

A scenic photograph of a rugged mountain landscape. In the foreground, there are several evergreen trees and some deciduous trees with bright yellow autumn foliage. The middle ground features a large, craggy rock formation. In the background, more forested mountain peaks are visible under a heavy, overcast sky. The overall tone is somewhat muted due to the weather conditions.

DuBois EE #1

EE = Epic Excursion

Epic Excursion Overview

Three generations of the DuBois clan (grandfather, father, and eldest son) spent 5 days exploring western South Dakota and eastern Wyoming from October 5 - 9, 2018. **Our mission** (on these and subsequent trips) is **to experience as much of our world** in as short a time as possible. We live in magical times where we can travel significant distances in short times. We also have the ability to record what we encounter and share it with others. We live on a wondrous planet with so much life, it is just fun to explore. We hope you enjoy this narration and a few of our photos.

We chose South Dakota because we had not previously spent much time there and it was within driving distance of central Illinois. Also, the Black Hills (and surrounding area) contains:

- five national parks and monuments (we visited three),
- nine major caves (we visited one - the third largest in the U.S.),
- three state parks (we visited one),
- two memorial mountain carvings (we visited both),
- five recreational reservoirs,
- a national forest (we drove through it),
- two wilderness preserves,
- one national grassland (we drove through it),
- three national scenic byways (we attempted to drive one, but it was closed),
- one national cemetery,
- three fish hatcheries,
- a wild horse sanctuary, and
- ancient petroglyphs (we hope to see these on another trip to the area).

Obviously, there is a lot to see in a relatively small area. We were able to view a lot of inspiring scenery in a short amount of time. Time well spent as three generations developed shared memories about one small part of our world.

We stretched a 4 day school weekend into 5 (and hopefully imparted a little more knowledge and wisdom that would have happened in the single day of school missed). We plan to do these excursions at least once each year (so this is the first of many - hence the hash tag). We prefer to document after we return as it is important to keep screen time to a minimum while we travel (and focus on what is happening around us). Otherwise, we would have likely missed the cougar print covering my boot print in Custer State Park (yes, one crossed the trail after we had hiked past and before we returned from further up the ridge).

A few statistics about our excursion

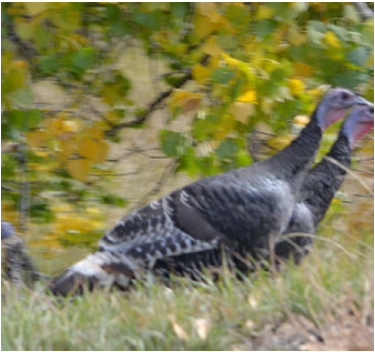
- We drove 2,431.8 miles in 5 days (nearly 500 miles a day - typical for one of our trips). We used my Prius so we got reasonable mileage throughout the trip. It took an entire day of driving (October 5) to reach Rapid City, SD.
- We took over 2,500 photos and video (occupying over 32 GB of cloud storage at the moment). Yes, many pixels have been inconvenienced for our benefit.
- We visited six national parks, state parks, and national monuments. We also visited the Crazy Horse Memorial (which remains under construction). We even stopped at Wall, SD of course (for the free water and nickle coffee, obviously).
- We hiked 22.1 miles of wilderness.
- Deepest we ventured underground (Jewel Cave) was 379 feet below the surface.
- Highest elevation walked (near Little Devil's Tower) was a little over 7,000 feet above sea level. For reference purposes, this is 10 times the elevation where we reside in central Illinois.

For those who are curious about details of our excursion, I have arranged these by sites visited (in the approximate sequence). Before we delve into the specifics, I thought it might be interesting to show some of the wildlife we encountered. Given the typical weather was overcast with temperatures never above 50 degrees (Fahrenheit), most of the animals we encountered

were birds and mammals. A few plants were flowering, but most had gone dormant.

Wildlife encounters

Here are some of the beasts we saw as we hiked and drove through western South Dakota and eastern Wyoming. Many more were observed, but the camera was not handy (or the batteries were dead). Still, this is a fair sampling of what we saw in the course of a few days.

