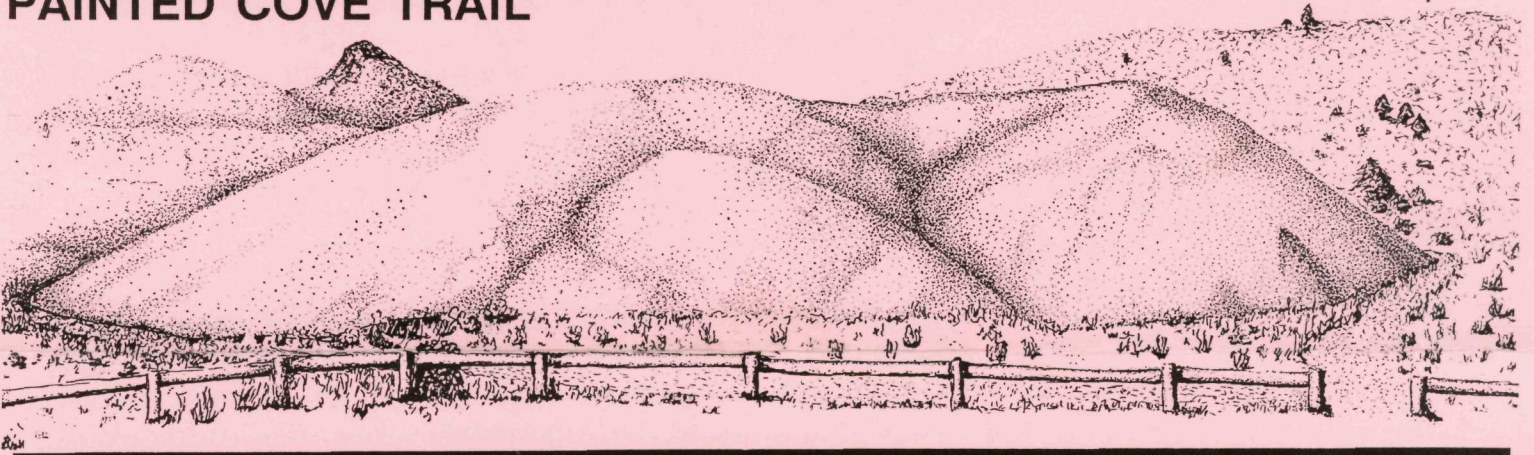


# John Day Fossil Beds

National Monument  
National Park Service  
U.S. Department of the Interior

## PAINTED COVE TRAIL



This 1/4 mile loop winds around a small hill and passes through some of the more colorful and interesting geologic features of the Painted Hills. Since these ancient formations are fragile, please stay on the established trail.

### STOP 1 RUST COLORED HILLS

Twenty to thirty million years ago volcanic ash settled in deep deposits over eastern Oregon. Natural processes transformed the ash into bentonite, a type of clay which expands as it absorbs water. When drying, the clay contracts, leaving the numerous small cracks that give the hills a "popcorn-like" appearance. The warm colors are from iron oxides, similar to those of ordinary rust.

### STOP 2 EROSION

Sudden summer thunderstorms release torrential downpours which wash large quantities of clay downslope. The half-buried dead sagebrush across the wash in front of you is a victim of this encroaching hillside. Through the years, the saturated clay slowly surrounded the plant causing it to perish.

### STOP 3 RHYOLITE FLOW

The purple layer in front of you is the highly weathered remains of a rhyolite lava flow, part of the Clarno Formation. We know its source is nearby, since rhyolite is a slow-moving viscous lava which flows relatively short distances.

### STOP 4 DESERT RAINBOW

Look back along the trail. Differences in weathering and mineral content produce a striking show of color.

### STOP 5 COLOR CHANGES

The colors of the Painted Hills change with the weather. On wet days, the clay absorbs water and seals the surface of the hills. This causes more light to be reflected, and changes the red to pastel pink and the buff to gold. When the hills dry, the clay contracts, producing surface cracks which diffuse light and deepen the color.

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**STOP 6  
WHY DOESN'T ANYTHING  
GROW ON THESE HILLS?**

Several factors make these hills inhospitable to plants. When it rains, the clay particles absorb water, sealing the surface so moisture cannot penetrate more than a few inches. Clay holds water so tightly that plants cannot use it. Two to twelve inches beneath the surface the clay is a hardpan which is impenetrable to plant roots. Finally, loose surface clay provides a poor foothold for roots, making it easy for plants to wash away during heavy rains. All this, combined with poor nutrient conditions and hot, dry summers, keep the Painted Hills barren and beautiful.

**STOP 7  
SINKHOLES**

This sinkhole is an example of "piping." Water finds weak spots in the clay. Gravity pulls the water downward, carrying with it the loosely consolidated clay particles. As the "pipes" become larger they collapse, forming sinkholes which may become quite large.

**STOP 8  
ROCK LEFTOVERS**

On the skyline before you is a remnant of the Columbia River Basalt, which covers the ash-clay hills of the John Day Formation. There are many layers of this basalt across the valley. These layers were formed 15 to 17 million years ago when large quantities of lava issued from cracks in the earth and flowed across thousands of square miles of eastern Oregon and Washington and into Idaho.

**STOP 9  
RED CANYON**

The Mars-like terrain before you is a fragile landscape. Without the benefit of soil-building plants these hills can be quickly scarred by footprints and vehicle tracks. The marks accelerate water erosion creating deepening channels and eventually destroying the scenic qualities of this unique geologic feature.

**STOP 10  
WATERSHED IN MINIATURE**

This drainage provides a small scale model of how natural erosion on a surface of uniform hardness produces what geologists call a dendritic (branch-like) drainage pattern. Think of the main channel as a river. The feeder streams, creeks and rills flow into it producing a pattern which looks like the branching of tree limbs.

**STOP 11  
AN EXPERIMENT**

The buff-colored layer you have just entered is thought to be the original ash color. If you have some water with you, pick up a piece of clay, wet it, and watch the clay expand. Making pottery from this type of clay is usually unsuccessful because of its expansive-contractive nature.

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We hope you have enjoyed your walk in Painted Cove. There is much more to learn and explore at the Painted Hills as well as in the other two units of the monument. You are invited to visit all of them. Please remember many areas of the monument are fragile and easily harmed even by foot traffic. Stay on developed trails or ask a ranger for guidance in exploring the monument off-trail.



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