



YELLOWSTONE FOREVER

Geology Field Trip: Gardiner to Paradise Valley #180602

Start: 6/2/2018 at 8:00 a.m.

End: 6/2/2018 at 6:00 p.m.

Location: Yellowstone Forever's Gardiner Offices
308 Park Street, Gardiner, MT 59030

Welcome to Yellowstone National Park. If you are a newcomer to the Yellowstone Forever Institute, you will be amazed at what awaits you during each day of exploration. We are glad that you are able to join us in Gardiner, Montana, a wonderful Yellowstone gateway community that many of us at Yellowstone Forever call home. Our goal is to provide you with an enjoyable, high-quality educational experience and a safe and memorable visit to Yellowstone.

The following information is provided to help you prepare for your program. Please read it thoroughly and call us at 406.848.2400 or email contact@yellowstone.org if you have any questions. We recommend all first time visitors seek general park information through the National Park Service at 307.344.2107 or www.nps.gov/yell.

Important Information Included in this Document:

- Letter from Your Instructor
- What's Included
- How to Prepare for this Program
- Suggested Reading
- Yellowstone Forever Park Store Information
- Yellowstone Forever Supporter Information
- Code of Ethics
- Cancellation Policy
- Travel Information
- Supplemental Lodging Information

From the Instructor

Yellowstone is arguably among the finest geology classrooms in the world! Geology was the premise for establishing Yellowstone as the first national park in the world. This Gardiner to Paradise Valley field trip will visit outcrops and features within the greater Yellowstone geologic province—most of them outside the northern border of the park. We will focus on some of the big stories that together comprise the vast and complex geologic history of the Greater Yellowstone Ecosystem (GYE). This program begins at the Yellowstone Forever Institute offices in Gardiner, Montana, sharply at 8:00 a.m. on June 2. After introductions, an overview of geology, a look at maps, and a check to make sure that everyone is properly equipped, we'll load the bus and head out. Please bring a lunch. We expect to return between 6:00 p.m. and 7:00 p.m.



YELLOWSTONE FOREVER

This class will spend a busy day of roadside stops and short hikes exploring some of extraordinary geologic stories written in the rocks. We will visit geologic sites that shed light on the unique geology of the GYE: the travertine quarries of Gardiner, the flood bar deposited by floods with 150+ foot headwalls near Cinnabar, the coal mining history of Aldridge and Electric, Devil's Slide and La Duke Hot Springs near Corwin Springs, ancient oceans at the tops of today's mountains, and the glaciated basement granitic gneiss of Yankee Jim Canyon. As time and conditions permit, we will also investigate the petrified forest at Tom Miner Basin, multiple volcanic centers, Hepburn Mesa, the basalt quarry at Emigrant, the terminal moraine of the Yellowstone Outlet Glacier, and the hard rock mining at Old Chico. Throughout, the class will examine landforms and outcrops—the hieroglyphs of Earth's history—and attempt to decode the amazing stories these rocks are telling us.

We'll ponder the powerful convective and tectonic forces at work—the forces that provide the endless motion that pulses energy to our living, breathing planet. We'll attempt to comprehend “deep” geologic time. Using tangible measures (a calendar, a football field, the Washington Monument, your arm), we will travel randomly through geologic time from the Precambrian Era to our Holocene Epoch, and perhaps imagine other worlds at this place in other times.

“In six thousand years, you could never grow wings on a reptile. With sixty million, however, you could have feathers, too.” — **John McPhee, Annals of the Former World**

I look forward to exploring the Gardiner to Paradise segment of the GYE with you!

John Gillespie

What's Included:

Your tuition includes daily outings and transportation during your program. It does not include transportation to the park, park entrance fees, meals, or lodging. Gratuities are not included in the price of programming. If you would like to recognize exceptional service by an Institute staff member, tips are appreciated. Donations to support Yellowstone Forever educational programs are also appropriate and will be used to improve and expand opportunities for people to make deep connections to Yellowstone.

Continuing Education Credit

Many of our Field Seminars are recognized by universities across the country. We are happy to provide a letter of completion and supporting documentation that you can submit to the institution of your choice to request approval for university credit or CEUs.



YELLOWSTONE FOREVER

Lodging Option

Yellowstone Forever Institute students in Field Seminars based out of Gardiner, Montana, may have the opportunity to stay in our comfortable lodging at the Yellowstone Overlook Field Campus for an additional charge. The Yellowstone Overlook features comfortable cabins on 80 acres, awe-inspiring views, and easy access to the northern section of the park. Cabins include self-serve kitchens for preparing meals and open-floor plans for group dining and evening activities. For more information please see the last page of this document. Feel free to call our contact center at 406.848.2400 to make your reservations today.

