

Trail Alignment & Issues with Water



LEARNING OUTCOMES

Understanding what contributes to soil loss and muddiness.

Visually identify trail sections with and without issues with water (erosion or muddiness)

Assess function of, or need for, tread drainage features

Confidently de berm sidehill, open drains, and recommend future actions to mitigate water on Trail

Why Manage Water on Trail?

Moving water erodes the surface of trails and degrades the walking surface by carrying away soil and leaving rocks. Standing water or mud on trails tends to drive hikers off the footpath which damages the natural environment as people go off trail seeking dry footing.

Trail Design

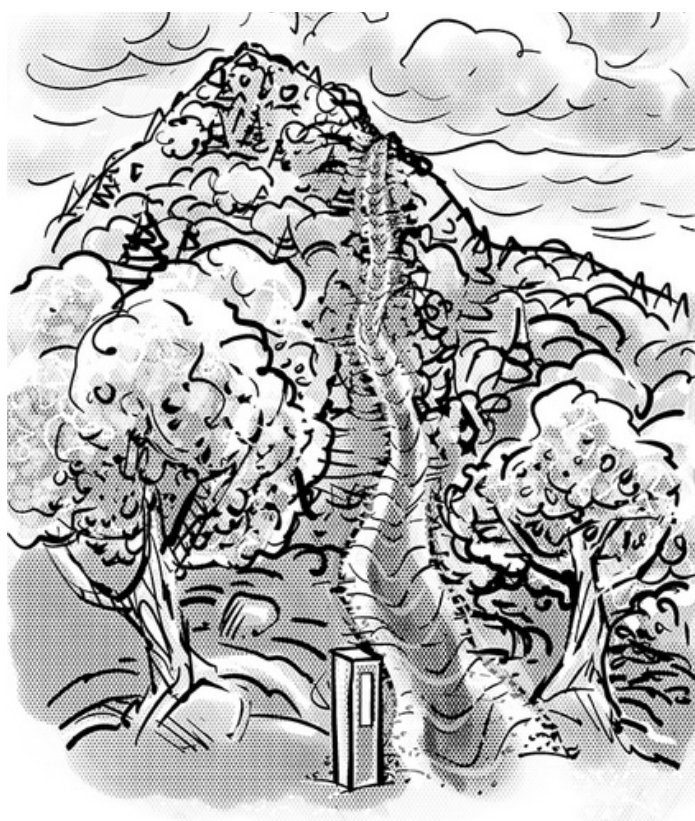
Trail design impacts how water relates to the trail. The trail can either be designed before it is built so that it sheds water, or features must be added and maintained later to divert water off the treadway.

Trail Design and Alignment



Fall line trail alignment: Tends to run perpendicular, or nearly so, to the contour lines. The trail becomes the most direct path for water to travel downhill. Water must be slowed and diverted to reduce soil loss on these sections of trail.

Contour trail alignment: Generally follows the landform's contour lines. Never very steep (ideally ~10% grade), the trail is sidehill construction with an outsloped tread so that water can flow across it in a sheet flow. Switchbacks and gentle turns help gain elevation.



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Water is a Powerful Force

The steeper the trail, the faster the water flows.

Water moving faster causes more erosion because water with greater velocity removes more soil. When the trail's existing grade is steep, the erosive power of water can be reduced by slowing the water down with steps and/or diverting the water off the trail with drainage features.

Spotting Soil Loss

Good sections of Trail, with little erosion, have some leaf litter, with a mix of fine soil particles, pebbles, and gravel. Some cupping may be present (the center of the treadway is lower than its outer edge).

Sections with significant soil loss will be scoured to a hard mineral layer, roots, or rocks, with little or no leaf litter, pebbles, or sediment remaining. The treadway may be gullied.

Spotting Muddiness

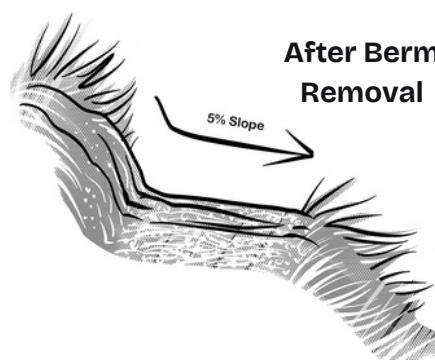
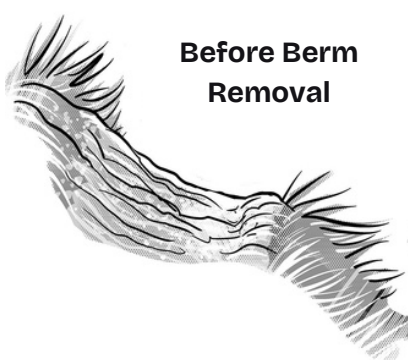
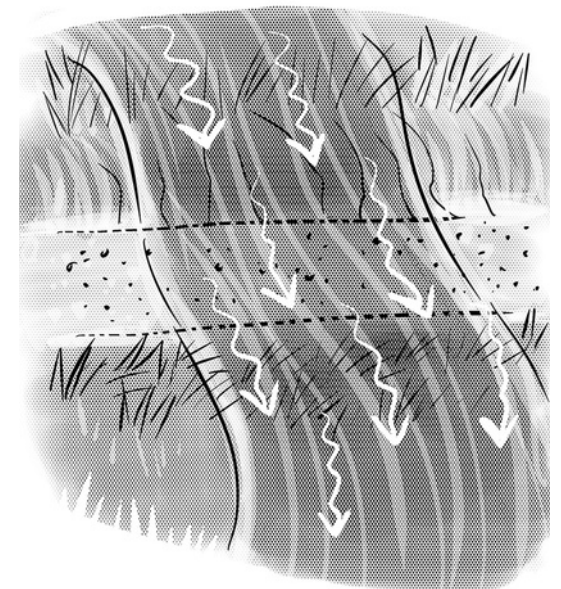
The trail widening caused by muddiness can be spotted year round, whether the area is actively wet or not.

