



California State Parks

Video Transcript



Mount Diablo State Park: A Geologic Island

Twenty miles east of the San Francisco Bay rugged Mount Diablo stands alone, isolated from the rest of the Coast Range by broad, flat mountains. On a clear day it may be seen for great distances. Mount Diablo State Park was established in 1921 and today serves as an oasis away from the busy crowds living and working in the Bay Area. Mount Diablo State Park is a geologic island, which preserves a fascinating rock history. It is an island of wildness in a sea of urban development and has served as a vital landmark in California for many years.

Hello, my name is Michael Rodriques. I am the park interpreter at Mount Diablo State Park. Our half-hour journey today, by car and on foot, will reveal the immense geological processes thought to have uplifted the mountain. We will examine a variety of rocks that support these concepts while exploring the great beauty of a park that has attracted millions of visitors.

The geology of the Coast Range, of which Mount Diablo is a part, has baffled earth scientists for many years. A basic belief of geologic thought once required that the oldest rocks be found on the lowest layers of the mountain and the youngest rock at the top. However, here at Mount Diablo, to find the oldest rock we must start out at the summit. Mount Diablo has a world famous view; on a clear day you can see Mount Lassen, 180 miles to the north. You can also see the entire Sierra Nevada Mountains laid out, and you can see San Francisco laid out like a picture postcard.

Today we'll be talking about the summit, which is made up of Franciscan rocks, a special mixture of rocks you find here at Mount Diablo. You will also see that rock type in the park over here at North Peak, and behind North Peak you can see the Antioch Bridge, which spans the San Joaquin River. On this side at Eagle Peak, right behind Eagle Peak, just outside the boundary of the park, you'll see a rock quarry. That rock quarry quarries a rock called diabase which is used for roadbeds by Caltrans and other crews. Today we'll also be looking at the Rock City area, which is to the south.

Most of what you see around you today was underwater 20 million years ago. When we go back down the stairs, I will show you evidence that it was underwater 20 million years ago. Then we're going to go inside the museum; we're going to answer the question "How did this mountain arise from the waves?" And I promise you a "peak" experience. Let's go.

The rocks that our visitor center are made up of were quarried right here in the park, in an area called Fossil Ridge. You can see these fossils of old scallops, clams, and oysters. They indicate that these rocks are about 12 million years old and were formed in a shallow marine environment. Let's go inside the visitor center.

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In 1939 the visitor center was built around the summit of the mountain, leaving the very top of it exposed. I am now standing on the top of the mountain and having that peak experience I promised you. This rock is called greenstone; it is a metamorphic rock, which means it has changed form since it was born. It was thought to be about 170 to 190 million years old. This rock started out hundreds of miles away from here, bursting out as lava underneath the ocean. How it got here we'll be able to see in the animation that follows.

ANIMATION: Although Mount Diablo is one of California's best known landmarks, the details of its origin have long been cloaked in mystery. To try to understand the mountain's history we must look far back in time, and far beyond the peak itself, at geological processes operating on a global scale.

Scientists have discovered that the Earth's crust is divided into large fragments, or plates, that slowly move relative to one another. In fact California appears to be the product of a long-term collision between two such plates, one including most of North America and the other much of the Pacific Ocean floor.

In the distant geologic past, at least 200 million years ago, the ocean floor began to slide like a giant conveyor belt beneath the western edge of our continent. During this process, known as subduction, material riding on the oceanic plate was scraped off on the continental edge or stuffed under it. Ultimately some of these jumbled scrapings, called melange, would form the rugged upper part of Mount Diablo, but for the time being this melange material accumulated offshore.

Between the mélangé and the continental uplands to the east a basin formed filled with the waters of a prehistoric sea. This sea covered much of what someday would become California's Coast Ranges and Central Valley. Into the sea washed layer upon layer of sediment over an almost unimaginable span of time—through 80 million years when giant reptiles ruled the earth, then through another 60 million years while land masses rose and eroded back into the sea and the climate gradually became cooler and drier. As the eons passed, countless plants and animals lived and died here, some leaving their remains in the ever-thickening beds of sand and mud.