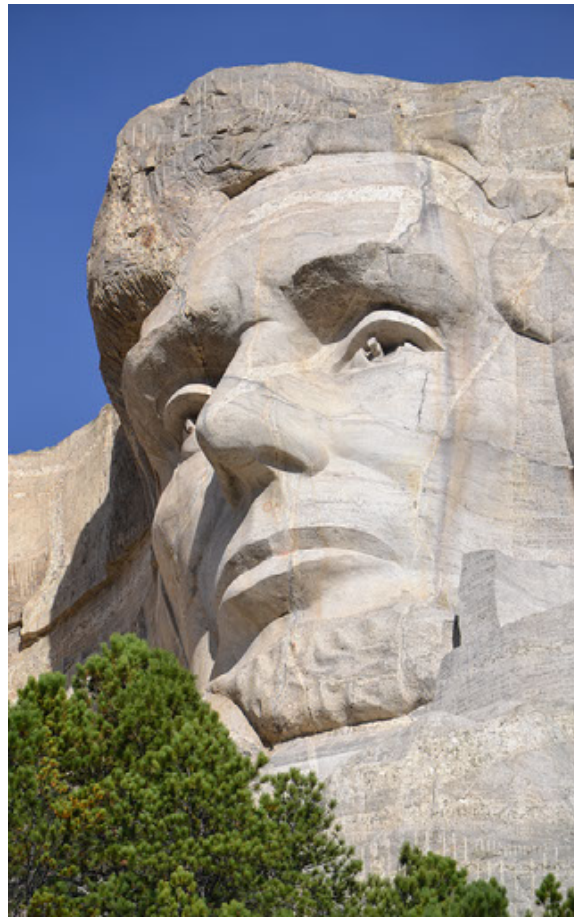
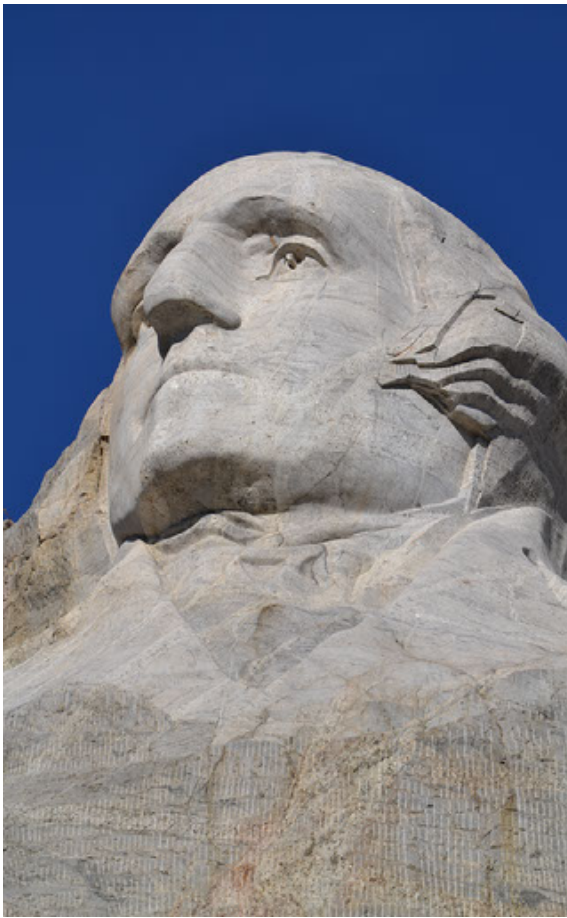




Some of the birds and mammals (and an insect) we encountered

Mt. Rushmore, SD

We visited this site on Saturday, October 6, 2018. We returned that evening so we could see this sight illuminated after dark (didn't know they did that every night until 9 p.m.). Known to the Lakota Sioux as Tunkasila Sakpe (the six grandfathers), this mountain was sculpted by Gutzon Borglum (with a lot of manual labor from helpers) into the 4 presidents. This mountain is an exposed part of the Harney Creek [batholith](#). This consists mostly of crystalline granite and pegmatite. The heads were sculpted from rock consisting mostly of quartz, feldspar, and mica. Pegmatite dikes show as white streaks on the foreheads of Lincoln and Washington.



Carved images of Washington and Lincoln with pegmatite dikes (which look like streaks).

Most of this rock crystallized from magma while buried nearly 8 miles in the earth. This granite was first exposed through erosion before the Cambrian seas covered this part of western South Dakota (that event happened roughly 550 million years ago - and the rock was old even then). These seas deposited the Deadwood sandstone. As the [Laramide Orogeny](#) began building the Rocky Mountains and pushing the Black Hills to their present height, approximately 7,500 of overlying sediment eroded to reveal the granite again. This upheaval started in the Late Cretaceous (about 75 million years ago).

Here is a close up of one of the granite boulders on the side of Mt. Rushmore. You can see the mica (mostly biotite), feldspar, and other minerals. These are large crystals indicating the deposit cooled at great depth (and cooled slowly over time).



Close up view of the minerals in Mt. Rushmore granite

Although there is a loop trail, part of it was closed. However, we were still able to see many views of the monument (including the traditional view below).



