

Bureau of
Land Management

Marsh - Felch Dinosaur Quarry



A Bone War Battlefield

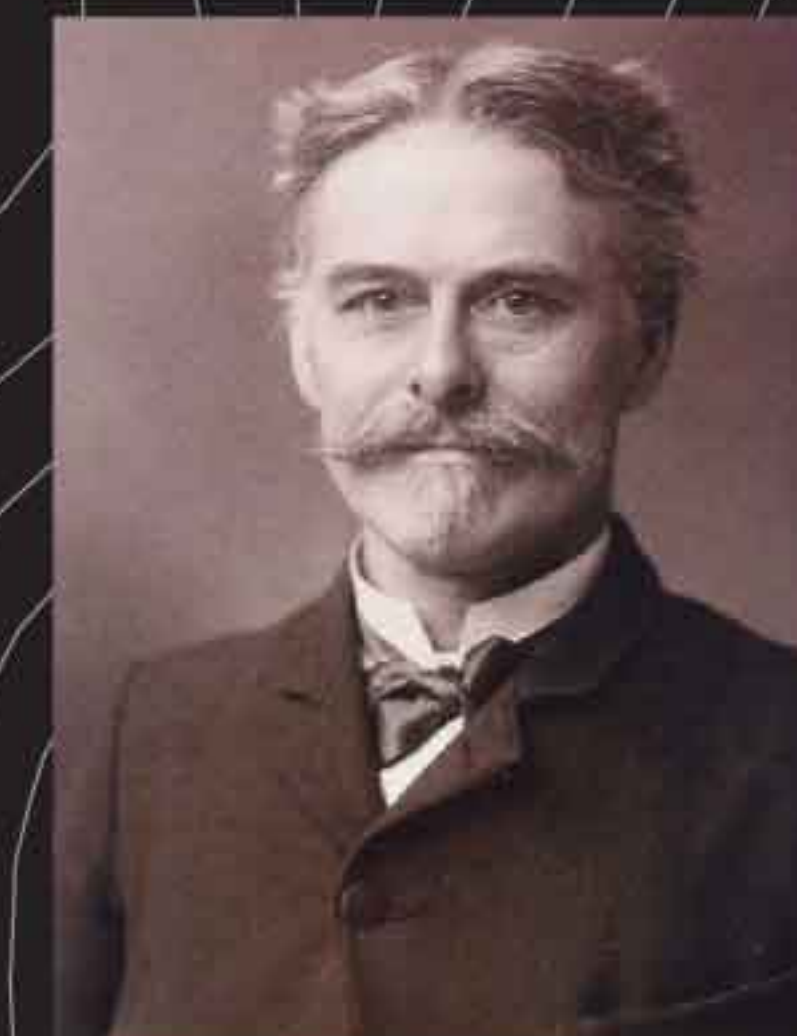
During the late 1800s, two paleontologists, Othniel Charles Marsh of Yale University's Peabody Museum and Edward Drinker Cope of Philadelphia's Academy of Natural Sciences, became bitter rivals as they competed to name the most new species of dinosaurs and other prehistoric animals. This bout became known as "The Bone Wars."

Marsh organized and funded an excavation on top of the cliff in front of you. A local man, Marshall Felch, was hired to exhume the massive fossils and send them by train to Marsh in Connecticut. The fossils found here represented the first of many new genera and species, including *Stegosaurus*, *Allosaurus*, *Ceratosaurus*, and *Diplodocus*.

Cope funded a quarry just one mile west of Marsh's quarry. There, another local man, Oramel Lucas, also discovered and shipped brand new dinosaur species to the east coast, including *Apatosaurus* and *Camarasaurus*. In a rush to name more new species than Marsh, Cope published notoriously brief papers, often lacking anything more than a short description.

Legends of sabotage surround the two paleontologists, from hiring spies to work undercover in the opponent's field crews to destroying fossils and quarries with dynamite. These stories are mostly unproven, but clearly, the two were willing to go to extreme measures to outperform each other. Many of their publications and papers directly attacked and questioned each other's work.

In the end, both paleontologists made great contributions to their field, even though the rivalry led to the destruction of many fossils and financial ruin for both men. Marsh's 80 new dinosaur species outnumbered Cope's 56; however, Cope devoted much of his time to fossilized mammals.



