

## Soil Condition Monitoring on the Barlow Ranger District of the Mt. Hood National Forest 1999

The Barlow Ranger District conducts annual monitoring surveys to assess the degree and severity of ground disturbance that has occurred as a result of ground-based logging practices. Termed “soil condition monitoring,” the practice is used to determine the areal extent of detrimental soil conditions in specified timber sale units. The data collected are used to evaluate the success of staying within maximum allowable thresholds, as established by standards and guidelines contained in the Mt. Hood National Forest (MHNF) Land and Resource Management Plan (LRMP; MHNF, 1990).

During the 1999 field season, the Barlow Ranger District hired the independent environmental consulting firm Shapiro and Associates, Inc. (SHAPIRO) to conduct the monitoring. SHAPIRO used a standard methodology for conducting soil condition monitoring designated the MHNF and known as “The Flying W.” Using this methodology, SHAPIRO monitored soil conditions on 10 timber sale units between May and October.

Three timber sale units underlain with soil types with clay loam textures, which typically become hard and dry by mid- to late summer, were monitored in the spring and early summer while soils were moist and friable. The remaining seven units were monitored at various times throughout the course of the summer. Six of the units were monitored to evaluate existing conditions before harvest entries currently being planned for the near future. Consequently, the effects of not-so-recent previous harvest entries on soil conditions were assessed to aid in planning efforts. The remaining four units were monitored after logging had occurred to assess soil conditions resulting from recent harvest activity (Table 1).

**Table 1. Units Monitored During the 1999 Field Season on the Barlow Ranger District**

Sale or Planning Area Name	Unit or Stand No.	Estimated Extent of Detrimental Soil Condition (Percent Area)	Pre- or Post- Recent Harvest Entry
Diablo	2	13	post-logging
Diablo	4	19	post-logging
Douglas Cabin	12500218	3	pre-logging
Douglas Cabin	12500308	2	pre-logging
Bear Knoll	145	>1	pre-logging
Bear Knoll	169	1	pre-logging
Junc Rock	8	3	pre-logging
Jordon	NA	7	pre-logging
Fish Log	NA	3	post-logging
Mt. Defiance	NA	1	post-logging

Standard and Guideline #FW-022 in the MHNH's LRMP states that no more than 15% of an activity area should contain detrimental soil impacts (MHNH, 1990). Of the ten units monitored in this study, one, Diablo unit #4, is estimated to exceed the 15% threshold. The remaining nine units are estimated to meet Standard and Guideline FW-022. Diablo unit #2 is estimated to be near or at the threshold. In both cases, estimated detrimental soil impacts detected in the Diablo units are cumulative, resulting from both past and recent harvest entries. An effort was made to differentiate impacts associated with the recent entry from those associated with past entries. It was estimated that 3% and 15% of the total area in a detrimental condition could be attributed to the recent harvest entry in Diablo units #2 and #4, respectively.

In the case of the Fish Log unit, skid trails were subsoiled following harvest. Consequently, it is inferred that this action markedly reduced the amount of detrimental compaction that would have been detected otherwise. Further observations suggest that the parallel skid trail system may also have contributed to a minimal degree of detrimental compaction.

Detrimental soil conditions in the units monitored before future planned harvest entries were generally quite low. Interpretation of field observations suggests that most of these stands had experienced some degree of "high grading," or select harvest. Consequently, overall ground disturbance was minimal, and a degree of recovery is inferred to have occurred since impacts were realized. The Jordan unit, however, had been subject to more repeated entries than the others and displayed the greatest extent of detrimental soil disturbance of the "pre-logging" units.

In addition to the soil condition monitoring, bulk density sampling was conducted to correlate the qualitative shovel probe determinations of low, moderate, and heavy soil compaction to actual bulk density measurements in a given soil type. This was conducted in the Jordan unit in early October to determine if qualitative shovel probe determinations of "heavy" could be considered detrimental compaction, defined in the LRMP as a 15% increase above natural bulk density.

Six core samples were extracted for each qualitative rating. Sites determined to be heavily compacted by a shovel probe included an old landing and skid trail with little or no vegetation growing on them. Sites determined to be moderately compacted by a shovel probe included an old skid trail with vegetation partially concealing its surface. Sites with little or no detectable compaction included undisturbed ground and places where it appeared that a machine may have passed over once or twice.

It is concluded from the data that bulk density of the heavy ground was indeed in excess of 15% of the natural for this soil type. Natural bulk densities averaged about 1.3 grams per cubic centimeter (g/cu cm), indicative of the clay content of the soil type sampled. Usually, forested soils in the Pacific Northwest exhibit natural bulk densities of about 1.0 g/cu cm. The average bulk density of the heavy ground approximated 2.0 g/cu cm. That represents an increase above

the sampled natural bulk density of nearly 36%. In contrast, the average bulk density of the sampled moderate ground was about 13% above the sampled natural or low densities. The moderate ground nearly meets the definition of detrimental soil compaction. Thus, it is concluded that the shovel probe method was effective at detecting detrimentally compacted soils in the Jordan unit.

Written By:  /s/ John Dodd \_\_\_\_\_ Date: 08/11/2003 \_\_\_\_\_

References:

Todd Reinwald, SHAPIRO and Associates, 1999 Soil Monitoring Report for Barlow Ranger District.

Mt. Hood National Forest. 1990. Land and Resource Management Plan, Mt. Hood National Forest. U.S. Forest Service, Pacific Northwest Region, U.S. Department of Agriculture. Gresham, OR.