

Appendix 5: The Use of Gravel on Forest Roads

Why to use gravel

Although gravel can be an added expense, it is a valuable resource on many logging jobs that provides all-weather access for log trucks while protecting streams and highway entrances from sediment problems.

- When used effectively, gravel will pay for itself by increasing the operability window and the subsequent productivity of that operation. At times, gravel may be the best way to prevent sediment from washing off a road and into a stream.
- When used ineffectively, a lot of money can be wasted on gravel that neither improves productivity nor prevents sediment problems.

Proper selection of gravel type and the use of geotextile fabric under it can minimize your expense.

Where to use gravel

Road entrances

Road entrances are probably the most common place gravel is used on logging jobs. The idea is to prevent mud from getting on the highway, which is both a sediment and safety concern. Ideally, at least 100 feet of road should be graveled at highway entrances to allow truck tires to clean properly. If trucks are pulling a lot of mud into the gravel, it may be necessary to replenish it occasionally to maintain a good, clean layer of gravel.

Culverts

Culvert crossings are another area where gravel may be necessary to prevent sedimentation and to keep trucks from getting stuck. Culverts are usually located at a low point in the road and, many times, the fill material over a culvert is not adequately packed. These two features can make for a road that stays wet and soggy.

SMZ roads

Another place where gravel is commonly used is on roads located within a SMZ. Long stretches of road located within 100-feet of streams can produce a lot of sediment during logging.

Occasionally, it may be necessary to gravel an entire access road from the public road to the deck. If the road must be used in all weather conditions, gravel will keep the road more passable and help prevent sedimentation problems that will be more evident with heavy use in wet weather. If a road has several stream crossings or wet areas that need the protection of gravel, it may make sense to gravel the entire road so mud is not tracked onto the graveled sections from those areas left as bare soil.

How much gravel to use

In most situations, a minimum of 6 to 8-inches of stone is needed to support logging trucks for any length of time. When less than that is used, it becomes “window dressing” that will look good for only a short time. Rather than skimping on the depth of gravel, it is better to put plenty of stone on places where it’s needed and perhaps skip over other less critical areas.

What type of gravel to use

The type of gravel to use is also a very important decision. Don't make the mistake of telling the quarry to, “give me the cheapest you've got”. Such a request will almost always result in crusher run (“ABC”) gravel. For most logging applications, ABC gravel may not be the best or even the cheapest option.

ABC Gravel

ABC gravel typically contains stone that is no larger than 1 to 1.5 inches. Larger stone (3-inch) has more strength to support heavy logging equipment. ABC and 3-inch crusher run gravel contain a high percentage of fines (gravel dust) that add no more strength to a road than the soil beneath it. In some applications though, the fines may help by bonding the stone together, creating a firmer travel surface on loose soil roadbeds.

3-inch Washed Stone

On most newly constructed roads, 3-inch washed stone is preferred because it bonds well with the soil and provides strength to support heavy equipment. A minimum of 6 to 8 inches of depth should be applied. If a smoother road is required later, a layer of crusher run gravel can be spread on top of this.

Three-inch (3") crusher run gravel would be preferred on any area where washed stone will not bond well to the road surface. These areas would include highly compacted sections of existing road, rocky areas, and where geotextile fabric is used.

Cost and Availability of Different Stone

In considering the cost of crusher run vs. washed stone, realize that 25% to 45% of the weight of crusher run gravel is composed of particles smaller than 2 mm.

Although quarries price gravel on a per-ton basis, its simpler to calculate gravel needs and compare costs based on cubic yards. The table below shows some cost comparisons for different types of gravel based on prices at several North Carolina quarries. The cost of washed stone may actually be lower when you look at the amount of road that it will cover. The washed stone will also provide a much more durable road surface in most cases.

Cost Comparison of Three Types of Gravel				
Gravel Type	Stone Size	\$/Ton*	Tons per Cu.Yd.**	Cost per 100' of Road (4" deep x 12' wide)
ABC	1" - 1.5" plus fines	\$7.00	1.65	\$171.00
3" Crusher Run	2" - 3" plus fines	\$7.00	1.75	\$181.00
3" Washed	2" - 3" aggregate	\$8.75	1.25	\$162.00

* Based on an average from several quarries across western N.C. in 2002.
** Weight varies from one quarry to another, depending on bulk density of the stone and water content

When Gravel Disappears: Using Geotextile

Fresh, unpacked fill material has many small voids that allow gravel to sink into the soil. Places where the fill is deep (like culvert crossings) can become bottomless pits that swallow all the gravel put there. Wet soil conditions in these places will only make the situation worse.

Possible solutions to this problem include adequately packing the fill as it is built up and providing water drainage off the road to prevent saturation of the fill. In an ideal world a road should be allowed to "settle" for one year before it is used for logging.

If a road must used immediately after it is built, one of the best ways to avoid losing gravel in soft spots is to place a geotextile fabric under the gravel. The fabric will allow water to pass through but hold the gravel up at the surface where it should be. At a cost of about \$1 per linear foot, the fabric can pay for itself by reducing the amount of gravel needed in soft areas. Geotextile fabric is commonly available in 300 feet to 400 feet rolls.

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