

HOW TO MARK A TRAIL IN A CAVE

By Jonathan B. Beard

Why mark trails?

Marking trails in caves is an important conservation tool. Marking the correct route is done to prevent damage to delicate cave features, to prevent people from becoming lost, and done with care so as to maintain the natural appearance of the cave as much as possible.

In a perfect world, there would never be a need to mark trails. There are some who argue against trail marking because it detracts from the aesthetic. These detractors have a valid point. No matter what you use to mark trails, you are changing the appearance of a cave passage and creating a “manmade” appearance of some kind. In some cases trails are not needed—the only feasible way through a passage is a relatively narrow constriction. If the passage is only two feet wide, no trail marking is useful in preserving the floor.

Trails are marked in caves, of course, to assist in the preserving the natural appearance of the cave floor, to prevent unnecessary damage to the ecosystem in a cave and to preserve antiquities that may be preserved in the cave environment.

Cave passages with intact floor surfaces are valuable for scientific studies and have an aesthetic beauty that trampled floors just don't have. It is very important to leave artifacts left by prehistoric people in pristine condition for scientific study by those trained in scientific methodology. As well as skeletal and other remains from extinct animals that visited the cave several millennia ago, these features are often well preserved in caves and are vital for understanding the past.

Most biota found in caves live on the floors of caves. Bat droppings (guano) act as the base of a food chain. The biota living off of the guano, leaf litter or other organic material on cave floors are the food for other biota higher on the food chain. If human visitation is limited to a relatively thin ribbon of a trail, where applicable, the incidental damage to the ecosystem is kept to a minimum.

Trails can be marked in newly discovered “virgin” passage as well as passages that are often visited by modern cavers. Marking trails in either situation helps to prevent unneeded damage to the floor and its features.

What would happen if trails were not established?

There are several situations that can make the marking of a trail necessary. Some cave passages have sections of floor that consist of deep, soft mud. The first explorers will leave a set of deep bootprints in the soft clay. These in time may fill with water and become small pools. The next set of visitors will find these small pools undesirable to use and will step to the side to walk, in time creating a second set of small pools. Before long, the passage degrades to a wall-to-wall quagmire of deep mud, countless unavoidable small pools and chaos. I have seen such scenes repeated in dozens of Ozarks caves.

A narrow marked path through such a section of cave from the beginning would have limited the damage to a narrow foot trench in the floor and left the rest of the floor natural and pristine.

Sometimes cave passages have large quantities of flowstone-covered floor. Visitors have created muddy coatings on large stretches of flowstone unnecessarily when a narrow marked path would have either prevented any flowstone from being marred or at least greatly reduced the area of damage. Remember that even a narrow trail of muddy bootprints placed on a sloped flowstone surface can spread downslope with a little assistance from gravity and flowing water.

Not every visitor is aware of, or is able to see, prehistoric footprints, claw marks, artifacts or bones on or in the clay floor of caves. Narrow paths carefully marked in caves can reduce or prevent damage to prehistoric prints, artifacts or bones. The more undisturbed a cave floor is, the more valuable it is for scientific studies. If the scientific researchers are not currently available, preserving the floor will save the features for the future when scientific study may be possible.

Where to place a trail?

The million dollar question. The ideal trail isn't always the shortest route from "point A" to "point B". The easiest, shortest route may very well have been the same route prehistoric people chose hundreds of years ago when they explored the cave. You don't want your footprints to destroy theirs! So, you'll have to determine the least harmful path through each given area. Do what's best for the cave, even if it means making the trail or the cave just a bit more difficult for modern man. Study the floor carefully before choosing your route.

Sometimes the trail is already there, more or less. It's that "elephant trail" previous modern visitors have already created, leaving a veneer of mud, scuff marks or a well-worn path. Perhaps your trail marking is necessary only to affirm a pre-existing pathway or to limit the width of the pathway. In many cave passages with flat, horizontal floors, the floor will be trampled wall-to-wall unless someone establishes a narrow marked pathway.