Traditional view of Mt. Rushmore (yes, I took this photo)

Most of the rubble from sculpting the monument was left at the base. One can see many of the original drill and chisel marks in the pieces (example below).



Rubble from sculpting activity on Mt. Rushmore. Note the drill and chisel marks.

If you have not heard the rumor, I can confirm that there is a "hall of records" carved into the granite behind Lincoln's ear. The vault contains 16 porcelain enamel panels with text (which includes the text of the US Constitution along with descriptions of the monument, the sculptor, and brief biographies of the four presidents depicted). Yes, I have a booklet which provides details. The vault was sealed in 1998. As I understand, the sculptor originally planned to hollow out Lincoln's head to use as a room; that idea later became this "hall of records."

We also had the chance to enjoy some vanilla ice cream. Ok, it may not be that big a deal to others, but the ice cream is based on [Thomas Jefferson's recipe](#) and is only made by one company in North Dakota. We all agreed, it was the best vanilla ice cream we had ever tasted. We were also intrigued by the light fixtures in the visitor center.

Lights in Mt. Rushmore visitor center



Since we learned that Mt. Rushmore is illuminated at night, we returned the same day before the facility closed at 9 p.m. This is what it looks like at night.



Mt. Rushmore at night (viewed from the trail near the base)

[Learn more about Mt. Rushmore via Wikipedia](#)

Crazy Horse, SD

This monument to Crazy Horse is presently under construction and is run by a not for profit organization. Although we were able to see the monument from the visitor center, it is fairly expensive to get closer (and one of us is on a fixed income). This is the view from near the visitor center (using my telephoto lens). As you can see, much work remains to be done.



Crazy Horse monument (still under construction)

We toured the visitor center and saw many Native American artifacts and artwork. I found the bead work most impressive. Note the detail on this saddle bag. I can only imagine how long it must have taken to stitch this.



Saddle bag covered in bead work

There was a large collection of beads as well (some are shown below).

Beads at Crazy Horse Visitor Center



Learn more about the Crazy Horse Memorial at Wikipedia

Devil's Tower, WY

Since a snow storm was predicted for Sunday, we decided that Saturday would also be a good idea to visit Devil's Tower. After all, it was only 113 miles away (a little over 2 hours drive). As we arrived via US 14 and Wyoming 24, we saw the tower across the valley. The Native American name for this formation is Mato Tipila. The ancestral Belle Fourche River eroded a significant amount of the sedimentary rocks to expose this formation. Theodore Roosevelt designated this as the first U.S. National Monument in 1906.



Devil's Tower viewed across the Belle Fourche river valley

Rock forming the tower is [phonolite](#) porphyry (which is similar to granite). It has the common name clinkstone (making a metallic sound when struck). It formed from a mass of molten magma which forced its way up through miles of rock. This happened roughly 50 million years ago (during the Laramide Orogeny which also formed the Black Hills and Mt. Rushmore). As it gradually cooled, the rock cracked into the honeycomb pattern we see today.



The top of the tower is highly fractured as it has been exposed through erosion the longest.

This is what the weathered rock looks like close up. Note the individual grains. Lichens covering these rocks have been used to estimate that the last rocks fell from the tower roughly 10,000 years ago.



