



# YELLOWSTONE FOREVER

## **INTO THE HEART OF THE YELLOWSTONE VOLCANO #180612**

Start: 6/14/2018 at 7:00 p.m.

End: 6/16/2018 at 5:00 p.m.

Location: Old Faithful

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 at Old Faithful, one of the park's most iconic locations. 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](mailto: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](http://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**

Welcome to the Yellowstone Forever Institute program, "Into the Heart of the Yellowstone Volcano." As you probably know by now, Yellowstone is not just a natural wonderland and national treasure—it's also one of the world's largest volcanoes! In this three-day seminar I hope to leave you with a lasting impression of volcanism at Yellowstone, and how scientists study the magmatic system that lies below. We will meet the first evening at 7:00 p.m. in Yurt A near the Old Faithful Visitor Education Center. At that time, I will provide a general introduction to Yellowstone's volcanic history and evolution of the Yellowstone Caldera.

The next morning we'll head out by bus to the western and northern margins of the Yellowstone Caldera. We'll start in the Madison Junction area, take several short-to-moderate hikes, and look at the Yellowstone landscape with a "volcanic perspective." We'll look at exposures of various volcanic rocks, review geologic maps, and interpret Yellowstone's landforms based on their history. Some of the places we may visit include hiking and driving along the western and northern margins of the Yellowstone Caldera; looking at



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stratigraphic relationships in the evolution of the caldera; looking across the shorter dimension of the 45 km x 75 km diameter Yellowstone Caldera; and looking at the pervasive effects of a large magmatic system, plus high water contents on the world's largest hydrothermal system—larger than all other hydrothermal systems combined.

The rest of the day will be spent looking at parts of the hydrothermal system created by a large magmatic system combined with high elevation and high precipitation rates.

We'll offer an optional evening hike to observe Old Faithful and look at thermal features on Geyser Hill and the Upper Geyser Basin. We'll discuss the behavior of geysers, the different kinds of thermal waters at Yellowstone, and the gases emitted through the ground. We'll talk about how volcanologists try to use this information to decipher the workings of the magma chamber, and how geyser basins are affected by earthquakes, ground movements, and other geophysical phenomena familiar at Yellowstone.

On the last day we'll set off to see the southern and eastern side of the caldera. We'll see the significant scarps associated with the collapse of the 2.08-Ma Huckleberry Ridge Caldera, some later used by the Yellowstone Caldera; we will see and discuss the two active resurgent domes, Mallard Lake and Sour Creek Domes, parts of the caldera that move up and down over decade-long oscillations; and we will look at Yellowstone Lake and discuss results from recent work. We'll walk around Mud Volcano, where gas from deep within the earth streams to the surface. Depending on the time available, we may visit other sites on the way back to Old Faithful.

By the time it's over, you should have a good feel for volcanic landforms of the park, the techniques used to monitor the volcano, and a rundown of all the recent action at Yellowstone. Except for the evening lecture and optional hike, all class time will be spent, rain or shine, walking around in the outdoors and making observations. Each day will consist of several short 0.5- to 4-mile round-trip hikes on park trails, including easy climbs. The longest individual walk will be a 3- to 4-mile walk. Good walking shoes will be required, as we could accumulate up to 8 miles in one day.

*Lisa Morgan*, USGS  
Scientist emeritus, Yellowstone Volcano Observatory

## **Program Itinerary**

### **Day One:**

7:00 p.m.      Orientation of class and the next two days in the field, and an overview of the geologic evolution of the Yellowstone Caldera. Meet in Yurt A near the visitor center.

Lunch and snacks are not provided, so please make sure you bring a lunch, snacks, and adequate water for your needs during each day.

### **Day Two:**



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7:15 a.m. Meet in front of the fireplace at the Old Faithful Lodge.

7:30 a.m. Depart for day. These locations are on my list to visit but are subject to change depending on conditions in June.

