



---

**El Malpais National Monument**  
1900 East Santa Fe Avenue  
Grants, NM 87020  
505-876-2783

*Notes:*

National Park Service  
U.S. Department of the Interior

El Malpais National Monument  
[www.nps.gov/elma](http://www.nps.gov/elma)



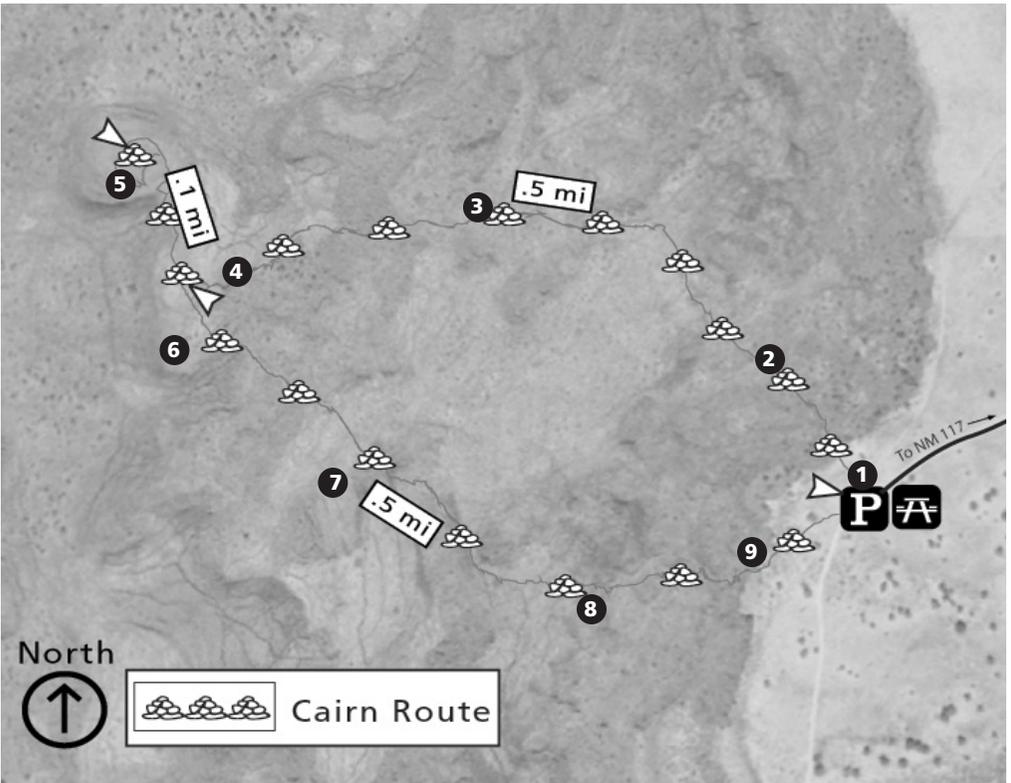
# Lava Falls Trail Guide



# Lava Falls Area

The cairn marked route at the Lava Falls Area offers exploration of the youngest lava flow at El Malpais National Monument. The Lava Falls Area is located 36 miles south of Interstate 40 on NM 117. Please check at the Visitor Center for road and trail conditions.

For more information, call a park ranger at the Visitor Center at 505-876-2783. The Visitor Center is open daily with the exception of Thanksgiving, Christmas and New Year's Day.



# Exploring Lava Falls

*Here, the earth is new. Flowing up from underground just 3000 years ago, the lava was a dynamic force—swirling, growing, collapsing and flowing its way into position before growing cold and resting in its final form. The course that the lava took remains here for us to ponder and explore.*

The Lava Falls Area lies on the youngest of the lava flows at El Malpais National Monument. McCartys Crater was active around 3000 years ago and probably erupted several times over the course of many years.

The cairn marked route leads you onto the pahoehoe lava of the McCartys flow. In-depth exploration of lava flow features is available on this easy to moderate one-mile loop route.

Please be adequately prepared so that your memories of Lava Falls are good ones.

## Exploring Lava Falls

- Carry plenty of water
- Wear sturdy hiking shoes

### ① A Sense of Wonder

This is a wondrous landscape and even volcanologists are prone to asking, “I wonder what happened here?” What was going on to make the lava dip over here and swell over there? Why is the lava so smooth here and so rough there? While some of these questions can be answered, some cannot. Use the information in this guide to help you understand the volcanic forces that created this area, but do not become bound by it. Stop and look closely at the rock; peer into cracks and crevices; ponder seemingly impossible formations. Let your own sense of wonder be your guide to this landscape.

At the same time, do not let your sense of wonder overtake your sense of safety. Pay attention to your surroundings and know your limitations.

## Finding Your Way

Piles of rocks, called rock cairns, mark the route on this one-mile loop hike. Cairns are the most obvious way to mark routes across the lava flows and have been used for centuries to mark pathways across this land. Be sure to not leave one cairn until the next is in sight.