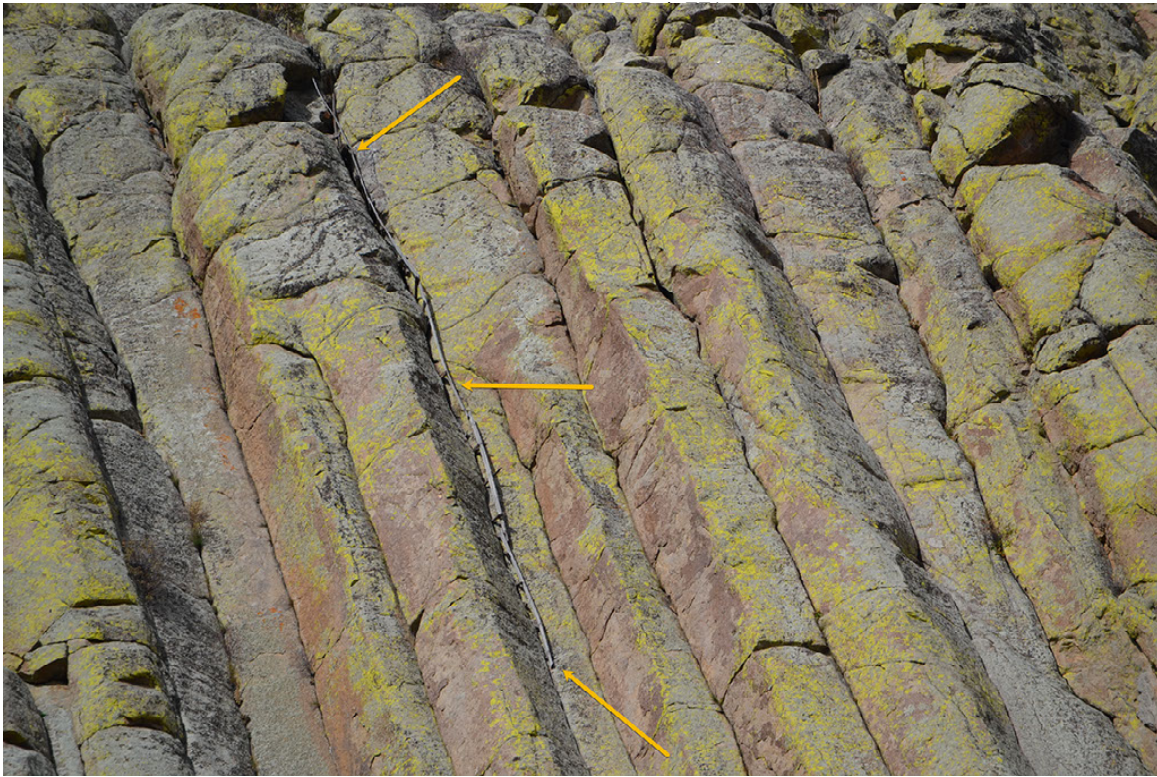
Close up of Devil's Tower rocks

We circumnavigated Devil's Tower (it is only a 1.3 mile paved trail). We were able to view the different faces of the tower. You will note that some of the porphyry clearly shows the extrusion was bent and cooled in place.



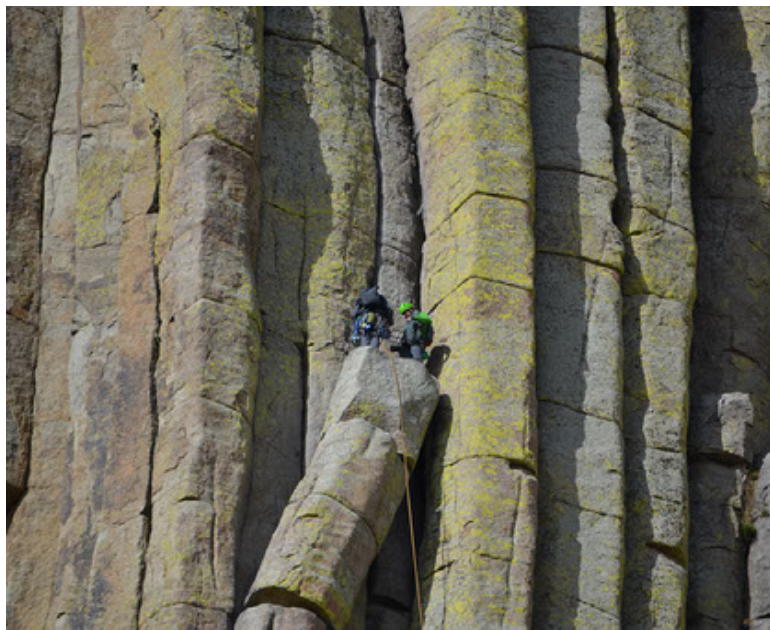
Note the differences when Devil's Tower is viewed from different directions

Devil's Tower was first climbed in 1893 by William Rogers (not [that one](#)) and Willard Ripley. They built a wooden ladder of 30 inch stakes driven into a continuous vertical crack. Yes, they were certifiably crazy (in my opinion) as no ropes or safety gear were used at all. Remnants of the ladder are still visible today.