- Travel to the west/northwest margins of the 631,000-year-old Yellowstone Caldera. We will travel from Old Faithful north to Madison Junction. We will hike about 1.5-2 miles along parts of the Gneiss Creek Trail, look at the caldera margin, pre- and post-caldera rhyolite lava flows, and the Lava Creek Tuff that erupted from the Yellowstone Caldera.
- Continue from Gneiss Creek Trail heading northeast along the Gibbon River and the topographic margin of the Yellowstone Caldera. Stop for a quick look at Gibbon Falls and short discussion about where we are with respect to the caldera boundary.
- Continue toward Norris Geyser Basin. Continue north to overlook of recent 2003 hydrothermal field at Nymph Lake.
- Turn around and drive south to Norris Junction. Turn left toward Canyon and drive until pull-off parking for Wolf Lake. We will hike about 1.5 miles north on trail over exposures of Lava Creek Tuff, member B until we come to sharp contact with post-caldera lava, Solfatara Plateau flow at Wolf Falls. Bring your lunch.
- Drive east to Canyon Junction. Turn left and drive north toward Dunraven Pass. We will stop and look at the caldera to the south and associated features.
- Drive south to Canyon Junction and drive to Brink of the Upper Falls. We will look at Yellowstone Canyon and well as look at interesting geologic features.
- Drive west from Canyon to Norris Junction, the northern margin of the Yellowstone Caldera. Turn left/south continuing along the northwest margin of the Yellowstone Caldera.
- Stop at Tuff Cliff and discuss welding and vapor-phase crystallization in the Lava Creek Tuff, member A.
- Stop at Midway Geyser Basin. We will walk around Excelsior Crater, which erupted initially as a large hydrothermal explosion crater in 1898, as well as Grand Prismatic hot springs, the third largest hot spring on Earth and the largest one in North America.
- Return to Old Faithful around 6:00 p.m.

Return to Old Faithful. Dinner is on your own. For those interested, meet at 8:00 p.m. at fireplace in Old Faithful Lodge and we will walk around Geyser Hill and parts of Upper Geyser Basin (optional).

## **Day Three:**

7:15 a.m. Meet at in front of the fireplace at the Old Faithful Lodge.

7:30 a.m. Depart for day.

- Drive over Craig's Pass to overlook of Duck Lake, West Thumb, and Yellowstone Lake.



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- Drive south to Lewis Falls, the contact between the older Aster Creek flow and the younger Pitchstone Plateau flow. Look to the east to see the spectacular 2.08-Ma caldera-related scarps in the Red Mountains and perhaps along the Snake River.
- Drive north to Pumice Point to look at the West Thumb flow, a post-caldera rhyolite flow that entered water.
- Drive north to Fishing Bridge and to look at 3-d solid terrain map of Yellowstone Lake.
- Drive east from Fishing Bridge to parking area for Pelican Valley. Walk north about 1.5 miles into Pelican Valley, site of part of ancestral Yellowstone Lake.
- Return to Fishing Bridge and continue west to main road. Turn right and head north to Hayden Valley. Pull into parking area to hike into Crater Hills.
- Stop at Mud Volcano
- Drive south, returning to Old Faithful area.

5:00 p.m.      Conclude

## **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.

## **Lodging Option**

Rooms will be held until 30 days prior to the program in the Old Faithful area for students attending this program for an additional charge. To make your reservation, please call 866.439.7375 and give them the Yellowstone Forever Institute program name.

## **How to Prepare for this Program:**

### **How fit do you need to be?**

This program is an activity level 4 and students enrolled in this program are expected to be active participants. Be prepared to hike up to 8 miles per day, at a brisk pace, comfortably, with climbs up to 1500 feet on dirt trails. Loose rocks, uneven footing, and off-trail hiking are possible. Good coordination is recommended. 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



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medical conditions can be affected by Yellowstone's environment and our activities, please visit [www.Yellowstone.org/experience/health-information/](http://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.
- 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.



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- 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.

## Required Reading

- Brantley, S. R., Lowenstern, J. B., Christiansen, R. L., Smith, R. B., Heasler, H., Waite, G., and Wicks, C., 2004, Tracking Changes in Yellowstone's Restless Volcanic System, U.S. Geological Survey Fact Sheet 100-03. <http://pubs.usgs.gov/fs/fs100-03/>
- Lowenstern, J. B., Christiansen, R. L., Smith, R. B., Morgan, L. A., Heasler, H., 2005, Steam Explosions, Earthquakes, and Volcanic Eruptions — What's in Yellowstone's Future?, U.S. Geological Survey Fact Sheet 2005-3024. <http://pubs.usgs.gov/fs/2005/3024/>
- Yellowstone Volcano Observatory Website (<http://volcanoes.usgs.gov/yvo>). Please read some of the articles on the front page, some of the archived articles, and the FAQs. We will likely be making changes over the next month, so keep an eye out for anything new!

