

Geology and Paleontology Curriculum from Dinosaur Ridge Learning Resources for Grades 2 and 3

Who We Are

Dinosaur Ridge was founded in 1989 with the purpose of preserving the fossils on and near Morrison, Colorado, and educating the public about the natural history of the area. Our mission was later expanded to include the fossil sites at Triceratops Trail in Golden, Colorado. Our organization operates Dinosaur Ridge with the support of, and in partnership with, Jefferson County Open Space.

Our amazing outdoor museum features one-of-a-kind dinosaur fossils that evidence Colorado's prehistoric past. This online lesson plan will introduce you to the dinosaurs and other critters that roamed Colorado 100 to 150 million years ago and the environments and habitats they roamed.

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Photo Credits:

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Dinosaur Ridge Curriculum

A Guide to Our Educator Materials

HOW TO USE THESE MATERIALS

Lesson Roadmap

- ◆ Assign the pre-activity. This is the second option located in the combined grade level worksheets.
- ◆ Watch the learning videos at the provided web address using the access password you were given. You can think of each "stop" as a single lesson, or present more than once stop at once.
- ◆ Optional: Present the Google Slides along with the Q and A's. Helpful background information can be found in the presenter's notes and in this document.
- ◆ Assign the post-activity, also found on the worksheet listed above in step one.
- ◆ The additional worksheet options can be completed in class as supporting material or assigned as homework.

Grades 2 and 3

Curriculum Focus: Physical, Life, and Earth & Space Sciences from the new 2020 Colorado Academic Standards for Science

Goal: This content will serve as an online classroom version of our Dinosaur Ridge guided tour. Videos of our outdoor museum sites will give students a closer look at the fossils and geology unique to our location without having to leave their seats! Students will gain an understanding of how dinosaurs thrived in their habitats and how those habitats shifted over long periods of time and get a boost to their scientific curiosity, wonder, and excitement about paleontology and geology.

Second Grade Learning Standards:

SC.2.1.1 (Physical Science 1)
SC.2.2.2 (Life Science 2)
SC.2.3.1 (Earth and Space Science 1)
SC.2.3.2 (Earth and Space Science 2)

Third Grade Learning Standards:

SC.3.1.1 (Physical Science 1)
SC.3.2.2 (Life Science 2)
SC.3.2.3 (Life Science 3)
SC.3.2.4 (Life Science 4)
SC.3.3.1 (Earth and Space Science 1)

If you encounter difficulties creating a lesson, reach out to us for ideas. We are happy to help!



BACKGROUND INFORMATION

Dinosaur Ridge Tour Stop 1: Bone Bed

SC.2.2.2; SC.2.3.1; SC.2.3.2 & SC.3.1.1; SC.3.2.2; SC.3.2.3; SC.3.2.4; SC.3.3.1

Morrison Formation - Late Jurassic, 150 million years old

A **formation** is a group of layers that are of similar age and type. The rocks here are all **sedimentary** rock (made of layers of sediment), and they were laid down during river flooding events. In these ancient river layers are over a dozen fossil dinosaur bones!

The Bone Bed is located on the West, Red Rocks, side of Dinosaur Ridge. This photo, taken by James St. John, shows the layers of this formation. The tan chunky rock on top is the sandstone and the crumbly grey/green/maroon is the mudstone. These layers are above the Bone Bed.



This photo, also by James St. John, is a look at one of our dinosaur bones!

BACKGROUND INFORMATION

Dinosaur Ridge Tour Stop 1: Bone Bed

Video Q&A

1. What modern environment is similar to Denver 150 million years ago?

Answer: Denver in the Late Jurassic was a seasonal **floodplain** - similar to plains of modern-day north-central Africa. Rivers, lakes and streams were full during the wet season, but animals likely had to travel or migrate to find food and water during the dry season.

Morrison Formation Environment: <https://bit.ly/2RlyMPY>

Artwork by Brian Engh

2. How did the bones get here and why are they an incomplete jumble?

Answer: Rivers carried the bones from somewhere upstream. As the rivers made twists and turns, the water slowed down. This caused the bones to sink into the channel sand and be buried in the sediment (sand, dirt, and mud).

Analogy: Imagine having three puzzles together side by side. Break up chunks of the puzzles into pieces and toss them into a box together, shake the box up, and then open the lid and toss the pieces into a gusty windstorm. Come back 150 million years later and see if you can put the three different puzzles back together!

Dinosaurs:

- ◆ *Apatosaurus* (uh-pat-oh-sore-us) - Credit: Melinda McNaugher, Carnegie Museum of Natural History - <https://bit.ly/2xDgxVn>
- ◆ *Stegosaurus* (stay-go-sore-us) - Credit: Colorado Geological Survey - <https://bit.ly/2KhixoV>
- ◆ *Allosaurus* (al-oh-sore-us) - Credit: National Park Service: Dinosaur National Monument - <https://bit.ly/2VBm9rm>
- ◆ *Camarasaurus* (kuh-mare-oh-sore-us) - Credit: Mario Modesto Mata (Jurassic Museum of Austerias, Spain) - <https://bit.ly/2KcXBQ0>

3. How does something become a fossil?

Answer: What's the first step something has to take to become a fossil? Most of the kiddos will probably answer "DIE" but...it's actually opposite of that! Below is a question and answer style discussion suggestion you can have with your students on the basics of **fossilization**!

1. Being Alive! - A fossil is a remnant of something previously alive - that is the first key to fossilization. Can you tell me what kinds of things could become a fossil?

BACKGROUND INFORMATION

Dinosaur Ridge Tour Stop 1: Bone Bed

Video Q&A

2. Dying! - This is the bummer part! In order for something to become fossilized, the next step is that it has to die.
3. Buried! - A dead animal or plant branch or leaf can't sit at the surface for millions of years. Fairly soon after the animal or plant died, it has to be buried if it's going to become a fossil.
4. Turning to Stone! - After being buried deep in the ground, the original material of the would-be fossil begins to change. This change can take thousands to millions of years, and as the layers begin to harden, minerals in the sediment seep in and begin to replace the structure and harden. This process is called fossilization! We now have a fossil!
5. Discovery! - Being a fossil doesn't end there. If no one had found *Tyrannosaurus rex*, would we know what it was? No! Discovery is the super important last step!

Stegosaurus Plate Fossil Video

Our Bone Bed is famous as the discovery site for the world's first *Stegosaurus* fossil!

The name means "roofed lizard", as it was originally thought by paleontologist Othniel Charles Marsh that the cool plates on the back laid flat like sections of a turtle shell. We now know that they stood upright in a single row tilting left and right as they ran down the neck and back.

Early *Stegosaurus* depiction by Frank Bond, 1899: <https://bit.ly/2XNK3m3>

Fun Fact: Stego Tails are Weird

Stegosaurs have a special tail. Instead of the end being covered in plates like the back, it's got anywhere from 4 to 6 spikes! These spikes are called the *thagomizer* (thag-oh-my-zer). The name came from a *Far Side* comic in 1982 by Gary Larson: <https://bit.ly/3aochGU>.