

FACT SHEET

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Timber & Timber Harvesting in West Virginia

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Forest Soils

In harvesting timber there are three things that a logger must protect regardless of the cost in time and effort – the logger, the soil and the residual stand.

What is Soil? In areas that are not perpetually covered with water, snow or ice, the soil is the weathered outer layer of the earth's surface, ranging from a few inches to more than 15 feet deep. It is made up of sand, silt, clay, organic matter, air, water and an enormous number of living organisms ranging from bacteria and fungi to rodents and reptiles. Soil is the basis for plant growth, providing mechanical support, nutrients and water that plants depend on. Soil and climate are the most important factors controlling the productive potential of a forested landscape.

Forest soils differ from all other soils because they developed under the influence of forest vegetation which has added large amounts of leaves and woody material that decays and forms a definite layer of humus (the forest floor) on top of the mineral soil surface. The depth, characteristics, and influence of this forest floor vary with the particular type of forest vegetation, but the forest floor is very important. This layer serves as home to forest organisms, many of which are unique to forests. These burrow throughout, forming a network of tunnels that assist the movement (infiltration) of rainfall into the mineral soil. Large amounts of nutrients are tied up in the accumulated organic matter, including the coarse woody debris, that characterize the forest floor. This input of organic matter from forest vegetation increases site fertility, and affects water infiltration and movement through the soil.

Soils are classified by texture from coarse to fine depending on the percentages of sand, silt and clay particles. Sand particles are the largest (0.5 to 2mm in diameter), clays the smallest, and silt particles are intermediate. Sandy soils, which are coarse-textured, are referred to as light since they are easily tilled or cultivated. On the other hand, a fine-textured soil, made up largely of silt and clay, may be sticky and therefore difficult to till or cultivate; it is therefore termed heavy. The admixture of these particles has a great effect on the properties of the soil, from water holding capacity to soil strength and load-bearing potential. Coarse-textured soils have the highest load bearing strength and are subject to less compaction than fine-textured sandy and clay soils. Coarse-textured soils also have good drainage and aeration capacity, but lower nutrient and water holding capacity. Fine-textured soils have high nutrient and water holding capacity, but

especially when wet, have low bearing strength and are subject to rutting and compaction. Soil structure, which is the arrangement of the soil particles, is a function of climate, time, vegetation type, and is generally stable over time. However, soil structure can be changed by abusive management practices.

The ability of soils to receive, hold and route water is a particularly important property, and one which foresters and loggers should be most concerned with. The maximum possible infiltration rate is called the infiltration capacity. Rainfall intensity is the rate at which rainfall is delivered to the ground. The canopy of a forested site helps to slow down the delivery of rain to the ground, but in general the infiltration capacity always exceeds the rainfall intensity in West Virginia. Overland flow is seldom seen on forested land, except where the forest floor has been disturbed. When the soil structure is damaged by the weight of machinery, hiking on trails, skidding logs, etc., infiltration can be significantly decreased. Such damage can result in overland flow and is the reason that foresters use BMP's to divert the water from such modified surfaces – always handling the water in small amounts!!! – to allow it to be re-infiltrated before it reaches a stream. Fire can also reduce infiltration, by burning off the forest floor, by creating a water repellent soil surface from very hot fires, and from clogging of surface pores with ash and soil when erosion begins.

The water holding capacity of soils vary from excessively well drained to very poorly drained. Timber can be harvested at any time on well drained soils, but in order to minimize soil disturbance and to prevent possible adverse effects on infiltration and drainage, logging is conducted on poorly drained soils only when it is very dry or when the soil is frozen.

Does acid rain affect forest soil nutrient content? This was a significant question in the 1980's when forest declines in Europe were credited to acidic deposition. The European situation was different from the United States, as Europe had much higher levels of acidic deposition, much longer management (hundreds of years of litter removal, for example) and more sensitive conifer forests. It was found that the decline symptoms observed in Norway Spruce plantations (yellowing needles and thinning crowns) could be reversed by liming. Growth rates, however, were largely unaffected in the stands where decline symptoms had been observed. In the U. S., acidic deposition has been found to affect high elevation red spruce health and growth in the northern Appalachians and Adirondacks, on soils with low available calcium, but no other direct effects of acidic deposition on forest soils have been documented.

Much information about specific soils can be found in the county soil survey reports distributed by the USDA National Cooperative Soil Survey, a joint effort of various state and federal agencies. Although primarily for agricultural use, a county soil survey can tell you what kind of soil you have on a particular piece of land, describe some basic properties of that soil, and provide information on limitations of that soil for various uses. These reports are available at most NCRS offices and city, county and school libraries.

Soil is one of the most important resources determining the productivity of our forests in West Virginia. We need to do all we possibly can to understand and protect this most important resource.

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