Tree Molds at Craters of the Moon

Emily F. Carbone (sponsored by the Geological Society of America, GeoCorps Program) and Douglass E. Owen

Before the volcanic eruptions that created the lava fields of Craters of the Moon, much of the land supported trees. Though we do not know the species or abundance of the trees for certain, it is likely that a moderate quantity of limber pines once grew on many of the areas covered by lava today. As lava encountered trees in its path, many simply burst into flames and were incinerated, leaving no mark of their existence. Near the edges of flows where the lava was thinner, some of the trees remained intact long enough to leave their impressions in the hardening lava. The moisture and gas released from the tree as it burned helped to quench the lava quickly enough that it solidified before the tree was reduced to ashes. This crust of hardened lava around the tree protected it from the molten lava flowing by.

Vertical vs. Horizontal

There are two general types of tree molds: vertical and horizontal. ***Vertical*** tree molds formed around trees that were not knocked over by the flowing lava and were therefore standing upright as the lava was quenched. They appear as round hollows in the lava. At Craters of the Moon, they are generally 20-40 cm wide and 40-200 cm deep (Fig. 1). When the lava flow that envelops the tree deflates as it drains, the tree mold can be left standing in relief above the ground surface and is then referred to as a "lava tree" (Fig. 2). Vertical tree molds, including lava trees, are especially prevalent on Trench Mortar Flat.



Figure 1. One of the deepest vertical tree molds in the park. This tree mold is located behind Crescent Butte.



Figure 2. A vertical tree mold, or lava tree, along the Wilderness trail that has a signifcant portion of the mold above the surface.

As lava flows through wooded areas, the flowing lava sometimes pushes trees down or burns through the trunks, causing them to fall onto the lava surface. ***Horizontal*** tree molds form around some of these felled trees. These tree molds are sometimes more difficult to spot because they do not usually stand out in relief from the rest of the flow. The Tree Molds Trail has the largest number of easily accessible horizontal tree molds in the park.



Figure 3. A horizontal tree mold along the Tree Molds Trail exhibiting a distinct tire tread pattern.

Most horizontal tree molds (and some vertical tree molds) exhibit a tire-tread-like pattern (Fig. 3). This pattern is formed when lava fills in the cracks in burning trees, much like the cracks that open up in charred logs that have been burning in a campfire, and then solidifies.

Charcoal

Occasionally, some carbon residue is left behind along with the mold of the charred tree (Fig. 4). Some of this charcoal was collected and used to date the Trench Mortar Flat event. This event, which we now know happened around 2200 years ago, created the fissures that run NW-SE across Trench Mortar Flat.

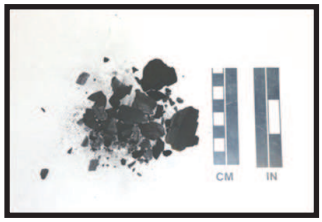


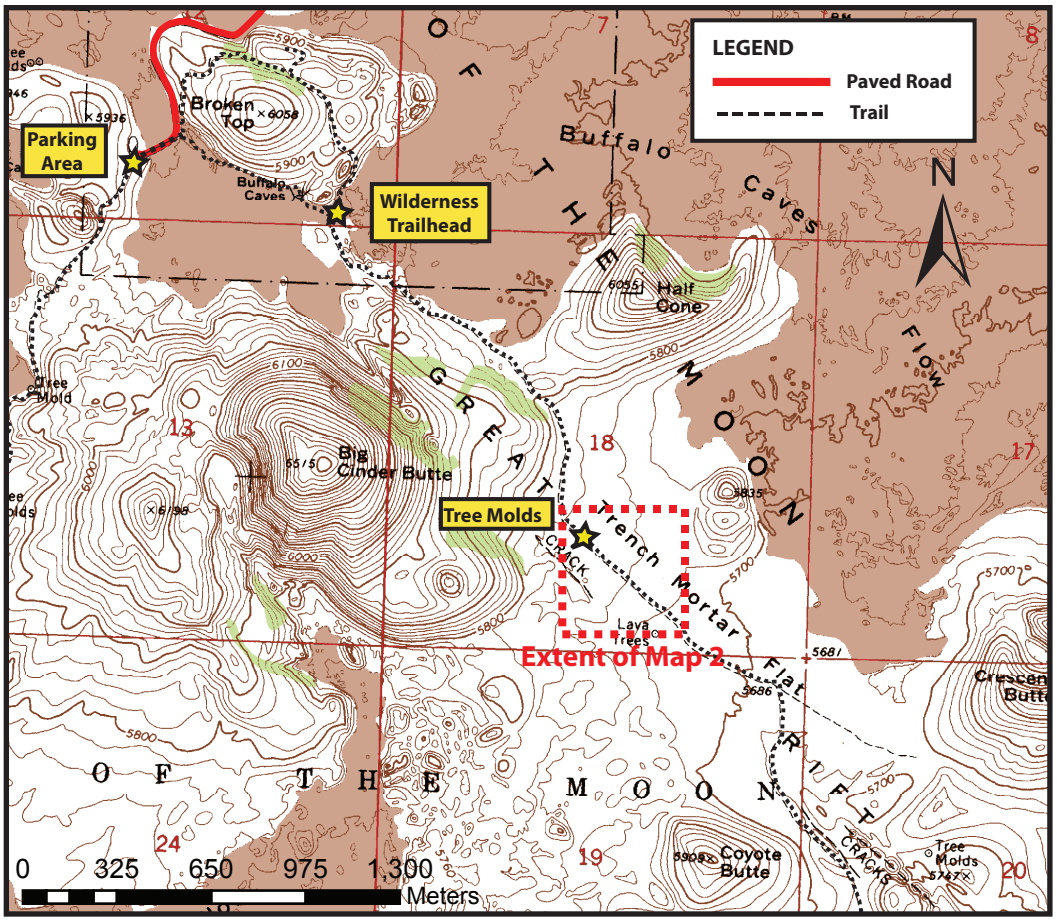
Figure 4. Charcoal from a tree mold on Trench Mortar Flat.

