



## Best Management Practices for Logging Operations

The purpose of Best Management Practices (BMPs) are to reduce soil erosion that is caused by tree harvesting and extraction of the logs from the woodland. BMPs are simple techniques to minimize erosion and keep the soil out of streams.

Cutting trees does not cause erosion. Skid trails and haul roads are necessary to remove logs from the woodland. The exposed compacted soil on these roads is very subject to erosion as it is dislodged by raindrops. The overland flow of water then washes these dislodged soil particles into streams or other water bodies.

Because of the very porous nature of the forest soil and the sponge-like action of the litter cover of leaves and other organic material, undisturbed forest soils allow the infiltration of rainfall at about 50 inches per hour. A common rainfall intensity is one inch per hour and easily infiltrates undisturbed forest soils. However, the soils of the skid trails and haul roads allow rainfall infiltration at a rate of a fraction of an inch per hour. The result is that virtually all logging operation erosion occurs on the road system.

### Proper planning

Proper planning of log decks, skid trails and haul roads is critical to avoiding unnecessary soil erosion. The use of a topographic map (Figure 1) is the best starting point for planning a harvest road system. Steep slopes, the streams and property lines can be located on the map.

A brief walk around the property will yield more information. Rock outcroppings, wet areas or streams that will cause difficulties in road construction and require the installation of a large number of erosion control BMPs should be noted and avoided.

When planning a road system, consider its ultimate use. If heavy trucks will haul large loads of logs out of the woods, the road will need to be constructed to a high standard. Also, if it will be a permanent road for access to the woodland after a harvest, the high standard road may be needed.

If it is to be a temporary road or will be used to skid a small number of logs from an area of the woodland, the road may not require the high standard of construction.

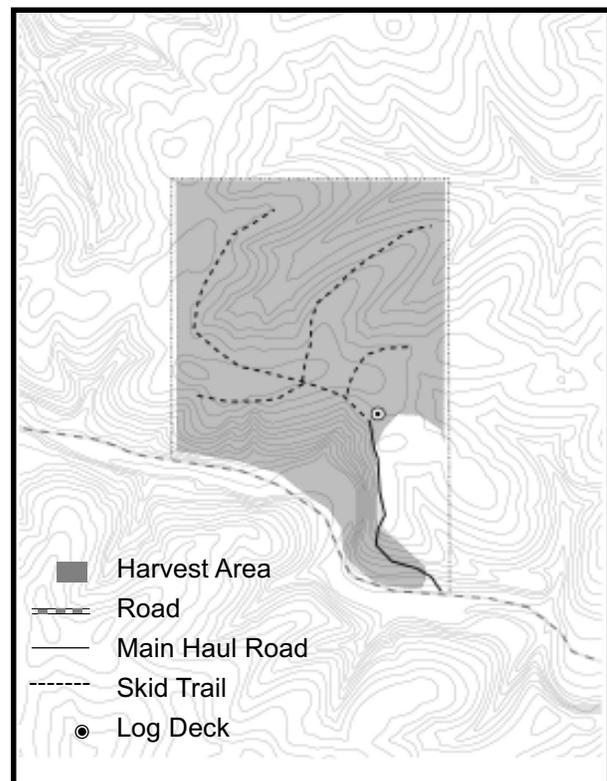
Remember, the best BMP is the one you don't need to install. Proper planning will help you avoid needless installation of costly erosion control devices.

### A Few Simple BMPs

There are many different BMPs. Only the most common and widely applicable ones will be described.

The challenge is to control the volume and velocity of water that flows on a logging road system. The principle behind most BMPs is to direct water from the road to undisturbed forest soil. The sediment carried in this water is deposited on the forest floor and becomes incorporated into the existing soil.

**Sediment barriers** should be used where there is little or no undisturbed forest floor upon which to divert the water. Examples of sediment barriers are silt fence and straw bales staked into the soil (see Figures 2 and 3). This is an expensive but effective practice. Proper construction and location are critical to the success of this BMP.



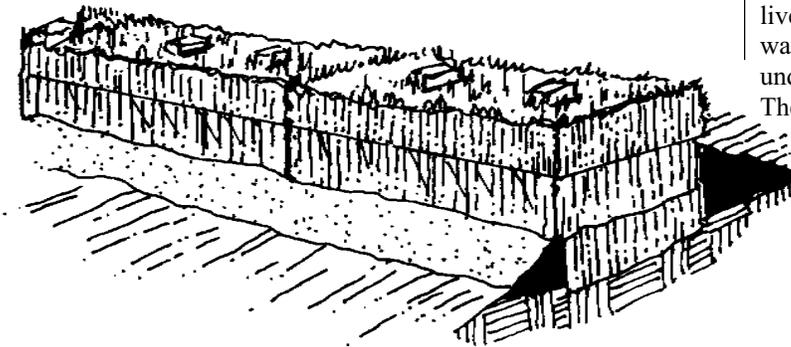
**Figure 1**

**A Topographic Map is a planning tool for locating a harvest road and trail system.**

Culverts may be needed to accommodate traffic during and after a harvest operation. There are several types to select from including **box culverts, pole culverts and pipe culverts** (see Figures 4,5 and 6). Box and pole culverts collect water from the road surface and diverts it to the forest floor. Pipe culverts collect the water from the road ditches and directs it under the road to an outlet. The spacing of these culverts is the same as for the waterbars (see Table 2). Brush or rock rubble should be placed at the outlet of these culverts to reduce the energy of the flowing water.