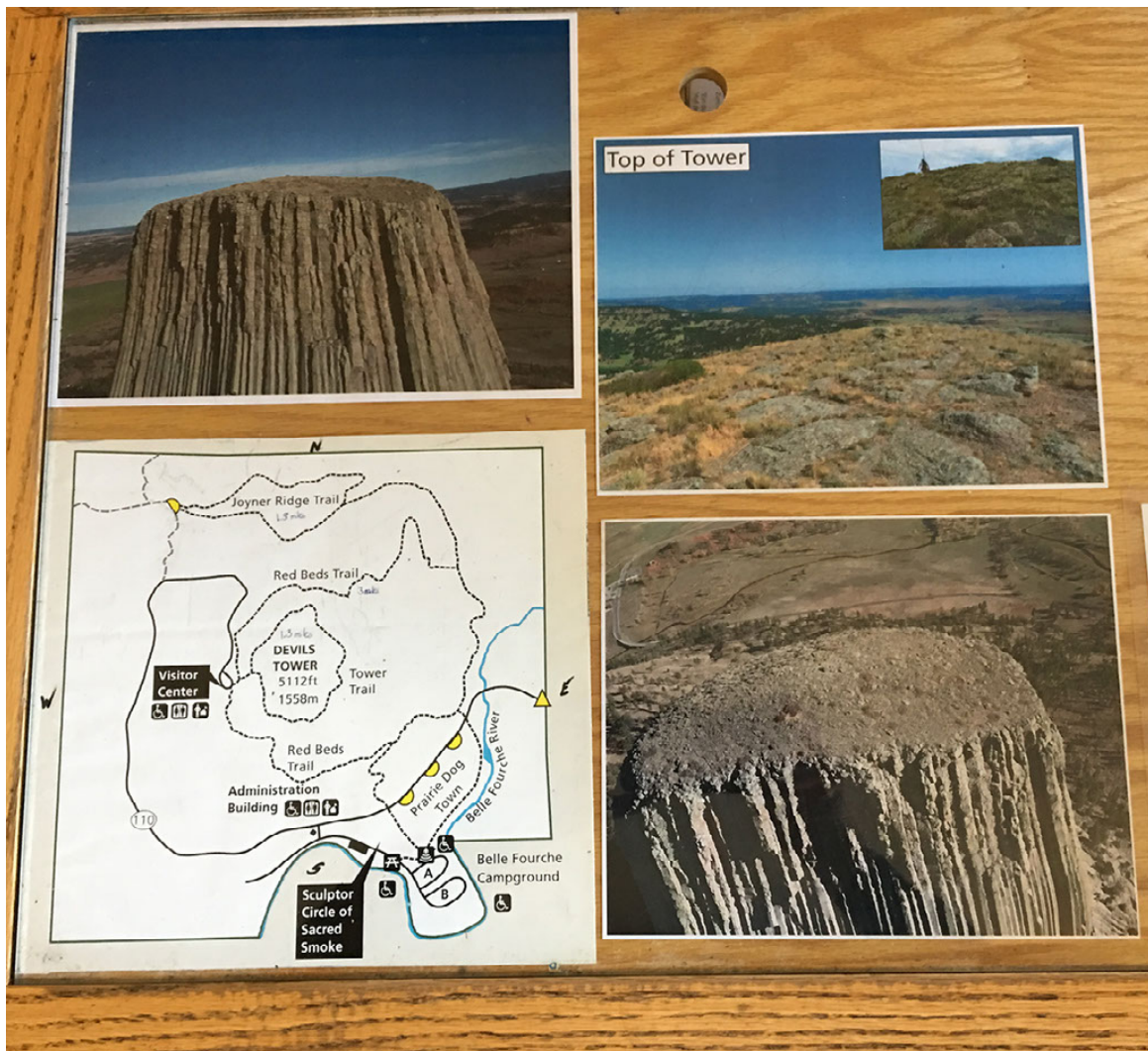
Arrows showing wooden ladder originally used to climb Devil's Tower

Yes, there were individuals climbing on the day we visited. In case you are curious, each climber must register before and after their climb. Each person is responsible for their own safety. Of the 400,000 annual visitors, less than 1% actually attempt the climb. Here are photos of some of the climbers to help you appreciate the scale of Devil's Tower.



Climbers descending Devil's Tower

There are over 220 routes up the sides of Devil's Tower. The Durrance Route (established by Jack Durrance in 1938) is thought to be the easiest ascent. The average time to climb is 6 hours (the shortest ascent was just over 18 minutes). Climbers typically rappel down once they have reached the top (which is roughly the dimensions of a U.S. football field (1.5 acres measuring 450 feet north to south and 250 feet east to west)). For those who are curious about what the top looks like, but not able to make the ascent, the Visitor Center provides these photos (I did ask if it was ok to take a photo and display it - these are the only photos not taken by us during our trip).



Fun fact - although the sheer rock shaft measures 867 feet tall, rattlesnakes, pack rats, and chipmunks have been spotted on the top of Devil's Tower. It is thought they climb up the cracks and fissures just as humans do. And... no, [mashed potatoes](#) were not involved in any aspect of this trip.

Learn more about Devil's Tower at Wikipedia

Custer State Park, SD

Sunday, October 7, 2018 began as a very overcast and chilly morning. We attempted to drive the Needles Highway. This road was considered impossible to build by many highway engineers. Although we had not yet arrived at the highway, this is one of the sharp bends and tunnels we encountered. Yes, just because you can drive a large vehicle doesn't mean you should.