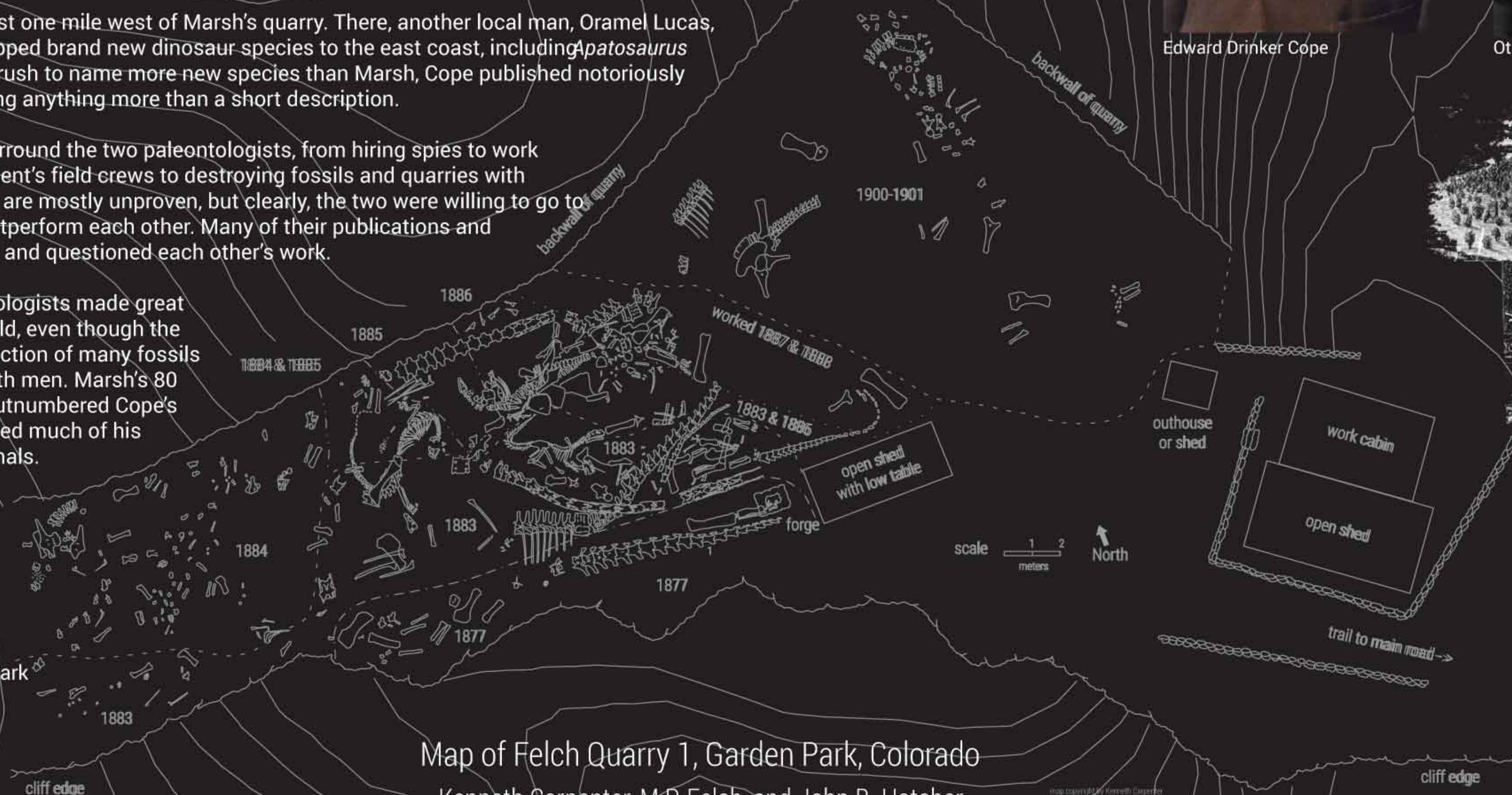
Edward Drinker Cope



Othniel Charles Marsh



Binkley and Hartwell



Map of Felch Quarry 1, Garden Park, Colorado

Kenneth Carpenter, M.P. Felch, and John B. Hatcher

map copyright by Kenneth Carpenter
April 2, 1988

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Marsh - Felch
Dinosaur Quarry



The Marsh - Felch Dinosaur Quarry

Marshall P. Felch was born in 1834 in Vermont and worked as a shoemaker until serving in the Civil War, where he managed field hospitals. In 1867, he moved by wagon to Colorado and began working as a freighter, hauling supplies into mining camps in the Leadville and Breckenridge area. He then settled here in Garden Park with his wife and four children and started farming.

After fossils were discovered near his farm, Felch went to work for Professor O.C. Marsh of the Yale Peabody Museum in New Haven, Connecticut, excavating dinosaur bones. Felch implemented new excavation techniques, enabling fragile bone encased in hard rock to be removed and reassembled at Yale. The quarry across from you was the most productive site Felch found; more than 270 crates of a wide variety of bones were excavated over an eight-year period. Three virtually complete, articulated skeletons, including the *Stegosaurus* and *Ceratosaurus* shown below, have been on display in the Smithsonian since 1910.

