, I was lucky enough to grow up in Gallatin Valley a couple hours north of the park, and I enjoyed many family visits and school trips to our nation's first national park. I grew to appreciate these moments as an adult.

Visitors travel to Yellowstone from near and far; for some, it's a once-in-a-lifetime journey, a trip planned for years. For others, it's their first glimpse of snow, an encounter with the mysteries of geology, or a glorious chance to see bison, elk or the great grizzly bear.

Whatever your trip to Yellowstone, this is your voyage, your Yellowstone. You might explore from the West Entrance (p. 24), visit Old Faithful (p. 34), or hike to a sputtering thermal pool (p. 29). Get off the beaten path if you wish. Who knows what you'll see (p. 44)?

Maybe you'll learn about the important science happening right here in our region (p. 66), and take pause to appreciate the millennia of history Native peoples have with the land (p. 92). Perhaps you'll be inspired by conservation and the effort to save the Yellowstone cutthroat trout (p. 74).

No matter your connection to Yellowstone, enjoy and appreciate that we have the opportunity to experience this place. Instilling awe in human beings for thousands of generations, Yellowstone truly is a wonder and is a kind of homeland for us all. I hope this guide informs your own exploration of this special place and reminds you just how lucky we are.

Jessianne Castle Managing Editor

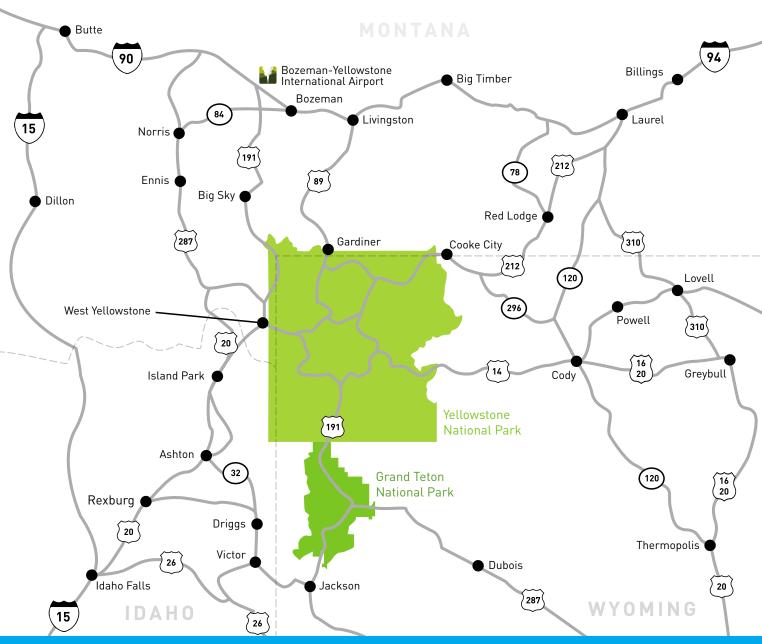


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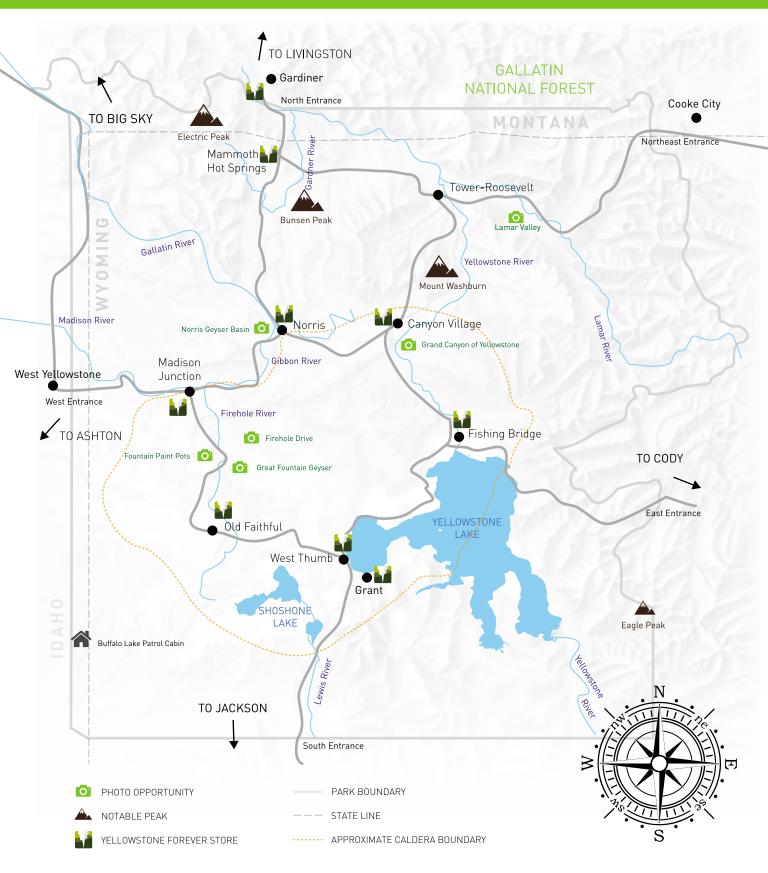
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Exploring Yellowstone









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ROUNDUP RODEO JULY 2-4 | Livingston, MT

BIG SKY FOURTH OF JULY CELEBRATION JULY 4 | Big Sky, MT

PEAK TO SKY JULY 5-6 | Big Sky, MT

TARGHEE MUSIC FESTIVAL JULY 12-14 | Grand Targhee Resort, WY

BREWFEST AT BIG SKY RESORT JULY 13 | Big Sky, MT

JACKSON HOLE PBR JULY 15-16 | Jackson, WY

BIG SKY COUNTRY STATE FAIR JULY 17-21 | Bozeman MT

BEARTOOTH RALLY & IRON HORSE RODEO JULY 18-21 | Red Lodge, MT

BIG SKY COMMUNITY RODEO JULY 19 | Big Sky, MT

TETON COUNTY FAIR JULY 19-28 | Jackson, WY

NATIONAL DAY OF THE AMERICAN COWBOY JULY 20 | Meeteetse, WY

YELLOWSTONE BEER FEST JULY 20 | Cody, WY

GARDINER BREWFEST JULY 20 | Gardiner, MT

BIG SKY ART AUCTION JULY 21 | Big Sky, MT **BIG SKY PBR** JULY 24-27 | Big Sky, MT

RED ANTS PANTS MUSIC FESTIVAL JULY 25-28 | White Sulphur Springs, MT





AUGUST

SWEET PEA FESTIVAL AUGUST 2-4 | Bozeman, MT

SMOKING WATERS MOUNTAIN MAN RENDEZVOUS AUGUST 2-11 | West Yellowstone, MT

LIVINGSTON CLASSIC PBR AUGUST 3 | Livingston, MT

CODY AIR FAIR AUGUST 3 | Cody, WY

RENDEZVOUS MOUNTAIN HILLCLIMB AUGUST 3 | Jackson, WY

BOZEMAN STAMPEDE RODEO AUGUST 8-10 | Bozeman, MT

SHOSHONE-BANNOCK INDIAN FESTIVAL AUGUST 8-11 | Fort Hall, ID

BIG SKY CLASSICAL MUSIC FESTIVAL AUGUST 9-11 | Big Sky, MT

GRAND TARGHEE BLUEGRASS FESTIVAL AUGUST 9-11 | Grand Targhee Resort, WY



Bozeman's Sweet Pea Festival offers music, arts and kids' activities. PHOTO COURTESY OF SWEET PEA FESTIVAL OF THE ARTS

MOONLIGHT MUSICFEST AUGUST 16-17 | Big Sky, MT

WILD WEST RIVER FEST AUGUST 16-18 | Cody, WY

THE RUT MOUNTAIN RUNS AUGUST 30 TO SEPTEMBER 1 | Big Sky, MT



38TH ANNUAL BUFFALO BILL ART SHOW AND SALE SEPTEMBER 20-21 | Cody, WY

YELLOWSTONE PLEIN AIR INVITATIONAL SEPTEMBER 24-29 | Yellowstone National Park



ONGOING

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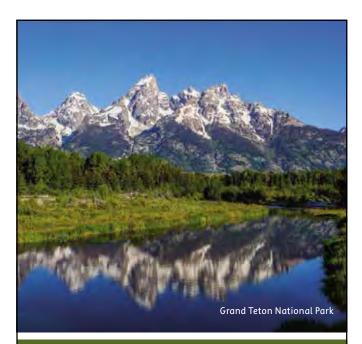
JACKSON HOLE RODEO MAY-SEPTEMBER | SELECT DAYS Jackson, WY

BIG SKY FARMERS MARKET JUNE-SEPTEMBER | WEDNESDAYS Big Sky, MT

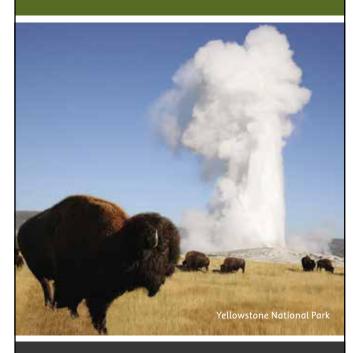
MUSIC IN THE MOUNTAINS JUNE-SEPTEMBER | THURSDAYS Big Sky, MT

WILD WEST YELLOWSTONE RODEO JUNE-AUGUST | SELECT DAYS West Yellowstone, MT

GRAND TETON MUSIC FESTIVAL JULY-AUGUST | SELECT DAYS Jackson, WY



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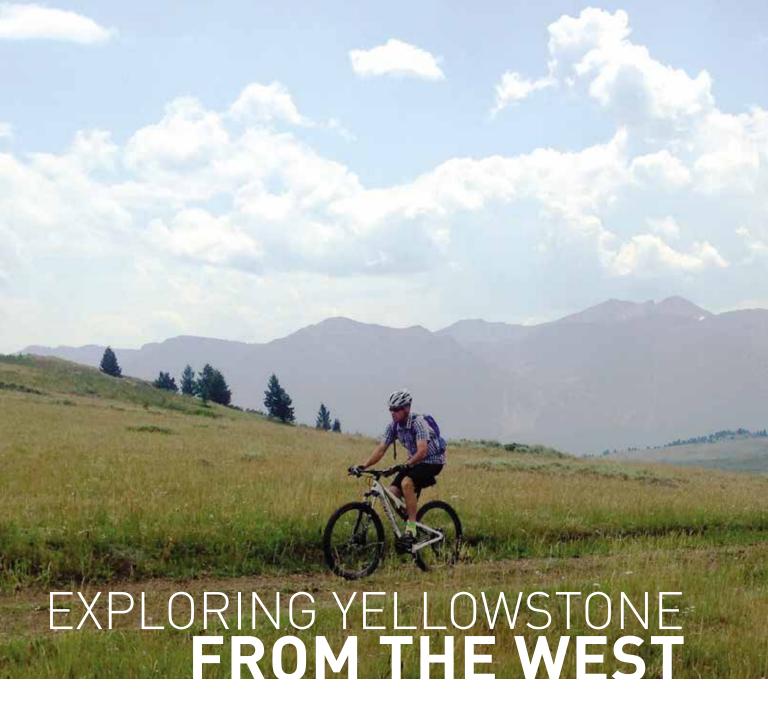
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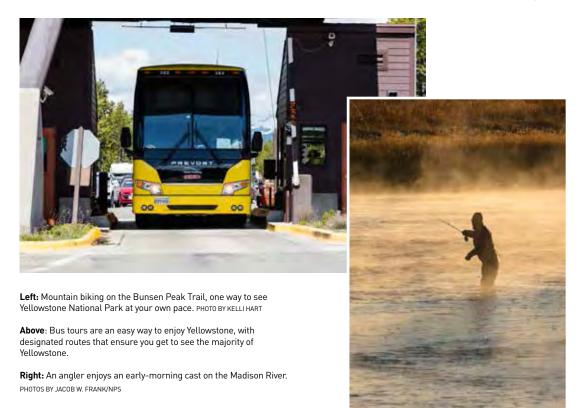
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BY CAITLIN STYRSKY

Yellowstone National Park has many options to explore, but you don't have to actually stay in the park to experience it all. Travelers lodging in West Yellowstone, Montana, have a number of opportunities for day excursions including guided bus tours, fly-fishing trips, cycling and hiking adventures.





