



YELLOWSTONE FOREVER

YELLOWSTONE FLOODS & LANDSCAPE CHANGE: PAST, PRESENT, & FUTURE

Itinerary & Details

FIELD SEMINAR - SUMMER 2023

INSTRUCTOR: Grant Meyer, Ph.D.

INSTRUCTOR BIOGRAPHY: **Grant Meyer, Ph.D.**, is a geologist specializing in geomorphology, the study of processes that shape the Earth's surface, including the action of water in both liquid and solid forms, as well as biological processes. Grant has reveled in exploring Yellowstone's unique landscapes since he first set foot in the park as youngster in the 1960s. He is a graduate of the University of Idaho (BS), Montana State University (MS), and the University of New Mexico (PhD). Since 1983, he has investigated a variety of research topics in Yellowstone, including long-term deformation in the caldera, the effect of forest fires on erosion and sedimentation, climatic controls on fires, the long-term effects of beaver activity on streams, and the history and impacts of major floods, the focus of this course.

ACTIVITY LEVEL: This course is an activity **level 2** and students enrolled in this course are expected to be active participants. Be prepared to hike up to 3 miles per day, comfortably, with elevation gains up to 600 feet. Some off trail hiking possible.*

**All field activities will be conducted as a group. If you cannot meet the activity level expectations during your program, you may be restricted from participation in daily outings. We will not alter program itineraries or activities to accommodate participants who cannot meet the expectations of the stated activity level.*

LOCATION: Lamar Buffalo Ranch – Yellowstone National Park, WY

PROGRAM DATES & TIMES: The program begins at 7:00 p.m. on Monday, August, 28, and ends on Thursday, August 31, 2023, at 5:00 p.m.

LODGING CHECK-IN & CHECK-OUT: Lodging check-in begins at 4:00 p.m. on Monday, August 28, 2023, and lodging check-out is at 9:00 a.m. on Friday, September 1, 2023.

MEALS: You will need to bring your own food; lunch should be able to travel in the field with you.

For general information about the facilities, preparing for classes, what to expect, cancellation policies, and more, please see the [Lamar Buffalo Ranch - Summer General Information](#) document.

FROM THE INSTRUCTOR

The extreme floods of 2022 in greater Yellowstone displayed much of their greatest power and effects in northeastern Yellowstone, the location of this field course. A rare landscape-altering event like this raises several intriguing questions: Have floods of this extraordinary magnitude occurred in the recent past, or are they unprecedented, as some have suggested? What is the evidence for large floods in the recent geological past, and how might their impacts on floodplains and riparian vegetation compare to those of 2022? There are several basic processes that have produced historic floods in northeastern Yellowstone, of both natural and human origin – how do these differ in their nature and effects on the ecosystem? Have floods played a significant role in landscape change over the millennia since glaciers last mantled Yellowstone, and after their retreat? And how do meteorological conditions and climate change play into the potential for flooding?

The joy and excitement of science lies in discovery, and we can gain a new understanding of the impacts of the 2022 flood through first-time observations and development of hypotheses to explain them. We will examine the field evidence along the spectacular mountain valleys of Soda Butte Creek and the Lamar River to address the questions above. We'll measure flow in a gentle stream to understand how discharge is quantified, and to compare with the impressive peak discharges in 2022 and earlier floods. We will also consider the longer-term climatic conditions associated with flooding and how our warming climate can be expected to alter Yellowstone's flood activity in the future.

Participants should be prepared to get their hands muddy and (optionally) their feet wet as part of our investigations, along with relatively short off-trail travels to key localities. As COVID will very likely still be with us, the wearing of masks is requested in the vehicle and classroom, as well as in the kitchen insofar as possible.

- *Grant Meyer*

PROGRAM ITINERARY

The itinerary is designed to take advantage of the best opportunities in the park, but may be adjusted to adapt to weather conditions, wildlife activity, holidays, and road construction. *The details and timing of the agenda are subject to change.*

Day 1 Evening Orientation

Evening welcome, introductions, and background information

Day 2 9:00 a.m. to ~5:00 p.m.

- Setting the stage: Field overview of northeastern Yellowstone geology, glaciation, streams, and postglacial history
- Barronette Meadow: Understanding runoff and erosion processes, flows of water and sediment in the landscape, and the persistent effects glaciation
- Round Prairie: History and impacts of modern and ancient floods and valley-floor vegetation
- Fire, storms, and debris flows: Evidence for extreme events on a more local scale

Day 3 8:30 a.m. to ~5:00 p.m.

- Warm Creek area: Mountain landscape processes and another way to generate extreme floods
- Have human activities caused flooding in Yellowstone?
- Trout Lake area: reading the landscape for ancient flood evidence
- Basic stream hydrology: Measuring streamflow velocity and discharge by wading
- Lower Soda Butte Creek and Lamar River: Stream systems, floods, and climate change over the postglacial millennia

Day 4 8:30 a.m. to 2:30 p.m.

- Lamar Canyon: Flood impacts in a steep narrow gorge
- Lower Slough Creek: From glacial deposition to the modern meandering channel and flood effects
- Boulder deposits in the Junction Butte area: Formulating hypotheses to explain their origin
- The Narrows of the Yellowstone River: Interpreting stratigraphy and long-term river system change
- Elk Creek: Beaver dams, floods, and their effects on postglacial stream valleys
- Farewell

PROGRAM EQUIPMENT

For a full list of recommended equipment for all courses see the [Lamar Buffalo Ranch - Summer General Information](#) document.

- ☐ Field notebook (preferably water-resistant, for example [this one](#)) and pencil for observations
- ☐ Geological magnifying hand lens (10x is best) (optional but recommended)
- ☐ Footwear for locally rough, rocky terrain
- ☐ Waders and/or angler's rubber-sole wading boots or old running shoes for *optional* wading. Felt-soled wading boots are not allowed in Yellowstone to avoid transportation of invasive species. River sandals are OK only if you are well accustomed to wading rock streams in them, as these provide limited traction and little protection from rocks and debris.
- ☐ Hiking poles, ski pole, or wading staff for wading
- ☐ Extra dry socks
- ☐ Lunch for field

*Medications or other essential personal items needed during long field days; pollen allergies may be activated when we walk through tall grass and herbaceous plants

RECOMMENDED READING

No prior reading is required, but participants might enjoy the following publications, that complement the program. Most publications are available at Yellowstone Forever's online store at shop.yellowstone.org. Yellowstone Forever supporters receive a 15% discount and proceeds directly support the park.

- ☐ J.M. Good and K.L. Pierce. 1996. *Interpreting the Landscape of Grand Teton and Yellowstone National Parks: Recent and Ongoing Geology*. Grand Teton Natural History Association.

Spoiler Alert: There are several scientific publications specifically investigating some of the topics and questions addressed in this course, but to allow participants to make their discoveries based on field evidence, the instructor is withholding these until after the class. These articles will then be made freely available to all participants. And again, we will all be making many brand-new observations about the effects of the 2022 floods – including the instructor!

WHOM TO CONTACT

For any questions, concerns, or additional information please contact the following:

- Program itinerary, health forms, payment, and activity questions please contact Yellowstone Forever at institute@yellowstone.org or 406-848-2400
- Road updates, park conditions, and general park information please contact Yellowstone National Park Service at <https://www.nps.gov/yell/contacts.htm>
- If running late for a program, please contact 406-848-2400