Do not add to existing cairns or build new cairns. Maintenance to the cairns is done on a regular basis by National Park Service employees. Building new cairns off the intended route may cause other visitors to become disoriented and even lost.



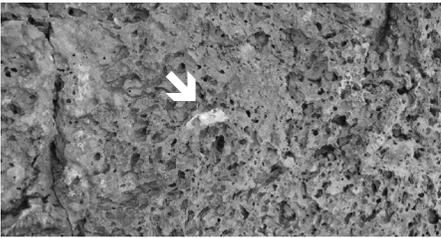
Rock cairns mark the way on this and many other routes at El Malpais. Although most of the cairns on this route are quite large, they can blend into the surrounding landscape and be difficult to see.

## Basalt and its associated flow top features



**Basalt:** The most common type of volcanic rock.

**Appearance:** Can be gray, black or reddish brown. Vesicles, or holes, were formed by escaping gas. Basalt at El Malpais can be smooth and ropy, called pahoehoe (pa-hoy-hoy), or rough and broken, called a'a (ah-ah). Basalt can take on many forms as seen below.



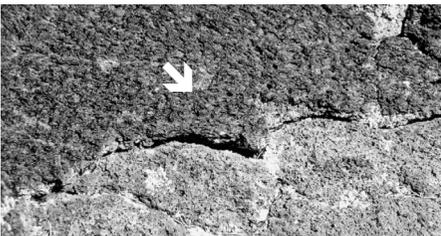
**Xenoliths:** Fragments of the Earth's mantle that were brought to the surface by fast-rising magma and encased as the lava cooled; means "foreign rock."



**Lava Toes:** These small lobes of lava are common along the edges of pahoehoe flows. They are formed when hot lava breaks out of semi-hardened lava.



**Ropy Pahoehoe:** Pahoehoe is a Hawaiian term for relatively smooth lava. Ropy texture is common on pahoehoe flows.

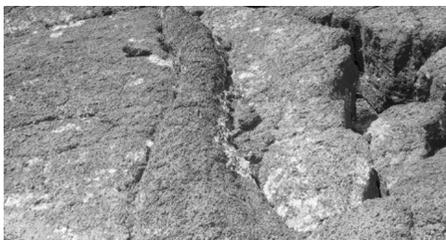


**Tachylite:** A glassy-textured basalt. Here, the tachylite can be seen as a thin crust. Part of the crust has broken away, exposing the basalt beneath it.

## Basalt and its associated flow top features



**Pressure ridge:** Ridges of lava formed by lateral pressures; almost always has a large crack running down the crest.



**Squeeze-up:** Small mounds or ridges of lava that have resulted from the extrusion of lava through a crack in the solidified crust.

### ② Lava All Around

From the air, large scale features of lava flows are visible. Collapses, cinder cones and miles of black rock tell the story of how lava flowed from a volcano and covered the land. From the ground, an entirely new dimension to the flows appears.

Cracks, ripples and bubbles tell a more intricate story. When lava spilled out of McCarty's crater, it did not just settle over the ground in a smooth, even layer. It was a dynamic force that took on distinctive features as it flowed over the land. Pressure ridges collided and cracked; collapses sunk into empty cavities; squeeze-ups pushed their way to the surface through weak spots.

Today, volcanologists study these and other features to get a sense of how volcanos and lava flows work. By doing so, they can better understand the story of how the earth was, and is, formed. Look around as you hike. What stories do you see in the lava flows?

**The Dating Game.** Volcanologists use both relative and exact age to determine the age of lava flows. We know the relative age of the McCarty's flow because it is on top of older

flows. By its relative age, we know that it is the youngest. The exact age of the McCarty's flow is a little trickier to determine.

All rocks contain unstable elements that decay into more stable elements at a certain rate. Some rocks, for example, contain Argon which decays into Potassium. By measuring how much Argon and Potassium are in samples, scientists are able to determine the age of rocks. This method is called Radiometry and is commonly used on basalt.

This method of dating, however, is only accurate in flows over 5000 years old. More accurate methods of dating young lava flows are Carbon 14 ( $^{14}\text{C}$ ) and Helium 3 ( $^3\text{He}$ ).



**A closer look at the lava flow reveals interesting discoveries.**



## ↘ McCarty's Crater

From marker number 3, the rim of McCarty's Crater is visible on the near northwest horizon.

**Carbon 14.** All living organisms absorb  $^{14}\text{C}$ . When they die,  $^{14}\text{C}$  decays into Nitrogen at a constant rate. By measuring how much  $^{14}\text{C}$  is left in a sample, scientists can determine how many years ago living organisms died.

When McCarty's erupted, the flow burned grasses and other vegetation. Scientists collected some of this charred vegetation from underneath the McCarty's flow and  $^{14}\text{C}$  dated it to 3.6 - 3.2 thousand years old.

