



PCTA Trail Skills College Curriculum Field Reference



Course 205. Tread Re-Construction

STUDENT SKILL OUTCOMES:

- Clear review of hillside hydrology, ideal trail design, and remedying cupped tread and restoring it to appropriate outslope by removing slough and berm.
- Understanding of the difference between of gullied trail on a sidehill, and gullied trail up the fall line (where only checks can remedy).
- Understanding of Tread Creep, Nasty Roots, Uprooted Trees and how to remedy.

KEY TERMS:

Berm: the mound of soil that develops at the outside of tread. Berm disrupts tread out-slope and prevents water from leaving the tread to the down-slope.

Checks: (aka check step, check dam) a log or row of rocks perpendicular to a gullied **fall line** trail, embedded in both banks, to slow the rate of water erosion. If several are constructed on a horse trail, they should be 6', 12, 18', or 24' apart to approximately match the gait of a horse.

Cupped Tread: trail tread that is dished out by users feet loosening the soil and then water (and/or wind) carrying the soil away. Such tread holds water on the trail leading to cupping erosion on grades above a few percent.

Erosion: the transport of soil by water, wind, or gravity, usually in a manner that degrades the preexisting soil condition.

Fall Line: the shortest and steepest way down a hill, indicated by a clinometer or a rolling ball. Trails that follow the fall line are likely to erode badly and are impossible to drain. Ideally they should be relocated to follow the side slope at a grade less than 10% or have **checks** installed to slow further erosion.

Grade Reversal: regular ups and downs designed into a trail alignment is the best way to shed water from a new trail. Such ups and downs can be added to an existing trail with great labor by constructing water bars and drain dips (aka rolling grade dip).

Hillside Hydrology: generally describes how water from rain, melting snow, and seeps travels down natural slopes. Here we are especially concerned with how such water interacts with trails. Troy Parker uses the additional term, "tread watersheds", to describe the subsections of a hillside that shed water to a particular piece of trail between two drainage structures.

Out-Sloped Tread: a trail surface that tilts to the downhill side of the trail to shed any water that arrives from above. Trails should be constructed and restored with 8-16% outslope (1-2" of drop per 12" of tread width) so that they will age to hold 5-10%. Less durable soils require greater outslope. On rare occasions tread is in-sloped, shedding water to an **inside ditch** just uphill of the trail, later crossing the trail through a culvert or other drainage structure.

Sheet Flow: the passage of rainwater and snow melt down a hillside as a thin layer, causing minimal erosion until it reaches a drainage. Such sheet flow, when it reaches a uniformly out-sloped trail, simply crosses the trail and continues down the hillside. If it is interrupted by a flat, cupped, or in-sloped tread, the water is diverted down the trail and erodes the tread.

Slough: the debris deposited on the inside of tread at the base of the back-slope, primarily delivered by gravity from the back-slope above. Its accumulation causes the tread to narrow, forcing users to the out side of the tread, which can lead to collapse or tread slip.

Tread: the surface of a trail, on which users walk or ride.

Trail Reconstruction: the process of revamping a badly eroded or slipped section of trail using all appropriate means such as tread reconstruction, construction of drainage structures, and minor relocations.

KEY CONCEPTS:

- 1) Safety Document and Concerns:
 - Personal Protective Equipment (PPE), Job Hazard Analysis (JHA), Tailgate Safety Session (TSS), Emergency Action Plan (EAP)
- 2) Trail Crew Leave No Trace: Have a positive impact on the land through trail work and be sensitive to off trail and camping impacts.
- 3) Proper/ Improper Tool Care and Use:
 - Fire shovel, McLeod, adze hoe, Pulaski, pick mattock, rock bar, Rheinhard
- 4) Hillside Hydrology/ How Trails Work:
 - Effects of water in diverse soil types
 - Basic trail design and maintenance
- 5) Develop "Trail Eyes":
 - Suggest hiking in rain to better understand water on trails
 - Have students observe various user types to see how they impact trails
- 6) Re-cutting Tread:
 - Layout and flag re-cutting work like with new tread construction
 - Remove all slough and berm, eliminate cupping
 - Restore 2-3 ft wide bench, shape backslope to 45 degrees
 - Make outslope 8–16% so it ages to hold 5–10%
- 7) Tread Reconstruction:
 - Cupped vs. Gullied Tread:
 - Cupped tread is minor, remove slough and berm, restore outslope
 - Gullied tread is severe, consider installing checks
 - If on sidehill, may be able to pull berm into tread
 - If on fall line, install checks, fill with tamped rock and soil
 - Use rip rap rocks to narrow overly wide gullied tread
 - Tread Creep:
 - Remove what's uphill pushing users to outer edge
 - Add guide features, re-cut tread if needed
 - Nasty Roots:
 - Restore outslope: build retaining wall and backfill to cover roots, or
 - remove roots, being careful not to kill tree
 - If just a few roots, remove ones with daylight under them, leave rest
 - Uprooted trees:
 - If unstable remove, if stable can be used in solution
 - Reestablish solid tread and 8' wide trail corridor
- 8) Report Work Promptly

