

Trail of the Fossils

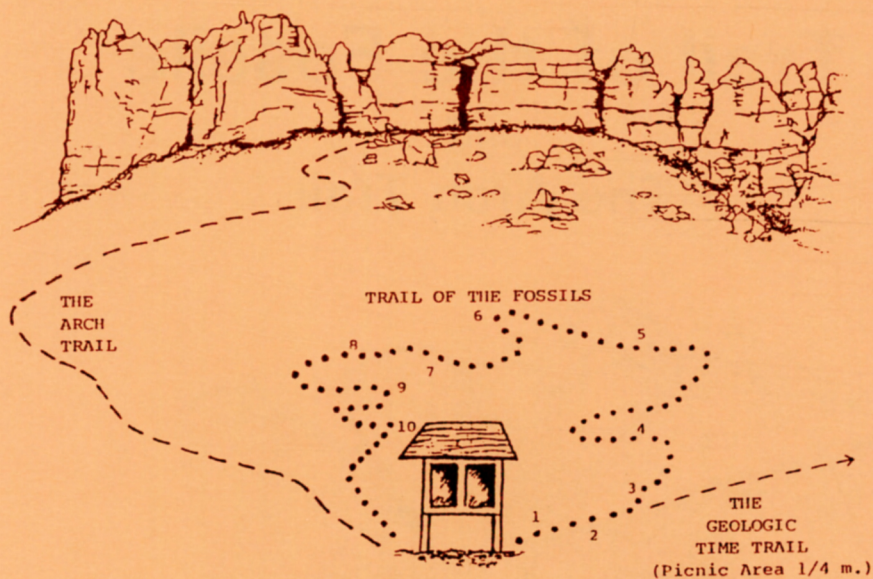
and

The Arch Trail



Self-guiding trails at the Clarno Unit,
John Day Fossil Beds
National Monument.

Remember, it is against the law to remove any
rocks or fossils, which are protected for public
benefit and enjoyment.



Trail of the Fossils: Winding 1/4 mile among a boulder-covered slope, this self-guiding loop trail begins to the right of the trailhead exhibit. Stops 1-10 are described in this booklet.

For both trails, please stay on the pathway and watch your footing. This is rattlesnake country, so do not climb among the rocks.

The Arch Trail: A moderate hike, this 1/4 mile trail rises 150 feet to the base of the cliffs and the natural rock arch above. The Arch Trail is the farther of two trails to the left of the trailhead bulletin board. The trail guide is on the back page of this brochure.

TRAIL OF THE FOSSILS

To many people the last 50 million years can be an incomprehensible length of time. Plant and animal species, and even mountain ranges, have come and gone! Along this trail you will have the opportunity to look back in time by observing the physical evidence of ancient life - fossils.

The Palisades, the castle-like cliffs above, were formed about 44 million years ago. In addition to the Palisades, hundreds of feet of layers below and above them make up the **Clarno Formation**. This entire formation represents a period of geological and environmental events spanning 54-37 million years old. Ten numbered stops along the trail feature some of the ancient and recent events, and allow you to see many plant fossils in the rocks.

Stop 1. BOULDERS - The large boulders strewn over the slope around you have fallen from the cliffs above. They contain fossil evidence of a lush, near-tropical forest of sycamores, palms, cycads, and other plants that once flourished in a warm, moist climate. About 44 million years ago, nearby (pre-Cascade) volcanoes periodically erupted lava, cinders, and ash. Heavy rains, perhaps 100 inches per year, saturated the newly formed soils and silica-rich ash producing tremendous

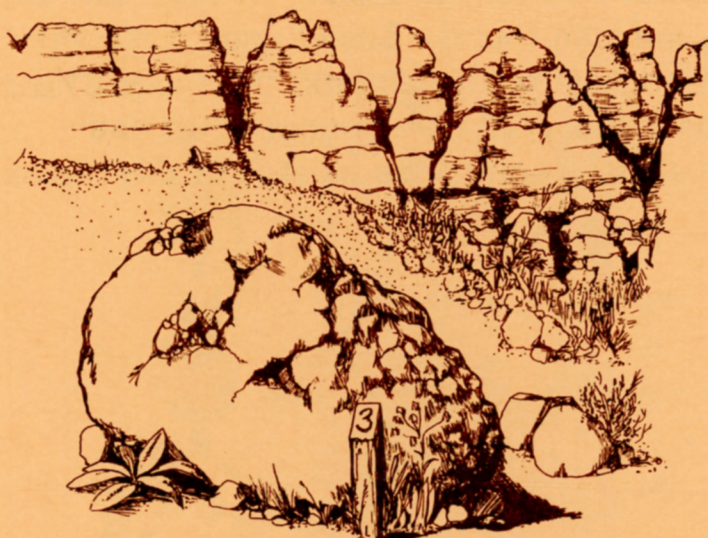
mud-flows (called lahars) which encased plant leaves and wood, and a few animals.

Over time, additional layers of sediment and lava flows were deposited above the lahars creating great pressure. This, along with a slow percolation of groundwater containing dissolved silica, cemented together the lahars forming the hard and somewhat weather-resistant layers of the Palisades.

Other fossil-laden layers above and below the Palisades contain specimens of nuts and seeds, and animals such as brontotheres, crocodilians, tapir-like rhinos, tiny four-toed horses, rodents, turtles, and meat-eating creodonts. These other layers are primarily made up of volcanic ash-fall deposits.