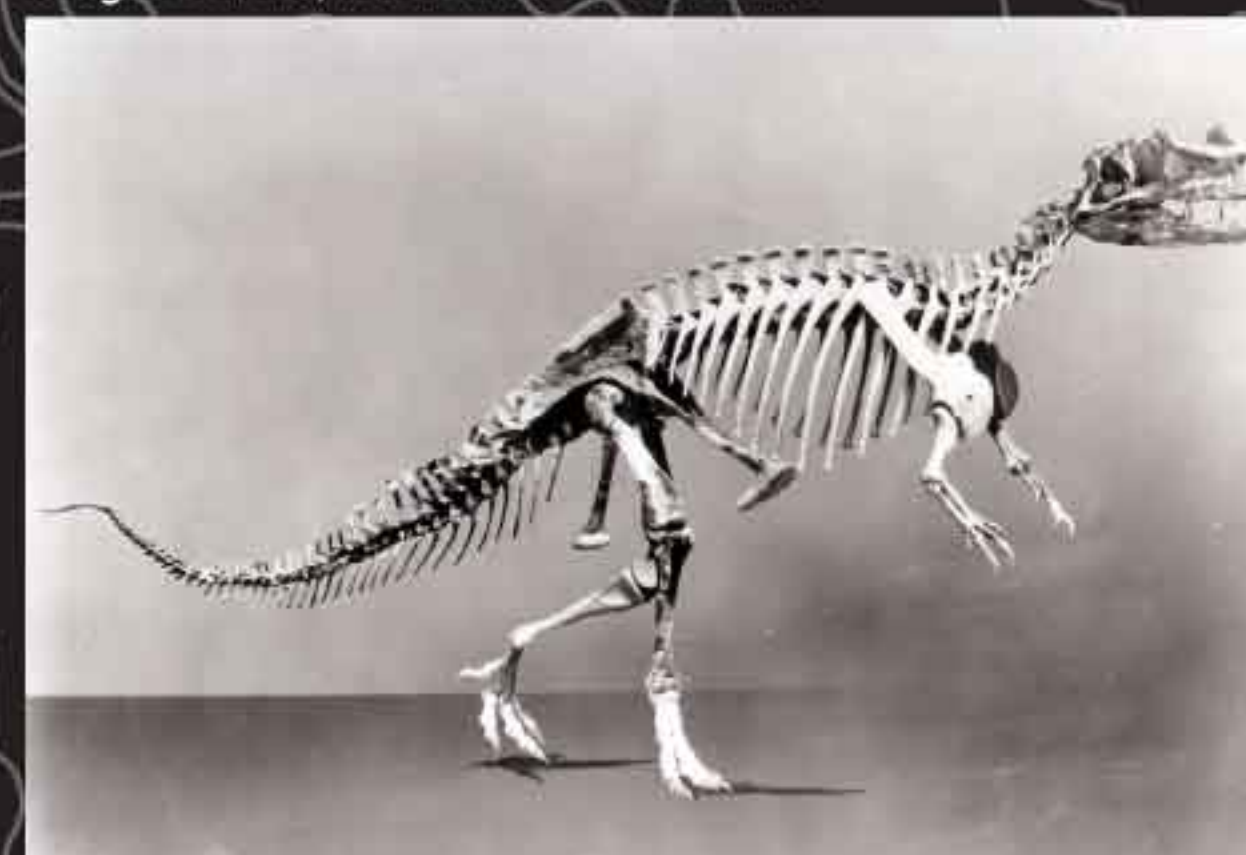
Courtesy of the Felch Family



Marshall Felch with a medal earned in the Civil War



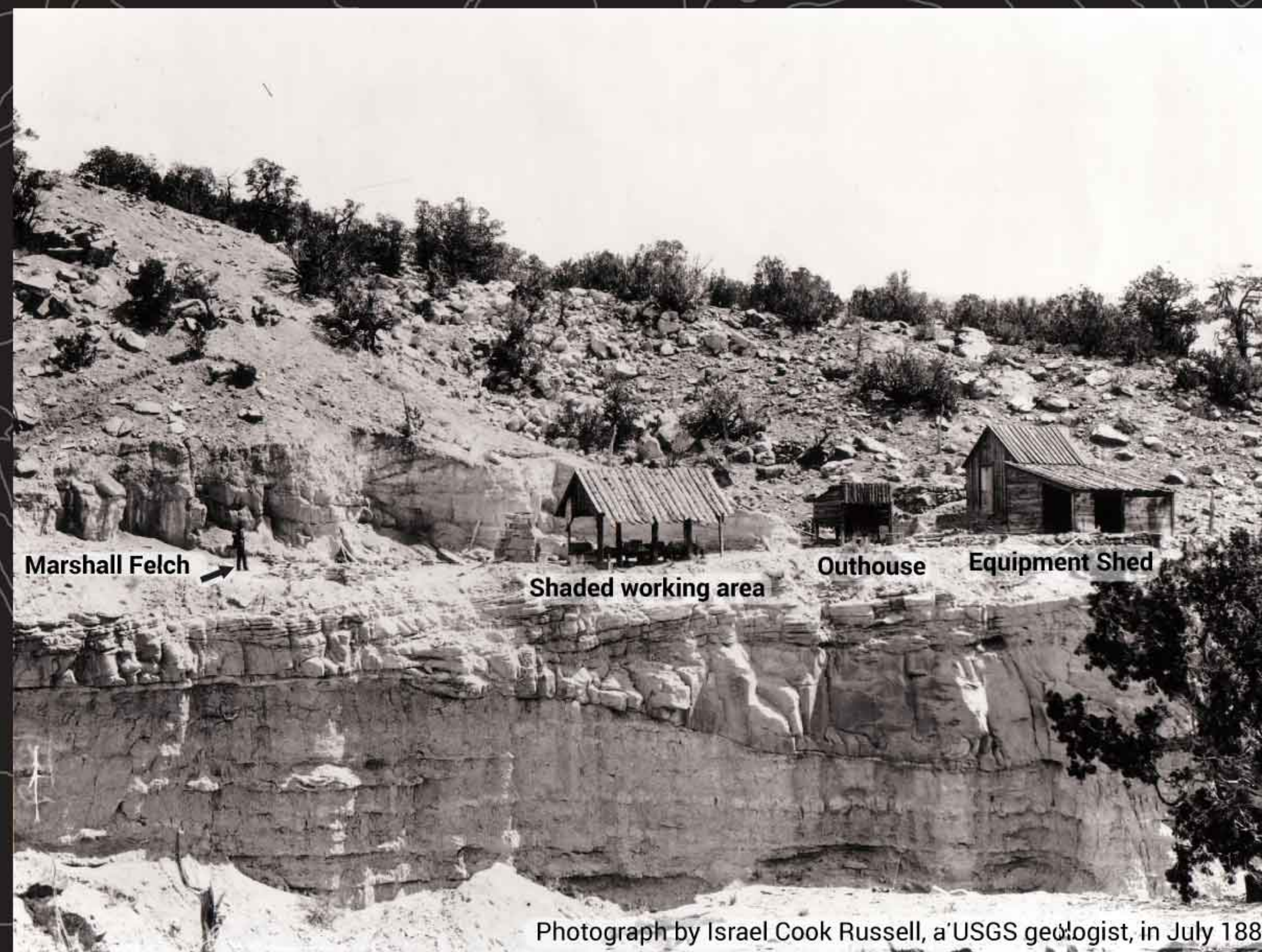
Stegosaurus, nicknamed 'Roadkill'



Ceratosaurus mounted at the Smithsonian

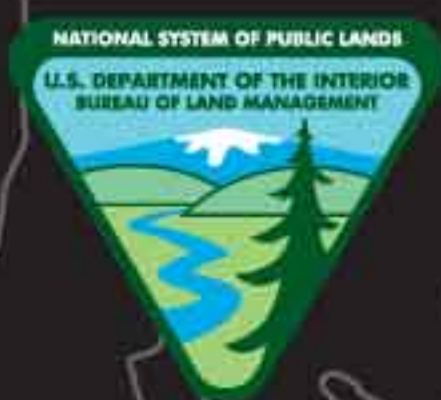
Garden Park Paleontological Society

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"The work of removing fossils from this quarry calls for a vast amount of ability skill and patience, sometimes more than I possess – and is like dislodging an enemy from some strongly fortified position – only there the more damage done the better the work – while here we must take the fortress and all belonging with it without a scratch."

