

## HOW DID THOSE RED ROCKS GET THERE?

All these sedimentary rock layers formed horizontally in their various environments. A mountain building event, called the Laramide Orogeny, occurred between 70-40 Ma, and was the secondary result of tectonic movements. This mountain uplift caused the once flat rock layers to become vertical.

Approximately 5 Ma ago, another uplift occurred, adding about 5,000 feet to the existing mountains. Now exposed to various erosional forces, the rock layers have formed the Garden of the Gods Park.



*“Geologist have a saying—  
rocks remember”  
—Neil Armstrong*

Please visit the **Garden of the Gods Visitor and Nature Center** for more information on the Park. Explore the interactive galleries, and also see the 14-minute, Geo Trekker theater experience, detailing how the park was formed.



All nine of the Gateway to Geology trail markers are made from regional quartzite. Quartzite is a metamorphic rock that began as sandstone. No metamorphic rocks originate, or are formed within the Garden of the Gods Park. This quartzite was quarried approximately 50 miles to the south of Colorado Springs, near the towns of Penrose, and Florence, Colorado.



## GATEWAY TO GEOLOGY

### Journey Through Time



is sponsored by  
**Friends of Garden of the Gods**,  
a non profit organization in support of  
the Garden of the Gods city park.

Want to learn more about FOGG?  
Go to [www.friendsofgardenofthegods.org](http://www.friendsofgardenofthegods.org)

## GATEWAY TO GEOLOGY

### Journey Through Time

Garden of the Gods Park  
Colorado Springs,  
Colorado



Geologists are the real time travelers.

Using clues from the rocks and soil, they piece together Earth's past showing us events and environments from long ago.

Garden of the Gods has undergone significant geologic changes spanning over 300 million years. Ancient mountains, deserts, oceans, and glaciers have all had their time here. The rock layers left behind give evidence of this changing landscape.

This brochure will help explain these environments and the rock layers that formed as a result.

Begin your own journey at Garden of the Gods Park and travel through millions of years of geologic time.

# Begin . . . Your Journey Through Time at the Visitor and Nature Center

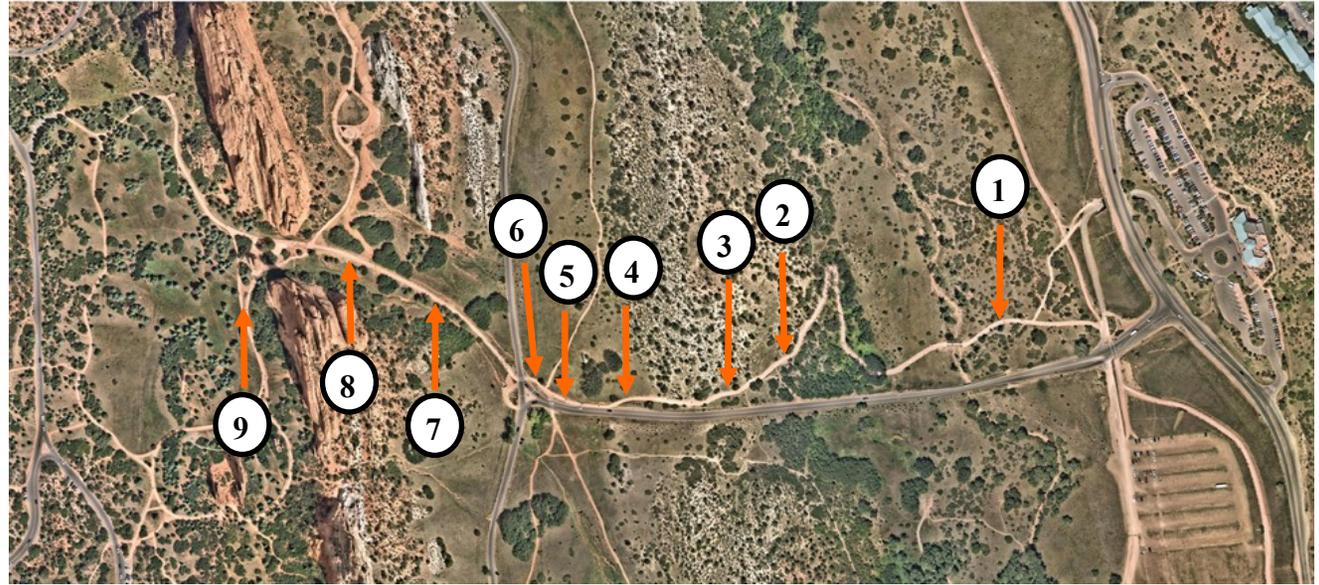
## TRAIL STARTS:

Use the tunnel on the west side of the Visitor and Nature Center's parking lot to safely cross under 30th Street. The Gateway Trail begins on the west side of the tunnel.

Trail markers with specific information for each rock layer are noted on the aerial map.