Not a good place to take your RV



We finally arrived at the entrance to Needles Highway only to learn that the road had just been closed.

Most of the rock outcrops in this area are 2.5 billion year old (Precambrian) granite. Custer State Park (the adjacent State Game Lodge) was the summer White House for Calvin Coolidge in 1927 and Dwight Eisenhower in 1953. Our first stop (after learning that Needles Highway was closed) was Sylvan Lake.



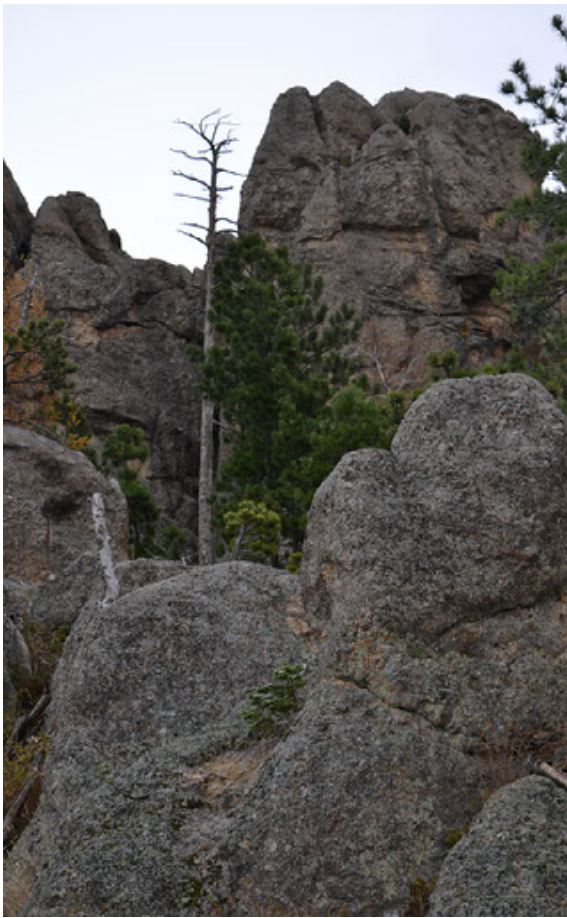
Sylvan Lake (Custer State Park)

We decided to take the trail to Little Devil's Tower after viewing Sylvan Lake (the trail head began at the same parking lot where we parked to view Sylvan Lake). Near the trail head, we encountered the entrance to an old mine. Yes, we investigated it a bit.



Entrance to an old mine near the trail head

Here are some of the photos I took as we walked along the main trail to the Little Devil's Tower overlook (on a ridge).



Views along trail to Little Devil's Tower (note the arch)

We were near the Little Devil's Tower area when I took these photos. The fog was getting heavier and we decided it was time to return to the car (as we did not want to experience bad weather while on the trail).



Views near Little Devil's Tower

We walked quite a distance in Custer State Park. I did notice this paw print covering our tracks. This means the cougar walked across our trail after we went towards a ridge and before we returned on the same trail. We all did feel that something was watching us as we walked along.



Cougar paw print overlaying our boot print on the trail

The South Dakota state mineral is rose quartz. We encountered quite a bit as we walked along parts of this trail. It inspired me to purchase a sizeable sample at one of the local rock shops we visited later in the day.





Rose quartz along the trail

[Learn more about Custer State Park via Wikipedia](#)

Jewel Cave, SD

Jewel Cave is so named because of the many calcite deposits which resemble diamonds (actually cave popcorn). While the cave was forming, it was flooded in ground water. The calcium carbonate rich waters precipitated forming calcite crystals visible today. It was established as a national monument in 1908. Here are a few statistics concerning the cave:



Example of calcite crystals found throughout Jewel Cave

- Although it was originally thought to be roughly 1 mile in length, explorations over many years have pushed the known length to over 196 miles (another expedition was exploring further reaches when we visited so it may now extend beyond 196 miles).
- This makes it the third longest known cave in the world (Mammoth Cave which we have also visited with our grandsons is the longest at 405 miles - hence the name).
- The deepest point in the cave is 749 feet below ground (the furthest we made it was 379 feet underground).
- There is one known natural entrance in Hell Canyon.
- Nine species of bats occur in the Jewel Cave National Monument.

We took the scenic tour (a guided 1/2 mile loop trail which requires roughly 1 hour 20 minutes to complete). There are 723 stair steps along this trail. This is after you take an elevator ride to the trail head. We did not realize that we were part of the last tour for several months. The metal stairs and platforms are going to be replaced with more modern ones. Although we were not walking anywhere near the bat populations, we still had to walk through

bleach water upon entrance and exit as white nose syndrome has been documented in this cave system.