How to Prepare for this Program:

How fit do you need to be?

This program is an activity level 1 and students enrolled in this program are expected to be active participants. Be prepared to hike up to 1 mile per day, comfortably, through relatively flat terrain on maintained trails. We recommend you begin an exercise program right away if you have not already done so. Participants residing at lower elevations may want to arrive a day early to adjust to the altitude. To learn more about how specific medical conditions can be affected by Yellowstone's environment and our activities, please visit www.Yellowstone.org/experience/health-information/

General Clothing and Equipment List

Much of your time will be spent outdoors and all programs are held rain, snow, or shine. You should be prepared for a variety of mountain weather conditions and temperatures. Appropriate clothing, equipment, and footwear are very important. Spring, summer, and fall temperatures can range from below freezing in the mornings to 85 degrees Fahrenheit in the afternoons. The layered use of garments for protection against the wind, sun, and temperature extremes should guide your clothing choices. Loose-fitting layers allow you to maintain a comfortable and dry body as outside temperatures change, and as your own body temperature and moisture output changes with different levels of exertion. Some colder-weather items may not be needed in July or August, but please keep in mind that Yellowstone's weather is unpredictable.

Equipment:

Yellowstone Forever field staff assigned to your program will be carrying a first aid kit, bear spray, and emergency communication device.

- Daypack**, with enough capacity to carry extra clothes, water, lunch, camera, binoculars, field guides, etc.
- Water bottle**, one-quart is the minimum recommended. Camelback or similar hydration systems work well in summer but can freeze in winter.
- Sunglasses**
- Sunscreen/lip protector**, sun at high altitude can burn unprotected skin quickly.
- Camera, binoculars**
- Notebook/pencil**
- Pocket hand and foot warmers**, recommended November through May.



YELLOWSTONE FOREVER

- Flashlight/Headlamp**, a small light for walking to and from your cabin in the evenings and mornings.
- Alarm**, so you're on time for the day's activities.

Summer Clothing:

- Insulating underwear**, capilene, polypropylene, or similar wicking fabric.
- Midweight insulating layer**, light, 200-weight synthetic fleece or wool shirt/pullover.
- Heavyweight insulating layer**, wool, down, or heavy-weight fleece jacket, for less-active times.
- Waterproof and windproof outer layer**, lightweight and breathable. Jackets and pants are recommended.
- Short sleeved shirt**, cotton okay in summer, but synthetic wicking shirts are ideal.
- Pants**, synthetic hiking pants, lightweight pile/fleece pants or tights or similar. Jeans are not recommended.
- Hats**, both a brimmed sun hat and an insulating hat for cool weather.
- Gloves**, lightweight glove liners and a pair of wool/fleece gloves or mittens.
- Socks**, light wool or synthetic liner sock with heavier wool or synthetic outer sock. The inner-outer sock combination helps prevent blistering, wicks moisture and reduces friction. Cotton socks do not wick moisture and are not recommended.
- Hiking boots**, that provide stability, traction, and comfort. Unless you've consistently hiked in athletic shoes, bring boots that provide ankle support.
- Off-duty shoes**, sandals, athletic shoes, or other leisure footwear.

Suggested reading

While these books and papers are not necessary for your program, they are some of the instructor's favorites and may add to your understanding and enjoyment.

- Coffin, Harold G. *The Yellowstone Petrified Forests*. 1997. *Origins* 24: 5-44
- Craighead, Frank. *A Naturalist's Guide to Grand Teton and Yellowstone National Parks*. 2006. Falcon. Yellowstone Association.
- Davis, Leslie B. Aaberg, Stephen A. Schmitt, James G. Johnson Ann M. *The Obsidian Cliff Plateau Prehistoric Lithic Source. Yellowstone National Park, Wyoming*. 1995. National Park Service.
- Mc Phee, John. *Basin and Range*. 1982. McGraw-Hill.
- Sutherland, Stuart. *A New History of Life*. 2013. The Teaching Company.
- Fritz, William J. and Thomas, Robert C. *Roadside Geology of Yellowstone Country*. Second Edition. 2011. Mountain Press Publishing Company
- Alt, David and Hyndman, Donald W. *Roadside Geology of Montana*. 2006. Mountain Press Publishing
- Hendrix, Marc S. *Geology Underfoot in Yellowstone Country*. 2011. Mountain Press Publishing.
- Hale, Elaine Skinner and Fritzke. *Trilobite Point Paleontological Resource Survey Report – Mount Holmes, Yellowstone National Park, Wyoming*. 2004. National Park Service.



