Dinosaur

National Park Service
U.S. Department of the Interior

Dinosaur National Monument

Fossil Discovery Trail

Fossils along the trail include clam shell impressions, dinosaur bones, and fish scales.

Hike through millions of years of geologic time on the Fossil Discovery Trail. Each rock layer shows evidence of former ecosystems and extinct plants and animals that lived in landscapes quite different from what we see today. Long ago, dynamic forces pushed and tilted these layers upward. Then erosion exposed the layers as colorful mounds and ridges, full of signs of ancient life.

Getting Started

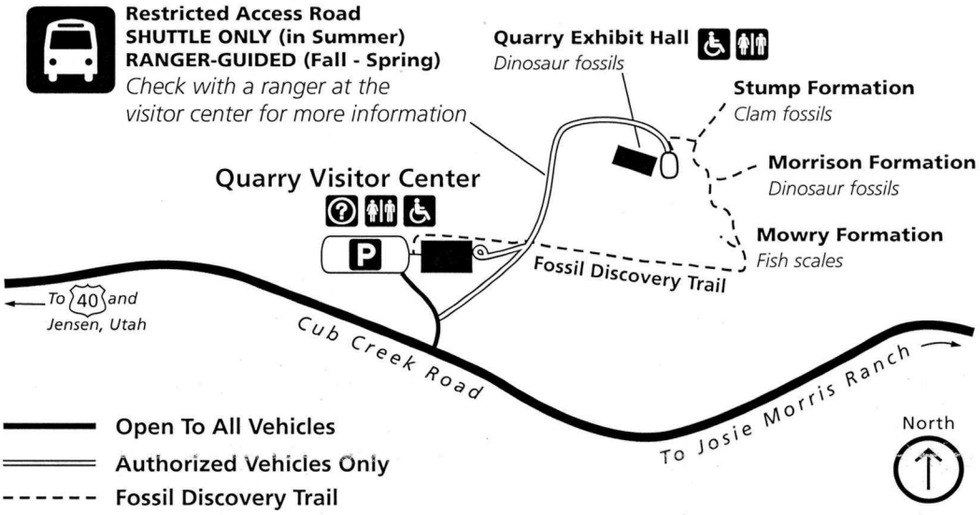
Trail Facts
Length: 1.2 mi/2 km one-way
Elevation change: 150 ft/46 m
Time to hike: about 1 hour
Rock layers exposed:
- Stump Formation
- Morrison Formation
- Cedar Mountain Formation
- Naturita Sandstone
- Mowry Shale
- Frontier Sandstone
- Mancos Shale

Geologic time exposed:
- Jurassic to Cretaceous

This guide describes the trail as hiked downhill from the Quarry Exhibit Hall to the visitor center. From the Exhibit Hall parking lot, follow the guard rail downhill (north) to find the trailhead. (You may also hike uphill from the trailhead located behind the visitor center.) Restrooms and water fountains are available during business hours near both trailheads.

Prepare for this rocky, sun-exposed trail by wearing good hiking shoes and dressing for the weather. In summer, bring plenty of water, sunscreen, and a sun hat. The trail is very muddy and slippery when wet.

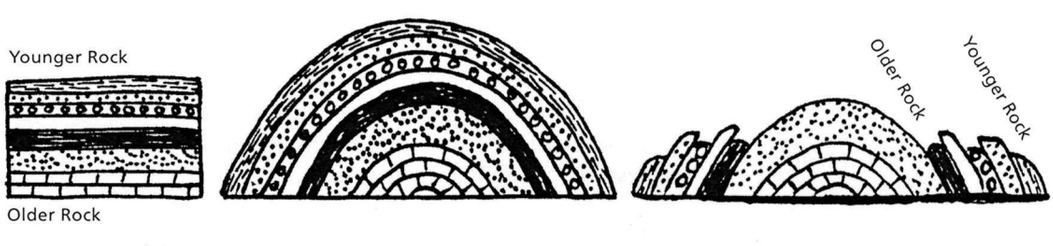
Please stay on the established trail and leave all plants, rocks, and fossils where you find them.



Split Mountain Anticline
The same tectonic forces responsible for the uplift of the Uinta and Rocky Mountains caused rocks in this area to rise and wrinkle on a grand scale. The trail travels through the edge of an arch, or anticline, where layers are tilted steeply to the south. On the other side of Split Mountain, the same layers tilt to the north.

As you begin your hike, take a moment to notice the dramatic tilt of the rock layers around you. These were once horizontal layers of sediment that eventually turned into flat-lying sedimentary rock, with older layers at the bottom and younger on top.

Between 50-70 million years ago, the rocks here were uplifted and folded into an arch, or anticline. Since then, much of the top of the anticline has eroded away, and what you'll hike through today are the younger layers flanking the anticline's south side.



Stump Formation

Where are the Stumps?
Despite its name, there are no tree stumps in the Stump Formation. This layer of rock formed from a sea-floor deposit that extended over a vast area. The Stump Formation gets its name for Stump Peak in Idaho where the formation was first researched in depth.

Start your fossil discoveries at the Stump Formation by turning left at the first trail junction. By the end of this trail spur, you will have traveled to 161-156 million years ago when this area was part of a large inland sea. The Stump Formation reveals evidence of an ocean environment with a large variety of life. Fossils in these rocks include belemnites (squid-like sea creatures), snails, ammonites, and bones of ichthyosaurs (a giant marine reptile that resembled a modern dolphin).

