

Management Effects on Soils Item 31

OBJECTIVE: Determine the effects of timber sale activities on soil productivity. The effects monitored include: soil compaction, rutting, displacement, severely burned soil, surface erosion, and soil mass movement as described in the Region 1 Supplement 2500-99-1.

DATA SOURCE: Soil inventory and site inspection prior to and after treatments on activity units.

FREQUENCY: Annually, 10 percent of completed projects per year.

REPORTING PERIOD: 2014-2015

VARIABILITY: More than 15 percent of the activity area detrimentally affected (total accumulation of detrimental compaction, displacement, puddling, and severely burned soil).

INTRODUCTION:

The soil quality evaluations were conducted to determine the effects of management activities on soil productivity as required by the BNF Forest Plan and Region 1 Soil Quality Standards (R1 SQS). To accomplish this task, soils were evaluated against definitions and guidelines provided in the BNF Forest Plan as well as the Forest Service Manual (2550, Amendment No 2500-90-2 and Region 1 Supplement 2500-99-1) and Handbook (2509.18 WO Amendment 2509.18-91-1 and Region 1 Supplement 2509.18-2005-1). Part of the objective was to determine if the unit being monitored exceeds the R1 SQS of 15% aerial extent of Detrimental Soil Disturbance (DSD). It is important to consider the 15% as a trigger point at which more in-depth soil quality evaluations would be conducted and soil amelioration is considered to move toward a net improvement in soil quality.

There are 2 sets of factors to review when evaluating soil quality. The first set is a determination of DSD from management activities. By definition, DSD includes (1) compaction in which the bulk density has increased by 15% above natural conditions; (2) rutting where wheel ruts are at least 2 inches deep in wet soils; (3) displacement with the removal of 1 inch or more of any surface horizon in a continuous area greater than 100 square feet; (4) severely burned soil; (5) surface erosion; and (6) any mass movement. The presence of these factors may indicate site impairment or soil productivity issues.

The second set of factors evaluated includes the site productivity indicators of: soil type, soil horizon thickness, the depth and type of duff and litter, the percent and type of ground-cover, native or non-native vegetation, root density and extension into the soil, soil-water interactions (infiltration rate, hydrophobicity), and stream channel conditions.

Soil quality evaluations were conducted for this report (2014 - 2015) on harvest units using the *Region 1 Approach to Soils NEPA Analysis Regarding Detrimental Soil Disturbance in Forested Areas, A Technical Guide* and also the *Forest Soil Disturbance Monitoring Protocol Volume I: Rapid Assessment*.

EVALUATION:

Determine the Effects of Timber Sale Activities on Soils

This report provides an evaluation of Bitterroot National Forest projects including:

1. Pre-Activity/Existing Condition Soil Monitoring Surveys;
2. Post Activity Soil Monitoring Surveys;
3. Monitoring Summary

1. Pre-Activity/Existing Condition Soil Surveys

Pre-activity/existing condition soil surveys were conducted to determine baseline soil conditions. The field reconnaissance data is used to assess existing conditions and effected environments during the planning process. Treatment units within the following projects were field reviewed:

- Meadow Vapor EA (2012-2014)
- Westside EA (2013-2015)
- Gold Butterfly (2015)
- Various administrative & recreation Site thinning projects CE's

Pre-activity/existing soil conditions meet R1 SQS in surveyed units. Units are proposed for ground-based and skyline harvest. All units will be required to meet R1 SQS following proposed activities.

Field surveys of soil conditions for these projects provide the baseline data which help guides project designs and proposed actions. Soil resource protections including Soil and Water Conservation Practices (SWCPs), Montana BMPs, and in some cases mitigations are prescribed to ensure soil resources are protected and maintained within the R1 SQS. Rehabilitation projects are also often derived from these pre-activity surveys.

2. Bitterroot National Forest Post-Activity Soil Quality Monitoring Surveys (2014-2015)

Post-activity soil quality monitoring was conducted to determine the effects of harvest and fuel reduction activities on the soil resource. Soil quality monitoring results from 2014 to 2015 monitoring are displayed in Table 1. Note that the results indicate the amount of new or additional DSD created following an activity, not the cumulative DSD for the units.

Table 1 - BNF Soil Quality Monitoring (2014 2015) - Post Harvest Percent New DSD in Treatment Units

Harvest/Fuels Treatment Method	Project	Unit Monitored	Year Monitoring Completed	DSD%	Average DSD%
Summer Ground-Based	Como	Unit 1	2015	5%	6%
	Three Saddle	Units 14, 17	2014	5-8%	
Winter Ground-Based	Como	Unit 12	2015	3%	3%
Skyline	Three Saddle	Units 4a, 10, 23b	2015	4%	4%

Summer Ground-Based Yarding

Summer ground-based yarding created 5% to 8% new DSD (average 6%DSD) on the monitored treatment units. Monitoring details are highlighted below.