YELLOWSTONE FOREVER

- Iddings, Joseph Paxon. *The Eruptive Rocks Of Electric Peak And Sepulcher Mountains, Yellowstone National Park*. 2009. USGS.
- Good, John M. and Pierce, Kenneth C. *Interpreting The Landscape – Recent and Ongoing Geology Of Grand Teton and Yellowstone National Parks*. 1969. Grand Teton Association.
- Love, L.L. Kudo, A. M. Love, D. W. *Dacites of Bunsen Peak, the Birch Hills and the Washakie Needles, northwestern Wyoming, and their Relationship to the Absaroka Volcanic Field, Wyoming and Montana*. 2002. GSA
- Pierce, Kenneth L. *History and Dynamics of Glaciation in the Northern Yellowstone National Park Area*. Geological Survey Professional Paper 729-F. 1979. United States Government Printing Office.
- Pierce, Kenneth L. Whitlock, Cathy. Morgan. Lisa. Et al. *Quaternary Geology and Ecology of the Greater Yellowstone Area*. 2003. INQUA Field Guide Volume. Desert Research Institute.
- Park County Planning Department. *Atlas of Park County*. 2013. Park County, Planning Department
- Keller, Gerta and Kerr, Andrew C. *Volcanism, Impacts, and Mass Extinctions. Causes and Effects*. GSA Special Paper 505. 2014. Geological Society of America.
- Rodman, Ann. Shovic, Henry and Thopma, David. *Soils of Yellowstone National Park*. 1996. Yellowstone Center for Resources.
- Ruppel, Edward T. *Geology of Pre-Tertiary Rocks in the Northern Part of Yellowstone National Park*. Wyoming . USGS Professional Paper 729-A. 1972. United States Government Printing Office.
- Shovic, Henry. *Landforms and Associated Surficial Materials of Yellowstone National Park*. 1996. Yellowstone Center for Resources.
- Fraser, George D., Waldrop, Henry A., and Hyden, Harold J. *Geology of the Gardiner Area Park County, Montana*. Geological Survey Bulletin 1277. 1969. United States Government Printing Office.
- Locke, William W. Lageson, David R.. Mogk, David W. Montagne, John. Schmitt, James G. et al. *The Middle Yellowstone From Livingston to Gardiner: A Microcosm Of Northern Rocky Mountain Geology*. Northwest Geology. GSA v.24 pg 1-65. 1995. Tobacco Root Geological Society.
- Lopez, David A. and Reiten, Jon C. *Preliminary Geologic Map of Paradise Valley South-Central Montana*. Open File 480. 2003. Montana Bureau Of Mines and Geology.
- Winchester, Simon. *The Map That Changed The World*. 2001. HarperCollins Publishers
- United States Geological Survey. *Geologic Map of Yellowstone National Park*. 2001. USGS.
- Feldman, Robert. *The Rockbound's Guide to Montana*. 1985. Folsom Press.
- Marschall, Mark. *Yellowstone Trails: A Hiking Guide*. 2008. Yellowstone Association.
- McPhee, John. *Annals Of The Former World*. 1998. Farrar, Straus and Giroux
- Merk, Frederick and Merk, Lois Bannister. *Manifest Destiny and Mission in American History: A Reinterpretation*. 1963. Knopf.
- Morgan, Lisa A.; Shanks, W.C. Pat; Lowenstern, Jacob B.; Farrell, Jamie M; Robinson, Joel E; *Geologic Field Guide to the Volcanic and Hydrothermal Landscape of the Yellowstone Plateau*. USGS Scientific Investigations Report 2017-5022-P. 2017. United States Geological Survey.
- Nabokov, Peter and Lawrence Loendorf. *Restoring a Presence: American Indians and Yellowstone National Park*. 2002. University of Oklahoma.