Cone-shaped fossils from the internal skeletons of belemnites are sometimes found in this area.

Find and feel many small indentations and bumps on the large rocks on the ground. These are impressions of saltwater clams. To explore a completely different type of environment, retrace your steps to the junction and continue down the main trail.

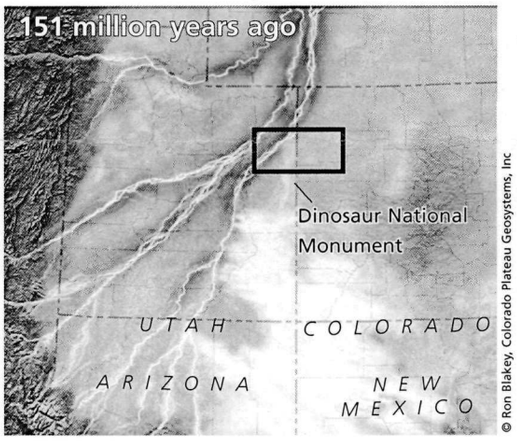
Morrison Formation

How do you date a rock?
One of the more accurate ways to determine the age of a geologic layer is to examine the ratio of different gasses trapped in crystals of volcanic ash. Geologists can calculate rates of radioactive decay using certain elements, including potassium, argon, uranuim, and lead, to estimate the age of a rock layer. A similar process is used in carbon dating, but only for much younger materials.

Each step leads you through rock layers with different colors, textures, and fossils. Sometimes these differences are subtle, sometimes striking. Most of the Morrison Formation is mudstone and clay, but watch for the trail spur that follows a sandstone cliff. This part of the Morrison Formation is made up of river-deposited sand and gravel. Based on radiometric dating of volcanic ash, in older and younger layers on either side of the sandstone wall, this layer is estimated to be about 151 million years old. Fossil fragments of dinosaurs are embedded in the cliff along with impressions of freshwater clams.

The Morrison Formation trail spur follows the same sandstone layer that is exposed in the Quarry Exhibit Hall. However, this cliff has not been worked on by paleontologists to make the bones easier to see. The first fossils along the spur are fragments that are shiny and dark orange in color. Some have a spongy-looking interior which contained bone marrow. Their texture is generally smooth and their size ranges from ½ inch to 10 inches in diameter.

As you hike along the cliff, the quality and size of the fossil bones increases. Just past the mid-point of the spur, the trail dips a few feet. From here, look up about 10 feet on the cliff face to see eight vertebrae. At the very end of the spur, a large femur rests in the rock. Sharp eyes can find more bones, depending on the angle of the sun.



This area was mostly dry and warm, similar to central Texas, when dinosaurs roamed what is now eastern Utah.

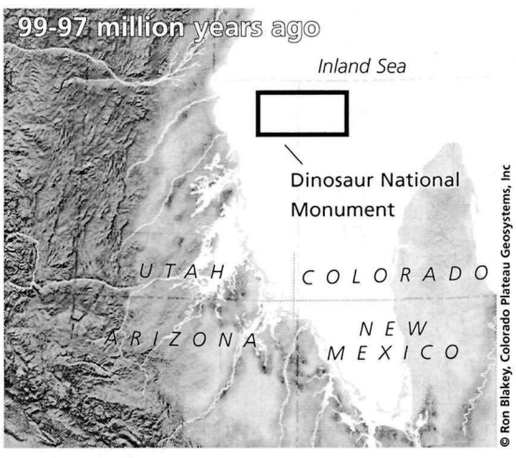
More than ten species of dinosaurs have been discovered in the Morrison Formation within the monument. They range in size from about seven inches to nearly 100 feet, with some sauropods exceeding 50,000 pounds. New research on non-dinosaur fossils such as small animals, plant remains, pollen, and insect trackways tell us more about the environment in which these animals lived. Based on this research, scientists believe that around 150 million years ago, the area was semi-arid and warm, with year-round streams. Ferns dominated the plant life, along with conifers, ginkgo trees, tree ferns and horsetail rushes.

When you return to the main trail, you return to the mudstone and clay layers of the Morrison Formation. Soon you will leave the Jurassic period and enter the Cretaceous, marked by a brown sandstone in the Cedar Mountain Formation. A new species of sauropod named *Abydosaurus* was recently found in this formation in the monument, proving that paleontologists still have much left to discover.

Mowry Shale

Which is the Mowry Shale?
Look for the silvery gray mounds of Mowry Shale between the prominent ridges of the Naturita and Frontier sandstones. The older Naturita Sandstone contains 100 million year old beach sand stained bright orange and yellow by iron-rich minerals. The younger Frontier Sandstone, formed from 90 million year old beach sediments, proved to be a good canvas for 1000 year old Fremont rock art.

The Mowry Shale is easy to overlook today, despite its fascinating history. Along the coast of an ancient sea, volcanoes (near the present California/Nevada border) spewed ash which fell into salty waters. By studying minerals decaying in the shale, geologists determined that the ash was deposited between 99 and 97 million years ago. The ash likely killed most fish swimming here. Currents at the bottom of the sea then scattered their scales. Look for tiny, shiny gray-to-golden fish scales fossilized in these rocks. Taking the time to discover even the tiniest of fossils can bring ancient ecosystems to life in our imaginations.



An inland seaway reached from the Arctic Ocean deep into North America, covering this area for millions of years.

Revised April 2021