About 20 million years ago the collision process changed in this region. The great plates continued to move past each other but laterally now, with the San Andreas fault system developing to accommodate the sideways motion. This rearrangement of geologic forces also led to the creation of the Coast Range mountains. Seawater retreated from the area for the final time.

According to current theory, within the last four million years local fault activity brought a slab of old ocean floor into contact with the layered beds of sediment. Then, during the last million years or so, powerful compressive forces caused the land to buckle, producing a massive fold. In the center of the fold the resistant slab of old ocean floor material became exposed in bold relief, as the softer surrounding strata were worn away. And so the landform that we recognize as Mount Diablo was born.

Even now the mountain's evolution is not complete; geologists suspect the peak may still be rising. Landslides reshape its contours from time to time, and erosion carries fresh sediment

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each winter to the valley flats. Every jolting earthquake and every tumbling rock are new evidence of Mount Diablo's dynamic nature, and new additions to an ancient story that continues to unfold.

MICHAEL: The mountain peak obtained added significance in 1851 when it became the initial point from which to survey land in California and all of Nevada. After the Mexican-American war, California became a state, and the great influx of miners and other settlers created a great need for accurate surveying. That was when Colonel Leander Ransom was sent in from Washington to create an initial point here at Mount Diablo State Park. This little depression you see here in the top of the rock was where Colonel Leander Ransom chipped out and set up his siting pole to make the measurements to make this the initial point in California. It was a very hot summer, they said, that year. He arrived in Martinez off the ship with his party. He hired horses and came to the top of the mountain. He intended to find a nice straight siting pole to use to make his measurements. Unfortunately, up here at the top of the mountain all the trees are very gnarled from the wind and the snow. So the poor guy had to go all the way back down to the bottom of the mountain to buy a siting pole. But he got the job done, and this still is the initial point for Central California.

The Fire Interpretive Trail was built originally to interpret a huge fire that burned 6,000 acres back in 1977. Today people like to take this easy walk to enjoy the tremendous views and learn a little bit about the plants and the rocks. Please join me now on the fire interpretive trail. Follow me.

Here is another outcrop of greenstone. As you can see, this fractures very unevenly and is very crumbly. That is a result of the great heat and pressure it underwent as it metamorphosed back in that subduction trench. This weathers brown, but if you can get a clean face, you can often see a green tint to the green stone, and that's caused by an included mineral called chlorite. Now we'll go on to our next stop where we'll meet a rock that is very old and has a crazy name.

Well, here's one of our local residents, a little surprise for us today. This is a Pacific western rattlesnake, and he seems to be trying to catch a little sun here in the middle of the trail. He doesn't look awful pleased that we're here. However, we have to forge ahead, and so I'm going to ask him to please move off the trail. Get on down the hill, please. That's a good job. That's a good job. You're a good snake, go on back down, down, down. Yes, yes, you're very annoyed; I see that. There you go.

These here are the oldest sandstones found in Mount Diablo; these are thought to be about 100 million years old. Now you notice how this sandstone fractures in a very even way, very much unlike the metamorphic green stone that we just looked at, and that's because it didn't have to undergo the metamorphic process that caused that other one to be so crumbly. Now what is the crazy name I was talking about? This sandstone is called graywacke. Let's head down the trail to see another rock that was very important to the Native American people and was formed in a most unusual way.

The beautiful rock formation you see here, layered as it is, was formed on top of the basalts that would someday become the green stone at the top of Mount Diablo. These rocks were formed in a most unusual way. They were formed from the bodies, the skeletons actually, of

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literally millions of little animals called radiolaria. The skeletons are rich in silica, and the silica was derived from the seawater by the little animals themselves. As they died in their millions and drifted to the bottom of the sea floor and piled up in great layers, they hardened into the rock that you see here today. The Native American people used this very hard rock and chipped it into the knives and the arrowheads that they needed to survive.