Essential Maintenance to Manage Water

Address Cupping with Berm Removal

A **berm** develops along the outside edge of sidehill trail when water flowing off the outer edge of the trail drops sediment as the center of the treadway compacts with use. This can happen even when the trail was built with the proper outslope. Berms prevent the trail from shedding water over the side of the trail. The trapped water either accelerates soil loss by flowing down the trail or creates muddy areas where water gets retained. Neither situation is desirable.

If water is getting stuck on trail, remove the outside berm and restore the tread outslope to 3-5% to allow for water to flow off the edge of the trail. The backslope may also need resetting if it has sloughed down onto the tread.



TIP: If time doesn't allow for berm removal over an extensive area, remove the berm along low areas of the trail (where the trail goes down then up) to provide an exit for trapped water. This is called "nicking the berm."

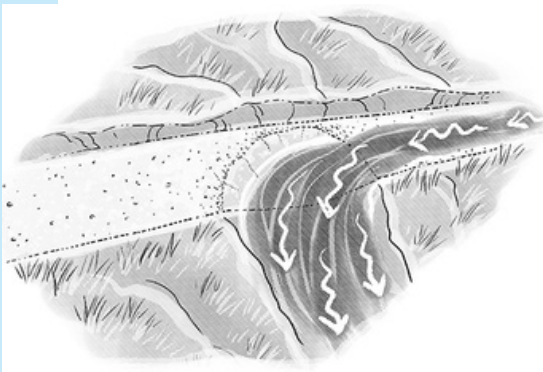
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Essential Maintenance to Manage Water

Maintain Tread Drainage Features

Drains separate water from the footpath. Tread drainage features fall into two main categories: ones designed and built into the trail, and those added to existing trails.



Well built drainage features have gently sloped sides to offer a smooth, sweeping exit for water. By promoting the water to leave at a controlled speed, it is less likely to drop as much sediment in the drain. However, if water slows down (or stops), then sediment in the water settles out and deposits into the drain.

Drains that are steep and narrow should be avoided because these "sudden stops" for water cause sediment to drop and drains to fill quickly, soon rendering them useless; also, they are more obtrusive to hikers.

All drains should be routinely maintained, and other drains may exist on a maintainer's section. Those features are not part of this training.

Grade Reversal

Grade reversals are a superior drain, especially when built as part of a relocation of the A.T.

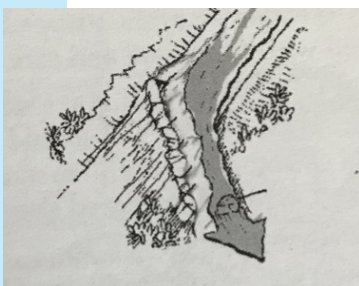


These subtle structures are smooth in their transition, offer ease of walking, and do not experience the decay or replacement needs of built structures like waterbars.

Grade reversals are structures of the trail where a descending portion of trail is followed by an ascending portion of trail. Since water doesn't flow up hill, the sag between the fall and the rise serves as the drain by preventing water from continuing down the trail. **Some maintenance is required to make sure that the outer edge of the grade reversal's drain does not develop a berm (see Cupping and Berm Removal above).**

Waterbars

Waterbars are the best option for legacy sections of the A.T. that are steep. Armored by wood or rocks set deeply enough to easily walk over, these drains on the uphill, down-slope side of the trail should offer a wide and sweeping path for the flow of water to continue down away from the footpath.



Several times each year, maintain the drain of waterbars by clearing a wide smooth apron above the waterbar and removing any sediment and material that is built up in the drain. Discard the material where it won't return to the treadway. Make sure not to dig too close to the waterbar itself since this increases the likelihood of erosion undercutting the structure. Be alert to waterbars being walked around, or ones that no longer offer a downsloped drain for exiting water; report these issues. Recommend replacement of decayed or damaged ones, or report identified areas for new ones to your trail supervisor.