YELLOWSTONE FOREVER

- Smith, Phyllis and Hoy, William. *The Northern Pacific Railroad and Yellowstone National Park*. 2009. Keystone Press.
- Schullery, Paul. *Searching for Yellowstone*. 1997. Diana Publishing Co.
- Schullery, Paul and Whittlesey, Lee H. *Myth and History in the Creation of Yellowstone National Park*. 2003 University of Nebraska Press.
- Whittlesey, Lee H. *Gateway to Yellowstone: The Raunchy Town of Cinnabar at the Montana Frontier*. 2015. Two Dot – An Imprint of Rowan and Littlefield.
- Whittlesey, Lee H. *Yellowstone Place Names*. 2006. Wonderland Publishing Company.
- Dupuy, David. *Paradise and Beyond*. 2023. David Dupuy.
- Whithorn, Bill & Doris. *Photo History of Gardiner, Jardine, Crevasse – Entrance to Yellowstone National Park*. 2016. Wan-I-Gan Press
- MacDonald., Douglas H. & Hale, Elaine S. *Yellowstone Archeology: Northern Yellowstone*. 2011. The University of Montana.
- Black, George. *Empire of Shadows - The Epic Story of Yellowstone*. 2012. St. Martins Press
- Whithorn, Doris. *Twice Told On The Upper Yellowstone; Volume #3*. 2000. Doris Whithorn.
- Whithorn, Doris. *Paradise Valley On The Yellowstone*. 2001. Arcadia Publishing
- Whithorn, Doris. *Emigrant Gulch – Searching For Gold In Park County, Montana*. 2002. Arcadia Publishing
- Whithorn, Bill and Doris. *Photo History of Aldridge*. ~2000. Acme Printing and Stationary.
- Spritzer, Don. *Roadside History of Montana*. 1999. Mountain Press Publishing Company
- Kolbert, Elizabeth. *The Sixth Extinction – An Unnatural History*. 2014. Henry Holt and Company, LLC
- Leopold, Aldo. *A Sand Country Almanac*. 1966. Oxford University Press

Park Stores

Our Park Stores feature more than 900 books, maps, and videos to help you plan your visit, along with a wide selection of shirts, hats, and other logo items to remind you of your visit to Yellowstone. Yellowstone Forever supporters receive a 15 percent discount on merchandise online or at any of our 11 locations in and around Yellowstone. Proceeds directly support Yellowstone. Visit: [Shop.Yellowstone.org](https://shop.yellowstone.org)

Supporter Program

Yellowstone Forever Supporters directly fund priority park programs and projects. Supporters also provide scholarships for teachers and help expand programming for underserved youth. Benefits include a subscription to our magazine *Yellowstone Quarterly*, early registration and discounts for Yellowstone Forever Institute programs, and discounts on retail purchases throughout Yellowstone (exclusions apply). If you are not yet a supporter of Yellowstone Forever, an introductory subscription (one year) to our magazine *Yellowstone Quarterly* is included with your tuition. For more information, visit: [Yellowstone.org/donate](https://yellowstone.org/donate)



YELLOWSTONE FOREVER

Code of Ethics

The Yellowstone Forever Institute is committed to demonstrating a high standard of appropriate and ethical behavior in Yellowstone. As a participant in a Yellowstone Forever Institute program, we ask you to adhere to the following Code of Ethics. In addition to the ethics highlighted below, the Institute abides by all National Park Service rules and regulations. We also practice Leave No Trace guidelines for traveling responsibly in the wilderness.

Observing wildlife: We will do our best to have as little impact on wildlife as possible. Animals will be observed from a distance, using high-powered spotting scopes to help keep our presence from affecting their behavior. Participants should not expect to get close-up photographs of wildlife. The Yellowstone Forever Institute will adhere to National Park Service regulations by keeping a minimum distance of 25 yards from bison, elk, bighorn sheep, deer, moose, coyotes and nesting birds and 100 yards from bears and wolves. We will not entice wildlife with food, animal calls or any actions that change their behavior.

Leave what you find: It is illegal to remove natural or cultural artifacts (plants, animals, bones, rocks, etc.) from Yellowstone. Yellowstone Forever Institute instructors have permission from the National Park Service to manipulate plants, rocks, bones, etc. for educational purposes and will return them to their natural positions and locations.

General etiquette: Yellowstone Forever Institute groups will be considerate of other visitors and respect the quality of their experience. Voices and vehicle sounds carry great distances and affect both wildlife and people—remaining silent or very quiet while watching wildlife lets the sounds of Yellowstone (including wolf howls) prevail.

Roads and vehicles: Expect wildlife on the road, and drive at or below the posted park speed limits. When stopping to observe wildlife or other park features, the Yellowstone Forever Institute will move vehicles entirely off the road. If there is no safe pullout available, we will drive to the next safe place and walk back to observe the wildlife. We will not stop in the middle of the road, and should a traffic jam develop as a result of our activities, we will cease the activity.