Bus tours provide guided trips to Yellowstone's most popular sites without the stress of driving your own car on the narrow, winding roads. Buses pick up visitors at their hotel in the morning, visit the park's main attractions, and return to town in time for dinner.

"You're going to be seeing the majority of Yellowstone," according to Said Medina, a tour guide with Yellowstone Vacations touring company. "Go into it knowing that you're going to see the world's first national park and it's hard not to have a good day."

A tour of the Lower Loop highlights Old Faithful, the geyser basins and Yellowstone Falls, while the Upper Loop offers a greater chance for wildlife sightings. Both routes make regular stops at points of interest and for wildlife viewing along the way. Guests should expect a full eightto nine-hour day and be prepared with a rain jacket, camera and a positive attitude.

Fishing trips are another popular experience for Yellowstone visitors. A number of fly-fishing shops in West Yellowstone offer guided full- and half-day trips to take advantage of the park's world-class fly fishing. During the summer season, anglers can fish the Firehole, Madison and Gibbon rivers as well as lakes and streams throughout the park.

"Guided trips allow beginners and experienced anglers an opportunity to fish the legendary waters of Yellowstone," said Arrick Swanson, owner of Arrick's Fly Shop. "Guides can take you to the best fishing holes and give you the best chance of catching trout."

Most shops provide equipment rentals for travelers packing light, or those new to the sport. Visitors fishing on their own can pick up a Yellowstone fishing license and equipment in town and head into the park for a day of exploration. Anglers are encouraged to read the Yellowstone fishing regulations and abide by park rules.





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Cycling is an option for tourists looking to explore the park at their own pace. During the summer season, cycling is permitted on park roads and mountain biking is allowed on specific trails. Local shops in West Yellowstone rent both road and mountain bikes at hourly or daily rates.

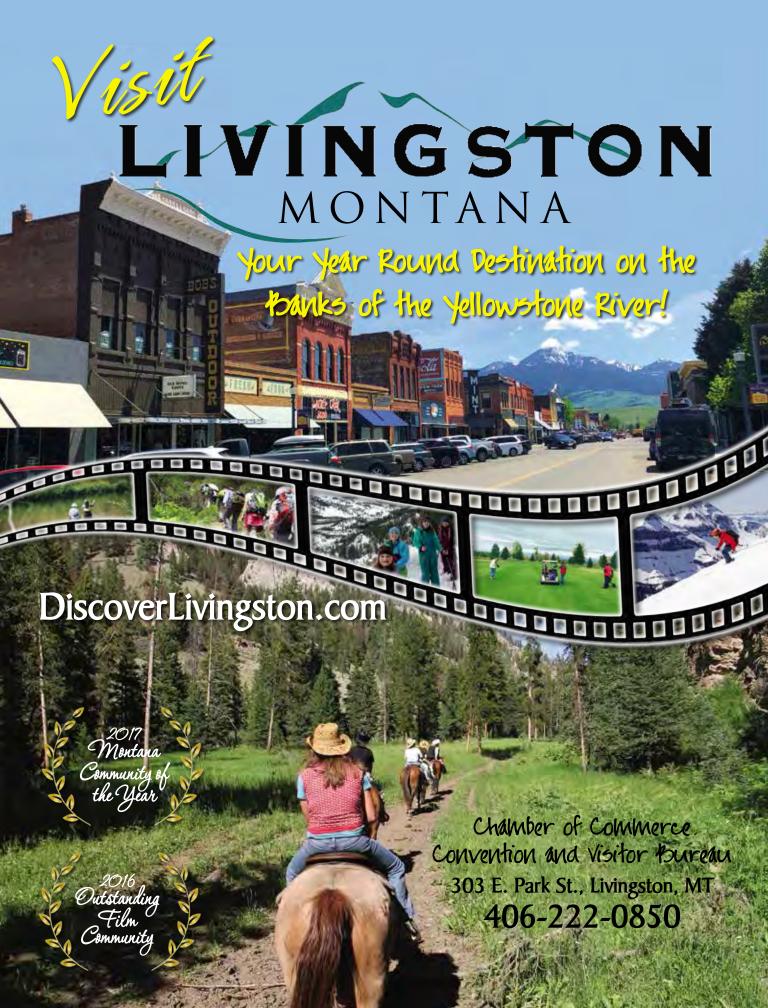
"I would recommend getting an early start due to the summer traffic," said Kelli Hart, co-owner of Freeheel and Wheel, a ski and bike shop in West Yellowstone. "Otherwise, you can wait until 11 a.m. to let all the morning vehicle traffic into the park, then you can bike in and be back by 3 p.m."

Hart recommends several cycling routes along the park's main roads as well as options for mountain bike enthusiasts including Fountain Flat Road, Lone Star Geyser and Bunsen Peak Trail. Visitors are encouraged to pick up a map, check with a local bike shop for cycling conditions and exercise caution due to the large volume of vehicle traffic during the summer months.

Hiking offers a chance for Yellowstone visitors to explore off the beaten path. A day hike in the park can range from a short, two-hour hike to an all-day excursion. A number of maps and guidebooks provide hiking options for all levels and durations. Hikers should remember that Yellowstone is located at a high altitude and be prepared with plenty of water and snacks and always carry bear spray.

Whatever you choose as a means for exploration, Yellowstone's West Entrance is the perfect hub to experience everything the park has to offer.

Caitlin Styrsky, of West Yellowstone, uprooted ber city life in Austin, Texas, in 2014 and moved to Big Sky Country in search of mountains, rivers and wide-open spaces.



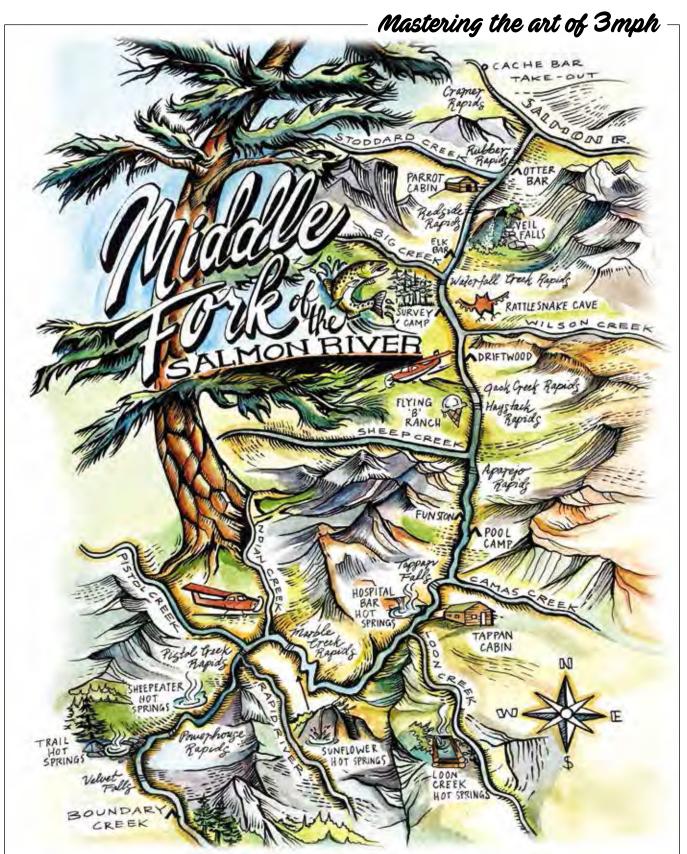
HIKE OR BIKE TO A YELLOWSTONE GEYSER

BY CHRISTINE GIANAS WEINHEIMER

Yellowstone National Park is home to over half of the Earth's geysers—more than 500 spouting, steaming, gushing spectacles of nature. While the geysers visible from the park's excellent system of boardwalks draw the most visitors, a few can be found slightly off the beaten path. The following trails offer close-up encounters with active geysers, and allow bicycles on at least part of the route.









Above: Hikers travel the Fairy Falls Trail that leads to Imperial and Spray geysers, as well as the namesake 200-foot Fairy Falls.

Below: Imperial Geyser, accessed via Fairy Falls Trail, shoots water 15 feet into the air and is surrounded by a blue pool ringed by colorful microbial mats.



FAIRY FALLS TRAIL

Named for a picturesque, 200-foot-high waterfall, the 6.7-mile round-trip Fairy Falls Trail also leads to Imperial Geyser and Spray Geyser. Park 1 mile south of Midway Geyser Basin at the Fairy Falls Parking Lot and hike or bike 1 mile on an old freight road to the trailhead. Don't miss the short trail segment that climbs to an overlook of Grand Prismatic Spring, the park's largest hot spring at 370 feet in diameter.

From the trailhead, traverse the young pine forest on foot to the falls then continue on to the geysers, which both erupt every few minutes. Imperial Geyser shoots water up to 15 feet from a blue pool ringed by colorful microbial mats. Spray Geyser has two vents that give eruptions up to 6 feet in height, making for a v-shaped appearance.

For a less-traveled route to the Fairy Falls trailhead—and nearly 10 miles, roundtrip—approach from the opposite direction by following the freight road around 3 miles from Fountain Flat Drive. On both routes, bicycles are allowed along the freight road, but must be left at the trailhead, where racks are provided. Note that these trails are in a bear management area that opens in late May.

Good to know: There are no restrooms at either trailhead, and parking is limited at the Fairy Falls lot. Consult a trail map for details on your planned route and stay on maintained trails, as the ground might be unstable in hydrothermal areas. Prepare for traveling in bear country by staying in groups of three or more and carrying bear spray.

Christine Gianas Weinheimer lives in Bozeman and has been writing about Yellowstone for 17 years.





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Grizzly and Wolf Discovery Center opening new exhibit

BY JESSIANNE CASTLE

The Grizzly and Wolf Discovery Center in West Yellowstone is currently developing a new exhibit hall that will feature ponds, streams and riparian vegetation. A viewing area for live river otters, cutthroat trout and grayling will round out the exhibit, which is slated to open this summer.



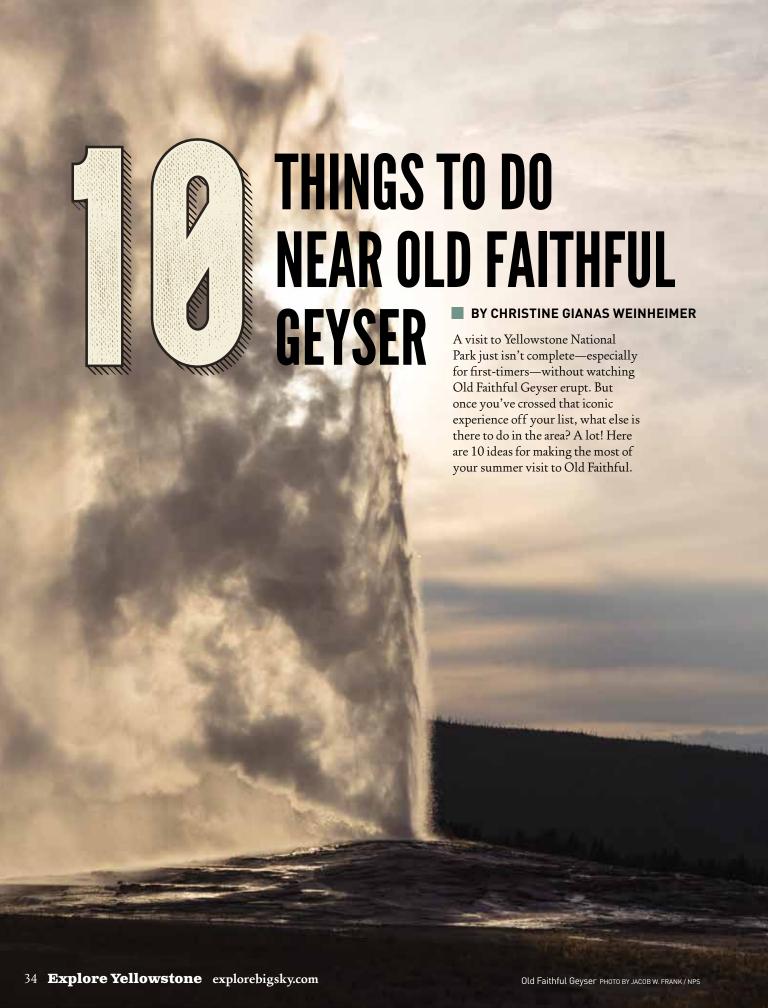
The center also boasts large enclosures where visitors can learn about and observe wolves and bears. Overall, a trip to the Grizzly and Wolf Discovery Center is an opportunity to learn about the diverse relationships between predators, prey and habitats.

