Soil Productivity and Harvest Operations

Deborah Page-Dumroese, Research Soil Scientist, Forest and Woodland Ecosystems Science Program, RMRS, Moscow, ID

Concern over changes in soil productivity due to forest management is often debated by forest managers and the public. One key element in the discussion is use of mechanized equipment (such as rubber-tired skidders, log forwarders, or tracked vehicles) to remove timber products from the forest. Part of the debate focuses on soil compaction, removal of nutrients when tree crowns are removed rather than left on the soil surface after harvest, length of time for soils to recover, and methods for monitoring. We have found that ultimately soil properties (texture, organic matter, and water content) determine the impact of harvesting or site preparation.

Researcher using an impact hammer core sampler to collect bulk density cores in Northern Idaho. (Photo by Han-Sup Han)

We are interested in studying how fuel reduction treatments proposed for the Trapper Bunkhouse Land Stewardship Project (Trapper-Bunkhouse Project) affect physical and chemical properties of soils. BEMRP requested the help of soil scientists at the Forestry Sciences Laboratory in Moscow, Idaho. The study sites in the Trapper-Bunkhouse Project will use a variety of harvesting and site preparation techniques. This year, we collected pre-harvest data. Crews assessed current soil surface and subsurface conditions using a visual classification system. This visual classification system (0-3) assesses current condition of the surface soil as it may have been affected by previous harvest, site preparation equipment, or burning. For instance, an area classified as "0" is one that has had no previous disturbance, the forest floor is intact, there are no ruts, and the area was not burned. On the other hand, a classification of "3" means there could be deep ruts from previous equipment use, the area was severely burned, or the forest floor was displaced more than 10 feet away.

In addition, our soil assessment crew collected soil cores to determine pre-harvest organic matter, pH, texture, and nutrient contents. To track impacts of the number of machine passes, we will attach a Global Positioning System (GPS) unit to each piece of mechanized equipment to track movements. We will be able to evaluate the impact of number of passes on soil physical properties like compaction or changes in pore-size distribution. After harvesting is complete, we will resample by reassessing the soil surface visually and by again collecting soil cores to determine how harvest methods may impact soil properties. However, the consequences of soil impacts must be measured against vegetation growth over a long period of time. Because this study involves many researchers from other disciplines, these sites provide an ideal location for tracking the long-term responses of both soil and vegetation after harvesting and fuel reduction activities.

Two types of cores collected with the core sampler. The large core (4 cm x 30 cm) is used to determine pore size distribution at various depths in the mineral soil, and the small core (4 cm x 10 cm) is used to determine bulk density (a measure of compaction). (Photo by Han-Sup Han)

Glossary . . . (from page 16)

SOIL PRODUCTIVITY: The inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

VMAP: A project to map current vegetation west of the Continental Divide in the Forest Service's Northern Region and designed to address several needs. The result of this project is a geo-spatial database that produces four primary map products: Dominance Type, Tree Canopy Cover Class, Life Form, and Tree Diameter Class.

WEIGHT OF THE EVIDENCE: Considering all available research and weighing its relevance and reliability in an integrated manner.