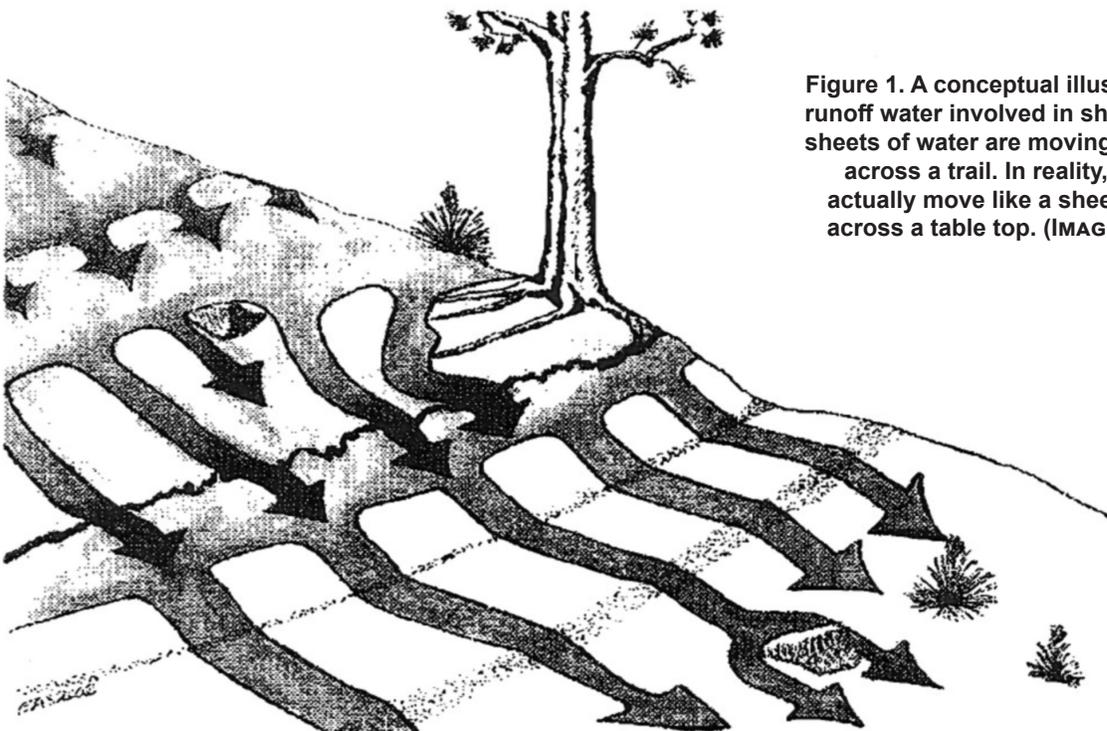


Figure 1. A conceptual illustration representing runoff water involved in sheet flow. Successive sheets of water are moving down a hillside and across a trail. In reality, the runoff water will actually move like a sheet of paper being slid across a table top. (IMAGE COURTESY OF VOC)

Figure 2. Trail Structure Terms (IMAGE COURTESY OF THE SCA)