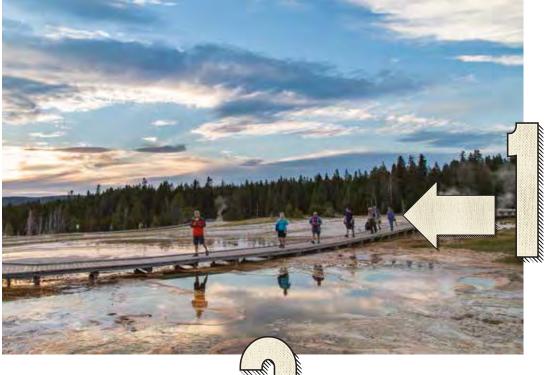
Currently, the center houses seven grizzly bears that were captured in the wild after becoming nuisance bears or orphaned cubs. However, the center is also

building additional bear habitat along with the riparian exhibit. With the new space, the center would be able to house at least eight more bears. This area would likely temporarily house bears that are awaiting placement at other facilities.

The Grizzly and Wolf Discovery Center is open 365 days a year from 8:30 a.m. to 8 p.m. and admission is good for two consecutive days. Visit grizzlydiscoveryctr.org to learn more.







WALK A GEYSER BASIN BOARDWALK

The Upper Geyser Basin surrounding Old Faithful is home to 150 geysers, plus hundreds of hot springs, many of which can be seen from the boardwalks looping through the basin. Walk or drive to nearby Black Sand Basin and Biscuit Basin to see even more hydrothermal wonders.

Above: Park visitors explore Upper Geyser Basin at sunset.

Below: Old Faithful Visitor **Education Center** PHOTOS BY NEAL HERRERT / NPS

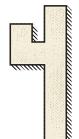
RIDE A MOUNTAIN BIKE

Two area bike trails are mostly flat and perfect for family bicycling. The Lone Star Geyser Bike Trail (4.8 miles roundtrip) leads to a large, active geyser. The Old Faithful Lower General Store to Morning Glory Pool Bike Trail (2 miles roundtrip) passes by several more geysers.



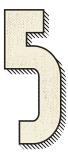
EXPLORE THE VISITOR EDUCATION CENTER

The Old Faithful Visitor **Education Center presents** fascinating exhibits on the park's hydrothermal features and the volcano beneath Yellowstone. Check out a geyser model and hands-on exhibits in the Young Scientist room.



BROWSE THE PARK STORE

Shop for everything from souvenirs and outdoor gear to books and trail maps at the Yellowstone Forever Park Store inside the Old Faithful Visitor Education Center. Purchases from Yellowstone Forever, the park's official nonprofit partner, directly benefit the park.



TAKE A HIKE

Mystic Falls Trail (2.4 miles roundtrip) follows a creek through a forest to the 70-foot Mystic Falls. Observation Point Trail (1.6 miles roundtrip) ascends to an ideal overlook of Old Faithful and the Upper Geyser Basin.

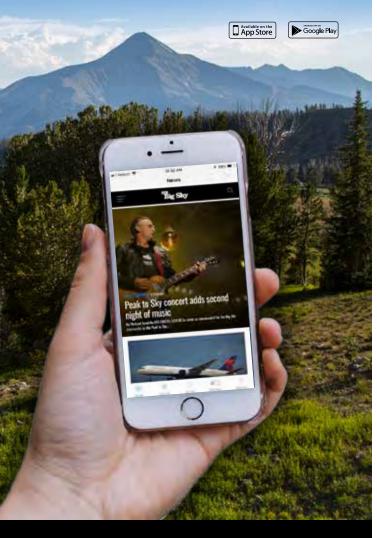
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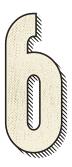












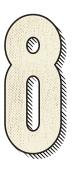
VISIT THE YELLOWSTONE ART AND PHOTOGRAPHY CENTER

The center celebrates the role of art and photography in Yellowstone's preservation. Peruse the art gallery and participate in free, family-friendly programs throughout the summer. Visit yellowstone.org/art for a schedule of activities.



JOIN A RANGER-LED PROGRAM

Yellowstone rangers offer a wide variety of free day and evening programs such as guided walks and talks on wildlife and hydrothermal features. Check the park's website or newspaper for a schedule.



TOUR THE OLD FAITHFUL INN

Take a free tour of the Old Faithful Inn, possibly the country's most famous National Park structure. See the quirks of its construction and hear fascinating stories about its history. Visit ynplodges.com for a schedule.





BECOME A JUNIOR RANGER

The self-guided Junior Ranger program for visitors aged 4 and up introduces kids to the park's natural wonders with fun activities. Pick up a booklet at the Visitor Education Center for \$3, and receive a Junior Ranger patch after completing the requirements.



RECHARGE AT THE OLD FAITHFUL LODGE

Get lunch, dinner or snacks at the cafeteria in the Old Faithful Lodge (not to be confused with the Old Faithful Inn), which offers some of the best views of Old Faithful Geyser. Or grab an ice cream cone and cool off on the huge covered porch.

The location, the style, the feeling you get when you walk through the door – every aspect of your home should be a reflection of who you are, where you've been, and the life you aspire to live. Your best life begins with a home that inspires you.



950 MARTINEZ ROAD

Bozeman, MT	\$3,600,000
MI S 310465	

3 5 25+ 7,529 BEDS BATHS ACRES SQ FT



42 COTTONWOOD LANE

Ennis, MT MLS 219155		\$1,990,000	
5	6	8.37	4,100
DEDC	DATHC	ACDEC	SO ET



42 LOW DOG ROAD

Big Sky, MT MLS 326721		\$2,399,000	
5	5	1.07	4,216
REDS	RATHS	ACRES	SO FT



1021 GATEWAY SOUTH

Gallatin Gateway, MT \$4,650,000 MLS 317770

4 4 55.12 5,583 BEDS BATHS ACRES SQ FT



LAKEVIEW RANCH

Helena, MT \$16,495,000 MLS 328983 10 9 315.5 17,533 BEDS BATHS ACRES SQ FT



LOST TRAILS LOT 8

Big Sky, MT \$679,000 MLS 328332 20 ACRES



JUSTA ADAMS



TIM CYR 406.580.6316



LAURA SACCHI 406.570.9651



CATHY GORMAN 406.580.2318



CALLIE PECUNIES 406.595.0755



LIVE MONTANA



48042 GALLATIN ROAD

Big Sky, MT \$1,450,000 MLS 326778

3 3.6 3.694 **BATHS BEDS ACRES** SQ FT



22 ULERYS LAKES ROAD

Big Sky, MT \$3,175,000 MLS 331336 20.25 3.545 **BEDS BATHS ACRES** SQ FT



ELKRIDGE RANCH PARCEL 22

Big Sky, MT MLS 325876 19.88 **ACRES**

\$550,000



36 HIGH PLAINS

Belgrade, MT \$620,000 MLS 331029 2.31 2,129 BEDS **BATHS ACRES** SQ FT



SUMMIT VIEW LOT 7

Big Sky, MT MLS 321879 **2.52 ACRES** \$300,000



JOY ROAD LOT 4

Big Sky, MT MLS 332452 7.33 ACRES

\$500,000



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TALLIE LANCEY



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406.580.8488



'ELLOWSTONE NATIONAL PARK ==

Which animals can you spot in the park? Check them off as you see them!



Their horns can weigh up to 40 lbs. which makes up 8-12 percent of their body weight.

Bighorns are herbivores and eat grasses, sedges and woody plants.

Their skulls have two layers of bone that function as a shock absorber for collision of head-on fighting.



Adult males can weigh up to 2,000 lbs. That's a TON!

They may live 12-15 years, and few up to 20 years.

They feed primarily on grasses and sedges.

Bison can be aggressive, and can run up to 30 mph.



They weigh less than their wolf relatives, between 25-35 lbs.

They will eat almost anything from rodents to fish, to fruit.

Also known as "song dogs," coyotes communicate with each other by different long-range vocalizations.

They can run up to 40 mph.



Adult males can weigh between 200-700 lbs.

Grizzlies lose up to 40 percent of their body fat during hibernation.

Grizzlies can locate food from miles away. They have a better sense of smell than a hound dog.

They eat about 35 lbs. of food in a typical day.



Adult eagles' wingspan can reach up to 7 feet!

Eagles primarily eat fish, carrion, birds and rodents.

Their distinctive white head doesn't develop until they reach 4-5 years old.

They may use the same nest year after year.



Adult males stand about 5 feet high at the shoulder.

Their antlers begin growing in the spring and usually drop in March or April of the next year.

They feed on grasses, shrubs, bark of aspen trees, conifer needles and aquatic plants.

They can run up to 45 mph.



Beavers transform unsuitable habitats by building dams.

They have webbed rear feet, and large, flat tails that aid in swimming.

Beavers can stay underwater for up to 15 minutes, and have a set of transparent eyelids they use like goggles.



Adult males weigh 300 or more lbs.

There are 208 in and adjacent to Yellowstone.

In the spring you can find them on south and west facing cliffs and in the summer you can find them in meadows, ravines, forests and on cliffs.



Adult males can weigh between 210-315 lbs.

Their food includes rodents, insects, elk calves, cutthroat trout, pine nuts, grasses and other vegetation.

They are considered true hibernators.

Black bears can live between 15-30 years.



Martens are usually 18-26 inches long.

They eat primarily small mammals, as well as birds and eggs, reptiles, insects and fruit.

They are active year-round and hunt mostly on the ground.



Adult males weigh close to 1,000 lbs, and females can weigh up to 900 lbs.

There are fewer than 200 that live in Yellowstone National Park.

A moose can keep his head underwater for three minutes!



Their long tail takes up 1/3 of their 40- to 54-inch body.

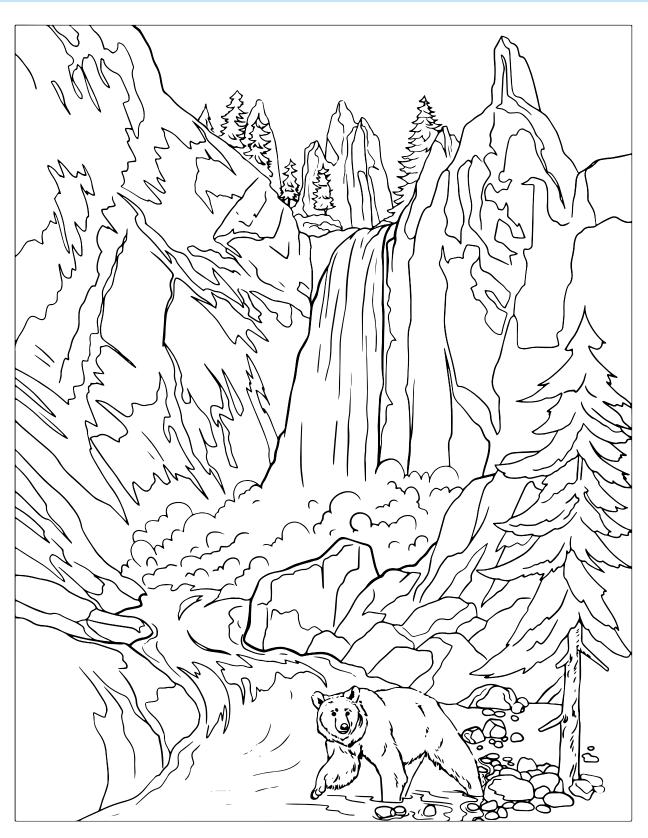
Otters eat crayfish and fish, frogs, turtles and sometimes young muskrats or beavers.