Marshall P. Felch, January 6, 1885



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Cleveland-Delfs Dinosaur Quarry



The Cleveland-Delfs Quarry

Across Fourmile Creek from where you stand was the site of a major dinosaur excavation. In 1954, Edwin Delfs, a zoology student at Yale University, joined the Cleveland Museum of Natural History on a fossil-hunting expedition throughout Colorado and Utah. After receiving a tip from geology students from Louisiana State University, Delfs guided his group of high school students to Cañon City. Upon arrival, the group discovered several large bone fragments and filed for a mining claim to prevent losing the fossils to uranium prospectors.

The layer of mudstone where the fragments were found, was sandwiched between two layers of hard sandstone. As the crew excavated the mudstone, they kept the upper sandstone in place with large timbers, creating a tunnel-like cavity into the cliff. During the next three years of excavating, Delfs and his inexperienced group decided to bulldoze the hillside and blast the sandstone with dynamite. These methods are extremely dangerous and not recommended.



Edwin Delfs setting a charge beneath an unstable rock shelf



Towing a field jacket across Fourmile Creek

The fossils were packed into field jackets, hard plaster shells wrapped around the fossils to protect them. At times, Fourmile Creek would experience flash floods. Transporting the jackets, weighing up to 2,500 pounds, across the creek was as dangerous as the methods used to extract the fossils from the rock. Wooden rafts, towed by a small bulldozer, carried the jackets across the creek.

In the end, the daring crew excavated about 60 percent of a *Haplocanthosaurus*, a large sauropod dinosaur with a long neck. Known as "Happy," this remarkably well-preserved skeleton is currently on display at The Cleveland Museum of Natural History. Of the four known *Haplocanthosaurs* discovered, the one from this quarry is the only specimen complete enough to be mounted in a museum. Despite the incredible preservation and completeness, no one has found a *Haplocanthosaurus* skull yet.

"Happy" on display at the Cleveland Museum of Natural History exhibits a skull modeled from a composite of similar sauropods.