### Map Key

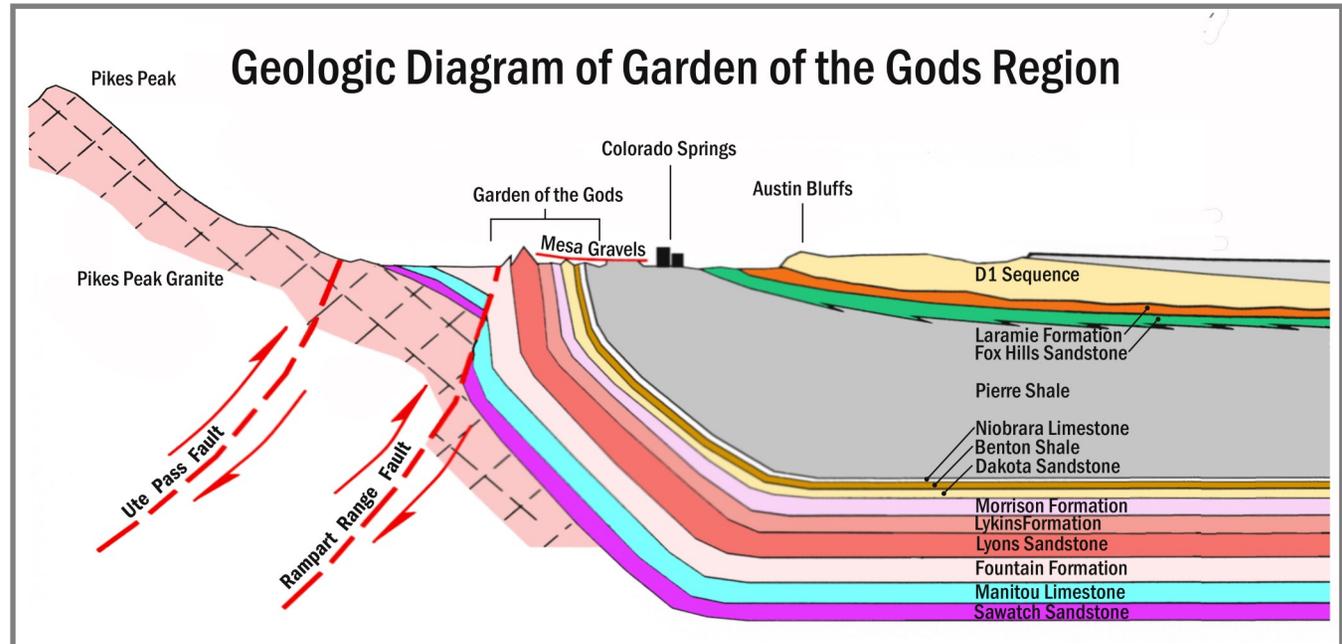
- |                |            |
|----------------|------------|
| 1 Pierre Shale | 6 Morrison |
| 2 Mesa Gravels | 7 Lykins   |
| 3 Niobrara     | 8 Lyons    |
| 4 Benton       | 9 Fountain |
| 5 Dakota       |            |



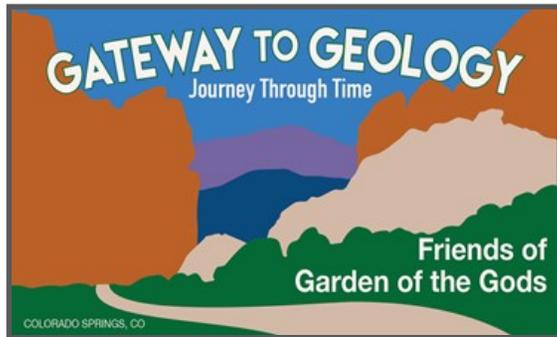
The formations, or rock layers found at Garden of the Gods City Park age dramatically from east to west. The rocks become older further west into the Park, or towards Pikes Peak.



Approximately 300 million years of geologic history is exposed by following the Gateway Trail into the Park.



Geologic diagram adapted from Geologic Folio Red Rock Canyon Open Space, Colorado Springs, Colorado by Ken Weissenburger, et al



All the rock formations in Garden of the Gods are sedimentary rocks. Sediments (sand, small chunks of rock, dirt) result from erosional events, then compact over millions of years to form new rock layers. Sandstone and conglomerate are examples of this type of sedimentary rocks.

An evaporating or changing body of water can also create a rock layer. Limestone, shale, and gypsum are examples of this type of sedimentary rocks.

***“In every grain of sand there is a story of the earth.”***  
***-Rachel Carson***

The science of geology measures time in terms of millions of years. This is due to the immense amount of time needed to create new rocks and rock formations.

Millions of years ago is abbreviated ‘Ma.’