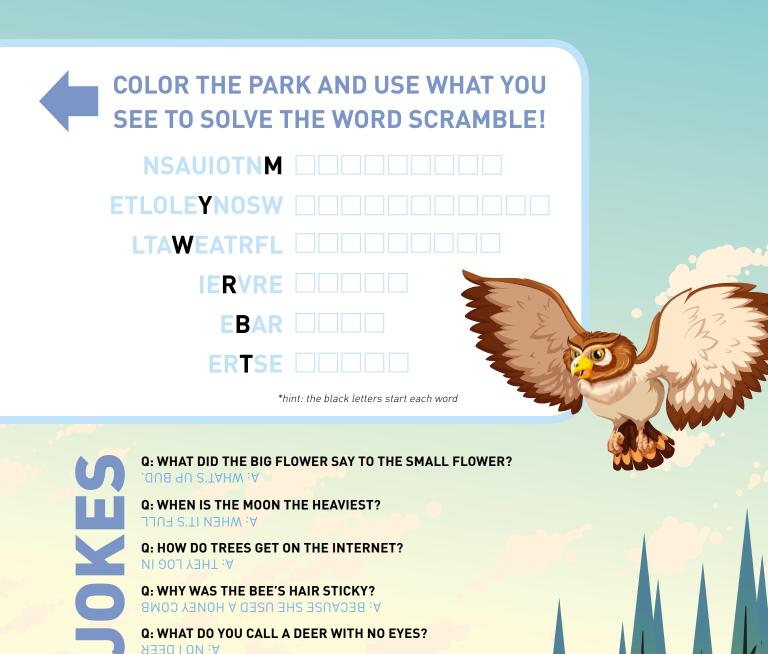
Their ears and nostrils close when underwater, and their whiskers help them find their prey.

DID YOU KNOW?

Yellowstone National Park has 67 mammal species, 258 bird species, 16 fish species, 5 amphibian species, and 2 threatened species.

KIDS' FUN PARK





a Million.

Mallaga an

and Maller

SNAPSHOT

AN
INTIMATE
YELLOWSTONE

Experiences off the beaten path

By the beginning of June 2019, Yellowstone National Park had already seen 576,776 visitors cross through the entrance gates. That number will erupt over the course of the summer—indeed, 4.1 million people traveled to the park last year alone.

While the vast majority of these visitors rightfully take advantage of Yellowstone's front-country infrastructure, it can be easy to forget the 2.2-million-acre expanse includes more than 900 miles of trails.

Even a day hike down one of these pathways will take you to less crowded, more remote sites and potentially afford you incredibly unique and intimate experiences. Explore Yellowstone asked our region's photographers to share images from some of these moments and here's what they sent.

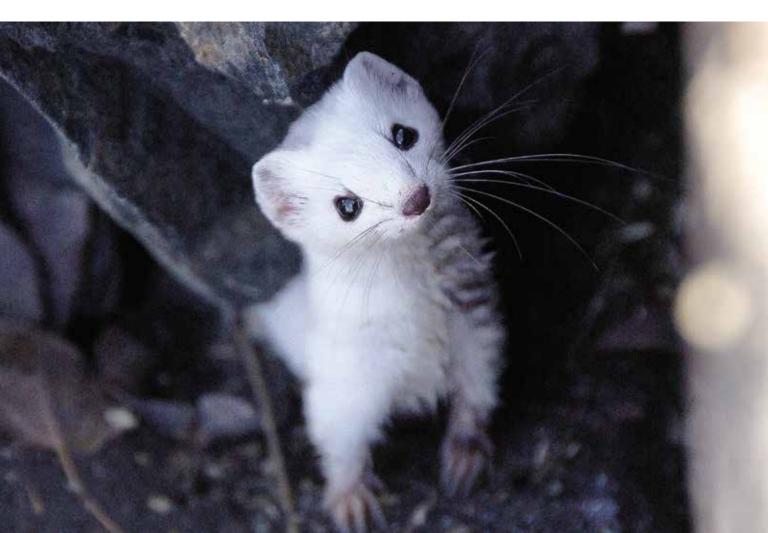






Above: A bison skull discovered in the Swan Lake Flats in Yellowstone's Northern Range. PHOTO BY MACNEIL LYONS

Below: Short-tailed weasels can be difficult to spot in winter as their fur changes from rustbrown to white. PHOTO BY JOHN LAYSHOCK





With his new antler growth covered in velvet, a bull elk drinks from a tributary of the Yellowstone River, where geothermally warmed water creates mist on cool summer mornings.
PHOTO BY THOMAS D. MANGELSEN







SECOND ANNUAL

YELLOWSTONE PLEIN AIR

INVITATIONAL





BY CHRISTINE GIANAS WEINHEIMER





THE MAJESTIC ELK—THE MOST ABUNDANT LARGE MAMMAL IN YELLOWSTONE NATIONAL PARK—IS A FAVORITE AMONG PARK VISITORS TO OBSERVE AND PHOTOGRAPH YEAR-**ROUND. BUT FOR A FEW WEEKS EACH AUTUMN, VISITORS** ARE TREATED TO AN EXTRA SPECIAL DISPLAY: THE DRAMATIC SPECTACLE OF THE FALL ELK RUT.

September to mid-October is elk mating season in the Greater Yellowstone Ecosystem, and people from all over the world flock to the northern section of the park hoping to hear the haunting bugle of a bull elk or witness the males engaging in battle.

During the rut, elk gather all along the Northern Range and at Yellowstone's North Entrance near Gardiner, but activity is primarily concentrated in Mammoth Hot Springs. You might see elk congregating on the lawns at Officer's Row, alongside the Gardner River in the Gardner Canyon, or outside the park entrance near the Roosevelt Arch. Elsewhere in the park, you might also spot them along the Madison River near West Yellowstone.

During this time, elk gather in mixed herds of many cows and calves, with a few bulls nearby. Bulls bugle to court females and also to warn and challenge other bulls in the area. When a challenge is answered, the bulls move toward one another and often engage in battle for access to the cows. They push against each other, loudly crashing their antlers together in a contest for dominance.

While these fights rarely cause serious injury to the elk, humans in close proximity should exercise caution. Bull elk can become extremely aggressive during mating season, and have been known to charge vehicles or even people if they feel threatened.

FLORA AND FAUNA

Bulls weigh about 700 pounds and are about 5 feet high at the shoulder, so visitors will want to keep their distance. Park regulations prohibit approaching elk closer than 25 yards, and imitating the call of an elk. Give the elk plenty of room and avoid approaching them in your vehicle.

When exiting the Mammoth Hotel, Albright Visitor Center or any building in Mammoth Hot Springs, be on high alert. You never know what might be bedded down in a patch of shade just outside, or grazing right around a corner.

The gathering of elk herds in Mammoth Hot Springs signals another type of pilgrimage: the intrepid Elk Rut Corps Volunteers. Along with National Park Service staff, volunteers from around the country are stationed in Mammoth to help ensure the safety of visitors who have traveled from near and far to witness the rut.

It's critical for visitors to listen to and follow the direction of NPS staff and elk rut volunteers; with a great deal of experience, they tend to know when the scene might become unsafe, and how to help prevent it from becoming so. Plus, NPS staff and volunteers know a lot of fascinating



A pod of elk travel across Mt. Everts in the fall. PHOTO BY NEAL HERBERT/NPS

information about Yellowstone's wildlife, including elk, and are more than happy to share their knowledge with visitors.

Yellowstone Forever—the official nonprofit partner of Yellowstone National Park—funds the staffing of elk rut volunteers as part of the Visitor and Wildlife Education Project.

Learn more at yellowstone.org.

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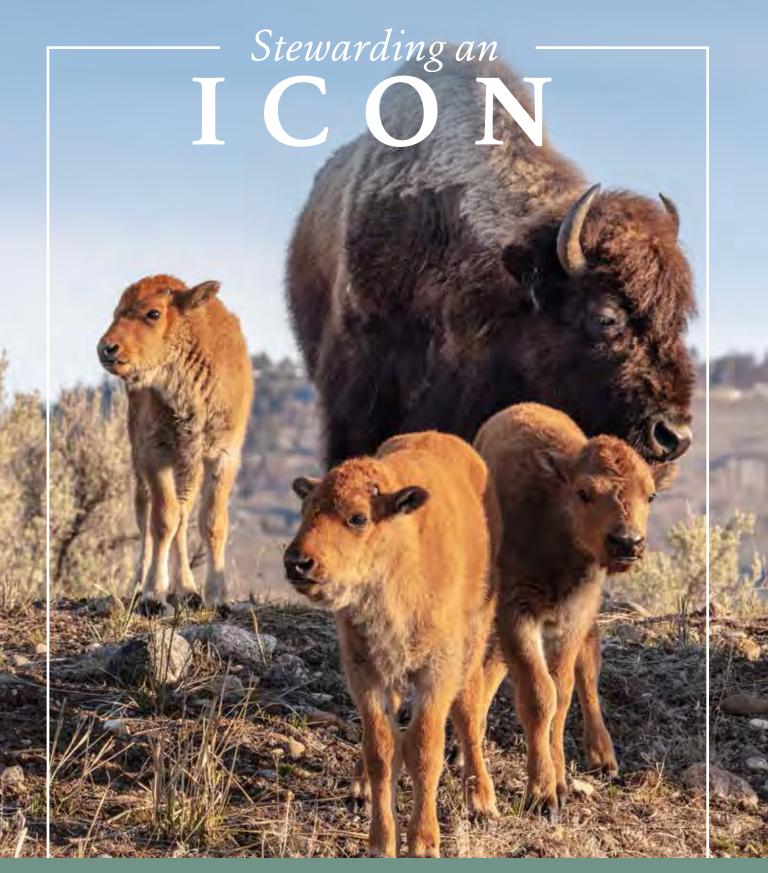


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Management for the Yellowstone buffalo

A cow bison and four calves, known as red dogs, in Lamar Valley. PHOTO BY JACOB W. FRANK/NPS

BY JESSIANNE CASTLE

The story of the buffalo is well-known in legend and myth. A species highly regarded by native peoples, hison became an American symbol in 2016 with the passage of the National Bison Legacy Act. They are among the most abundant animals in Yellowstone and are one of the few genetically-pure herds in the U.S., as many others hybridized with cattle.

Yet, the tale of today's Yellowstone bison is steeped in a mire of public opinion and policy centered on a disease that triggers abortion, and how we'll engage with and see these animals on the landscape in the future remains unclear.

AN ONEROUS DILEMMA

Bison are the largest land-dwelling mammal in North America, with males weighing up to 2,000 pounds and herds of about 1,000 individuals in July and August for

Today, approximately 4,500 bison live within the bounds of Yellowstone National Park, though the Interagency Bison Management Plan, which guides the handling of Yellowstone bison, sets a population goal of 3,000.

When asked about bison management, officials respond specifically about quarantine, Yellowstone bison program coordinator Tim Reid described the conversation as

to migrate freely across park lines due to livestock-producer

Livestock State Veterinarian Marty Zaluski said the spread of brucellosis, which causes miscarriage in bison, elk and transportation limitations for the cattle industry. There's

Though there hasn't been a documented transmission of brucellosis from Yellowstone bison to cattle, Yellowstone Superintendent Cam Sholly says up to 60 percent of Yellowstone's bison test positive for exposure to brucellosis. "Identifying animals that do not harbor the

To protect livestock producers, who contribute more than \$2.1 billion to the Montana economy, and to limit the bison and elk by domestic cattle in the early 1900s, Montana law significantly limits the transportation of live bison and their natural tendency to migrate out of the park.

However, Yellowstone's bison population continues to unbound growth could lead to overgrazing and starvation within the national park.

STRIVING FOR A SOLUTION

"Until there is more tolerance for bison outside Yellowstone, the population can only be controlled by hunting outside the park and capture near the park boundary," Superintendent Sholly said.

Montana Fish, Wildlife and Parks issues a limited number of public hunting tags, while some tribes exercise their rights to hunt bison that migrate outside of Yellowstone. In addition, Yellowstone officials capture groups of migrating bison as they move from high to low elevation in the winter at a facility known as Stephens Creek near Gardiner and the North Entrance.

This year, capture efforts ran throughout the month of March and a total of 348 bison were captured and consigned for slaughter while 114 were harvested during organized hunts. Following capture, bison are tested for brucellosis and then shipped to slaughter; the meat and hides are distributed among members of partnering tribes.