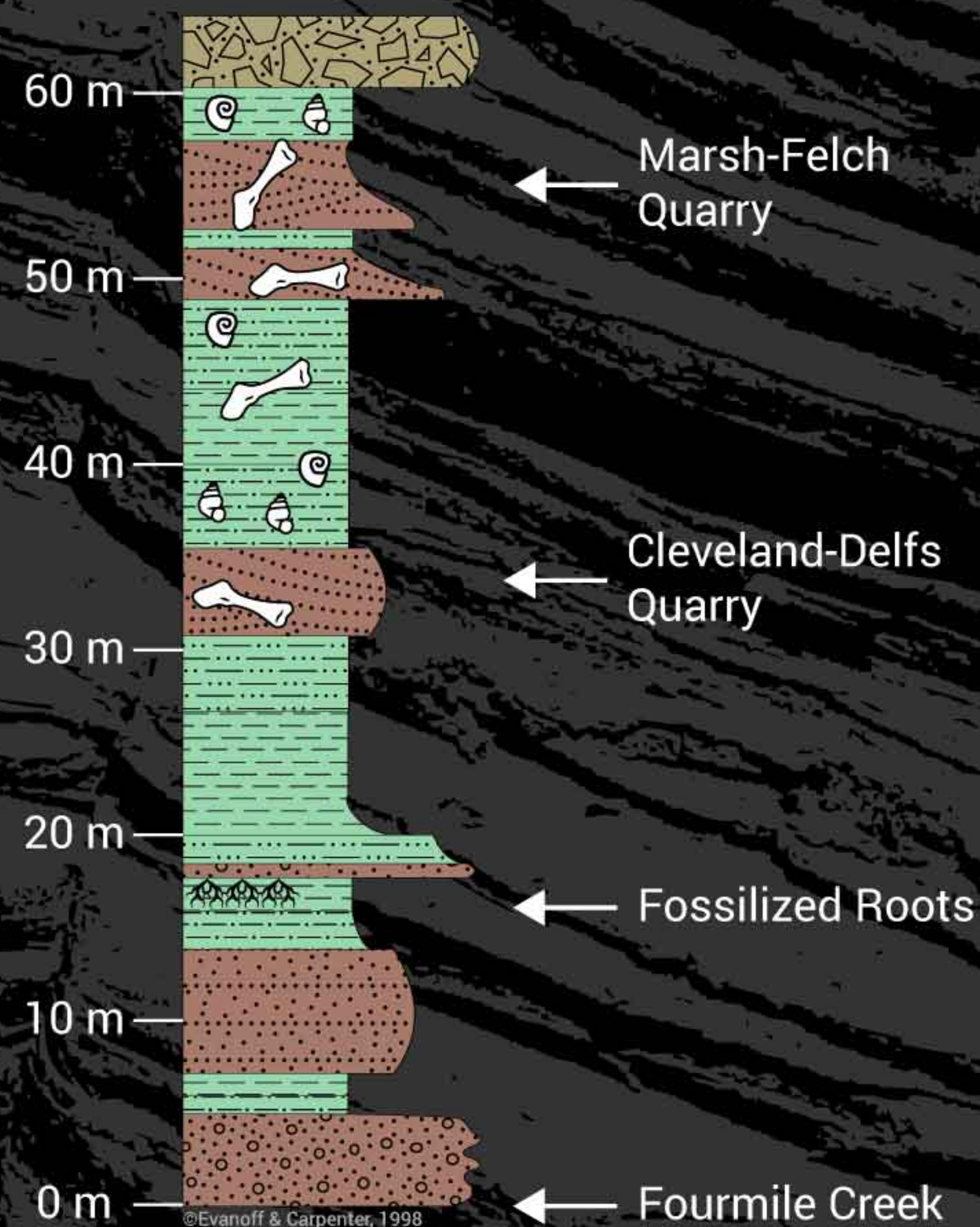


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The Morrison Formation



Stratigraphic Column of the Lower Morrison Units



The Morrison Formation

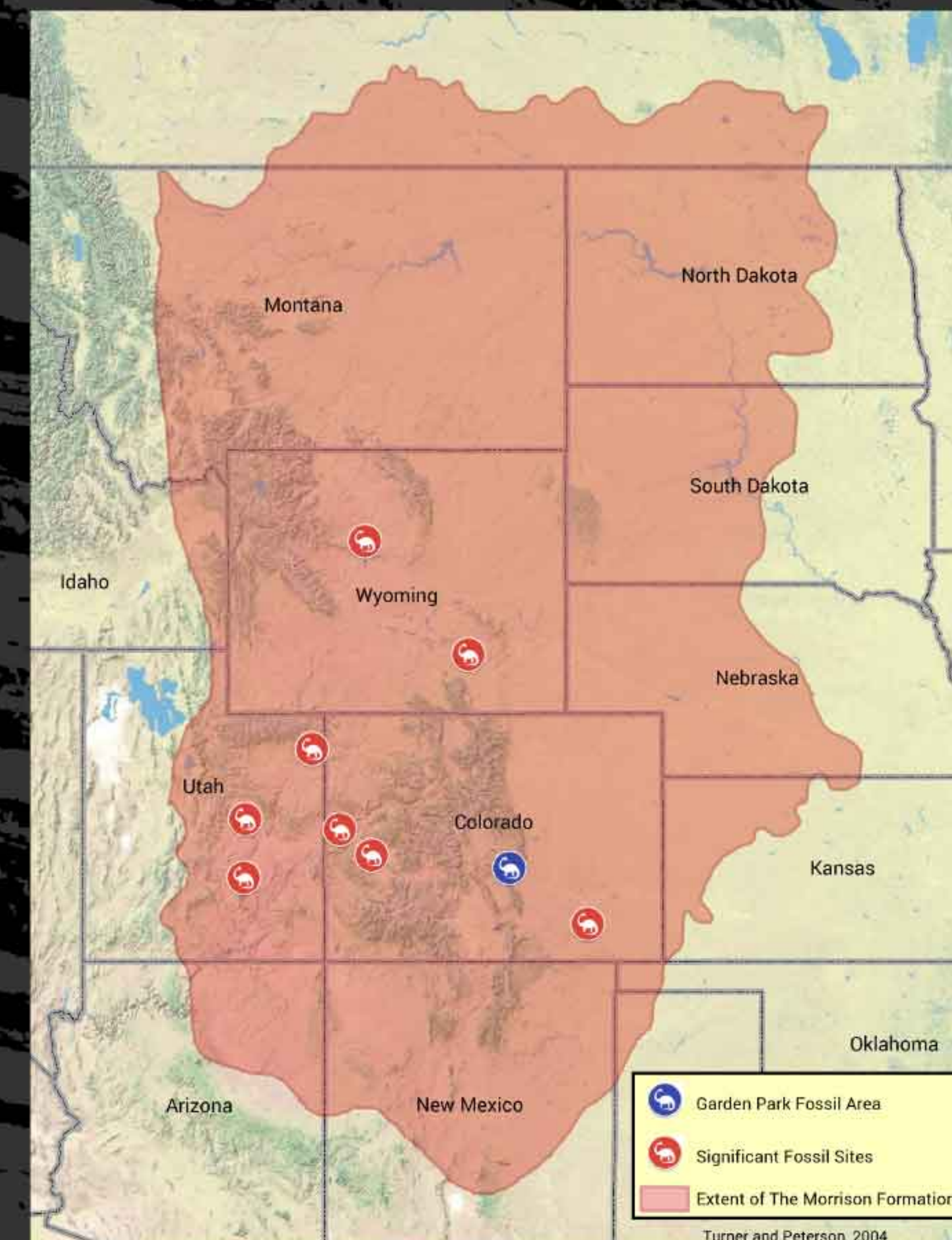
Look for the red and green rock layers around you. This is the Morrison Formation that extends for 600,000 square miles throughout the Western United States. The majority of the formation is covered by other rock layers. The few areas where the Morrison Formation is exposed excite paleontologists and geologists because they preserve large amounts of highly detailed fossils. Through studying these areas, researchers are able to gain a clearer understanding of what the world looked like during the Jurassic Period.

This area was a vast floodplain in a semi-arid environment 155 million years ago. Frequent flash floods covered the banks of streams in muddy silt, while pools in the streams collected coarser sands. Over the course of 10 million years, these streams continued to stack sediments on top of each other. Now, those sediments have been compressed into 280 feet of mudstone and sandstone.