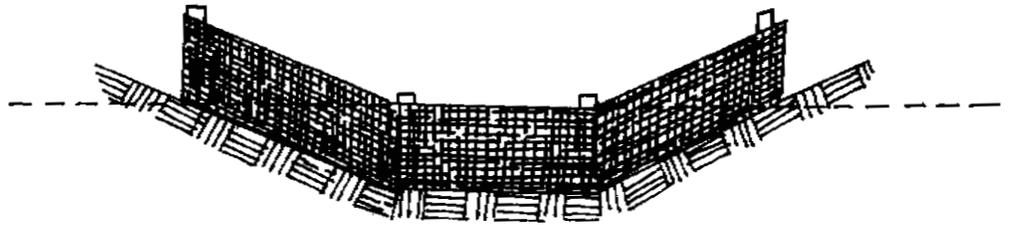
**Stream crossings** are the most sensitive area of a road and should be avoided. If it does become necessary to cross a stream, several guidelines apply. The preferred method to cross a stream is to use a bridge. If this is not possible then 1) cross the stream at right angles; 2) cross the stream where the stream bottom is rock and the banks are rock; and, 3) apply gravel and rip-rap to skid road approaches. If **culverts** are used to cross a stream, they should be in line with the stream course. If a temporary bridge is used, the stream banks will be least disturbed if bridge abutments are left intact when the bridge is removed.

**Stream management zones** (Figure 7) deserve special treatment. These areas are composed of a “shade strip” and a “filter strip” that protect water quality and the organisms that live in the stream. It provides shade to the stream and filters water that passes through to the stream. The goal is to have an undisturbed forest floor within the stream management zone. The shade strip is a minimum of 15 feet of trees on both sides



