



Texas Hill Country Field Trip: Creating a Virtual Field Experience

Dr. Jenny Rashall & Dr. Mike Read

SFASU Department of Geology | CoSM

2022 CTL Teaching Showcase

Creating the Virtual Hill Country Field Trip



Why?



- ***Necessity!*** When the COVID-19 pandemic began, we were weeks away from the originally scheduled trip. Several senior-level students were relying on the course to graduate that semester.

Course Goals!

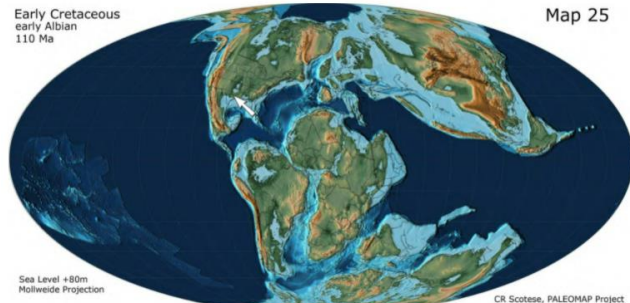
- Be familiar with geologically significant sites in the Texas Hill Country.
- Articulate fundamental geology concepts.
- Recognize the ever-changing landscape of Texas throughout deep time.

How?

- Combining elements of ***field-based learning*** and ***place-based learning***.
- Brightspace (D2L) modules include maps, landscape and outcrop photographs, 360° panoramas, videos, and instructional figures and text.

Introduction

The rock units of the San Gabriel River were deposited in the early part of the Albian, when Texas was still partially covered by a **shallow epeiric sea**. You might notice that the **Western Interior Seaway** has not yet formed and land still connects the eastern and western parts of North America. Sea-level was relatively shallow in the region during this time, which is why we can find evidence of terrestrial, or land animals, along with some marine fossils.



Source: Scotese, C.R., 2014. Atlas of Early Cretaceous Paleogeographic Maps, PALEOMAP Atlas for ArcGIS, volume 2, The Cretaceous, Mollweide Projection, PALEOMAP Project, Evanston, IL.

Let's take a walk

Although we can't physically walk down the San Gabriel River together, this 360° video will give you a pretty good idea of what we would have seen. Be sure to use the arrows to look around as you watch. Around the 5:20 mark in the video, you can see one of the most well-preserved footprints in the riverbed. Take note of the large blocks of limestone and scattered smaller rocks you see along the banks of the river, we will be discussing those next.

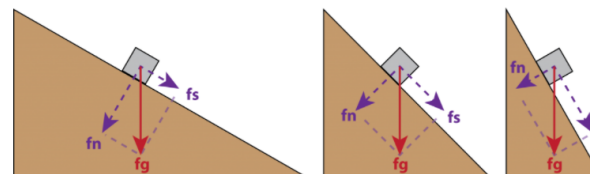


Note: This video has no audio that is necessary for the content, only a music track to play in the background. Feel free to mute the audio as you use the video to explore the riverbed of the San Gabriel River.

Mass wasting along the San Gabriel

Mass wasting is the movement of rock or soil under the influence of gravity down a slope or cliff. **Slope failure** occurs when a slope is no longer stable enough to resist the forces of gravity acting on it. Mass wasting acts continuously on all slopes, although the rate can vary drastically. In some cases, mass wasting acts so slowly that a slope might appear to be stable for a significant period of time. Other times, mass wasting can occur very quickly as a catastrophic event.

There are two main forces acting on a slope contributing to slope failure: the **normal force** (f_n) which pushes into the slope producing friction, and the **shear force** (f_s) which pushes down the slope. As the slope angle steepens, the shear force becomes stronger than the normal force, eventually resulting in downslope movement.



(Source: Paul Inkenbrandt in *An Introduction to Geology*, 2017, <https://opengeology.org/textbook/>)



Stop 9: San Gabriel River, Leander, TX

Enchanted Rock, Fredericksburg, TX

Enchanted Rock State Natural Area, located approximately 17 miles north of Fredericksburg, covers 640 acres of land centered around the namesake dome of pink granite. The geological feature derives its name from spiritual folklore of the Apache, Comanche, and Tonkawa tribes. Enchanted rock also served as a hideaway for indigenous people seeking refuge from European settlers.