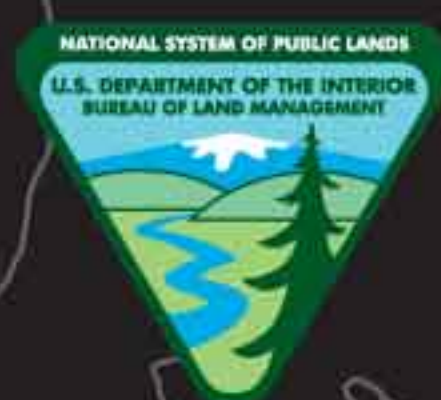
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NPS Artwork by Bob Walters and Tess Kissinger



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Marsh Quarry Interpretive Trail



Welcome to Garden Park

Beginning in 1877, fossil discoveries in Garden Park revealed enormous plant-eating dinosaurs to the world. Continued exploration uncovered large concentrations of bones from a wide variety of dinosaurs. Paleontologists have also excavated plants, fish, turtles, crocodiles, lizards, mammals, frogs, crayfish, and clams, representing 10 million years of late Jurassic history. Discoveries in the Garden Park Fossil Area continue to this day, and each new find gives a clearer understanding of what this area was like 155 million years ago. If you make a discovery of your own, please leave the fossil where it is and alert the local Bureau of Land Management office in Cañon City. Please remember, collecting vertebrate fossils from public lands without a permit is illegal.



Camarasaurus bones in one of Cope's quarries named Saurian Hill.

Local residents have played an important role in the dinosaur discoveries. They alerted rival paleontologists to the presence of fossils and did the "dirty work" of excavating the fossils. Marshall P. Felch, a local rancher, worked for many years in this area for O.C. Marsh of Yale University. He excavated fossils, mapped their locations, and shipped them to Professor Marsh in Connecticut by train. Today, his detailed notes, maps, and letters are important scientific and historic records.

Meanwhile, Oramel Lucas, a schoolteacher in Garden Park, did very similar work for E.D. Cope of The Academy of Natural Sciences in Philadelphia. The Cope-Lucas quarries were about one mile northwest of here. The dinosaur Lucas found most frequently was *Camarasaurus*, a 75-foot-long, 50-ton, long-neck sauropod.

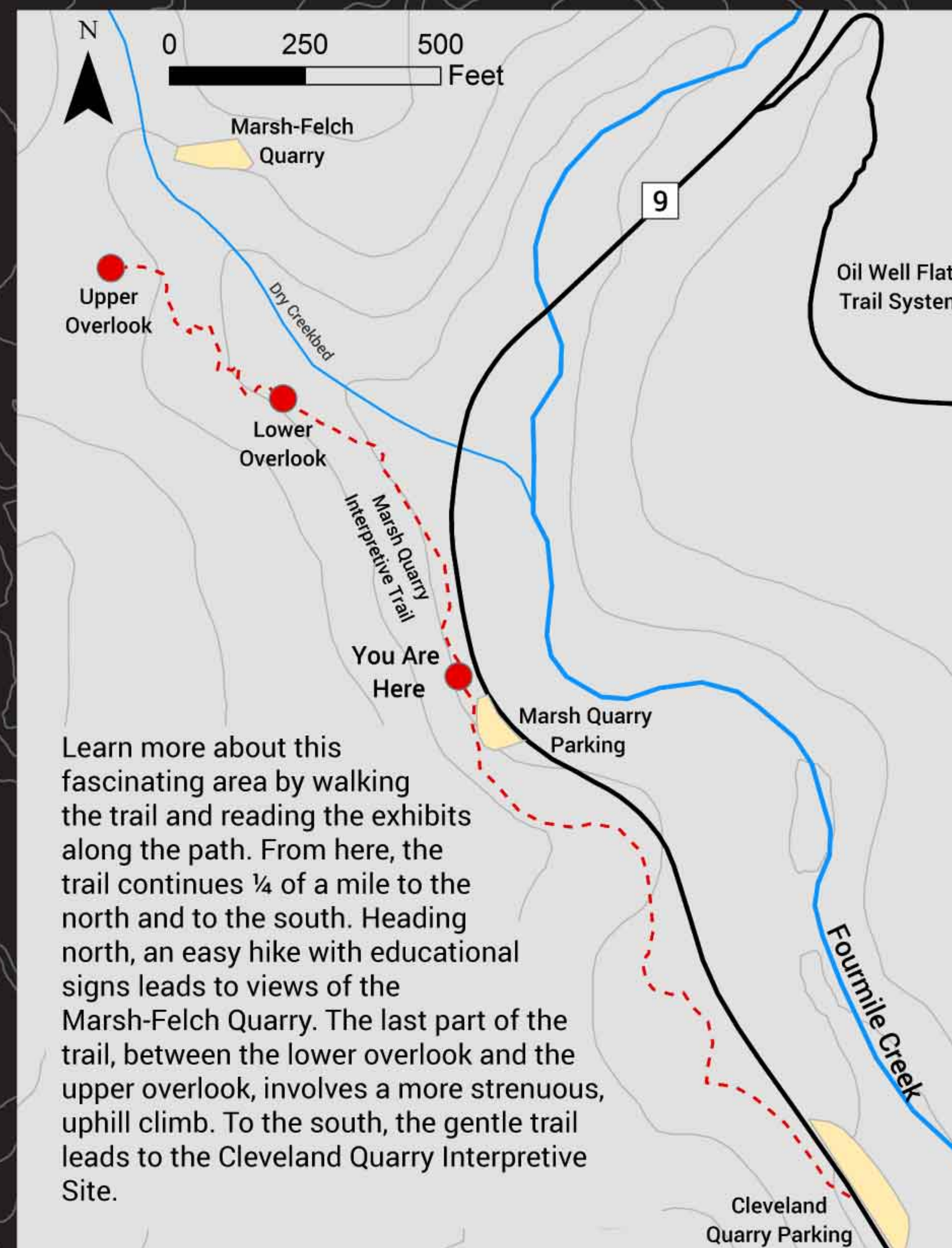


Skull of *Goniopholis*, a type of crocodile found in Garden Park.

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Learn more about this fascinating area by walking the trail and reading the exhibits along the path. From here, the trail continues $\frac{1}{4}$ of a mile to the north and to the south. Heading north, an easy hike with educational signs leads to views of the Marsh-Felch Quarry. The last part of the trail, between the lower overlook and the upper overlook, involves a more strenuous, uphill climb. To the south, the gentle trail leads to the Cleveland Quarry Interpretive Site.