2. TIME CLUES - Castle-like spires, leaf imprints, and broken boulders characterize this landscape. The gouge to the left of the trail (post "A") gives evidence that this boulder fell from the cliffs above, hit and slid a short distance, and then flipped over before coming to rest. The noticeable absence of colored lichens on faces of the boulder offer a clue, suggesting a recent fall. Evidence of ancient life is found in the leaf impressions located one foot to the right of post number 2. Take your time looking. Careful and close observation will reveal other fossils along the trail.

The Geologic Time Trail ... branches off to the right from the **Trail of the Fossils** just before stop 3. This gentle trail, passing below and along the Palisades, ends at the picnic area 1/4 mile away, along State Route 218. Markers along the trail indicate environmental events over the last 50 million years.



3. LAHAR BOULDER - In recent times this boulder crashed down from one of the layers in the cliffs above. It carries evidence of a lahar's characteristics when it first formed. The sizes of rocks and debris carried and then embedded in a lahar are directly related to the speed, size, and viscosity of the ancient mudflow. Thin layers indicate quiet times between flows with calmer water depositing finer sediments. Fossils found in many of the layers also show that enough time passed between some lahars for new forest growth to develop.

4. ANCIENT TREE - This live hackberry tree survived a wildfire that swept through this area in 1994. It is well adapted to today's climate of hot, dry summers and cold winters, and is closely related to trees that lived here 44 million years ago. Fossil wood and seeds of hackberry trees, are found in the Clarno Formation. Fossils of palms, cycads, and tree ferns are also found. Based upon a modern knowledge of plant habitats, the types of plant fossils discovered here suggest that near-tropical conditions once existed in this region.

hackberry



5. ROCKFALL - A crack, a rumble, and a roar greeted nearby ranchers one morning in 1962 when a large section of cliff came crashing down - a reminder that geological processes which sculpt the landscape continue today just as they have for millions of years. Above, look for the light-colored area of cliff-face where the rock section fell away.

Among the major cracks visible in the Palisades, look for the one directly ahead of you, in line with this trail. It is a long, curving diagonal crack. Someday it may cause a rockfall similar to the one through which you have been walking.



6. BENT LEAF - Two feet behind this sign is the impression of a leaf which was carried along in one of the lahars. It came to rest against a stone, which caused it to bend. Finding many bent and curved fossil impressions, mixed with dissimilar debris of

various size, suggests vigorous movement during a mudflow. Look about the red-stained rocks of this cove for other leaf impressions.



7. FOSSIL FOREST FLOOR - This flat, upturned slab is covered with leaf imprints, small branches, and limbs buried when one of the devastating lahars poured over the forest floor.



8. ROCK ARCH - At the top of the cliff you can see a rock arch (or bridge). Water erosion and frost action, combined with an erosional weakness in a lower rock layer, have caused this unusual feature.



sycamore leaves

9. SYCAMORE LEAF FOSSILS - The fingered leaf impressions which cover this boulder are those of a sycamore, a tree which is not native to eastern Oregon today. As the local environment gradually changed from near-tropical forests to the present near-desert landscape, the sycamore disappeared. Sycamores do grow in areas of the South, East, and Midwest where the rainfall is greater and the climate is milder, conditions similar to the climate here 44 million years ago.

TREE LIMB FOSSIL - Look for a circular, green-colored area on the left side of the boulder, about 3 feet higher than this sign. This circular spot is one end of a fossilized tree branch (1 ½ inches in diameter). The other end

(3 inches in diameter) is visible on the other side of the boulder (3 feet to the right and a bit higher). Limbs, leaves, seeds, and nuts are all found together in the Clarno Formation - a rare occurrence that makes this fossil area world-famous.



10. TREE TRUNK - To the left of the sign, follow the rock gully uphill for 15 feet. Look along the right rock wall. Visible in the large boulder on the right is the circular, reddish end of a petrified tree trunk (species unknown), 9 inches in diameter. Note that several other leaf impressions, branch ends, and limb casts occur in this area. How many types can you locate?

The fossils you have seen along the trail are just a small portion of the entire Clarno Formation fossil record. Nearby are fossil beds

that are even more abundant (which are now protected within the monument but not yet accessible to the public).

In 1995, with the publication of a scientific treatise, all of these deposits took their place among the world's most significant fossil localities. We now realize that the fossil record here shows a much more complex and diverse plant environment than earlier thought. Previously unknown members of modern plant families, such as bananas, grapes, custard apples, and various climbers and vines have been discovered. This recent and exciting research has expanded our knowledge of ancient life.

BACK TO THE PRESENT - As you walk the last few feet of the trail you are completing a time-trip through a segment of Oregon's prehistoric life. Take a good look at the landscape about you and compare it to the environment the nearby fossil treasures suggest. There have been many changes in the land and life since the layers of the Palisades were an ashy ooze entombing plants and animals over 40 million years ago.

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Artwork - Cynthia Tait, 1980

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The Arch Trail

The Arch Trail is the farther of two trails to the left of the bulletin board. It ascends 150 feet, in 1/4 mile, to the base of the cliff.

Upon reaching the bench at the base of the cliff, look up the cliff face about 40 feet, then to the left about 30 feet. Notice the vertical fossil log about 14 inches in diameter. This log is a remnant of a tree trunk which was probably still standing after an ash-laden mudflow (a lahar) buried it. At the top of this log is a horizontal log that may have been jammed against it during the flow. A few feet from the fossil log are bird nests made of mud. Cliff-dwelling swallows are common here. Pigeons and birds of prey also frequent the cliffs. A closer look at the cliff layers may reveal other plant fossils of various sizes.

At the end of the trail you will see an impressive rock arch (or bridge) and chute. Water erosion and frost action, combining with a weakness in a lower rock layer, have caused this unusual feature.

You may wish to return this guide to the brochure box for others to use.

Thank You.