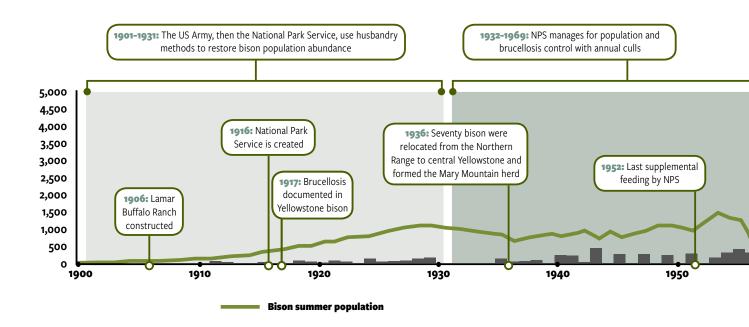
The total, 460, falls short of the goal of removing 600 to

900 bison, which was agreed to by interagency partners during the fall of 2018. Removal efforts are largely dictated by the migration, as park staff and hunters must wait until bison move outside of the park before they can be removed.

"It's all based on the winter," said Reid. "This winter got intense late, so the migration started late."

While capture efforts are guided by a multi-agency directive that includes input from FWP, National Park Service, U.S. Forest Service, Montana Department of Livestock and several tribal partners, some are critical of the territory control and culling initiatives.

"We adamantly, vehemently oppose the Interagency Bison Management Plan," said Stephany Seay, the media coordinator for Buffalo Field Campaign based in West Yellowstone. One of the most outspoken critics of Yellowstone's capture program, Buffalo Field Campaign would prefer to see bison that migrate freely in and out of Yellowstone and within Montana. Seay said she believes managers currently give livestock priority over bison due to competition for grass.





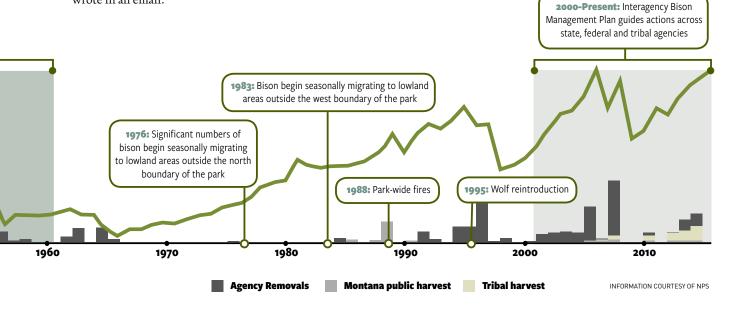
"We want to gain more habitat [for bison]," Seay said, "so buffalo can stay in Montana as long as they want and use the landscape like deer and elk." She added that the group is also opposed to quarantine programs, calling them a form of domestication.

In part, Superintendent Sholly agrees with some of Seay's sentiments. "For long-term conservation, Yellowstone bison need access to more suitable habitat outside the park," he said. "Yellowstone has long wanted to send bison to other conservation areas."

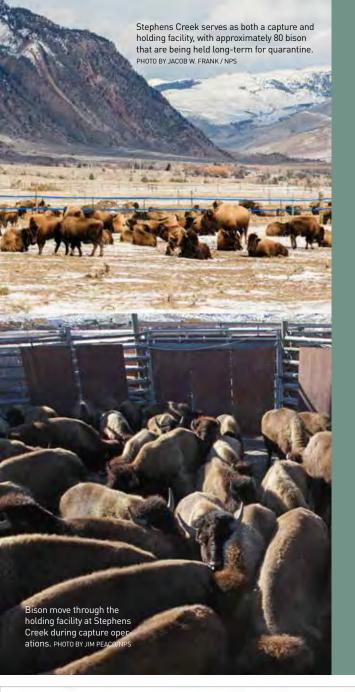
To further this effort, Yellowstone managers are working with the Assiniboine and Sioux tribes at Fort Peck in the northeast corner of the state to develop a quarantine program for bison. Animals that have proved to be brucellosis free after multiple years of testing will be eligible for release at the Fort Peck Indian Reservation.

To aid with the multi-year quarantine process, the Fort Peck tribes constructed a quarantine facility in 2014 to the tune of about \$1 million, said Daniel Wenner of Elk River Law, who serves as the Fort Peck tribes' attorney. "The National Park Service wanted to start the quarantine program and Fort Peck stepped up to make it happen," he wrote in an email.





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RESTORING A RELATIONSHIP

On Feb. 22, 2019, five bulls that were born in captivity as a part of a research program by the Animal and Plant Health Inspection Service were transferred to Fort Peck for a final year of quarantine after the initial phases were completed at Corwin Springs near Gardiner.

APHIS has approximately 50 more bison that could be eligible for relocation to Fort Peck and Yellowstone has about 80 that were captured from the wild and held for quarantine, with the intent of relocating them to Fort Peck in the future. Currently, Fort Peck has two herds and about 200 bison.

"Restoring that cultural, spiritual and traditional relationship with buffalo is incredibly important for tribes," Wenner said. "Historically, the federal government killed buffalo as a way to force tribes onto reservations. Bringing buffalo back helps [them] heal from those old wounds.

"Yellowstone buffalo are important to tribes because they have those pure buffalo genetics and are the descendants of the buffalo tribes lived with for thousands of years," he added. "This makes bringing buffalo out of Yellowstone National Park incredibly important. The tribes [at Fort Peck] want to see these buffalo expanded to other tribes as well."

Park officials say that additional stakeholder involvement will be integral for future bison management. "It's our goal to find ways of expanding the quarantine program, at Fort Peck and other locations, to ensure a more regular and predictable number of bison can move through the pipeline," Sholly said.

For more information on Yellowstone bison, visit nps.gov/yell/learn/nature/bison.htm, nps.gov/yell/learn/management/bison-management.htm or nps.gov/yell/learn/management/bison-management-faqs.htm.





Invasive non-native plants, animals and diseases are getting more press and for good reason. Native ecosystems and all that depend on them are at risk. The Center for Invasive Species Management reports invasive species are the second leading cause of animal population decline and extinction worldwide. Once invasive species get established, nature has no mechanisms that enable landscapes to restore ecological balance.

It's difficult to raise awareness about this issue. Weeds aren't a glitzy endangered species that get a lot of press. However, fighting weeds protects the habitat these species live on.

Noxious weeds are plants designated as injurious to agricultural or horticultural crops, natural habitats or ecosystems, humans or livestock. There are hundreds of noxious weeds in North America, with 32 listed in Montana.

Consider the example of spotted knapweed. Once the invasive is established along a river, seeds float downstream, infesting gravel bars and river banks. This increases soil erosion and negatively affects fish habitat. Research shows runoff increases by 150 percent and sediment yields by 300 percent in areas of invasive spotted knapweed.

Other wildlife is also affected. Spotted knapweed can reduce winter forage for elk by 50 to 90 percent. This can change

seasonal elk distribution patterns. Habitat decline is also a primary threat to local bighorn sheep populations.

Noxious weeds come from all around the world and often invade disturbed areas like roadsides, powerline clearings, trails, construction sites and burned or logged areas. However, because they are so competitive, they can get established almost anywhere. And unlike native plants, they usually have no natural control like bugs that eat them or diseases that keep their populations in check.

Weeds spread easily via cars, ATVs, motorcycles, dogs, heavy equipment, livestock, hay, contaminated topsoil or gravel, hiking boots, clothing, fishing waders, and more.

Getting educated, though, is key for prevention. Learn to identify invasive plants and other weeds by visiting gallatinisa.org. You can also download "Montana's Noxious Weeds" from the Montana State University Extension by visiting store.msuextension.org.

John Councilman is a retiree from the U.S. Forest Service with over 40 years of experience working in the Northern Rocky Mountains on a wide variety of vegetation and wildlife management issues. He is currently the board chair of the Gallatin Invasive Species Alliance.



Noxious weeds, among other things:

- Replace native plant communities
- Degrade water quality
- Reduce for age for wildlife
- Decrease property values
- Increase the severity and frequency of wildfires
- Eliminate recreational opportunities

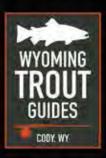
What can you do?

- Learn to identify invasive species
- Clean plant materials and mud from boots, gear, pets and vehicles before and after using trails
- Drive only on designated routes
- Use local firewood and certified weed-free hav
- Plant native plants in your garden and remove invasive plants
- Avoid dumping aquariums or live bait into waterways
- Clean and dry your fishing waders and wading boots after each use
- Drain all water from your boat, including in the engine's cooling system, live wells and bilge



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TRASH

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TREASURE

BY MARSHALL SWEARINGEN

By As tourists gathered on a cool June morning in 2018 to view some of Yellowstone National Park's most iconic geysers, Montana State University researchers took to the boardwalks for another purpose: to collect trash that could lead to new ways of recycling plastic.

Steam from nearby Old Faithful billowed in the breeze as the researchers shuffled past geyser-gazers, fixing their attention instead on the shallow, orange-tinted waters surrounding the thermal features.

"There's a bottled water lid!" exclaimed Megan Udeck, a junior from Missoula who is majoring in biotechnology at MSU.

That cued Russell Bair, one of two park rangers accompanying the crew, to extend his trash-picker and pluck the small cap from the mineral-encrusted rivulet. Udeck and two other students waited with rubber-gloved hands to receive the quarry.

"The trash in these springs could be a natural medium for microbes that could break down plastics," explained trip leader Dana Skorupa, an assistant research professor in MSU's Department of Chemical and Biological Engineering. Moreover, she said, because the organisms live in near-boiling water, it means they likely can withstand the heat that helps plastics soften and become easier to break down.

When Skorupa and other researchers in MSU's Thermal Biology Institute and Center for Biofilm Engineering collected water samples from Yellowstone hot springs and inserted small pieces of certain plastics back in the lab, they observed microbes colonizing the material. The team's Yellowstone foray in June 2018 marked their first attempt to collect additional microbes that may already be thriving on various plastics, and then further cultivate them in the lab, Skorupa said.

The project's principal investigator and director of MSU's Thermal Biology Institute, Brent Peyton, is optimistic that they might find microbes that could naturally break down plastics into their raw ingredients, which could then be used to make other plastic products.

"There's a huge diversity of organisms in the hot springs, much higher than we originally thought," Peyton said. While hot springs may often appear devoid of life, a sugar cube-sized portion of water from some Yellowstone thermal features can contain as many as a million cells of bacteria and archaea, he said.



Above: A ranger removes garbage from a hot spring in the Upper Geyser Basin. PHOTO BY JIM PEACO/NPS

Below: Dana Skorupa, assistant research professor in MSU's Center for Biofilm Engineering, holds a collection of microbes sampled from Yellowstone National Park thermal features. PHOTO BY ADRIAN SANCHEZ-GONZALEZ

For the rangers, the June outing was a normal morning. Each day they walk the boardwalks throughout Yellowstone, collecting a variety of trash—windblown wrappers, dropped cups, even coins and other objects ceremonially tossed into hot pools.

"We get some interesting stuff," Bair said, adding that he was glad that the plastic from the day's cleaning would go to beneficial use.

Around the time Old Faithful spurted skyward, the four scientists spotted a camouflage ball cap in a trickle of geyser runoff. Skorupa used a sterilized pair of heavy scissors to cut two small sections from the plastic in the hat's bill. Ashlyn Hemmah, a sophomore, helped prepare the samples for the trip back to the lab: one into a cooler of dry ice to be frozen for DNA analysis, the other packaged with hand-warmers to keep warm for cultivation.

"There's a spoon out there," said Noelani Boise, a senior double-majoring in environmental biology and German. Having grown up in Paradise Valley, she was inspired from a young age to become a scientist in Yellowstone. "I'm excited to be doing this," she said.



The three students working on the project were selected to work in Peyton and Skorupa's lab after taking a course in MSU's Honors College called "Extreme Microbiology of Yellowstone." The class, taught by Skorupa, gives students hands-on field and laboratory experience with the microbes from Yellowstone's unique geothermal hot springs.

As the researchers completed their half-mile boardwalk loop, Skorupa said she was pleased with the samples taken, which included various wrappers and other bits of plastic. The rangers carried a bucket full of non-plastic litter.

"I love learning about this kind of stuff," said Udeck, enveloped in sulfury steam. "And how cool would it be if we found something that could break down plastic?"

Marshall Swearingen is a writer for Montana State University News Service in Bozeman, Montana.



BY JESSIANNE CASTLE

Becky Smith remembers the fires of 1988 that burned 793,880 acres of Yellowstone National Park. Then eight years old, Smith was on a family trip in her grandmother's box-van during the first days after the park reopened to the public following the burn.

"I was really awestruck," she said. "I had never seen more than a campfire or a burning ditch. I thought the helicopters were really cool, along with seeing the flames on a hillside with elk grazing below.

