CENTRAL HARDWOOD NOTES

Management Practices And Water Quality

In the upland forests of the central hardwood region, most water quality changes associated with cultural practices are from the access roads and harvesting. Yet research shows that in the eastern United States, sediment yields from careful harvesting and site preparation on upland sites is actually less than from normal geological erosion-between 0.05 and 0.10 tons per acre per year for harvesting and site preparation compared to an estimated 0.18 to 0.30 tons for geological erosion.

Why Soil Erodes

Soil losses and sediment yields due to silvicultural activities generally occur when the protective litter layer is disturbed. Water from undisturbed forest lands is high quality because the canopy and litter layer protect the soil surface, and enhance soil biological activity. With the litter intact, water infiltrates the porous upper soil layers rapidly and rarely flows over the surface. Without this protective layer, however, raindrops detach soil particles and start eroding, transporting, and depositing sediments. Dislodged soil particles wash into soil pores, decrease soil porosity, and overland flow starts. Soil porosity is also reduced by compaction from heavy equipment used in forest operations, especially when soils are wet.

What About Nutrients?

More nutrients are lost following cultural treatments because fewer mobile nutrients are taken up, organic matter decomposes faster, and soil erosion increases. However, losses are usually low. Nutrient levels in streams do not change much and generally remain below the levels of natural geologic weathering and atmospheric inputs. Fertilization and fire may cause temporary, short-lived increases in stream nutrients.

Cutting Can Increase Streamf low

Changes in stand density or the forest canopy will change the water regime (fig. 1). The change in streamflow or water yield will be proportional to stand density reductions. Clearcutting may significantly increase streamflow from the harvest area because the amount of water lost to interception and used by vegetation in the evapotranspiration process is reduced. Reduced evapotranspiration increases soil water content and prolongs streamflow. Streamflow will last longer in the spring and begin sooner in the fall. Peak flows from moderate to small size storms occasionally increase as a result of timber harvesting. But newly harvested areas are usually small compared to entire drainage basins and do not contribute significantly to flood peaks. Generally, the increased flow during low flow periods is beneficial to other forest resources

Figure 1 -Streamflow increases after clearcutting as shown by this gauging station in a Clearcut watershed.

What About Logging?

Generally, the smaller the area harvested, the lesser the effect on water yield and quality. Instead of rubber-tired or crawler tractors use cable or helicopter logging on steep slopes, fragile soils, or where you want fewer roads. The key to protecting forest watershed values is to minimize soil disturbance and water channelling in logging roads and skid trails during harvests. A careless logger can cause water quality problems even with appropriate silvicultural treatments.

What About Site Preparation?

Site preparation often involves only selective treatment with herbicides or a light prescribed burn. If done properly, neither would significantly affect water quality or yield. Very hot fires will increase sediment and nutrient losses for a short time and will damage residual hardwoods. Prescribed fires to enhance regeneration or improve wildlife habitat will generally not degrade water quality or site productivity.

Best Management Practices

The following recommendations are designed to reduce soil disturbance and minimize the effects of timber harvesting and site preparation. More specific guidelines for best management practices may be available through state agencies.

1. Provide streamside management zones (SMZ's) along both sides of well-defined ephemeral, intermittent, and perennial stream channels and along the edges of lakes and other water bodies. The SMZ's should be wide enough to protect the area around the channels or shores from disturbance. State and federal guidelines or regulations provide specific SMZ widths depending on local criteria (call your state forestry agency). Some trees may be harvested from the SMZ's on a selective basis-up to 50 percent of the canopy. But skidding equipment or other vehicles should not be permitted in the zones. All treetops should be promptly removed from stream channels or other water bodies. In addition to protecting stream channels from disturbance, SMZ's help prevent excessive changes in stream temperatures, and protect aquatic organisms.
2. Select a contractor who will log carefully and who has equipment that will do the job properly without excessive damage to the site or residual trees.
3. During harvests skid uphill or away from stream channels to haul roads located on contours or ridge tops. Avoid skidding practices that channel water into streams.
4. Log only when soils are relatively dry. Wet-weather logging compacts soils and increases erosion.
5. After logging operations are completed, high erosion hazard areas such as landings, skid trails, and temporary access roads, should be disked or ripped, seeded, and fertilized based on local or regional recommendations.
6. Prevent water from collecting in landings and flowing down roads, skid roads, and skid trails. Water bars, outsloped roads, and revegetation immediately after logging will generally prevent excessive erosion. For minor soil disturbances, use cull logs and brush to disperse water until natural vegetation forms a protective cover.

7. if herbicides or pesticides are used follow label directions carefully, avoid spillage, and keep chemicals away from stream channels or water surfaces. Do not use chemicals in buffer zones.
8. Carefully examine logged areas a few months after harvesting and restoration are completed. Use logging residues, revegetation, or land treating equipment to stabilize any actively eroding areas.

References

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