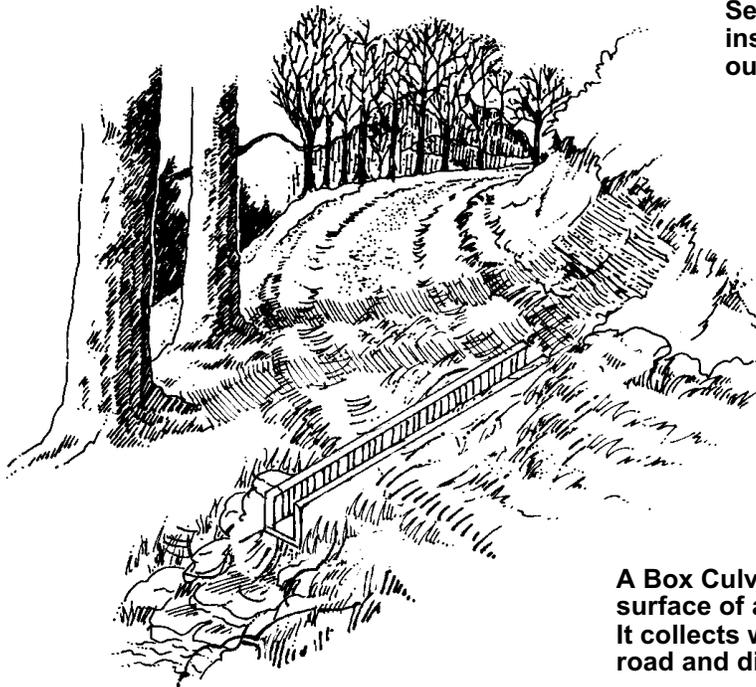
**Figure 2**

**Sediment Barrier -Hay Bales** can be staked into the ground on the slope contour to filter sediment out of runoff.



**Figure 3**

**Sediment Barrier -Sediment Fence** can be installed on the slope contour to filter sediment out of runoff.

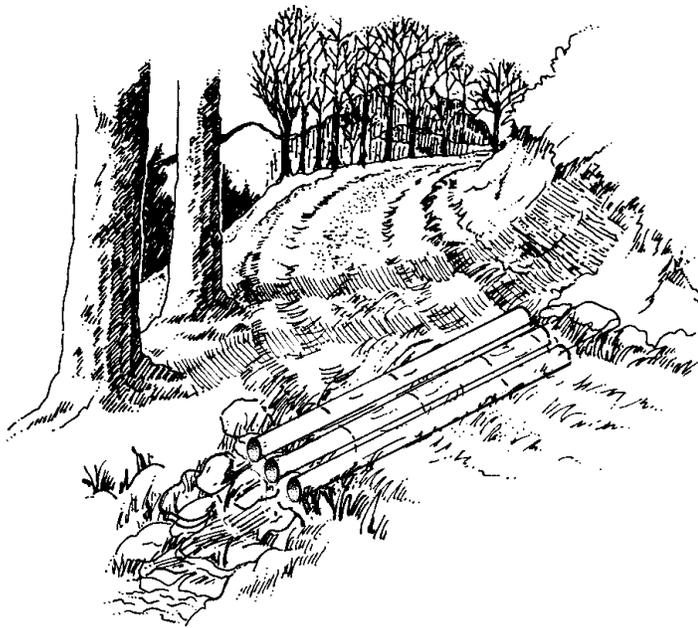


**Figure 4**

A **Box Culvert** is an open-topped box laid into the surface of a road and at an angle across the road. It collects water running down the surface of the road and diverts it to undisturbed forest floor.

of the stream within which trees are not disturbed. The filter strip width, which includes the shade strip, is determined by the slope of the land between the stream and main harvest area (see table1). Filter strips, exclusive of the shade strip, may be lightly harvested but equipment should not be allowed to operate in this area; logs should be winched out and equipment should only be allowed to operate at established stream crossings.

**Log decks or landings** are areas to which logs are skidded for loading on to trucks or to be further processed. These decks should be located on a dry site and drain easily. Skid trails or haul roads should not drain into them.



**Figure 5**

A Pole Culvert is a series of three poles laid parallel to each other at an angle across a road. It collects water running down the surface of the road and diverts it to undisturbed forest floor.

**Haul roads** deserve special treatment where they meet township, county or state highway roads. These **main road approaches** should have gravel (or other durable material) applied from the road to a minimum of 200 feet up the haul road. This gravel will minimize the amount of mud that is tracked onto the public road surface. As the gravel becomes embedded into the road surface or becomes covered with mud, new gravel should be applied.

**Maintenance** is important to the function of all of these BMPs. Maintenance will ensure that they function properly throughout the harvest operation and beyond. Culverts and ditches need to be cleaned. Rock rubble or brush at the end of culverts or waterbars needs to be replaced. Sediment barriers may need to be repaired or replaced. Gravel may need to be reapplied to haul roads to maintain their stability.



**Figure 6**

A Pipe Culvert is pipe that runs under the road surface that captures water from an uphill ditch and diverts it to undisturbed forest floor.

## Closing the Sale

Closing the sale properly will avoid future problems. There are several things that need to be done before a sale can be officially closed.

**Waterbars** should be installed on skid trails and haul roads that will not have future vehicular traffic. A waterbar is a trench and mounded soil that acts as a barrier to the flow of water down a road. The obstructing mound should extend across the ditch, the entire road and be angled at 30° to 45° downgrade (see figure 8) to direct the water off the road. The outlet of the waterbar should be open and direct the water to undisturbed forest litter. If the waterbar will be carrying a high volume of water, brush or rock rubble should be placed at the outlet to limit erosion caused by the flowing water. Waterbars should be spaced down a slope (see Table 2 for spacing guidelines). These waterbars need to be installed as soon as practicable after the last load of logs goes over the road. They also need to be maintained so that they continue to function.

Roads, trails, decks and other areas of disturbed soil should be **revegetated**. Grass seed, lime and fertilizer (if necessary), and straw or hay for mulch should be applied to these areas to ensure stabilization. The roots of this newly established vegetation will help hold the soil in place and augment the other BMPs in preventing soil erosion.

**For more information on BMPs contact your local service forester. You can also contact your local state forest or Soil and Water Conservation District, a consultant forester or Master Logger\*.**

*\*Master Logger is a program of the Ohio Forestry Association's Loggers Standards Council.*

Slope of Land Between Road & Stream (%)	Width of SMZ for Common Logging Areas	Width of SMZ in Critical Areas
0	25	50
10	45	90
20	65	130
30	85	170
40	105	210
50	125	250
60	145	290
70	165	330
80	185	370
90	205	410
100	225	450

**Table 1**

Determining Water Bar Spacing	
Slope %	Spacing in Feet
2	250
5	135
10	80
15	60
20	45
25	40
30	35

**Table 2**



**Figure 7**

**The Stream Management Zone (SMZ)** provides shade to the stream and filters water that passes through to the stream.



**Figure 8**

**A Water Bar** is a trench and mound of soil placed at an angle across the road to divert water running down the road to the undisturbed forest floor.