## Suggested reading

- Good, John M., and Pierce, Kenneth L., 1996, Interpreting the Landscapes of Grand Teton and Yellowstone National Parks - Recent and Ongoing Geology., 58 p. doi:ISBN-10: 0931895456, available at Yellowstone Forever Park Stores in the park.
- Lowenstern, J.B., Smith, R.B., and Hill, D.P. 2006. *Monitoring Super-Volcanoes: Geophysical and Geochemical signals at Yellowstone and other caldera systems: Philosophical Transactions of the Royal Society A*, v.264, no. 1845, p. 2055-2072. <http://volcanoes.usgs.gov/yvo/publications/2006/royalsoc.pdf>
- Christiansen, R. L., 2001, The Quaternary and Pliocene Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana, U.S. Geological Survey Professional Paper: 729-G, 145 p., 3 plates, scale 1:125,000. This is the ultimate word on Yellowstone's volcanic geology. Available through the YA Park Store or a **large** online version can be downloaded from: <http://geopubs.wr.usgs.gov/prof-paper/pp729g/>
- [Morgan, L.A., Shanks, WCP, Lowenstern, JB, Farrell, JE, and Robinson, J, 2017, Geologic field trip guide to the Volcanic and Hydrothermal Landscape of the Yellowstone Plateau: U.S. Geological Survey Scientific Investigations Report 2017-5022-P.](#)

## 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](http://Shop.Yellowstone.org)



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## 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)

## 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.





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**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!*

## **Field Seminar Cancellation and Refund Policy**

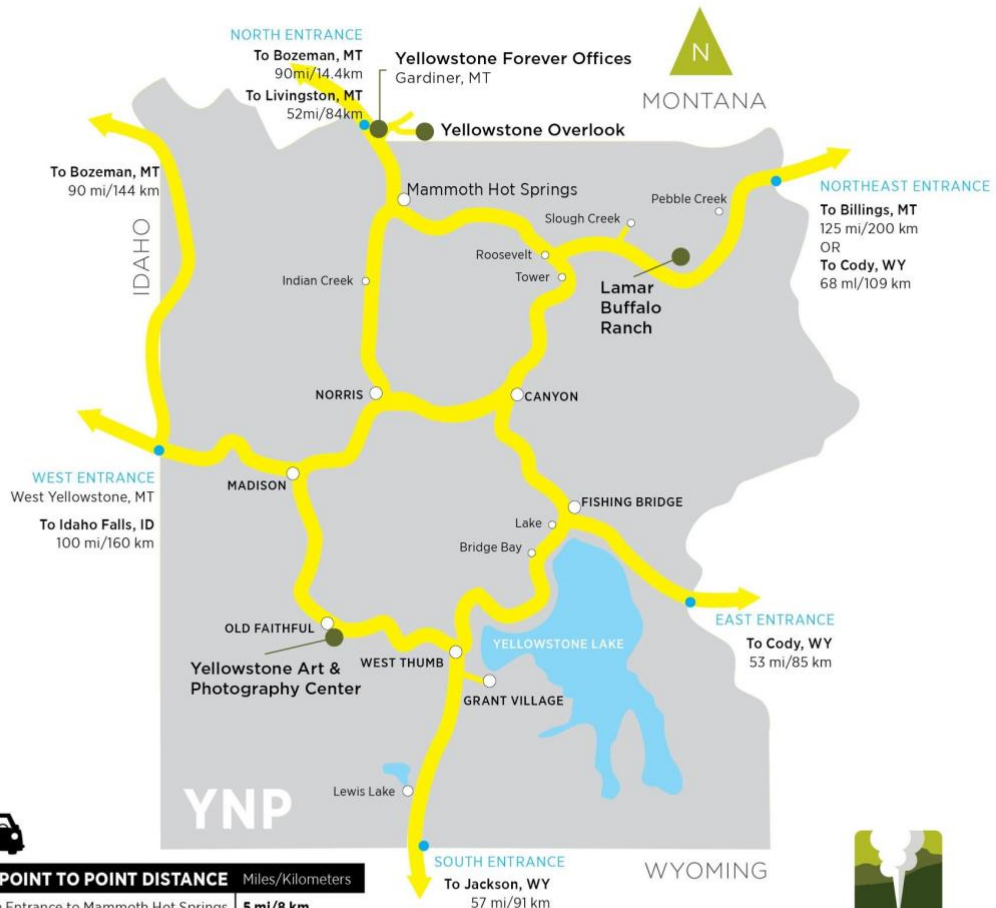
If you cancel within seven calendar days of your registration date, your payment is refundable less a \$50 per person per course processing fee. Under most circumstances, if you cancel on the eighth calendar day or after, from the date of registration, 100% of registration payments will be forfeited. 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.





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## 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)