"I don't ever remember being scared while in the park, even though I remember seeing flames close to the roads and boardwalks," she added. "It was a memorable experience for a young girl from North Dakota who had never been to Yellowstone, or even the mountains."

Thirty years later, Smith serves as Yellowstone's wildland fire ecologist. Having completed a degree in natural resource management at the University of Minnesota, Crookston,

she says she's often wondered about the impact her experience in '88 had on her choice of profession.

Smith said she wasn't surprised when she got the call in 2016, alerting her about a lightning-started fire burning near the western boundary. What did startle her though was the location. "I was surprised the meadows burned. Usually they don't burn in the park," she said. "It tells me how dry it was that year."

In 2016, 22 fires covered more than 70,000 park acres, becoming the most active fire year since '88, while the fire in question, known as the Maple Fire, torched approximately 52,000 acres.

Standing in the overlap of the '88 and 2016 fire scars in July 2018, Smith gestured to the charred knobs that were once 28-year-old lodgepole pines. She pointed to red shadows on a darkened soil, indications of where large logs burned at high severity and left nothing behind.

But she also directed our attention below the hill to a stand of still-green timber. "Other areas didn't burn as hot [in 2016]," she said, adding that some trees survived that year, and even others survived the '88 blaze. "You can see how diverse the landscape will be."

While perhaps unsurprising given the lack of precipitation that summer, the Maple Fire was unprecedented in the years following the '88 burn.

"What's really significant for us about the Maple Fire is that it's the first significant fire we've had in the '88 fire scar in 30 years," said John Cataldo, the wildland fire management officer for Yellowstone.

He added that the fire started, established and burned in its entirety in the '88 scar. This was unique from previous fires, which hit the new growth and quickly burned out.

"We had to start looking at the '88 fire in a new lens. It was no longer a barrier to fire," Cataldo said. "Now the '88 scar is in play."

According to Smith and Cataldo, safety is always a priority when managing a fire in Yellowstone, but thanks to the 2009 federal fire policy, officials are able to manage fire for ecological benefit.

"Without fire, Yellowstone doesn't exist as we know it," Cataldo said. "Ecologically, it's almost invariably good to have a fire here." In addition to impacts on nutrient cycling, fires aid in developing plant community composition and structure. Some native plants rely on fire to reproduce, such as the lodgepole pine with its serotinous cones.



Amid the charred knobs of pine trees that had grown back after the '88 fire are occasional red shadows burned into the soil. This indicates a place where a large log burned at high severity. PHOTO BY JESSIANNE CASTLE



Yellowstone fire ecologist Becky Smith and wildland fire management officer John Cataldo observe the varied landscape within the 1988 and 2016 burn scars, PHOTO BY JESSIANNE CASTLE

Over the last 46 years, the park has averaged 26 fires per year. Of those, flames started by lightning are allowed to burn as long as there are no risks

to human safety—it isn't until developed areas are threatened that managers step in to suppress the flames. However, human-caused fires must be controlled or suppressed.

"It's very important that even though fire is good, folks are very careful with fire in the park," Cataldo said.

Prior to 1972, Yellowstone's policy was to suppress every fire, but as paradigms changed, so too did fire management. In 1972, naturally-ignited fires were allowed to burn in limited areas of the park, and slowly those areas became larger. Aside from a brief period from 1988 to 1992, when the "let it burn" policy was reviewed, this has remained the protocol.

Currently the federal fire policy is up for scheduled review after a decade of use, and policy makers are seeking input from managers and officials.

"With 80 percent of our fires started by lightning, I'm comfortable with the policy as it is," Cataldo said. "We're going to get the fire we need." Instead of seeking a policy change, Cataldo said taking advantage of modern technology is an exciting option for the future. Specifically, he referenced early conversations about using drones to manage fire in national parks.

"Fire's interesting in that we have a lot of new technology that we use and that's all changed since '88," Cataldo said. "But we're still depending on people to use them."

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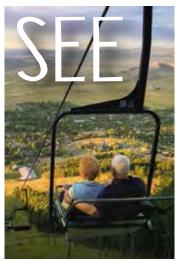


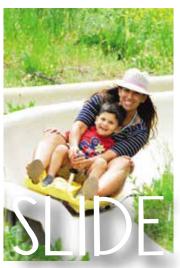


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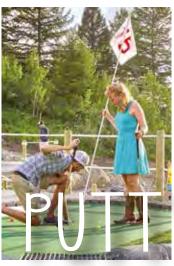
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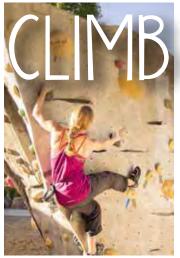














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the great outdoors? Growing opportunities in citizen science provide an exciting way to assist Yellowstone National Park by helping researchers collect data that aids park managers in planning their conservation efforts. Here's your chance to think like a scientist about the future of Yellowstone's plants and animals, while giving something back to the park.

The Yellowstone Citizen Science Initiative is a collaboration between Yellowstone National Park and its official nonprofit partner, Yellowstone Forever. The program encourages visitors to collect essential data that will help park scientists and management officials better understand how the Yellowstone ecosystem is responding to changing environmental conditions.

The projects that citizen scientists work on are all priorities of Yellowstone National Park, so the work they do directly contributes to the science-driven management of the park.

"By leveraging our unique partnership with the park, we are able to provide unique experiences for park visitors, reach our educational objectives, and contribute usable data. It's a win, win, win," said Joshua Theurer, citizen science program manager at Yellowstone Forever.

Yellowstone Phenology Project—the study of plant and animal life-cycle changes over time—plus red-tailed hawk nest monitoring, invasive weeds mapping and Northern Range ungulate research. During the summer season, volunteers commit to several days in a row, or a series of weekends, to participate in one of the studies.

Yellowstone Forever is currently working to create even more opportunities for participants to become involved by folding the research projects into existing educational programs.

"We are building out our youth programs to incorporate these projects as a core component of those experiences," said Theurer. "There is profound value in allowing students to contribute to real research."

Starting this summer, the Yellowstone Forever Institute will also add four new citizen science programs to its popular Field Seminar series. Participants will contribute to a citizen science project while learning new skills, engaging with Yellowstone on a deeper level, and enjoying spending time in the park.

Learn more about the Yellowstone Citizen Science Initiative and related Field Seminars at yellowstone. org/citizen-science.

The Cauldron of the **Sleeping Giant**

Yellowstone Lake and its cutthroat

STORY AND PHOTOS BY SEAN JANSEN

The Yellowstone National Park ranger seemed astounded. "You're going to do what?" he asked after I told him of my objective to circumnavigate Yellowstone Lake on a standup paddleboard. My peripheries caught on to glances from the other rangers, looking to see who had made such a statement.

With eyebrows raised, they slapped me in front of a television screen for a safety video, inspected my board and handed me my permit. Still full of disbelief, the ranger then told me to, "Take a hike you crazy paddler!" and off I went.

The lake itself has 110 miles of lakeshore. All packed up and strapped in with the bugle of an elk as a starting gun, I jumped on my board and began stroking Yellowstone Lake, the largest alpine lake in North America. A high lake sitting at an elevation of 7,732 feet, spooning the Continental Divide, it makes for a special experience with regards to exploration, adventure and most importantly habitat.

Many animal species call the park and lakeshore home. Eagles, elk, moose, deer, porcupine, grizzly bear and wolves all need the lake. The food chain was evident as I cruised the miles of shoreline, visible in my imaginary rear-view mirror on my 12-foot SUP.

With perfect conditions, the sheet glass and clear waters offered excitement. I smiled with every paddle, knowing almost full-well that I might be the first to attempt a solo circumnavigation of the lake.

As the miles of shore began clocking away like an odometer in a car, the waters of each bay offered clarity but not quantity. The other goal of the trip was to fulfill my passion for fly fishing, with hopes of hooking into a Yellowstone cutthroat trout that the lake was once famous for. However, about halfway through the first day and after covering nearly 20 miles, I hadn't spotted a single fish or rise on a lake literally buzzing with other life.









Above: Camped along the southeast arm of Yellowstone Lake.

Left: A Yellowstone cutthroat trout blends with the sandy lake bottom.

Right: The geology, geography and botany of the lakeshore differed almost around every corner. This section boasted forested shores.

The lake is considered by biologists as a headwater for the Yellowstone cutthroat. The lake once held the title for the most densely populated area in the world for genetically-pure Yellowstone cutthroat trout. Prior to 1994, Yellowstone Lake became a visual spectacle during the spawn, when the waters would churn beautifully with the color of cutthroat.

The native trout is a food source for everything from bears to osprey, feeding over 30 different species of aquatic birds, mammals and, sadly, non-native fish.

In the early '90s, a fisherman caught a different species in Yellowstone: a lake trout. At first, the intruder—thought to have been illegally introduced from another lake in the '80s—didn't present any immediate threat. However, over time, the lake trout outcompeted the native cutthroat and the numbers of cutthroat dwindled. This unforeseen event has now become a major problem, not only in Yellowstone Lake, but throughout many other park waters.

The issue with lake trout is that they produce a significantly larger number of eggs than the cutthroat, and the growth rate for lake trout exceeds that of the cutthroat. Lake trout also spawn in the depths of the lake, where as the native trout head to rivers and tributaries, where they become far more vulnerable to predators.

Over time, cutthroat fry make it to the lake and then become a food source for the lake trout, which are deep-dwelling fish that remain protected from nearly every predator that roams the lake.

Unfortunately, the National Park Service didn't know about this issue until it was almost too late. But now, significant efforts are being made to eradicate the non-native fish. Fishing regulations dictate that all lake trout must be killed and cutthroat must be released. Additionally, park staff have implemented a number of methods to reduce the impact of lake trout, with gill-netting being the most effective. Park efforts have led to nearly 1.5 million lake trout removed since the program started in the mid-90s.

As I passed the halfway mark on day one of my trip, my hopes were high because I'd planned my first night out at the mouth of the Yellowstone River: a hot bed of habitat for trout.

The eastern shore of the lake boasted forested lines mixed with different geology around every bay. Downed trees washed up on shore created structure for all sorts of creatures. Wildflowers painted the forest floor unlike any artist I've seen. Bright pink fireweed mixed with blues and oranges invited me in to my own private beach where an antler of an elk lay submerged just offshore.

With my campsite visible 100 yards away, I had completed 20 miles of lakeshore and only spotted five fish. Upon landing, I set up the fly rod and tried for an hour before sunset, only to see the footprints of a grizzly bear as the single reward for the day's fishing effort.

The wind is notorious on the lake. With that in mind, the goal was to wake early and paddle as far as possible before 11 a.m., hoping the projected weather forecast held true. The wind rips up from Idaho, through the Snake River Valley after getting funneled from the Teton Range. It narrows further, creating a virtual shotgun effect and dangerous conditions without warning.

Conditions remained excellent, however, and the time flew by. I saw a herd of elk in a distant valley. A curious porcupine roamed the shore. While enjoying the splendor of nature and paddling through the remote bays, I somehow arrived at my campsite for the night around 3 in the afternoon.

It had been glassy conditions all day and I ripped across the lake, set up camp and grabbed the fly rod again, with little hope after a 33-mile day unveiled a single fish. The campsite had outstanding views, situated just east of the West Thumb Geyser Basin.

I welcomed the early afternoon stop and took advantage of the rest and fishing. The campsite, named "Ravine" by the park service, was situated about 20 feet up from shore with a vantage point for a fire pit. In Yellowstone, all camping must be done a minimum of 100 feet from water and sites are nestled in the trees within the depths of Yellowstone's forests. I had an evening fire and watched the sunset and afterglow glisten on the lake, sans a single ripple from the rise of a summertime trout.

The next day was to be the longest day of the trip and sadly the windiest, with a projected breeze from the southwest that would serve me as a tailwind. The morning beckoned with glass conditions and a fire sunrise. Nearby wildfires had caused smoke to drift in, turning the sun bright red with its rise. A quick cup of coffee and off I went to take advantage of the morning bliss and the day's goal of reaching the car.

I made it to the western shore of the lake just in time for the wind to start pushing me north to my car and to the greatest abundance of cutthroat for the entire trip. I was able to get quick glances before they'd dart off to a distant patch of sand, disappearing into the abyss, camouflaging wonderfully.