Example of the stairs we climbed (up
and down)





"Cave popcorn" deposits



Flow stone (this part is still forming)





More flow stone



Stalactites we observed





Stalactite almost meeting a stalagmite to form a column





"Soda straw" formation





This example of "cave bacon" is nearly 30 feet long

Over the course of my life, I have visited many caves (in the US and elsewhere). Without a doubt, Jewel Cave is at the top of my list in terms of impressive formations you can easily observe.

[Learn more about Jewel Cave at Wikipedia](#)

Hot Springs Mammoth Site, SD

This is run by a not for profit organization founded in 1975. The site was exposed in 1974 when the hill containing these skeletons was being leveled for a housing project. This site was designated a National Landmark in 1980. It is the largest accumulation of Columbian mammoths, discovered in context, in the world. At least 59 Columbian and 3 Woolly Mammoths perished in a sinkhole at this spot during the Pleistocene. Two short face bears and many other animals (including snails, clams, and at least one ant) have also been found at the site. They are preserved where they died.

The animals were trapped in a spring fed sinkhole which formed in the Spearfish Shale. The sinkhole was a permanent source of fresh water and surrounded by plants (which likely attracted the mammoths). The sides were easy to navigate into the water. However, they were slippery mud meaning that it was easy to enter, but nearly impossible for the animals to leave. They either drowned or died of starvation. Their bones were redistributed as the spring kept pouring warm water into the sinkhole. The sinkhole is roughly 165 feet across and estimated to be at least 65 feet deep. The mammoths were all young adult males (which likely were forced out of the herd - much like modern male elephants). Over time, the spring dried up and the bones were encased in sediment. This hardened into a protective covering which eventually became a hill as the surrounding sediment eroded away. It was this

hill which was going to be leveled in 1974. Although the "hot springs" leached all organic materials from the carcasses, the bones are well preserved (even some hyoid [tongue] bones have been covered - mammoths had 5 hyoid bones; humans have one for comparative purposes). The entire sinkhole is now covered by the visitor center. These are a few of the photos I took during out visit.



Views of the mammoth site (where excavations continue)

There are spots in the sediment where you can see the last struggles of the mammoths as they tried to pull their feet from the mud. Here are a couple of photos.



Examples of bioturbation (where animals tried to lift their feet from the mud)

Here are a few photos of the site. Yes, I took many more. I didn't think anyone wanted to see multiple sets of mammoth teeth. If you want to see any in person, contact me as I have some in my personal collection (from Siberia).





Mammoth remains

[Learn more about Hot Springs Mammoth Site at Wikipedia](#)

