Assessing Impacts of Cover and other Factors on the Erosion Risk in Forests

ABSTRACT

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In a forest environment, soil erosion can lead to sedimentation which can adversely the health of stream channels and reservoirs. It has been estimated that in forests between 30 to 100% of the sediment budget comes from surface erosion. Less than 10% of the surface erosion is from interrill or raindrop impacts, whereas over 90% of the erosion is from rills and gullies.

The main factors that affect soil erosion rates are climate, soil, topography, and management or vegetation. Management affects erosion through canopy amount, ground surface cover, and soil water conditions. Typical rates of erosion in a forest are under 0.1 t/acre in undisturbed forests, 1 to 5 t/acre on harvested areas, 25 to 50 t/acre from skid trails, and 10 to 50 t/acre on burned areas. On forest roads, native-surfaced roads can erode at 30 to 100 t/acre, marginally quality graveled roads at 10 to 30 t/acre, and good quality graveled roads 2 to 5 t/acre. Not all eroded sediment, however, reaches streams

Forest road erosion appears to be driven by runoff flow path lengths. If roads can be managed to minimize concentrated channel flow, then erosion rates can be reduced by 80% or more. Rut formation depends on traffic density and soil conditions, and can be minimized by frequent blading, good quality gravel, or reduced tire pressures.

In harvest areas, the variability of erosion potential is large, due to natural variability, and to the distribution of disturbance effects such as skidding, mechanical site preparation, and fire. Fire not only reduces canopy, but also consumes protective litter and can lead to hydrophobicity or water repellancy in the soil. Typical harvest area erodibility rates vary from almost nothing in undisturbed forests to 5 t/acre on a harvested area, 25 t/acre on a skid trail, to 50 t/acre on an area severely burned. To minimize sedimentation from harvested sites, minimize disturbances, keep areas of disturbance away from ephemeral and perennial streams and channels, and manage to reduce the likelihood of a severe wildfire.

The Water Erosion Prediction Project (WEPP) is an erosion prediction tool developed by several federal agencies to predict sediment yields from site-specific activities. It models the processes that lead to soil erosion and sedimentation. We have developed typical input files for forest conditions including roads and harvest areas.

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