Tree Mold Inventory Project

An inventory of tree molds was created in 2001 in response to the National Park Service's desire to better monitor and protect paleontological resources. An initial exploration and reconnaissance survey was conducted in 2001 and 2002 by the park geologist. Of the 141 tree molds that were documented, 11 showed some anthropogenic damage. A second survey, conducted in 2012, included 22 newly discovered tree molds, and found that 17 of the total in the park (163) were damaged. The damage was not severe in either survey, suggesting that most visitors have some appreciation of and respect for this remarkable resource.

LAVA FOREST *On the Wilderness Trail*

There are many intriguing tree molds along the Tree Molds Trail, but fewer people know about the lava forest along the Wilderness Trail. To get to the Wilderness Trail, park at the Tree Molds parking lot and follow the sign for the Broken Top Loop. Shortly after the sidewalk ends, the Broken Top trail forks. Take the trail on the right side for the shortest route. When the trail forks again, turn right onto the Wilderness Trail. Take the Wilderness Trail until you come to a sign that reads "Lava Trees" (about 1.5 miles). Follow the path next to this sign until you reach the first tree mold, "Teapot" (Fig. 6).



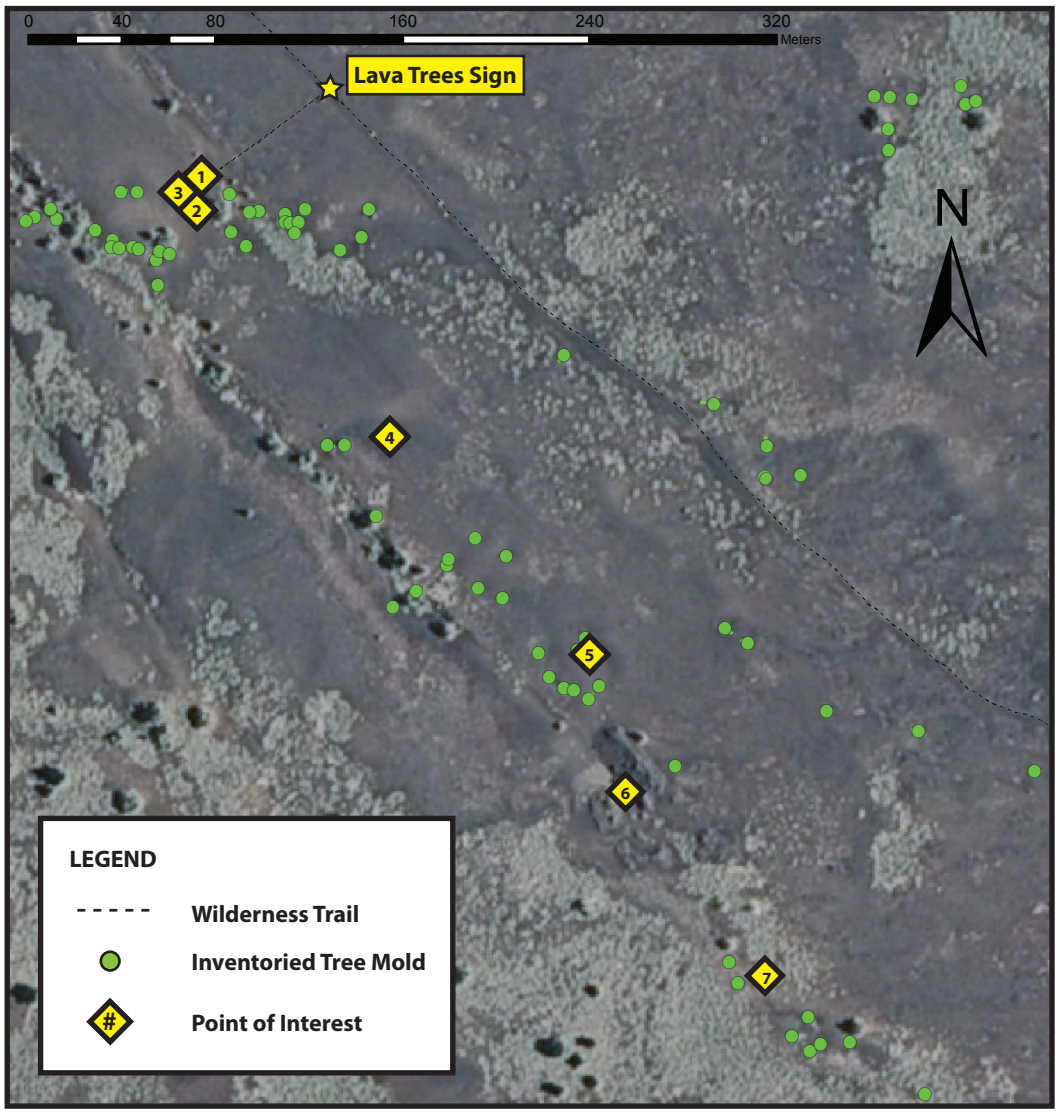
Map 1. Topographic map, showing location of Wilderness Trail and tree molds. The extent of Map 2, which shows the location of specific tree molds, is outlined by the dashed red border.