Badlands, SD

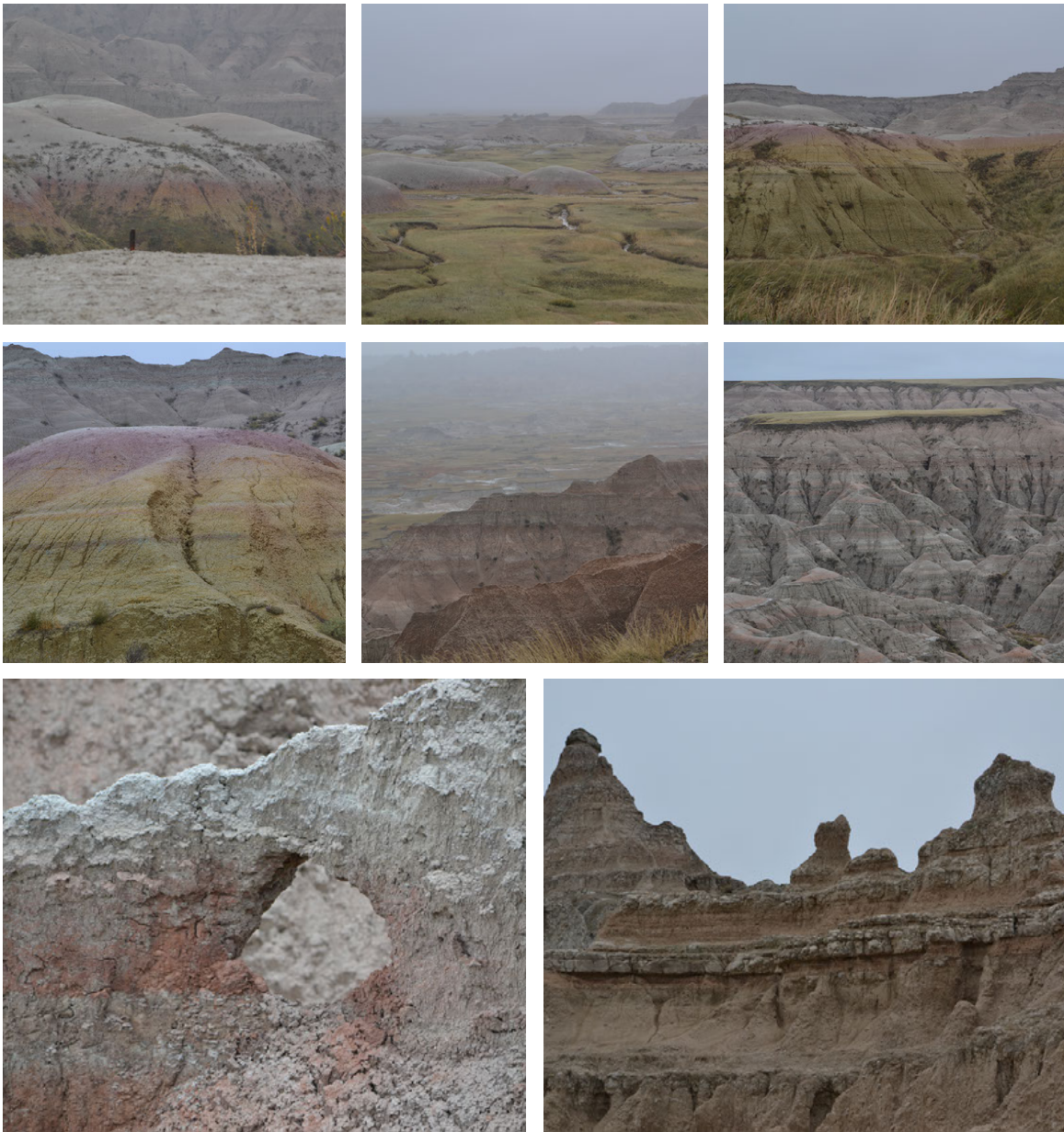
The Lakota called this place mako sica. This land looks desolate and forbidding, but it has supported humans for over 11,000 years. The Badlands began eroding about 500,000 years ago. Based on current erosion rates, they will erode completely in another 500,000 years. On average, these formations erode 1/3 inch each year.



Badlands formations (stratigraphy discussed below)

Stratigraphy

The oldest formation in the Badlands which is exposed is the **Pierre Shale**. These black layers were deposited at the end of the **Cretaceous Period** (roughly 75 to 69 million years ago). The upper layers of this shale are eroded into a yellow soil called Yellow Mounds and are an example of a fossil soil (paleosol). Overlying this is the **Chadron Formation** (which is grey in color) deposited between 34 and 37 million years ago via a river floodplain. This formation is known for many fossils, particularly mammals. Above this is the **Brule Formation (Oligocene Epoch - 34 to 30 million years old)**. This formation also contains sandstone (deposited from ancient rivers draining the Black Hills to the west). Red layers in this formation represent additional paleosols. A thick layer of volcanic ash was deposited on top of this (the Rockyford Ash). On top of this is found the **Sharps Formation** (28 - 30 million years old). Most of the peaks and canyons in the Badlands are formed within the Sharps and Brule formations. We followed the Badlands Loop Road as we drove from Wall, SD.



Badlands vistas

Of course, some photos require no explanation. Why this was here is anyone's guess.



Things that make me go hmm.

Since I have written a number of papers on ants over the years, it just didn't seem proper to not include at least one obligatory ant nest photo in this trip overview. This is a nest of a species of the seed harvesting ant genus [*Pogonomyrmex*](#). The area surrounding the nest entrance is kept clear of living plants and the mound surface is often covered with rock fragments.



Nest of seed harvesting ants in the badlands

[Learn more about Badlands National Park at Wikipedia](#)

Final thoughts

For those who don't know much about my background, I have degrees in entomology (I specialized in ant classification and biology), but I also have a solid background in geology (and was considering a career as a mining engineer at one point in my life). Since many insects were not readily observable given the time of year we visited the area, I focused on the geology of the area. Regardless of where I visit, I am always interested in the natural history of an area (and I am usually learning something new in the process). That is one of the great aspects of being interested in nature - there is always something new to learn through observation.

What I liked most about this trip was the ability to spend time with my son and eldest grandson. In today's frenetic pace of activities, it is rare that we get the chance to connect and spend time in long conversations. I relish these times. This is why I hope to have many more of these excursions (taking a

different grandson on each trip). I think we all learned more about each other (and a little more about the natural history of the area as well).



CREATED BY
Mark DuBois

♥ Appreciate

Credits:

Photos by Mark DuBois (except where noted)