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Garden Park
Fossil Area



Where Have The Fossils Gone?

Each year, tens of millions of people marvel at the dinosaurs from the Garden Park Fossil Area in museums across the country. In the early and mid-1900s, museums were in search of large dinosaurs to become the centerpieces of their new exhibits and a few found them here. The *Stegosaurus* at the Denver Museum of Nature and Science (in the far right photo) was found here in Garden Park in 1936 and is Colorado's State Fossil.

Discoveries continue to be made in Garden Park; as the rock erodes, new fossils are unearthed. In 1992, a crew from the Denver Museum of Nature and Science discovered the world's most complete *Stegosaurus*. This find has helped deepen our understanding of how *Stegosaurus* looked and behaved.

Garden Park is unique because of the large number of detailed and whole skeletons found here. Only the most complete and best-preserved are showcased. However, the majority of fossils collected are rarely displayed. Small pieces are valuable to a museum's collection and reveal new information as scientists learn more and develop new methods for researching fossils. To the right are three specimens from Garden Park housed at the American Museum of Natural History in New York.

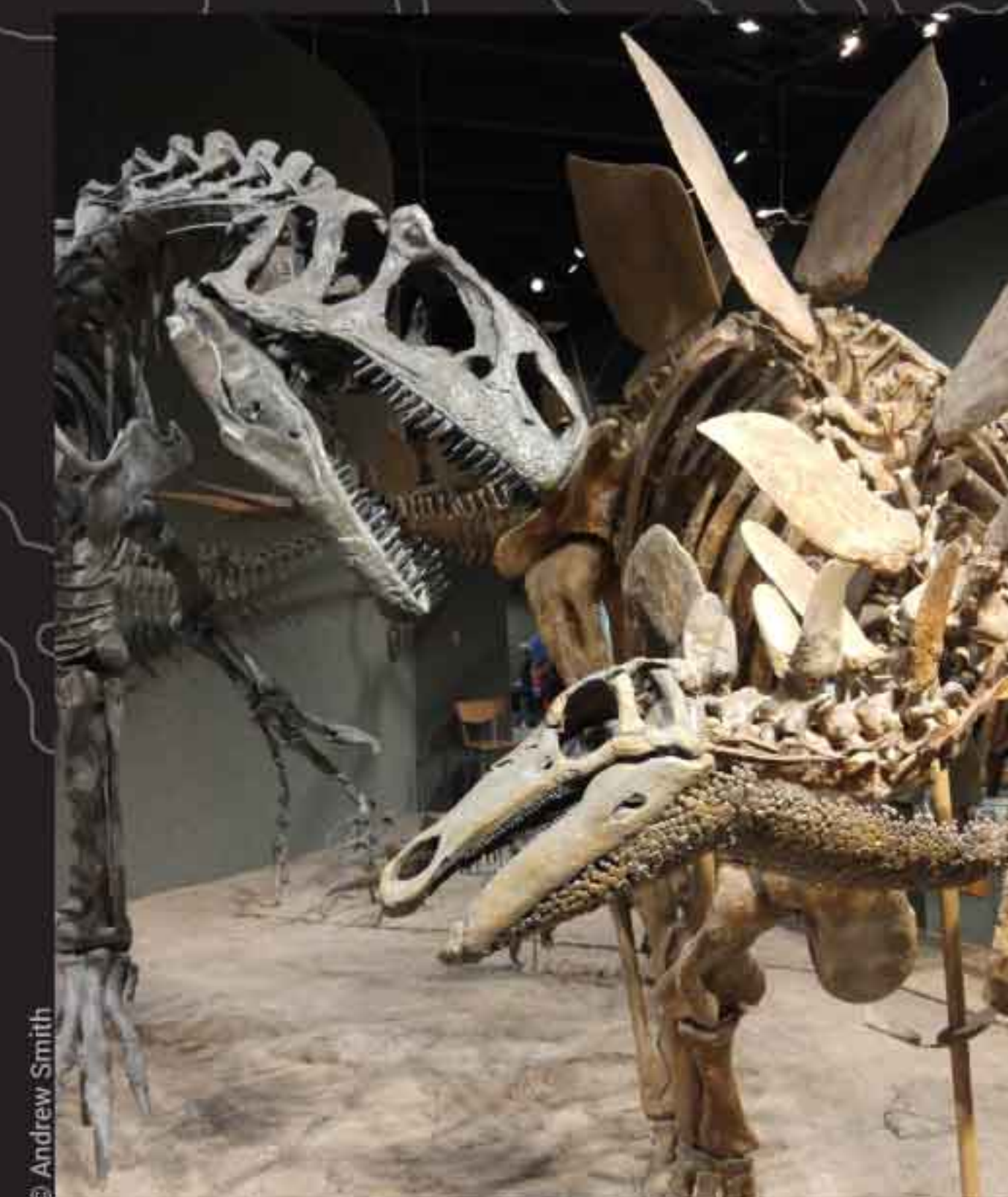
Visit the Royal Gorge Regional Museum and History Center in Cañon City, the Denver Museum of Nature and Science, or any of the museums listed below to see magnificent examples of Garden Park's dinosaurs for yourself!