**More information on the Park’s geology**

**can be found at:**

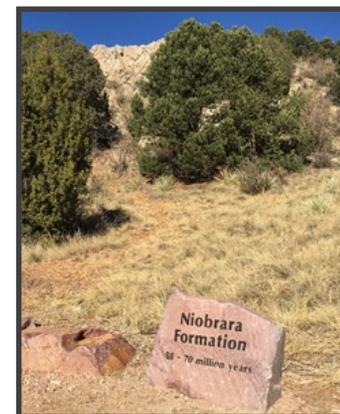
**[www.friendsofgardenofgods.org](http://www.friendsofgardenofgods.org)**



**1) Pierre Shale 73 –70 million years ago:**  
 The Visitor and Nature Center, and most of Colorado Springs are built on top of the Pierre Shale Formation. The Pierre Shale formed when Colorado was under a deep ocean. Sea sediments, mostly mud and clays, formed this layer, which is around 5,000 feet thick. Fossils, such as ammonites and mosasaurs have been found throughout the Pierre shale.



**2) Mesa Gravels 2 Ma--10,000 years ago:**  
 Many hilltops in the Park have chunks of reddish rock on top of them. These gravels are the remains or evidence of glaciation. The rock layers here had already been uplifted and somewhat exposed when glaciers formed and moved across this area. The varied freezing and thawing cycles of these regional glaciers deposited significant debris on hilltops. These glacial deposits are named the Mesa Gravels.



**3) Niobrara Formation 88—70 Ma:**  
 This white, or buff layer is a mixture of shales and limestones, and forms small hills in the Park. These deposits contain evidence that a shallow sea once covered Colorado. Clams, ammonites, and other marine fossils are found in this layer.



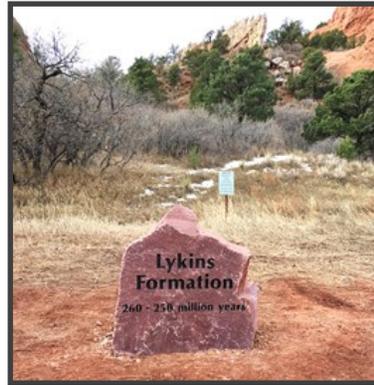
**4) Benton Group 100– 88 Ma:**  
 The small, flat valley between the Niobrara Formation and the towering red sandstone hogbacks was formed by the easily eroded Benton Group. Consisting mostly of black shales and limestones, this formation also contains thin lenses of volcanic ash clays.  
 These layers were created as the Cretaceous Seaway was encroaching.



**5) Dakota Group 112—100 Ma:**

This grayish-tan ridge (covered in large boulders) was formed in a coastal flood plain and beach sand environment during the Cretaceous period.

Keep a lookout as this ridge is also a favorite spot for Rocky Mountain Bighorn Sheep.



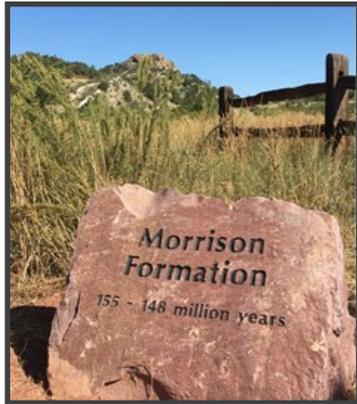
**7) The Lykins Formation 260—250 Ma:**

This Triassic Period formation is a thin, light-colored outcrop in front of the more impressive red sandstone. This layer formed in a tidal environment that produced a mixture of shale, dolomite, and limestone rocks. This layer also contains primitive fossils known as stromatolites.



**9) The Fountain Formation 320—300 Ma:**

Looking west (towards Pikes Peak), the reddish hills of the Fountain Formation can be seen. Formed as the Ancestral Rockies eroded, the Fountain has conglomerates and sandstones within it. Balanced Rock, located further southwest in the Garden, is Fountain Formation.



**6) The Morrison Formation 155—148 Ma:**

The shales and gypsum of the Morrison Formation are visible on the hillside next to the road (Juniper Way Loop). A swampy lowland, and large lakes created this environment and the resulting sediments. This rock layer formed during the late Jurassic period, a time known for dinosaurs.



**8) The Lyons Sandstone 300—260 Ma:**

The largest red and white outcrops, or hogbacks in the park are members of the Lyons formation. The red sandstone forms the Lower Member, while the lighter sandstone is the Upper Member of the Lyons Formation. This weather resistant sandstone formed in an arid, dune environment. The middle member of the Lyons is an easily eroded shale.



**Pikes Peak:** This impressive mountain is not part of Garden of the Gods Park. The igneous rock that created this mountain began forming over 1 billion years ago, cooling slowly underground into granite (Pikes Peak was never a volcano!). Tectonic activity nearly 70 Ma began to slowly uplift the granite, creating Pikes Peak. Now this mountain is 14,115 feet high. Chunks of the distinct pink Pikes Peak granite can be found throughout the Garden and Colorado Springs.