Project & Treatment Unit: Como EIS- Unit 1

Location: Darby Ranger District, Lick Creek Drainage

Background: The pre-activity soil assessment completed in the summer of 2011 and 2012 identified 5% pre-existing DSD. The unit covers approximately 42 acres on glacial moraine topography. Mitigations in the EA required that summer ground-based harvest be completed during dry soil conditions to minimize soil impacts. Operations were completed in 2014.

Observations: Harvest in the unit was completed during dry soil conditions in summer 2014. This monitoring was completed after harvest operations but prior to rehabilitation and sale closure of the unit. Ground-based operations in the unit created 5% DSD due to displacement main and skid trails. Summer ground-based yarding over the last 10 years has typically created 10% DSD on the Bitterroot NF.

Conclusion: The unit is within R1 SQS.

Project & Treatment Unit: Three Saddle EA – Units 14 and 17

Location: Stevensville Ranger District, Ambrose drainage

Background: The pre-activity soil assessment completed in the summer of 2009 found no pre-existing DSD in unit 14 and 5% in unit 17. Mitigations recommended by the soil scientist in the EIS required that summer ground-based harvest be completed during dry soil conditions to minimize soil impacts.

Observations: Harvest in the unit was completed during dry soil conditions in summer 2014. This monitoring was completed after harvest operations. Ground-based operations in unit 14 created 8% DSD and 5% in unit 17 due to displacement created on main skid trails leading to landings. Soil disturbance on main skid trails was the highest near the landing where more passes with the skidder occurred.

Conclusion: The units are within R1 SQS.

Winter Ground-Based Yarding

Winter ground-based yarding created an average of 3% new DSD. Monitoring details are highlighted below.

Project & Treatment Unit: Como EIS – Unit 12

Location: Darby Ranger District, Rock Creek Drainage

Background: The pre-activity soil assessment completed in the summer of 2006 found the unit had 5% pre-existing DSD from historic road prisms.

Observations: Operations were completed in winter 2014. Mitigations in the EIS required that if winter ground-based harvest was completed, frozen ground/snow requirements must be met. Winter conditions were met and mitigations were successful at minimizing soil disturbance, creating only 3% DSD. Native vegetation remained intact and was not affected by winter yarding in most areas. Total DSD measured following harvest activities totaled 8% which included the pre-existing soil disturbance on historic road prisms.

Conclusion: The unit is within R1 SQS.

Skyline Yarding

Skyline yarding created an average of 4% new DSD. Monitoring details are highlighted below.

Project & Treatment Unit: Three Saddle EA – Units 4a, 10, 23b

Location: Stevensville Ranger District, Ambrose Drainage

Background: The pre-activity soil assessment completed in the summer of 2009 found no pre-existing DSD. These units are located on west facing slopes directly below FSR 2129 Slopes in the units are suitable for skyline yarding.

Observations: Skyline harvest in units 4a, 10, 23b was completed in the 2015. Soil displacement was noted on skyline corridors near landing sites and totaled less than 4% DSD across the units. The detrimentally disturbed areas were rehabilitated by placing slash on disturbed portions of the corridors and also seeding and fertilizing areas of bare soil.

Conclusion: The units are within R1 SQS.

3. Summary: Bitterroot National Forest Post-Activity Soil Quality Monitoring Surveys

The following table is a summary of the 2014-15 post-activity soil quality surveys conducted on the BNF.

Table 2 – Percent New DSD by Harvest/Fuels Treatment Method

Harvest/Fuels Treatment Method	Summer Ground-Based	Winter Ground-Based	Skyline
Average DSD %	6%	3%	4%

The 2014 - 2015 BNF soil monitoring has shown that:

- **Summer ground-based** yarding created an average of 6% DSD. This amount of DSD is slightly less than the average DSD identified over the last 15 years (10%) on the Bitterroot NF.
- **Winter ground-based** yarding created an average of 3% DSD. This amount of DSD is in line with DSD measured over the last 15 years (4%) on the Bitterroot NF.
- **Skyline** yarding resulted in 4% DSD which is in line with DSD measured over the last 15 years on the Bitterroot NF.

The 2014-2015 monitoring results for summer-ground based, winter ground-ground based, and skyline yarding systems are within R1 SQS and all follow trends observed for the last 15 years.