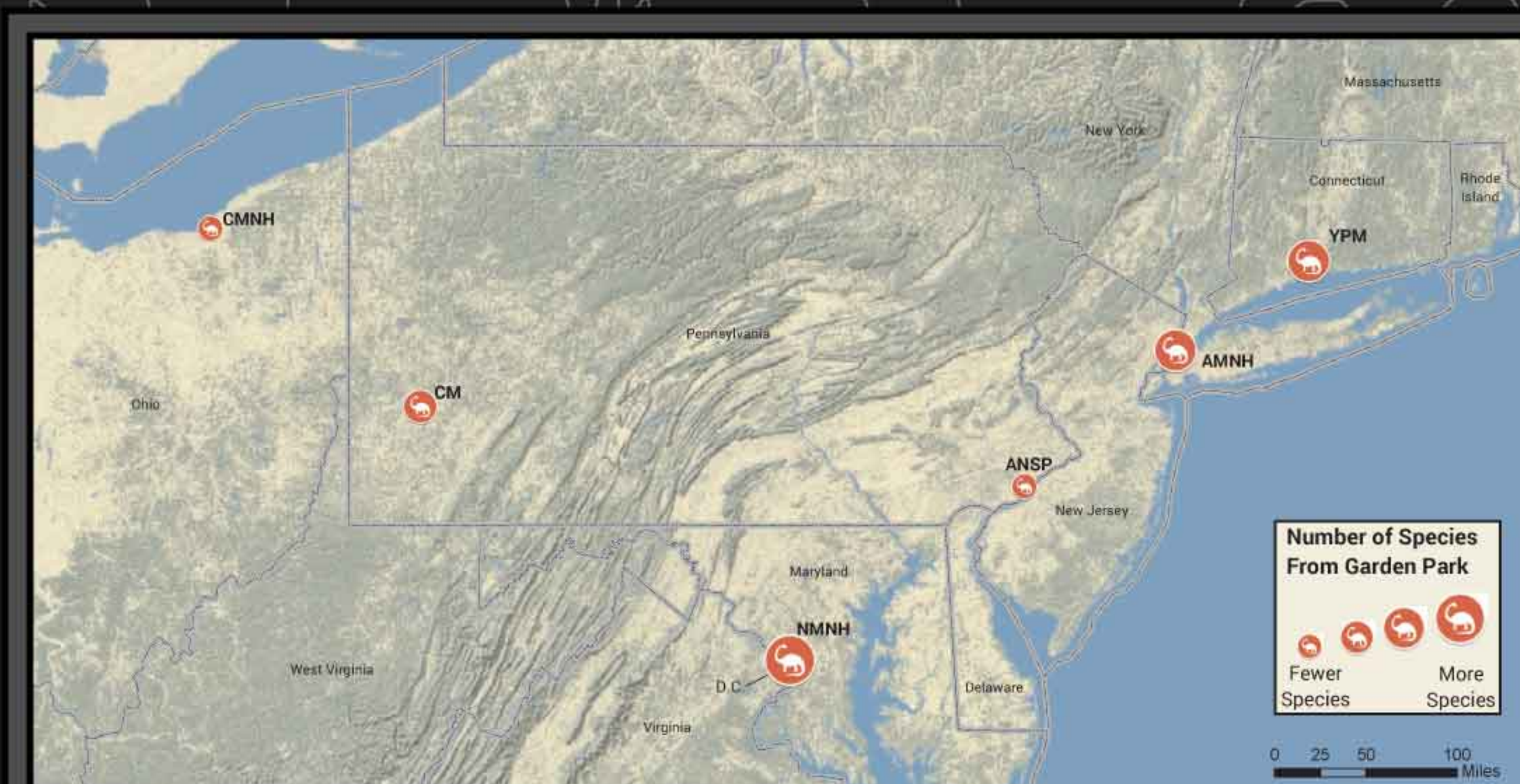
Top left:
Camarasaurus
vertebra

Top right:
Allosaurus tooth

Bottom:
Dryosaurus tibia



An *Allosaurus* (left) and a *Stegosaurus* (right)
at The Denver Museum of Nature and Science



ANSP - Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania

AMNH - American Museum of Natural History, New York, New York

CM - Carnegie Museum of Natural History, Pittsburgh, Pennsylvania

CMNH - Cleveland Museum of Natural History, Cleveland, Ohio

DMNS - Denver Museum of Natural Sciences, Denver, Colorado

RGRM - Royal Gorge Regional Museum and History Center, Cañon City, Colorado

NMNH - National Museum of Natural History, Smithsonian Institution, Washington D.C.

YPM - Yale Peabody Museum of Natural History, New Haven, Connecticut

Visit HandsOnTheLand.org/Garden-Park for an interactive version of this map.





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Tony's Tree
Excavation Site



Brandegee Buckwheat: A Rare Plant Among Rare Fossils



© Susan Spackman

Colorado's Wealth of Rare Native Plants

The Brandegee wild buckwheat, or *Eriogonum brandegeei*, represents only one of more than 200 rare plant species native to Colorado. To discover the key to Colorado's plant diversity, look at the landscape around you. The canyons, mountains, and foothills here provide just a small sample of Colorado's variety of terrain. These places, with so many differences in geology, soil, temperature, and moisture, provide the perfect conditions for many different plant species to flourish. If you look closely, you may see this rare plant growing along the trail!



© Andrew Smith

Geology is Key to Rare Plants and Fossils

Paleontologists, scientists who study ancient life, identify areas to search for fossils based on geology. They know that certain types of rocks often bear fossils. Botanists, scientists who study plants, also use their knowledge of geology to identify areas to search for rare plants. They know that rare plants often grow in soils formed from specific types of rock. The Morrison Formation here in Fremont County and the Dry Union Formation in Chaffee County are the only rock types where the Brandegee buckwheat grows.



Garden Park Paleontological Society



© Andrew Smith

Tony's Tree

In May 1998, Tony Moreno of Colorado Springs made an exciting discovery on his 15th birthday. While hiking this trail with his classmates, Tony found an unusual rock. This rock turned out to be a 20-foot-long, 155-million-year-old tree! It took three months to excavate this rare tree — the only Jurassic tree found east of the Continental Divide. Today, you can see Tony's Tree below the *Stegosaurus* cast at the Royal Gorge Regional Museum and History Center in Cañon City.