Properly dispose of waste: We will pack out all trash, leftover food and litter. Your instructor will discuss techniques for properly disposing of human waste in the field.

Traveling lightly: When hiking or walking in Yellowstone, we will use existing trails and boardwalks. We will follow appropriate techniques when walking off-trail. Walking around muddy or wet places in the trail increases erosion and negatively affects the resource; proper equipment is essential to hiking ethically. Participants should come adequately prepared with the equipment listed for their course and should expect to walk through mud, snow or puddles in the trail.

Thank you for helping us set a good example in Yellowstone!



YELLOWSTONE FOREVER

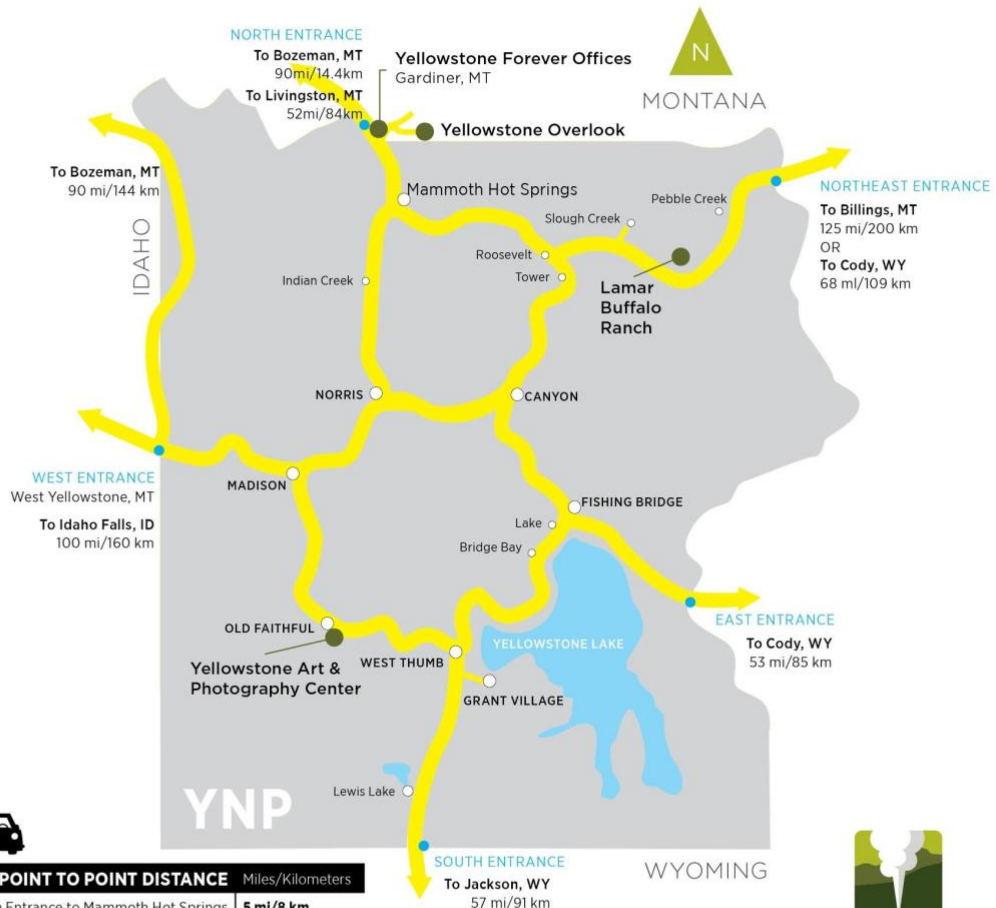
Field Seminar Cancellation and Refund Policy

If you cancel within seven calendar days of your registration date, your payment is refundable less a \$50 per person per course processing fee. Under most circumstances, if you cancel on the eighth calendar day or after, from the date of registration, 100% of registration payments will be forfeited. If lodging is cancelled after the eighth calendar day from the date of registration, 100% of lodging payments will be forfeited. Applicable taxes will be refunded in the event of program or lodging cancellations. We reserve the right to cancel a course up to 30 days before the first class day. If we cancel, you will receive a full refund of your payment. We urge you to take out accident, baggage, and trip cancellation insurance through a travel agent or website such as [TravelGuard.com](https://www.travelguard.com). Travel insurance can help protect you against financial loss if you must cancel or interrupt your trip.