The lava that formed these tree molds erupted in the Trench Mortar Flat event, approximately 2200 years ago. The vents that were active during this event run from Watchman up to the flank of Broken Top. The cracks labeled on Map 1 are part of the eruptive fissure system that is also characterized by numerous spatter ramparts in this area.

Tree molds that are included in the inventory are marked on Map 2. Keep in mind that tree molds are very common in this area, so keep your eyes open and you might discover a new one.

It is sometimes necessary to temporarily travel off-trail to explore the area for tree molds, but remember to keep to the trails as much as possible, and watch out for plants and geologic formations underfoot!

PLEASE DO NOT COLLECT ROCKS: Collecting of rock samples is not permitted anywhere in the monument. Please take only photos as souvenirs and leave all rocks for future students and visitors to enjoy.



Map 2. Map showing locations of tree molds included in the tree mold inventory and points of interest in the Trench Mortar Flat area, off of the Wilderness Trail.

All coordinates are in UTM Zone 12 N, North American Datum 1983.

1 TEAPOT

N 4809934 E 295389

At Teapot (Fig. 6), you will notice one large hole with a smaller, curved hole beside it that connects to the larger hole – like the spout of a teapot. Can you picture the tree that the lava must have flowed around to form this impression? The larger hole was probably formed by the trunk of a tree, and the smaller hole was probably a branch off of that trunk. Look on the left side of the base of this tree mold for a small, perfectly round hole (Fig. 5). This is a drill hole that was made when a core was taken to date the lava using paleomagnetic dating.

