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Rolling Grade Dips: Smarter Than the Average Water Bar

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A good contour trail is slightly outsloped or canted out which allows water to sheet across the trail, without impeding the natural flow of water. Keeping water from running down the trail tread is crucial. Over time and heavy use outsloping can be lost, which means the trail is in need of maintenance.

The best trails have subtle grade reversals or grade dips which act like a backup system to outsloping. These grade dips prevent water from running down the tread, which would otherwise wash away loosened soils. Grade dips also give users a break or a rest in climbing or descending. Grade dips that utilize natural undulations in the land are the best, because they mimic nature.

Many contour trails lack enough grade dips to impede the flow of water and so structures are built into the trail afterwards to relieve the situation. Drainage structures such as rock water bars, wooden check dams, or ditches have traditionally been tried. However, these structures have many faults: a) they require constant maintenance b) they clog up with sediment quickly c) strong water events wash right over the top d) users can't negotiate them so they go around, thus widening the tread. It's true that something is better than nothing to keep water from ruining a trail, but if its not doing its job and its forcing users off the trail, there must be a better way. Our secret weapon is the "Rolling Grade Dip" or "RGD", which is a device that imitates the qualities of a natural grade dip.

Typical drainage dips are deep, short and abrupt which clog and force users off the tread. RGDs are long, subtle and nearly invisible, keeping water off the trail and users on. RGDs are sometimes described like an open-ended spoon with the handle being the ramp. The dip itself should be enough to invite water off the trail, because of its exaggerated outslope (10to 20%). The dip is kind of like taking a nick or a chip out of the tread and should be longer than a bike (about nine feet). The excavated soils from the dip can be used for a backup ramp that fortifies the dip. This ramp is long, 10-20 feet from tip to tail (depending on the steepness of the tread) and outsloped like normal tread (5%). The total length of an RGD, from the start of the dip all the way to the tail of the ramp varies widely depending on steepness of the trail tread, but most are somewhere between 15-30 long.

Placement of RGDs are crucial. Look for a natural roll or change in trail grade that can be exaggerated. Keep water diversions out of turns and corners. Instead, put them in the straight-aways above turns. On steep hills several RGDs may be needed and most true fall-line trails may have to be rerouted if water is a constant problem. Certain soil types like decomposed granite (DG) or sand don't bond well and may need an outside substance like clay to improve its integrity. Every place is a little different and sometimes experimenting with many ideas will uncover an answer.

#1 LAYOUT AND OPENING

DRAIN: Before hacking away at a perfectly good tread, spend a little time choosing the best place for the RGD. Look for slight rolls in the trail that can be enhanced by an RGD. Choose straight sections of trail. Never put water diversion structures in a turn. Water diversions can be placed a bit before or after turns as long as they don't change the flow of the corner. Make sure there are no



trees or natural objects that block the drain. Remove organic material (leaves, sticks, dark soil) from the drain. The drain should be wide (8to12ft) allowing water to sheet not channel. This will also keep the drain from clogging and it will look more natural in time.



#2 EXCAVATE DRAIN: Soil excavated from the drain can be flung downhill to form the ramp. Compaction must be done in layers as soil lands on tread and soil should be moist.



#3 SHAPING: The outer or lower edge of the tread inside the dip can be shaped. Think about shaving the tread a bit at a time. Don't hack into it, because if a hole is created it cannot be filled. Flung the excavated soil down the trail onto the ramp and compact. Working in teams of two or three is perfect.

#4 COMPACTION: The ramp will start to form and should be 10-20 feet long from tip to tail and very subtle which will ensure its sustainability. The soil must be



moist to ensure the layers bond. Sometimes water has to be brought in for the compaction process.



#5 FLING: The further excavated soils are flung down onto the ramp, the more natural its shape will be. The ramp isn't an abrupt berm; it should mimic a natural roll.



#6 FINISH: The dip is shaped like a spoon and is outsloped 10 to 20% with an open-ended drain. The ramp is long and subtle with a normal outslope of 5%. The total length of the structure is 15-30 feet and it's almost invisible! Water is invited off the trail naturally and is not forced off. Users cannot tell it's a water diversion structure, so they stay on the trail instead of riding off trail to avoid an obstacle.

Thanks to everyone in Susanville who worked on this model RGD including BLM, City of Susanville, Lassen County Parks and Lassen Velo. Great trails!

