

## Geology and Paleontology Curriculum from Dinosaur Ridge Learning Resources for Grades 4 and 5

### 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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# 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 4 and 5

**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.

#### Fourth Grade Learning Standards:

SC.4.2.1 (Life Science 1)  
SC.4.3.1 (Earth and Space Science 1)  
SC.4.3.2 (Earth and Space Science 2)  
SC.4.3.3 (Earth and Space Science 3)  
SC.4.3.4 (Earth and Space Science 4)

#### Fifth Grade Learning Standards:

SC.5.1.1 (Physical Science 1: C.C.)  
SC.5.3.3 (Earth and Space Science 3)

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



### BACKGROUND INFORMATION

#### Dinosaur Ridge Tour Stop 5: Bone Bed

SC.4.2.1; SC.4.3.1; SC.4.3.2; SC 4.3.3 & SC.5.1.1 (Cross-Cutting); SC.5.3.3

#### 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 5: 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.

Artwork by Brian Engh - Morrison Formation Environment: <https://bit.ly/2RlyMPY>

#### 2. How did the bones get here and what is the evidence?

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). The channel layers are pinched on the sides showing where the layer was cut off by a flowing river, and that's what tells geologists/paleontologists that rivers were here.

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/2KcXBO0>

#### 3. What is a unique structure seen in the Allosaurus back bone? What animal today has that structure?

Answer: Allosaurus had hollow back bones (vertebrae). The hollows in the bones were filled with air sacs, and that helped make them lighter and more flexible. Birds inherited their hollow bones from their dinosaur ancestors.

Note: Birds evolved from a small branch of raptor-like meat-eating dinosaurs, and not from Allosaurus or long-necked dinosaurs. BUT - they all still had these hollow bones in their necks and backs because all dinosaurs have common parts to their DNA that was passed on to birds via adaptation and evolution.

#### Fun Fact: Stego Tails are Weird

Stegosaurus 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>.