Yellowstone cutthroat trout boast an almost kaleidoscope of color. Their canvas is tan, and speckles of color create a natural artistic masterpiece. If Vincent van Gogh had his take, I imagine he'd dot the fish's sides with a paintbrush dipped in reds and browns and golds and slide a deep red brush under the gills,

giving the subspecies its name. The top lateral of the fish is a brownish-green that tricks the avian predators from above, allowing the fish to merge with the sand and green waters of the lake.

The lovely tailwind grew in strength and exceeded the day's forecast and I was heavy with exhaustion from the 40-mile day. Yet I was smiling; a few bays away I could see my car. With each of the last bays angled into the wind, I had no other option but to zig-zag my way like a sailboat, tacking against the wind. Five miles later, I stepped foot onto ground where I'd started two days previous, giggling.

As much of a success as circumnavigating the lake truly was, the situation with the cutthroat trout was disheartening. Paddling 110 miles and only spotting 14 fish was troublesome.

Perhaps the scarcity was because I'd traveled during late



summer and the fish were down and out of sight. Perhaps their camouflage worked so well that my polarized sunglasses and 20/20 vision didn't see them. Perhaps I am a terrible angler and need to work on my technique.

Ultimately though, let's hope and help the park service by following the fishing guidelines. Doing so may produce an abundance of Yellowstone cutthroat trout once again. A literal keystone species, with impacts to many other living beings in the park, if cutthroat don't rebound, it will only be a matter of time before we begin to see other species in Yellowstone decline.

Sean Jansen is a freelance writer and photographer living in Bozeman, Montana, who enjoys fly fishing, adventure and conservation.



Catch and release, do it right

BY PATRICK STRAUB

Most anglers want the glory shot with a big grin and an even bigger fish. In today's world of selfies, social media posts, and mega-sharing, the desire is strong to photograph our catch.

For those of us who've been fishing a long time and have caught plenty of big trout, photographing every catch is a thing of the past. But even for us more experienced anglers, you can bet we want to share a pic of a trophy trout. For folks new to fly fishing, a photograph is a fine way to document the experience.

Our wild trout are beautiful creatures and deserve a large part of the angling spotlight. The more we prominently feature our local fish in social media, the more awareness and protection they're likely to receive. However, be very aware of proper fish fighting and handling techniques if you plan to photograph and release a trout.

Here's some help to ensure you get a good pic and the fish survives to be caught another day.

LEARN TO FIGHT FISH QUICKER. A general rule is to be sure the rod has a full bend to it while applying pressure at a sideways angle to the current. Use your thumbnail as a guide: when a fish is hooked have your thumbnail pointing upstream against the current and not up to the sky. This application of sideways pressure tires a fish more quickly and allows you to pull the fish in the desired direction.

GET THEIR HEAD ABOVE WATER. The moment you feel the fish begin to rise to the surface, use the upward momentum to your advantage. If its head breaches the surface, quickly raise your rod hand above you to keep its head out of the water. If a trout's head is above the water, it can't steer itself and you can net it faster.

USE A NET. By using a net, the fish are brought in quicker; are less prone to flopping on the bank and causing injury, or ingesting sediment into their gills; and a net allows a safe place for fish to be held in the water while you ready the camera.

KEEP THE FISH WET AT ALL TIMES. Do not take a trout out of the water until the camera is on, the photographer is ready, and the angler has a gentle hold of the fish before taking it out of the net. Raise the fish out of the net quickly, give a big grin, snap a shot, and get the fish back in the net. If you can see water dripping from the fish in your picture, you know you've succeeded.

GENTLY GRIP AND GRIN. When holding a trout for a picture, place one hand underneath the fish between the head and belly, and have the other hand gently grasping the underside of the body where the tail begins. Do not try to grip the top or side of the fish, as this will squeeze its vitals and also cause it to struggle more. Think about it: the harder someone squeezes you, the more you want to get away.

KEEP THE FISH AS CLOSE TO THE WATER AS

POSSIBLE. Pictures with fish in them always look better when the fish is as close to the water as possible. If you're in a boat, do your best to get out of the boat or lean over the side so the fish is near the water. If you're wading, kneel into the water. Both the fish and your Facebook friends will like the photo that much more.

RELEASE PROPERLY. Allow the fish time to recover in clean, slow-moving water before its release. If a fish shows few signs of breathing—gills opening and closing—and the tail isn't moving side to side, gently hold the fish upright by the tail and move it forward and backward in the current to get water flowing through the gills. The fish will begin to swim with its tail when it's ready to swim on its own. Never release a fish in calm, dirty water or very fast-moving water.

Catching trout is fun and taking a nice photograph is an ideal way to hold onto a memory. By practicing proper catch and release techniques, you can keep the fish alive and still be the darling of the World Wide Web.

Patrick Straub is the author of six books and former owner of Gallatin River Guides in Big Sky, Montana.

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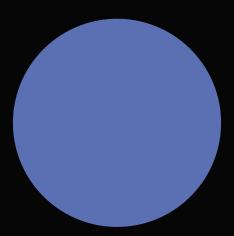
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-Carl Sagan



Winter Wonderland





Getting around

PHOTOS BY JACOB W. FRANK / NPS

If you've ever wanted to experience the quieter side of Yellowstone, try visiting in the wintertime and hitting a trail. Many park trails are groomed for skiing and snowshoeing throughout the winter season, including some boardwalks. Skis or snowshoes let you see more of the park than you would normally see from a car or over-snow vehicle, from birds and wildlife, to mountain views and thermal features.

Mammoth Hot Springs, in the northwest region of the park, provides the perfect starting point for your winter trail adventure, as it is accessible by automobiles year-round and offers both beginner-friendly trails and more advanced terrain.

If you don't have your own skis or snowshoes you can rent them at the Bear Den Ski Shop at the Mammoth Hot Springs Hotel. Inquire at the ski shop about current trail conditions and ski shuttle schedules.

You may encounter elk, bison, deer or other wildlife when using Mammoth-area trails. Remember that federal regulations require you to stay at least 100 yards away from bears and wolves, and at least 25 yards away from bison and all other wild animals. For your safety, stay on boardwalks and designated trails, keeping in mind that the ground is unstable in hydrothermal areas.

There are also many opportunities to join up with a guided ski or snowshoe with the Yellowstone Forever Institute and Yellowstone National Park's free ranger programs often include a guided, beginner-friendly snowshoe walk around Mammoth Hot Springs. Also, Yellowstone National Park Lodges offers guided cross-country ski tours and lessons. - Christine Gianas Weinheimer

Photographing wildlife

movement against the snowy landscape.

blanket of white.

the wildlife that call it home. For Sommers, the winter is the perfect way to connect to



Thermal activity

During the winter season, Yellowstone's famed thermals are transformed, creating an exquisite landscape ripe for exploring. While several feet of snow covers the ground, the hot springs continue to simmer and plants like the monkey flower—a short yellow wildflower—flourish in the still-warm setting.

While the ground around the thermals may still be warm, the air is frigid cold. During extreme cold, hydrothermal mist accumulates on nearby trees and bushes. It collects with falling snow to mask the trees in a white rime, giving them an eerie appearance and the name of "ghost trees." When the air is particularly frigid, near-boiling water from a geyser's eruption can turn to frozen ice as it falls back to the ground.

Winter wind rips through the landscape, picking up snow and creating drifts and sometimes breathtaking formations. And when conditions are just right, ice crystals will linger in the air, creating a kind of ice fog.

While some bodies of water freeze over, others run unhampered by the cold thanks to Yellowstone's thermal activity. Yellowstone Lake can freeze over with several feet of thick ice, but some spots on the bottom of the lake might continue to boil. - Jessianne Castle

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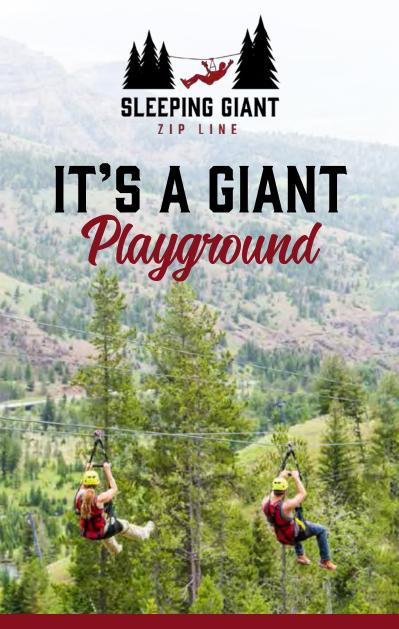
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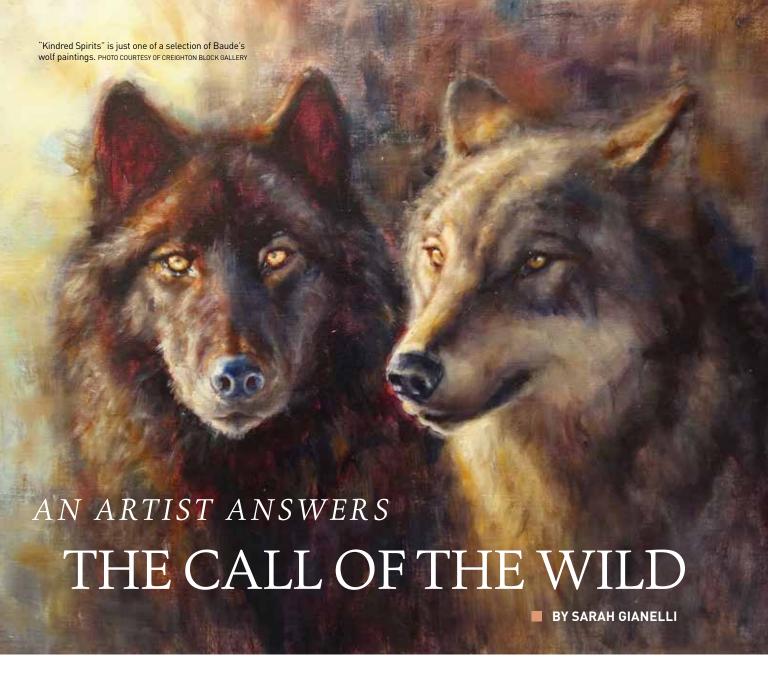






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Painter Virginie Baude remembers the moment wolves captured her imagination. She was six years old and a mobile library came to her small town in the south of France. She came across an edition of the Jack London classic "The Call of the Wild" with an image of a howling wolf on the cover.

Baude's fascination with wolves never left her, and fueled a dream to live in Yellowstone National Park and study the animal in its natural habitat.

She pursued this end by earning a master's degree in wildlife biology from a French university, but remained uncertain about how she would make her dream a reality.

But getting to Yellowstone turned out to be a matter of serendipity. A college friend told her about the J-1 Visa

Program that gave foreigners the opportunity to work in the U.S. for five months and travel for another two.

Baude applied to numerous national parks, and the only one she received a job offer from was Yellowstone.

She was ecstatic, but her parents were not. She had a master's degree and was going to bus tables?

"I didn't care," Baude said. "All I wanted to do was go to Yellowstone—if I had to start at the bottom, I was going to do that."

She didn't get any closer to working with wolves, but returned for a second season anyway, and began sketching in her free-time.



Upon a friend's suggestion, Baude decided to spend a season in Alaska, where she started assisting mushers with their sled dogs.

"That's where it really all started," she said of her deepening affinity for the wild. "I was out in the middle of nowhere with the dogs and it's so quiet and peaceful, and there are the northern lights—I felt an overwhelming love for nature and wildlife and began sketching animals."

Her American visa opportunities having run out, Baude took seasonal, outdoor-oriented jobs in Australia and New Zealand, her sketching turning to painting.

While working on the South Island at the Franz Joseph Glacier Visitor Center, she met a local artist who had a show at a nearby lodge and invited Baude to display some of her work.

She made more money from the sale of two paintings than from all of her odd jobs combined and, for the first time, thought maybe she should give being a professional artist a shot. But she wanted to do so in North America.

"The Down Under was not for me," she said. "I was missing the snow, the North, the landscape, the bears and the wolves—the call of the wild, really."

In another show of the universe aligning, a friend from Alaska called in need of a dog handler.

Baude went and began painting wolves out of a longing to see them. One day, in what was only her third sighting, she saw a big black wolf running across a frozen river.

"It was amazing," she said. "I wish I could've stopped time; it was a fleeting moment and it was gone."