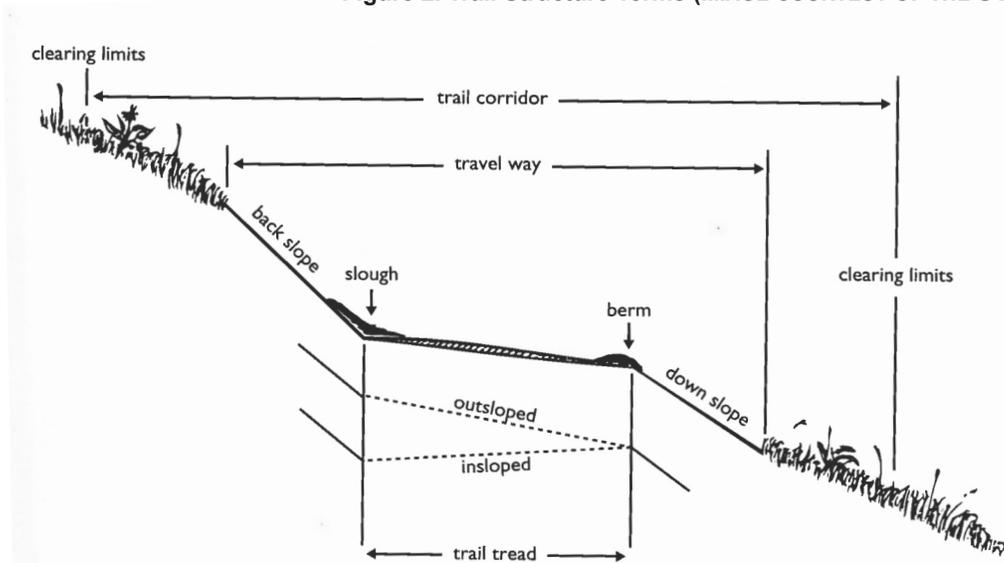


Figure 3. If your ankles start to roll, the tread has too much outslope. (IMAGE COURTESY OF USFS)

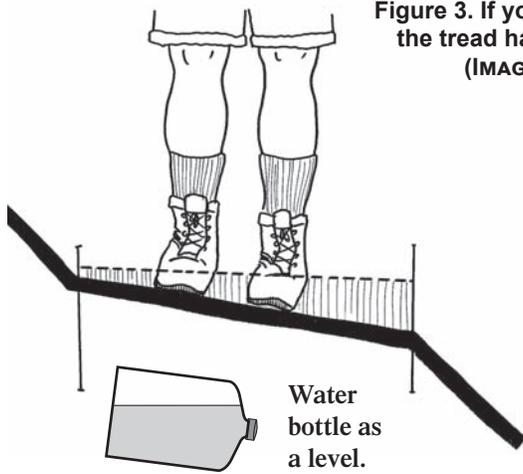


Figure 4. A McLeod used as an outslope gauge. (IMAGE COURTESY OF VOC)

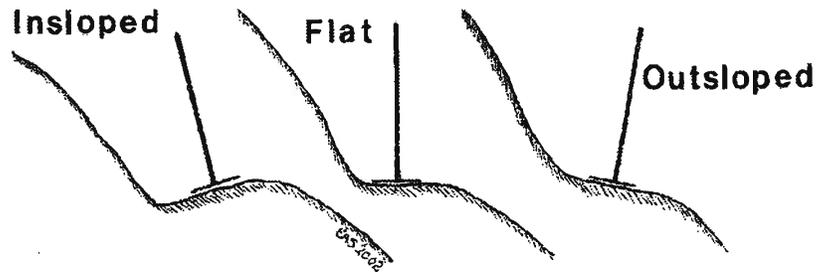
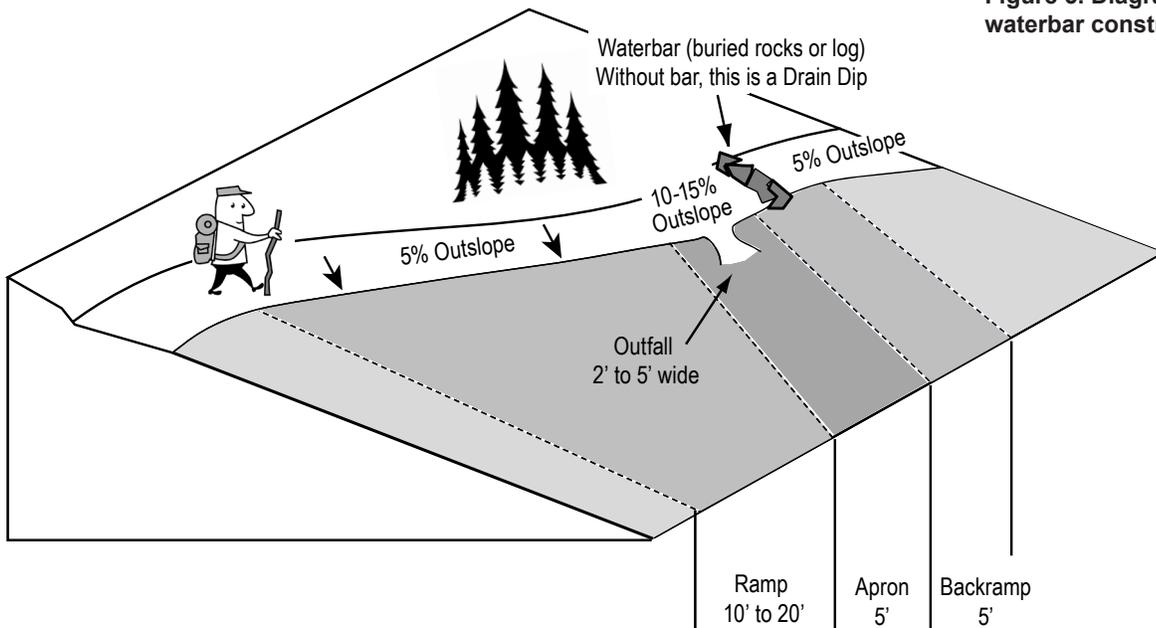