Screen capture of 360° Google Earth panorama



Weathering and exfoliation



Although the granite of Enchanted Rock is 1.1 Ga, much more recent geologic processes have sculpted the rock into the shape we see today. It was previously mentioned that Enchanted Rock is an **exfoliation dome**. This means that Enchanted Rock weathers in an onion-like fashion, as the rock cracks into layers and eventually "sheds" under force of gravity. Notice the layers of granite "peeling off" in the photo above. The sub-parallel fractures in the granite are known as exfoliation joints, or sheeting joints, that result in the slabbing-off of concentric blocks of rock. This process can occur both on the centimeter-scale, as illustrated below by a small exfoliating nodule, and on the kilometer-scale.

Stop 17: Enchanted Rock State Natural Area



Applying this method in other courses:
GEOL 1304 Historical Geology...

Permian road trip

Guadalupe Mountains
National Park,
West Texas

View from Guadalupe Peak



~265-million-year-old marine
deposits of the Delaware Mtn Group

reef
slope

reef

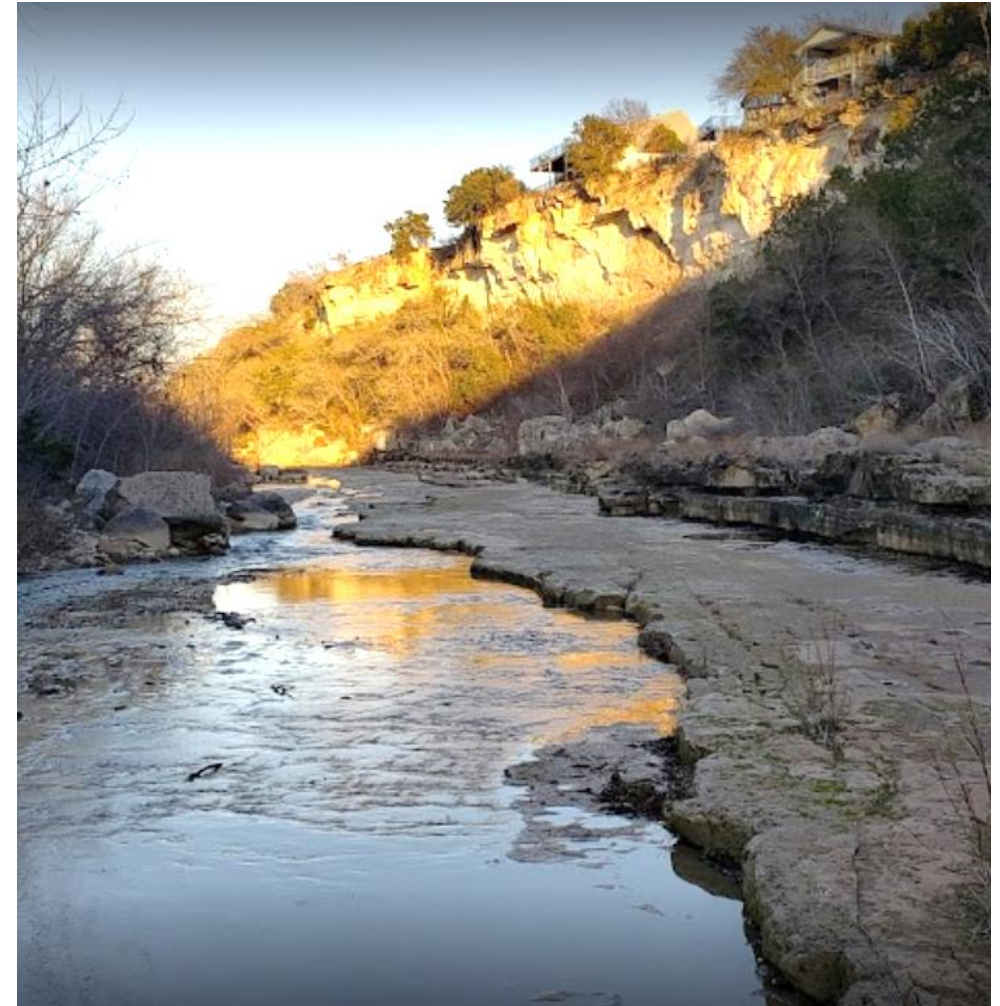
reef
slope

toe of slope

Cherry Canyon Fm (older basin deposits)

Accessibility Issues in Field Courses/Activities

- The original *in-person* field course required students to camp for the long-weekend trip, an activity that is not an option for all of our students.
- Having the *virtual* field course option will give all students who want to learn about the regional geology of the Texas Hill Country an opportunity.



Conclusions

- Introducing students to *recognizable locations* and utilizing elements of *place-based learning* helps to develop meaningful connections to course concepts.
- *Accessible alternatives* for some traditionally in-person experiences benefit the wider student population.