**Helium 3.** As cosmic rays interact with atoms on the surface of the flow, it leads to a buildup of  $^3\text{He}$ . By testing how much  $^3\text{He}$  is in the surface of the flow, scientists can determine the age of the flows. McCarty's has been  $^3\text{He}$  tested to a date of approximately 2.5 thousand years old. This date is close enough to the  $^{14}\text{C}$  testing method that scientists estimate this flow is approximately 3000 years old.

### ③ McCarty's Crater

Looking to the northwest, you will see a small hill in the foreground. This is McCarty's Crater. A small shield volcano with a cinder cone near the top, it was named for the small village at the northern reaches of its flows.

During World War II, the United States Army, set aside 9-square miles around McCarty's Crater for use as a practice bombing target. Fifty years later, in 1994, unexploded ordinances were detonated and removed by officials from several National Guard Explosive Ordinance Disposal Detachments. Although a search was done for other bombs, there may still be more hidden in the lava.

### ④ Lava Fall

This small "fall" of lava was created as one lava flow slowly dripped over the edge of a previous lava flow. The small recess behind the fall is a perfect habitat for moss and algae.

Look for moss, algae and ferns in other cracks and crevices as you hike. In the winter and early spring, look for ice formations.

### ⑤ Natural Amphitheater

This wall of lava that forms a circular ridge around a relatively flat bottom is what volcanologists call an inflation ridge. Scientists once thought that these formations were caused by a collapse of lava; however, by watching active flows in Hawaii, they learned otherwise.

As the still flowing lava cooled, it released gases. The gases made their way to the surface of the flow and caused the lava to rise, much like a loaf of bread rising in the oven. The result is a ridge of lava that rises above previous flows. These formations are common on the McCarty's flow.

**Lichens.** Worldwide, there are thousands of lichen varieties. El Malpais is home to about seventy. Ranging in color from gray-green to bright orange, these lichens are found on much of the McCarty's flow.

Lichens are a combination of algae and fungus and help to break down rocks by way of a chemical reaction between itself and the rock. The by-product of this chemical reaction makes the rock more susceptible to the elements and weathering.

Lichens have been used by humans for everything from model decorations to food. Neighboring American Indian tribes still use lichens as a dye for wool. One of the more interesting uses of lichen is to measure air quality. Because lichens absorb chemicals from the air and rainwater, they are a very susceptible to air pollutants.

### ⑥ Pygmy Forest

The lava isn't the only interesting aspect of the McCartys flow. A pygmy forest of ponderosa and piñon pines twist their way out of the lava. The twisting of the trunk and branches mimics the twisting of the roots below the surface.

These trees find enough water and nutrients to survive, but not enough to reach the lofty heights of trees found off the lava flows.

**What's eating the piñon pine?** Life on the lava in this dry climate is difficult under the best of circumstances. Weakened by recent drought conditions, the piñon pines here have another challenge. Piñon Needle Scale has infested many of the trees you see along the trail. These tiny insects appear as black bumps on piñon needles and suck sap from the trees. Piñon Needle Scale can kill small, weak trees, and make larger, healthy trees more susceptible to attack by other insects.

Life on the lava. Many other plants also find this a suitable environment. Apache plume displays its distinctive pink plume in late summer. The purple flowers of the vervain stand out against the black of the lava. Cacti nestle close to the surface and display their showy blooms in early summer.

*A Volcanic Wonderland. The McCartys flow is a wonderland of volcanic features. Trenches, ridges and countless other formations combine to tell the story of this area's volcanic past. Hiking this young lava flow reveals many opportunities for exploring these formations closely, and to imagine what this area looked like as it was being formed.*

### ⑦ Sink Holes

Sink holes like these are scattered across the McCartys flow. These depressions offer interesting exploring opportunities. Look for ferns and other plant life in shady areas and ice formations in the winter. Use caution exploring these areas and watch for loose rocks and cracks.

### ⑧ Surrounded by Wilderness

From this point, you can see for miles. On the distant western horizon is the Chain of Craters, a string of cinder cone volcanos. Between the Chain of Craters and here is the West Malpais Wilderness. To the east and southeast, directly across from the Lava Falls Area, is the Cebolla Wilderness. Much of El Malpais National Monument is a Wilderness Study Area and is actively seeking Wilderness designation.

### ⑨ Connections

After walking across these lava flows you are now part of a long history of people who have crossed the lava in exactly the same way as you have: on foot.

Before stepping off the lava and driving away in your vehicle, imagine what it may have been like to hike the lava flows before the days of sturdy hiking boots and motorized transportation. Imagine hiking across the lava flows in a pair of yucca sandals. Imagine that this hike was only one part of your much longer journey on foot.

Undoubtedly, the same formations that caught your eye and made you wonder what happened here also caught the eye of all those who have walked this way before.