

# Bank Benches

**BANK BENCH** - A step or terrace constructed on a road bank that reduces the amount of up-slope water reaching the road, while diverting the water to a stable outlet.



Photo 1

A bank bench on Red Rose Rd., Huntingdon County, just after construction. This bench is one width of the backhoe bucket and was constructed from the road way.



Photo 2

The same bank bench after native vegetation has been re-established.

## PURPOSE

The purpose of a bank bench is to slow water entering the road corridor and divert it away from the road to a stable outlet location. Bank benches not only reduce the amount of water reaching the road, they also decrease its velocity. Slowing down and re-directing water to a stable outlet location minimizes its erosive force, prevents water flowing over the bank onto the road, and directs sediment-laden flow to a well vegetated stable outlet point encouraging infiltration and trapping sediment. By reducing the loss of road material, the sediment supply to pollute nearby streams is decreased, road ditches and culvert pipes function more efficiently and subsequent maintenance costs decrease.

## HOW THEY WORK

Bank benches work by slowing and diverting up-slope surface water that would otherwise enter the roadway profile before the water can reach the road ditch (Fig. 1). Diverting water before it reaches the road ditch or road surface minimizes the volume of water and sediment carried in the road drainage system. Slowing and diverting the water to a stable outlet location enables infiltration and groundwater recharge.

## WHERE TO USE

Bank benches work best in situations with large areas up-slope of the road that contribute significant volumes of water to the road. Drainage should be directed away from the stream at a stable, well vegetated location to outlet the water.

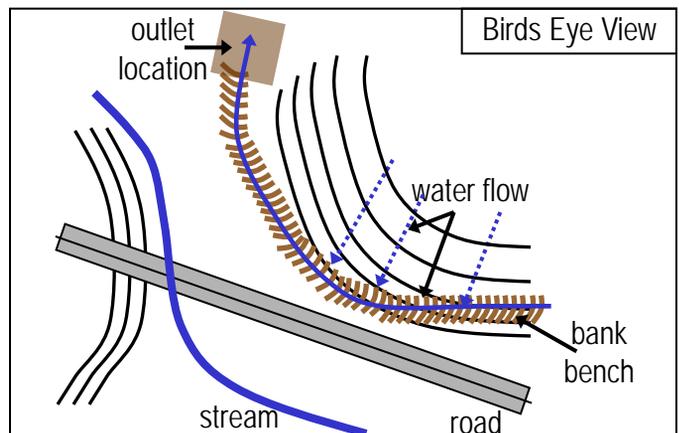


Figure 1

A bird's-eye view of a bank bench. Water flowing down the hill slope encounters the bench and is slowed and re-directed away from the road to a stable outlet location away from the stream that promotes infiltration and prevents concentrated drainage from entering the stream.

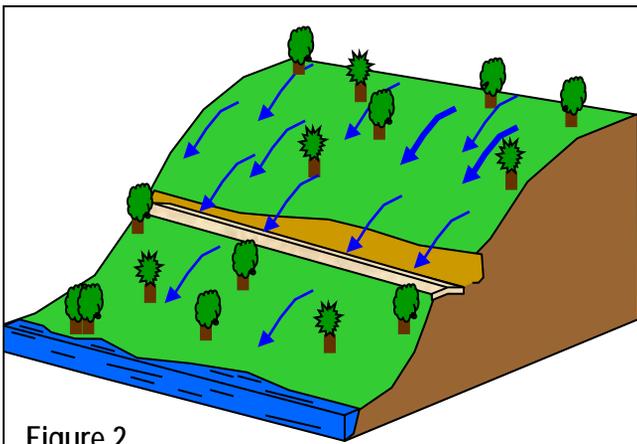


Figure 2

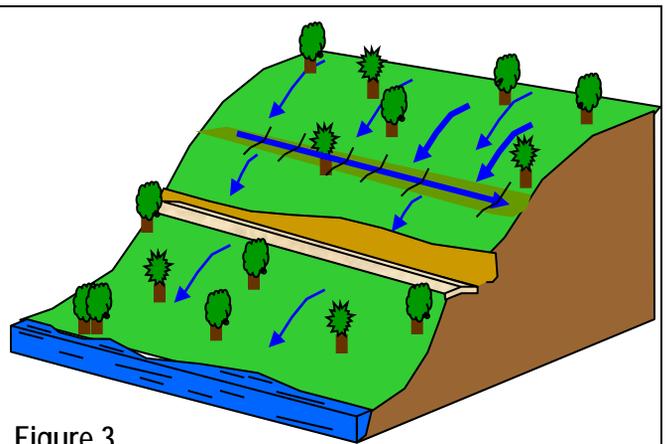


Figure 3

Bank benches are an easy-to-install structure for managing roadside drainage. In **Figure 2** above, water travels down the entire length of the slope uninterrupted and flows into the roadway and ditch. The further water travels downslope in this fashion, the more erosive it becomes. By dividing drainage with a bank bench and keeping it away from the road, as shown in **Figure 3**, the volume of water reaching the road is reduced, and erosive flows concentrated in the ditch are eliminated.

### IMPORTANT CONSIDERATIONS:

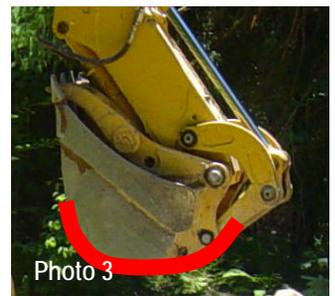
**EQUIPMENT** - A backhoe can be used from the roadway to build this structure.

**SLOPE:** The bank bench must have enough fall to direct the water toward a stable outlet location. Slope should be sufficient enough to move the water, but not so steep as to cause the water to gain velocity and become erosive.

**TRANSITION** - A 3:1 ratio (3 feet horizontally for every 1 foot vertically) is ideal for transitioning the existing bank into the vegetated bank bench. A 3:1 ratio will minimize cutting of the bank by the water flowing on the bench.

**WIDTH & SHAPE** - The bank bench should be wide enough to avoid concentrating water flow; wider is always better. Generally, a width of 4 to 10 feet is sufficient. Shape of the bench should be a gentle “U” shape (see the highlighted profile of the bottom of the backhoe bucket in Photo 3), to allow the water to spread out over the width of the bench and flow in a wide, shallow pattern.

Photo 3 shows a highlighted profile of the bottom of a backhoe bucket, the recommended shape of a beveled bank bench.



**STABILIZATION** - Seeding and mulching of the newly constructed bank bench is critically important. The quicker vegetation can be established, the less erosion will occur on the disturbed areas. Native vegetation growing in the area should be used whenever possible, as these plants are adapted to the site and will provide the best soil protection without introducing non-native or invasive species. Selecting vegetation suited to the soil moisture conditions on and near the bench should also be considered.

**OUTLETS** - Outlets should be located in stable, well vegetated areas as flat and wide as possible. This level area for spreading the collected and diverted drainage over a wide, flat fan will maximize infiltration and help recharge groundwater.