YELLOWSTONE FOREVER

Yellowstone Map **YELLOWSTONE FOREVER**



POINT TO POINT DISTANCE		Miles/Kilometers
North Entrance to Mammoth Hot Springs	5 mi/8 km	
Mammoth Hot Springs to Norris	21 mi/34 km	
Norris to Canyon	12 mi/19 km	
Norris to Madison	14 mi/23 km	
Madison to West Entrance	14 mi/23 km	
Madison to Old Faithful	16 mi/26 km	
Old Faithful to West Thumb	17 mi/27 km	
West Thumb to South Entrance	22 mi/35 km	
West Thumb to Bridge Bay	21 mi/34 km	
Fishing Bridge to East Entrance	27 mi/43 km	
Fishing Bridge to Canyon	16 mi/26 km	
Canyon to Tower Falls	19 mi/31 km	
Roosevelt to Northeast Entrance	29 mi/47 km	
Roosevelt to Lamar Buffalo Ranch	11 mi/17 km	
Roosevelt to Mammoth Hot Springs	18 mi/29 km	

ELEVATIONS		feet / meters
North Entrance	5314 / 1620	
West Entrance	6667 / 2032	
South Entrance	6886 / 2099	
East Entrance	6951 / 2119	
Mammoth Hot Springs	6239 / 1902	
Old Faithful	7365 / 2254	
Grant Village	7733 / 2357	
Lake	7784 / 2373	
Canyon	7734 / 2357	
Roosevelt	6270 / 1911	



OPEN ROADS

YF FACILITIES

ENTRANCE GATES

COMMON POINTS OF INTEREST

1 mile (mi) = 1.609344 kilometers (km)



YELLOWSTONE FOREVER

YELLOWSTONE OVERLOOK FIELD CAMPUS INFORMATION

Directions:

From Livingston, travel south on Highway 89 into Gardiner, Montana. Just before you cross the Yellowstone River, you will see the Conoco gas station on your right and 4th Street on your left. Turn left on 4th Street (you'll see a green sign indicating 5 miles to Jardine) and go up the hill for 1.5 miles. Turn right on Above the Rest Lane at the sign for the Yellowstone Overlook Field Campus (by the mountain man carving) and follow the signs to the cabins.

From Yellowstone, leave the park through the North Entrance and go through the Roosevelt Arch. Turn left on Highway 89 towards Livingston. Cross the bridge over the Yellowstone River. You will see the Conoco gas station on your left and 4th Street on your right. Turn right on 4th Street (you'll see a green sign indicating 5 miles to Jardine) and go up the hill for 1.5 miles. Turn right on Above the Rest Lane at the sign for the Yellowstone Overlook Field Campus (by the mountain man carving) and follow the signs to the cabins.

What to bring:

Each cabin includes a fully equipped kitchen for you to prepare meals. You will need to bring your own food and toiletries. Groceries are available nearby in Gardiner. Linens and towels are provided. Smoking is not allowed in the cabins. Camping and pets (with the exception of service animals) are not permitted.

Arrival and departure:

Our volunteer campus host will be available to greet you between 4:00 and 8:00 p.m. on the day of your arrival. Check out is by 9:00 a.m. the day of your departure to allow our volunteers to begin preparing the cabins for the next group. Parking is available in front of your cabin. Please do not store food in your vehicle as it can attract animals.

If you are visiting during the winter we recommend an all-wheel- or 4-wheel-drive vehicle as roads can be snow-packed and icy. Feel free to call our office at 406.848.2400 Monday through Friday from 8 a.m. to 4:30 p.m. to check the local weather and road conditions.

During your stay:

Our volunteer caretakers live on-campus in the cabin with the "Welcome" sign. They will help orient you to the Overlook campus. An emergency phone is available all hours outside their cabin. We do not have a housekeeping staff at the Overlook. Quiet hours are observed between 10:00 p.m. and 6:00 a.m.

Verizon is the only cell phone provider currently providing reliable coverage at the campus. In the event of an emergency during your stay, the caretaker's cabin phone number is: 406.848.9128. Wireless Internet is available in the cabins and at several businesses in Gardiner.

The campus has a picnic table and pond. A marked, 1-mile-long trail leads down to the Yellowstone River. Wildlife is abundant. You may see bison, wolves, elk and deer. You may also see rattlesnakes. Please exercise caution, and notify someone of your plans if you will be away from the campus alone. Each cabin has a TV/DVD player and an educational library with books and videos. The Overlook is designed to be a comfortable and peaceful base from which to explore and learn in America's first national park. We look forward to your visit!