Rolling Grade Dips - Erosion Control Basics

Jan and Mike Riter

Hello again fellow tread heads. This month's Trail Tips covers a problem which gives trail workers constant headaches: erosion control devices, more commonly known as water bars. We mostly advocate only one kind of water bar, the rolling grade dip, and we offer here some advice on how you can construct this effective trail structure.

The important thing to remember about water bars is that they are "band-aids" used to fix a poorly designed trail, or one that is forced into too steep a grade because of the terrain. Trails that require water bars should (ideally) be rerouted. If they cannot be moved, then erosion control structures are necessary.

The Great Water Bar Trials

After the Olympics in Georgia, we rebuilt the mountain bike race course to open it to the public. During that effort we were able to try a lot of different types of water and erosion control devices in a controlled environment. Our test period was under Georgia's most adverse weather condition months, November and December. In this test period we had a total of 2,700 riders make close to 5,000 passes on the course. We tested water bars made of rubber, wood, rock, and dirt, and an adaptation of the dirt water bar we call the rolling grade dip.

The first device we observed failing was the rubber water bar. It's the wicked witch of the lot. It is composed of a section of rubber conveyor belt sandwiched between two 4x4 posts and buried in the trail surface at varying angles and depths, usually producing the same results...high maintenance, or failure. We oppose the use of this device.

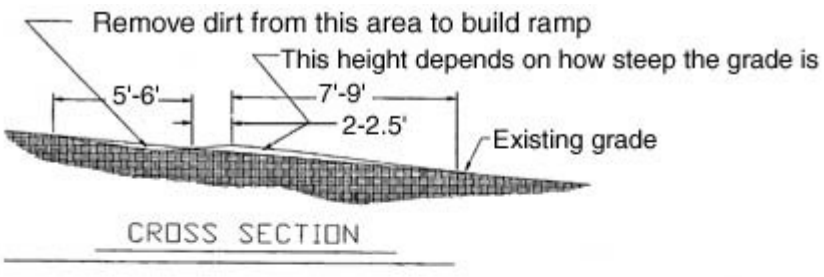
In our trials, the rubber water bars either flattened out and did not retain their original upright shape, or collected silt and debris behind and became six to eight-inch drop-offs, with holes just beyond created by the impact of falling tires and hiking boots. We tried slicing them into one foot-wide strips, but this just caused them to fail faster. We changed the bars' angle, trying to increase the velocity of water to make them self-cleaning, and learned that the angle needed to accomplish this made them extremely difficult to negotiate. We also observed that trail users had difficulty crossing them at any angle. If they were even slightly wet falls were frequent. Mike even slipped and landed hard on his posterior while walking across one. Users were also quick to make a path around either side, which caused even bigger erosion problems than existed before.

Safety problems make rubber water bars a liability concern for land managers. They also ruin the natural aesthetics of the trail. Who wants to be out for a nice ride or hike and see a scenic hillside covered with rubber strips?

The wood and rock water bars shared many of the same characteristics as the rubber water bars. They were slippery when wet, posed a high liability factor, and were difficult to negotiate. On the good side they lasted much longer than the rubber water bars. The dirt water bars were more in tune with the natural aesthetics, but because of their size and steep sides (like the rubber, wood, and rock water bars) were intimidating to all but experienced people. So again bypass routes developed, or users destroyed the top and downhill side, quickly developing ruts that caused an even bigger mess.

The Only Effective Solution - Rolling Grade Dips

The only erosion control device that we found that required almost no maintenance, did not intimidate people or cause falls, and was aesthetically pleasing was the rolling grade dip. It is an adaptation of the dirt water bar. By utilizing the natural materials found on or near the trail, you will be building with materials already suited to that particular climate. Not only will they blend in with the natural surroundings, but properly constructed, they will last.



To describe the construction of the rolling grade dip we like to
use an analogy conceived by our friend Patrick. Think of a spoon oriented with the handle on the downhill side of the trail tread. It begins with a five to six foot long "spoon" or dip that is dug no more than five or six inches into the tread. The entire downhill side of the dip is opened up for drainage. This promotes high volume drainage with very low water velocity. Water moving slowly is less apt to cause erosion cuts or channeling in the surface of the tread.

Take the excavated soil and pile on the trail at the lower end of the dip a slight hump no more than six to eight inches tall. Think of the part of a spoon where the handle joins the main part of the spoon. It should have a smooth, consistent transition from the center of the dip to the top of the hump; no sharp edges or steep humps. Next complete the "handle" of the spoon by building a ramp that extends eight to ten feet down the trail from the hump.

The hump and the handle should be built in layers. Pack each layer with a McLeod or some other large surface packing device before piling on more dirt. This will keep the center-line from dishing or forming a rut. (This is a good rule to use anytime tread is being built up or restored.) Pack the entire structure and remove any divots or bumps, making it as smooth as possible. Afterwards walk up the trail and observe your handiwork. The rolling grade dip should be barely noticeable.

If you brought your bike, ride the structure in both directions. You will see that it is very easy to negotiate in both directions, without the intimidation factor brought on by the obtrusiveness of the other types of erosion control devices, so riders won't skid and will go over it, not around. It will remain smooth and fun to ride.

Hikers won't have to worry about rolling an ankle or slipping. The mass of the dirt in the handle will help support the hump and add years of longevity. If built properly, the only maintenance it will require is the removal of leaves or other debris that will occasionally collect in the dip.

One last tip: If you have to build the hump taller than stated here because of steeper slopes, then use the following formula; for every inch you go up on the hump add one foot to the length of the ramp (the handle). Apply the same to the "dish" of the spoon: If you dig it in deeper, it should be longer. This will keep the structure stable and smooth.