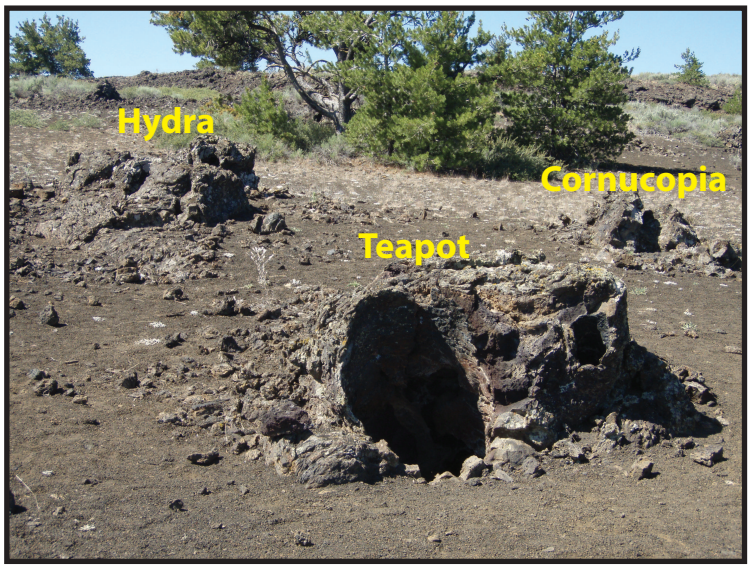


Figure 6. Photo of the first three tree molds you will encounter on the Wilderness Trail: Teapot, Hydra and Cornucopia.

Figure 5. Hole at base of Teapot, left from paleomagnetic core sampling.



2 HYDRA *N 4809927 E 295389*

Look carefully around the entire tree mold, and you will find at least 7 branches pointing out in all directions (Fig. 6). Try to imagine the cluster of branches or trees that could have made this impression.

3 CORNUCOPIA *N 4809929 E 295383*

This tree mold shows the imprint of one branch or trunk that bent over, probably due to either the force or the heat of the lava (Fig. 6).

4 CLARK'S TREE MOLD *N 4809826 E 295475*

You should find the impressions of three separate trunks preserved in this pile of lava (Fig. 7). If you have spent some time in the park, you may have heard about Clark's Nutcracker (Fig. 8), a small bird with gray, black and white coloring that stashes pine nuts, burying them in caches of three to five. The bird sometimes does not return to eat its cache, and the seeds germinate. The resulting clusters of trees and forked trunks can be found throughout the park. This tree mold has preserved one of these clusters that was likely the work of a Clark's Nutcracker or a similar animal that caches its food.



Figure 7. Photo of Clark's Tree Mold, which includes three separate vertical trunks.



Figure 8. Clark's Nutcracker, a bird that buries seeds in caches of three to five.

Clark's Tree Mold also shows us something very interesting about the lava in this area – the flow direction. Do you see how the lava is piled up on the south side (note the "N" arrow in Figure 7) and much thinner on the north side? As the lava flowed, it wrapped around the trunk, piling up on the up-flow side. This indicates that the lava that created this tree mold (and the others in the area) was flowing from south to north.

5 GRANDPA *N 4809731 E 295562*

This is one of the largest tree molds in the park (Fig. 9). It is over two meters deep and almost a meter wide! We found the impressions of nine branches. See if you can find them all.



Figure 9. Photo of Grandpa, a large tree mold on the Wilderness Trail.

6 ERUPTIVE FISSURES *N 4809673 E 295575*

A series of vents trend east-west cut across the landscape in this area, starting at Broken Top (Fig. 10) and continuing through the lava forest (Fig. 11). These gashes are the remnants of the eruptive fissures from which the lava that formed these tree molds flowed. These fissures are lined by spatter ramparts, piles of pyroclastic material lining either side of the vents. The spatter that makes up these ramparts and the cinder that covers the ground both erupted directly after the smooth lava flow that created the tree molds.

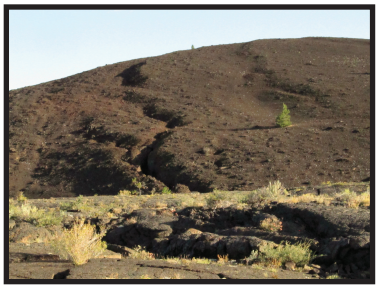


Figure 10. Fissures on Broken Top from the Trench Mortar Flat event.

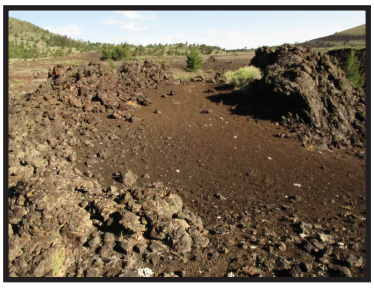


Figure 11. Vent on Trench Mortar Flat, lined by spatter ramparts.

7 BIG RED *N 4809570 E 295659*

This is another of our larger tree molds. Big Red is narrower than Grandpa, measuring 0.4 meters across, but is slightly deeper, at 2.5 meters. This distinctive red coloring is caused by oxidation of the iron in the lava (Fig. 10).



Figure 10. Photo of Big Red, a large tree mold on the Wilderness Trail with red coloring from oxidation.