Figure 5. Diagram of modern waterbar construction



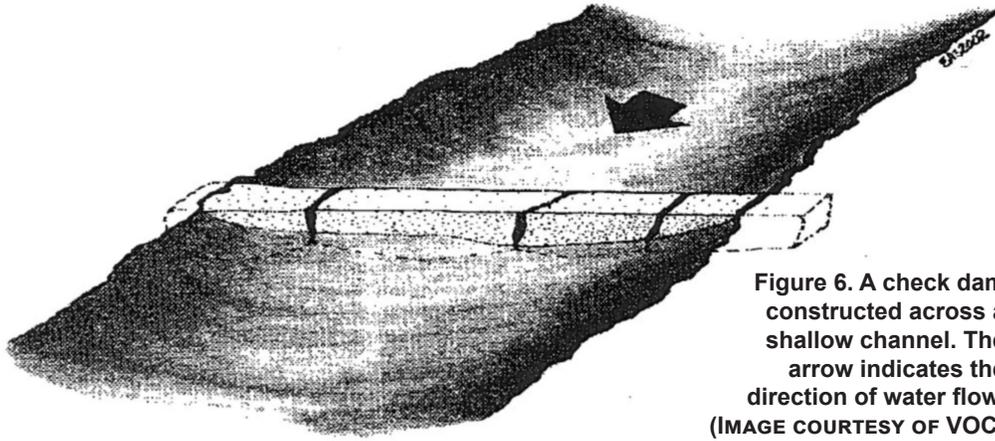


Figure 6. A check dam constructed across a shallow channel. The arrow indicates the direction of water flow. (IMAGE COURTESY OF VOC)

Figure 7. Stabilizing Tread Creep. Guide rock properly installed to help prevent tread creep. Do not create a continuous barrier that impedes water drainage. (IMAGE COURTESY OF USFS)

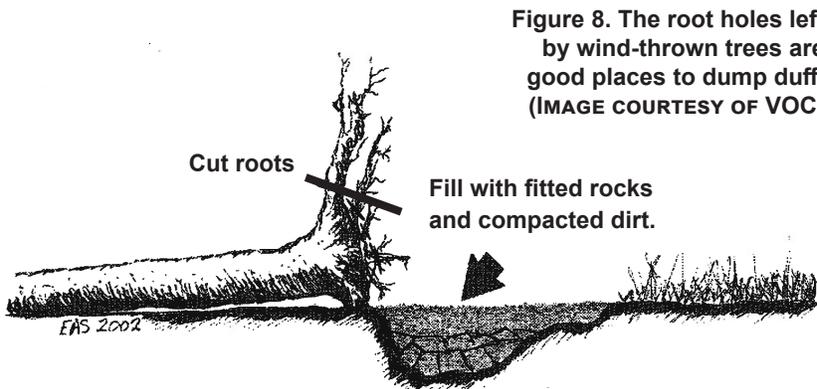
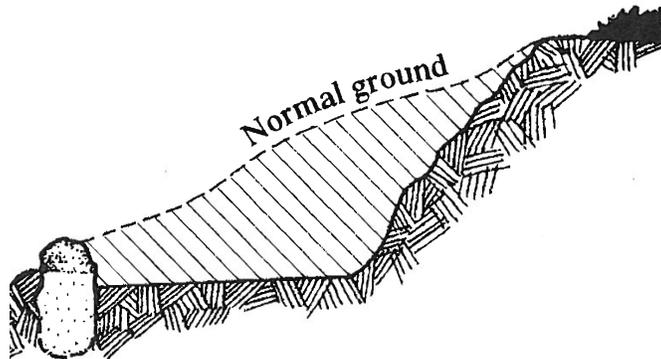


Figure 8. The root holes left by wind-thrown trees are good places to dump duff. (IMAGE COURTESY OF VOC)