Rocks are wonderful in the diverse forms and shapes they can take. They can stimulate your imagination kind of like clouds. Here in the park there are two outcrops of chert that have formed a common mental image in the people that see them. Let's stretch our imaginative muscles, if you will, and see if you can see them, too. Guarding the northwest boundary of the park, this giant outcrop of radiolarian chert looks like a mighty turtle with its horny head facing to the right. It's name, of course, Turtle Rock. This formation is located to the north and just below Turtle Rock. It doesn't take much imagination to see this desert apparition. I think you'll agree it is properly named Camel Rock.

So, did you see the turtle and the camel? Well, chert isn't the only rock that weathers into fantastic forms here in the park. The sandstone monoliths of Rock City also weather into exquisite shapes. Welcome to the Rock City area. You've seen a camel and you've seen a turtle, now to add to the Mount Diablo menagerie let me introduce you to Elephant Rock. Let's head down the mountain to examine the mysterious wind caves.

These towering sandstone structures were formed in deep water about 50 million years ago. Sand, small stones, and other sediments were deposited, along with calcium carbonate, which acted as a cement. Over millions of years, as they piled up, these rocks formed these huge sandstone structures. The caves were formed when rain hits these poor sandstones; it mixes with calcium dioxide in the air, forming a weak acid. As that seeps deep into the porous rock, it causes that calcium carbonate cement to dissolve, loosening the structure within. During the summer, the heat causes evaporation, which brings the water back out, carrying that cement with it, forming a hard outer shell on the outside of the rock. The inexorable forces of erosion, wind, and rain eventually wear a hole in that outer shell, exposing that now much more loosely cemented rock inside. This erodes at a much faster speed, causing the exquisite wind caves of Rock City. The Rock City area is more than just fascinating geology. Historically, Native American people used this area for campgrounds. At our next stop we will see evidence of the first peoples at Mount Diablo.

The Ohlone, Bay Miwok, and Northern Valley Yokut people came here to stay in seasonal camps. Here they hunted, collected grasses of various kinds, dug up nutritious bulbs and roots, and collected acorns, which were the most important food to the native people. The acorns were then dried and stored in these structures called granaries. When needed, the acorns were ground up in grinding rocks for use. We see here the grinding rocks used to process the dried acorns into flour to make a mush, kind of like cream of wheat, and also bread. When you sit here alone, you can almost hear the rhythmic pounding of the grinding rocks, the sound of women softly talking to each other, laughing, and watching their children playing nearby.

While Mount Diablo was important for gathering the necessities of survival, it also served a much higher purpose. To the indigenous people, Mount Diablo was the home of the spirits. It was, and still is, considered a sacred place. To the Miwok this was the place where people

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were created, therefore it was an important location for religious ceremony to many of the native people living within sight of the mountain.

As we leave Rock City and head further down the mountain to our last stop, we will find the Briones formation. Here we will find clear evidence of the great slow upheaval that created Mount Diablo. The rocks for the Briones formation were formed in a shallow marine environment about 10 to 15 million years ago. These fossil-rich rocks were the formation of the rocks that built the Mount Diablo Summit Visitor Center that we saw earlier. The spectacular view to the east shows what we call the Devil's Slide, running down the western slope of Blackhawk Ridge. These formerly flat, horizontal rocks have been pushed up by the mighty forces of the tectonic plates that uplifted Mount Diablo.

I hope you have all enjoyed exploring the rugged beauty of Mount Diablo. The resources found on the island mountain serve to educate, delight, and inspire all those who visit its rocky slopes and vast vistas. The great power and the remarkable stretch of time needed to build a mountain are difficult for people to truly understand. Yet, in stretching our minds to look across the ages, we rediscover the awe and wonder to be found in the world around us. Here in Mount Diablo State Park we preserve these wonders for future generations. I hope that all of you, in your future, holds a visit to Mount Diablo or to one of the many other beautiful California State Parks. Thank you.

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