That was 2006; Baude was 28 and still hadn't gotten any closer to becoming a wolf biologist. Then she went to Canada on a one-year work visa to be a biologist's research assistant. In the winter she'd return to Alaska to guide dog-mushing expeditions.

There was a radical break in her story when she married and moved to the East Coast, where she couldn't find meaningful work. Then, a near-fatal car accident landed her in a wheelchair for three months.

She remembered the words of an aboriginal man she knew in Australia.

"If you were a millionaire, what would you still do?" he had asked her. She answered without hesitation: She would paint.

"I decided life was too short. I was going to go for it," she said.

She took a painting workshop in Montana's Flathead Valley, and began to think that instead of studying wolves, she could honor them in paint.

Her wolf paintings were quickly picked up by galleries in Jackson, Wyoming, and Whitefish, Montana. Since 2011, the value of her paintings has increased from \$5,000 to upward of \$20,000.

"Since I read that book, [wolves] are the only animal to me that represents the spirit of the wild. I didn't become a painter because I love painting," she said. "I became a painter because I love my subject so much, I want to give it justice on the canvas. For most painters it's the other way around."

Baude is now settled in Driggs, Idaho, where she's close to Jackson's thriving art scene and has easy access to the parks and wildlife that feed her artistic soul.

The artist's work can be found locally at Creighton Block Gallery in Big Sky Town Center in Big Sky, Montana. Visit creightonblockgallery.com or amongthewolves.com for more information.

Sarah Gianelli is the former senior editor for Explore Big Sky newspaper.





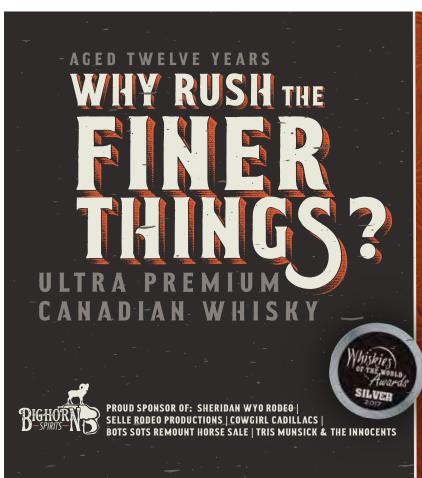
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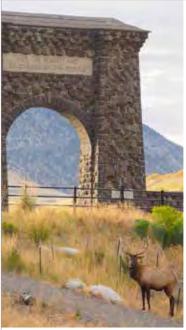
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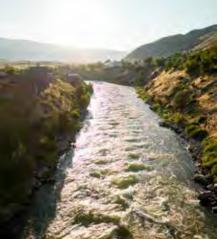


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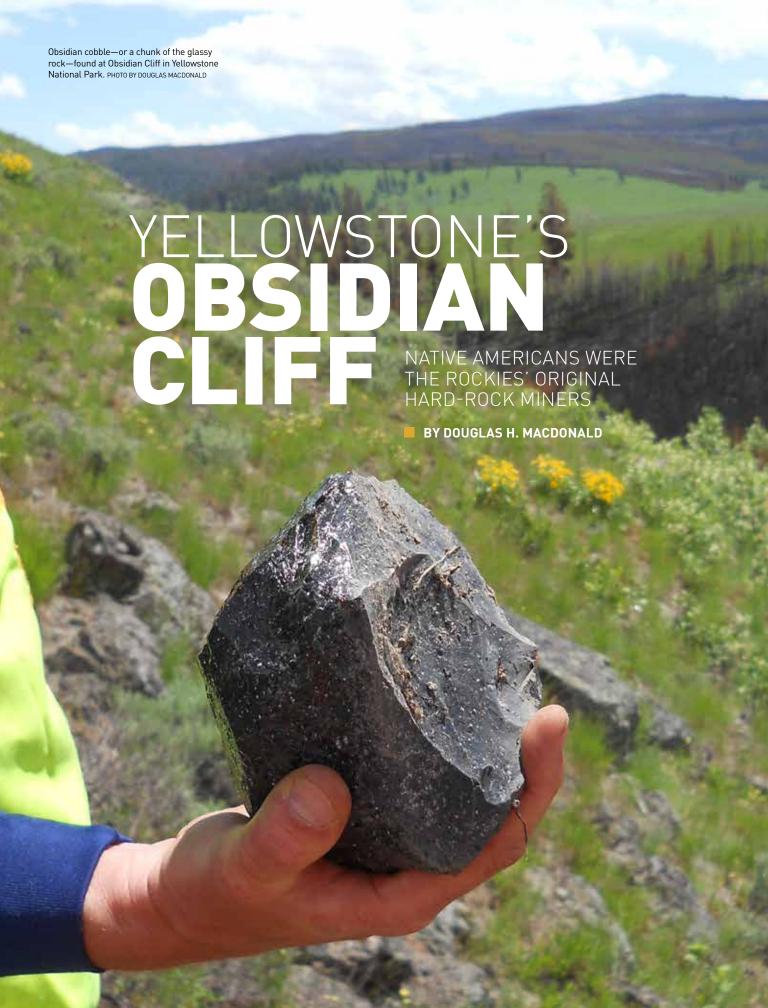
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While there are still many unresolved mysteries about the first Native American peoples in Yellowstone, one thing is for certain: ever since they arrived, they really liked Yellowstone obsidian for making stone tools.

Numerous quarries of the glassy volcanic rock are present throughout the Yellowstone region, marking the places where Native Americans collected obsidian as a key to their survival for the last 11,000 years. None of these places was more important than Obsidian Cliff, just south of Mammoth Hot Springs.

Here, Native Americans excavated thousands of pounds of

obsidian from quarry pits and trenches in order to find the best obsidian to make stone tools. Among the Crow Indians, elders still talk about the rich source. Obsidian Cliff, as Shiiptacha Awaxaawe, translated roughly as Ricochet Mountain. Several other stone sources were used in the region as well, including Bear Gulch in Idaho, Park Point at Yellowstone Lake. Cougar Creek near West Yellowstone, and Teton Pass near Jackson Hole.

Obsidian is so sharp that it is used in modern surgery, because it cuts more deftly and cleanly than the best surgical steel, thus reducing scarring. Early Native Americans

valued the material more than any other type of rock in Yellowstone. They used it to make arrowheads and spear points for hunting, to make knives for butchering bison, and to make scraping tools to remove gristle and meat from hides for tipis, blankets, clothing and other items.

As most visitors to the park know, Yellowstone is extremely active volcanically and could explode at any moment. Over the course of more than two million years, active and violent volcanism has completely reshaped the topography of Yellowstone National Park.

These explosive events transformed the region from a rugged, mountainous landscape to a high-elevation volcanic plateau covering much of southern Yellowstone National Park. Obsidian was also formed during these volcanic

eruptions, as the silica-rich-magma cooled rapidly into the glassy rock thousands of years ago.

Today, as you wind along the Grand Loop Road north of Norris Geyser Basin toward Mammoth Hot Springs, the massive volcanic outcrop of Obsidian Cliff stands tall above the gently meandering Obsidian Creek. Massive boulders of obsidian are visible along the roadside at this location south of Sheepeater Cliff.

Working for the U.S. Geological Survey in 1879, William Henry Holmes was the first European American to document Obsidian Cliff in scientific detail. Holmes was in

> the park recording its geologic history soon after the park was formed in 1872. While recording his findings, he used the original dirt wagon road constructed by the park's first superintendent, P. W. Norris.

Archaeologists estimate that there is enough obsidian at Obsidian Cliff to fill 3,000 large sports stadiums. Imagine 3,000 Rose Bowls filled to the brim with glossy black obsidian.

Each volcanic flow, including the one at Obsidian Cliff, ejects magma with specific chemical attributes. And so the rocks that form within each volcanic flow are unique and can be finger-printed as to their precise chemical composition. This

way, we can match the chemical signature of the recovered artifact with its original volcanic flow. And we can know that someone collected that obsidian at a particular original source and transported it to the later archaeological site, where it was found by archaeologists thousands of years hence.

My team from the University of Montana surveyed the southernmost portion of Obsidian Cliff a few years ago. We observed millions of stone artifacts that attest to the vast amounts of stone tools produced at Obsidian Cliff by Native Americans. Rivers of worked obsidian are present at the cliff, with large obsidian boulders broken open by Native Americans to make their tools. The ground is covered with literally billions of flakes, the by-products of the manufacture of millions of stone tools.



An illustration by artist and archaeologist Eric Carlson recreates a Hopewell individual interred in the mound in Ohio where obsidian from Yellowstone National Park was found. IMAGE COURTESY OF DOUGLAS MACDONALD





The first use of Obsidian Cliff was approximately 11,000 years ago, as evidenced by a Clovis projectile point found by my team from the University of Montana at Yellowstone Lake. Clovis Native Americans used large spears with obsidian tips to hunt mammoths, camels, bison and horses. Ever since then, Native Americans visited places like Obsidian Cliff to collect stone tools. By the Late Archaic period, between 3,000 and 1,500 years ago, Native Americans increased their reliance on Obsidian Cliff.

One of the most remarkable occurrences of Obsidian Cliff obsidian is far removed from Yellowstone in the state of Ohio. There, at the Mound City site south of the city of Columbus, archaeologists excavated a series of mounds built by the Native American Hopewell culture some 2,000 years ago.

Above: Archeologists log information from an obsidian site. Photo BY DOUGLAS MACDONALD

Below: Obsidian Cliff was first studied by European Americans in 1879 by William Henry Holmes. It was designated a National Historic Landmark in 1996. PHOTO BY JIM PEACO/NPS

One of the mounds contained more than 300 pounds of obsidian, most of which was from Obsidian Cliff. Inside one mound at the Ohio site is a platform upon which was found Obsidian Cliff obsidian ceremonial tools, a copper sculpture in the shape of a bighorn sheep horn, mica from North Carolina, shark teeth from the Gulf of Mexico, and strips of copper from the Great Lakes region. At still another site from the same time period in Wisconsin, one Hopewellian individual was buried holding large obsidian tools in each hand.

Archaeologists suggest that the purpose of collection of the obsidian was to obtain spiritual power. Upon the deaths of Hopewell Native Americans, religious items, including Obsidian Cliff obsidian, were interred in their graves within the famous mounds of the Hopewell culture of Ohio.

It is almost inconceivable to think that people actually walked and canoed 2,000 miles from Ohio to get obsidian in Yellowstone National Park, only to turn around and walk 2,000 miles back home. Averaging 20 miles per day, this 4,000-mile journey would have taken approximately 200 days or the better part of a year. Perhaps the ancient Ohioans started the journey in March when the snow began to melt and took the better part of the summer and fall to finish the trip before snow fell again in November.

Within the state of Wyoming, Obsidian Cliff is only one of two National Historic Landmarks, of 25 total, that are associated with a Native American archaeological site. Based on this recognition, it is fair to say that Obsidian Cliff is one of Yellowstone's, Wyoming's, and all of America's, most important Native American historic places.

This article is adapted from Douglas H. MacDonald's Before Yellowstone: Native American Archaeology in the National Park (University of Washington Press, 2018).

Douglas H. MacDonald is a professor in the department of anthropology at the University of Montana.



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partners with our community to promote arts, education, community services, and conservation through two semi-annual grant cycles.

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2018 Achievements

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to the Bozeman Sports Park Foundation for soccer, lacrosse, and rugby fields for children and adults from Big Sky and the Gallatin Valley.

\$375K Two-Year Grant

to Big Sky Medical Center to extend care in Big Sky with an additional advanced care practitioner and expanded evening and weekend hours.

\$1.28M Raised in 24 Hours

YCCF underwrote the Give Big Gallatin Valley online giving day where the community raised \$1.28 million in 24 hours with 764 first-time nonprofit donors.

MEETING AND EVENT SPACE

YCCF continues to fund nonprofit meeting/event spaces with matching funds for nonprofits at Fork & Spoon.

SUBSIDIZED COMMUNICATIONS TRAINING

Subsidized two community communication trainings for Big Sky and Bozeman nonprofits.

DOWN PAYMENT ASSISTANCE PROGRAM

YCCF seed funded a new Down Payment Assistance Program to help community workers buy a home in Big Sky.

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A storm consumes Gallatin Valley, with lightning strikes across the open sky. PHOTO BY BRANDON KEIM

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