Situations to ponder when determining where to place a trail:

- Where is your destination? That is, where do you want the trail to go? Is it best to place the trail along one wall or another of the passage or somewhere down the center? If there is more than one passage that will get you to your destination, which one is the better one to place the trail?
- What is the best way to get there? Check the floor and avoid trampling on sensitive areas that might contain antiquities, delicate speleothems or biological communities. In many cases, it's okay to get relatively close to features worth protecting, but don't get so close that splashing from muddy, wet boots or lint from clothing will affect the areas you're trying to protect.

- How wide or narrow should the path be? Typical trails should be no less than a meter wide. This allows for comfortable easy traverse in most places and is wide enough to allow people going in opposite directions to pass one another without causing one or both to step outside of the trail boundaries. If the trail is too narrow that it causes people to step off trail, then what was the point of making the trail so narrow? However, there are times when the trail must be more narrow than one meter (3 feet). As mentioned before, sometimes the shape or width of the passage necessitates a very narrow path. In a passage where the floor consists of flowstone, delicate speleothems, prehistoric artifacts or animal remains, the trail must be narrow to avoid damaging cave features.
- As mentioned before, if there is a dominant pre-existing path through an area where the floor has already been trampled, marking a trail may prevent future damage, delineate the official width of the trail and prevent things from getting worse than they are. (see How to Restore A Cave Floor)

What to use to mark the trail with

Okay, you've determined where the trail will be, but what to mark the trail with? Consider the following materials, each used in various caves throughout the Ozarks:

- Plastic survey flagging
- Reflective markers
- Synthetic rope or other hand lines
- Gravel, cobble bordering
- Concrete or mortar pavement
- Stepping stones
- Plastic drinking straws and coffee stirrers

The type of markers to use will be very dependent on the floor material. Is the floor level or sloped? Does it consist of bedrock, breakdown, flowstone, mud, silt, gravel or water? In dry seasons, the floor may be muddy or dry, but in wet seasons, it is wet with ponded or perhaps flowing water. A particular type of marker may be ideal for one situation, but totally inappropriate for another. Some markers are best placed on the floor, a wall or even the ceiling!

NOTE: In some Ozarks caves, there are critters that love to chew and disperse trail markers, no matter what kind they are. Imagine flagging a trail, then returning weeks later to find that some species of cave beetle has strewn little pieces of flagging all over a section of floor you were hoping to preserve! Be careful how you mark trails—inspect the markers on a regular basis to see how well they last, how well they're doing their job. Be prepared to make changes if the markers aren't working out so well.

Plastic Survey Flagging - Make sure the flagging is **non**-biodegradable. You want it to last, and you don't want it to be some cave critter's dinner. There are two types of flagging—long continuous rolls one to two inches wide cut to desired lengths and small flags on stainless steel wire "posts", the kind used in construction sites. In many caves, survey flagging is very effective. Be conservative in its use if possible.

Sometimes just the occasional piece laid on the floor is all that's needed. Sometimes a continuous application must be used to define the trail. In some cases, you need to mark both left and right borders to the trail. This not only establishes maximum width of a trail, but in cases where only one ribbon or flag is placed, the visitor may not know **which side** of the flagging is the trail ("Hmm, do I step to the left of the flagging or to the right??"). Flagging is especially vulnerable to biological attack, ribbon flagging being stepped on and being dragged by a muddy boot to new locations! SPG uses a white flagging with red dots, which really stands out from most any surface. If this is not available, use bright red, orange or yellow if possible. To help prevent post flags from being munched on by cave critters, bend the wire post in two adjacent 180-degree turns—insects are less likely to crawl up the wire, then down, then back up to reach the flag. Persistent beetles may still find the flagging, so be prepared to replace it with another type of marker. Flagging that is not attacked by critters can last many years.

Reflective Markers – Reflective markers range from those plastic markers you mark the edges of your driveway with to pieces of plastic reflecting tape with adhesive backing. The use of plastic reflectors has been used with success in some caves. Reflectors were experimented with in Breakdown Cave in Christian County years ago to determine their effectiveness. Some occasionally get stepped on or brushed off of the walls, but overall, they have been shown to do the job. Currently, trail areas in Breakdown, Lon Odell, Watterson and Garrison #2 Caves have been in place for many years. Occasional maintenance is necessary from time to time. The reflectors I use are made of a 3M product that uses minute glass bubbles and a color dye to produce white, yellow, orange and red markers. I use yellow to mark most paths ("follow the yellow brick road, with caution"), red to mark "do not enter", orange to mark alternate routes, loops or side passage routes and white to draw attention to a feature. The reflectors only reflect from the observer's source. You do not see the reflection from another person's light unless they are standing in your line of sight. One light can often light up reflectors in a straight section of passage for hundreds of feet. Photographers tend to complain about them—they occasionally show up as bright dots in cave photography. To prevent the bright dots in photography, cover them or temporarily take them out of the picture, if feasible.

Synthetic Rope or other Handlines – In some cave passages, rope or other handlines are needed to keep traffic on trail. This may not only be effective in preventing damage to the cave floor, it might also prevent the visitor from falling in an especially hazardous area. The rope or handline material should be of a synthetic material that is resistant to biological attack or decomposition. Sometimes an old decommissioned length of rappelling rope that is still in good condition can be used for such a purpose. Handrails are the concept taken to the extreme, most often seen in show caves. If used, it should be stainless steel, which is most resistant to rust. It is much more expensive than other handlines, but also supports the weight of a caver leaning or falling against it. The vertical poles holding up handlines or rails should be securely anchored in the floor. Of all of the caves I've helped to manage, former show cave Crystal Caverns of Barry County is the only one with stainless steel handrails.

Gravel or Cobble Bordering – In some caves, lines of gravel or stones are used to make neat and obvious trail borders. Such systems are used in outdoor trails and in caves. If possible, use stones native to the cave. This is easy when there are caves with lots of chert gravel or cobble. But if the cave does not have a readily available supply of stones, then stones found in streambeds can be used as long as they are washed clean of material that may have a detrimental effect on the cave ecosystem.

Concrete or Mortar Pavement – Trails made by covering a section of floor with concrete or mortar are most noted in show caves. They not only help to keep the visitors on trail, they help to keep the shoes of the visitors relatively clean and dry. It can also prevent the visitors from transporting excessive floor material from one cave environment to another. In Tumbling Creek Cave in Taney County, Tom and Cathy Aley have created their trail from the artificial entrance to the end of the trail in the East Passage. It is delineated with a 36-inch wide mortar path, with occasional pieces of grating along the way to wipe excessive material off of shoes and boots.

Stepping Stones – Stepping stones are used to not only mark a trail, but also are used to prevent creating unnatural holes in deep, soft mud that could create small pools of water, trapping cave biota. A section of Skaggs Cave in Pulaski County, a 5,900-foot cave owned by the MCKC, is marked with a trail of concrete stepping stones and an adjacent section marked with cobble borders. This is helping to prevent the making of a wall-to-wall quagmire in the section of cave between the entrance passage and Harlen's Puzzle. The area contains a seasonal cave stream, and, at other times, it contains no water at all. Flagging or other loose markers would be impractical in an area that has occasional floods.

Plastic Drinking Straws or Coffee Stirrers – Where other trail marking systems are not available or impractical in a section of deep soft mud or clay, white or color striped plastic drinking straws or coffee stirrers can be used to mark the borders of a trail. These items can be purchased in stores or collected by saving them when visiting restaurants. They may also be used in conjunction with reflective markers applied to heavy gauge stainless steel wire posts if you're short on reflective markers or don't want the trail to be too obvious. Just poke the straw or stirrer into the mud as deep as you want.