

SOILS

Key Points

- Post-harvest treatment soil organic matter showed minimal changes in thickness and would not be expected to have any impacts on nutrient cycling or subsequent effects to the vegetation regeneration.
- Soil monitoring of the Famine Lake and Ham Lake wildfires revealed no measurable soil erosion.

A. MONITORING AND EVALUATION

Forest Plan Direction

This monitoring was conducted in accordance with Forest Plan Direction: 36 CFS 219.12 (k) [2] Documentation of the measured prescriptions and effects, including significant changes in productivity of the land and Forest Plan Guideline: G-WS-9 During resource management activities, minimize adverse impacts to soil productivity by striving to have no more than 15 percent of a treatment area in a detrimentally compacted, eroded, rutted, displaced, or severely burned condition.

Monitoring Conducted

Soil Protection

Pre-treatment and Post-treatment Monitoring

Pre-treatment and post-treatment monitoring for effects on the soil resource occurred in the Alnus, Lupus, Marble and Murphy Sales (all covered by the Whyte Environmental Assessment [EA]); Deeryard Sale (East Side Thinning EA); Dorothy Lake and Pine Thin Sales (both within the Tomahawk EA project area); Honeymoon Sale (Mid Temperance EA); Pick Sale (Devil's Trout EA); and the Snake and Two Deer Sales (Dunka EA). Post-treatment monitoring will occur as harvest and site preparation activities are completed. Monitoring of harvested acres impacted by landings, skid trails and temporary roads will also assess the effectiveness of mitigations outlined in Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines (Minnesota Forest Resources Council 2005).

Fire and fuels

One indicator used to measure adverse impact to the soil (outlined in the Region 9 Soil Quality Standards (FSH 2509.18, Chapter 2), the Forest Plan (guideline G-WS-10, 11) and the Minnesota Forest Resource Council (MFRC) Voluntary Guidelines) is change to the forest floor. The presence and depth of organic layer (forest floor, duff layer) were monitored for effects from both wildland fires and from mechanical and prescribed fire

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fuel reduction treatments associated with the Boundary Waters Canoe Area Wilderness Fuel Reduction EIS. Wildfire monitoring for soil resources was carried out as part of the Burned Area Emergency Response (BAER) during 2007 for the Famine Lake and Ham Lake Fires, and the areas were revisited in 2008.

ELT 18 Guidance

Interim guidance on Ecological Land Type (ELT) 18 was developed for the Echo Trail Environmental Impact Statement (EIS) project and was used in the Dunka EA project. The intent for this direction was to document ELT 18 capability for reforestation within five years as required by the National Forest Management Act (NFMA). Ecological Land Type 18 is defined as dense bouldery till on very shallow material underlain by bedrock vulnerable to management activities such as logging and fire.

Monitoring on several units with ELT 18 within the Dunka EA project area was initiated prior to harvest (pre-treatment monitoring) to determine organic layer depth as well as the site's quality as "suitable timber land". Three to four site index measurements for several tree species were taken. In addition, monitored sites were compared to nearby similar stands (ELT 18) that had previously been treated (prior to the 2004 Forest Plan). Finally, stocking survey information was gathered from ELT 18's that were reviewed and selected for harvest after the 2004 Forest Plan was signed. These data will be used in considering harvest on ELT 18 sites in future projects especially given the potential difficulty of regeneration and low productivity level.

Minnesota Forest Resource Council Biomass Guidelines

The guidelines focus on sustainable harvest of biomass while protecting the soil, water and habitat essential to a healthy and sustainable ecosystem. Soil features addressed were compaction, organic layer (forest floor duff) retention, and other relevant factors. The published guidelines were made available in October of 2007. Training, to implement monitoring on the biomass guidelines, began in the spring of 2008.

Minnesota Forest Resource Council Voluntary Forest Harvest Guidelines

The report "Timber Harvesting and Forest Management Guidelines on Public and Private Forest Land in Minnesota, Monitoring for Implementation 2004, 2005, 2006 Results Compared to Baseline Monitoring Report" came out in 2008. The report is available online at the following address: www.frc.state.mn.us/documents/council/MFRC_Site-level_Monitoring_Compared_to_Baseline_2008-04-01_Report.pdf. Also, a statewide pool of 20,000 sites was identified by satellite imagery showing disturbance between 2006 and August of 2008. Two of the four sites randomly selected by the Minnesota Department of Natural Resources (MN DNR) on the Superior National Forest (SNF) met the criteria for monitoring during the 2009 field season.

Restoration

Watershed improvement projects completed in 2008 included erosion reduction measures such as water bars, monitoring shorelines and other areas for vegetation condition and

plantings and timber stand improvement practices within riparian areas. Ten acres were accomplished during 2008.

One of the projects occurred on Pear Lake located on the Kawishiwi Ranger District where a boardwalk was constructed to reduce impacts caused by user-created recreation motor vehicle trails (Figure 3.1).

Evaluation and Conclusions

Soil Protection

During 2008, 1,913 acres of pre-treatment monitoring was completed while post-treatment monitoring was accomplished on 80 acres. Additional post-treatment monitoring, for sites where pre-treatment data has been collected, will be completed once harvest activities have concluded. Additional monitoring will take place on the sites that require site preparation as a resource management activity.

Post-harvest treatment monitoring data collected for organic matter showed minimal changes in organic matter thickness (Figure 3.2). Changes in organic matter thickness, from pre-treatment to post-treatment, varied from a decrease of 2.1 (-2.1) inches to an increase of 0.19 (+0.19) inches with an average decrease of 0.64 (-0.64) inches across all sites monitored. Four sites on nutrient sensitive soils, ELT 11, were included in monitoring activities. Ecological Land Type 11 can be susceptible to nutrient loss if a significant amount of the organic layer was lost. Ecological Land Type 11 sites also showed minimal changes in organic matter thickness. The minimal changes would not be expected to have any impact on nutrient cycling and therefore no expected effect to the regeneration of vegetation.

Monitoring data was collected on sites to determine if management activities (timber harvest) adhered to Forest Plan Guideline G-WS-9 mentioned above. Monitoring data collected from 19 sample points in four harvest units were analyzed and revealed that management activity was well below the threshold of 15 percent.

Wildfire

Wildfires are more likely to impact soil resources than prescribed fire, especially on ridge tops and where shallow soils occur. Impacts to soils from the Famine Lake and Ham Lake Fires (77,000 acres) were monitored during the summer of 2008 as part of the Burned Area Emergency Rehabilitation (BAER) process (Figure 3.3). In the areas where resource assessments were completed during the BAER visits there was moderate burn intensity in which 95 percent of the forest floor was consumed. However, no measurable erosion was observed and there was no water repellency (Figure 3.4). The natural re-establishment of vegetation in these areas, along with the residual organic matter and downed debris remaining from the fires, has provided adequate material to protect the soil resource from erosion.

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Ecological Land Type 18

Continued discussion, review and documentation occurred to outline an approach for further understanding of ELT 18 limitations regarding nutrient sensitivity. To date, ELT 18 is normally not a candidate for treatment activities. Three to four site index measurements, for several tree species, will be taken to assess regeneration capability and stocking survey information will be collected from ELT 18 stands approved for treatment (after the 2004 Forest Plan). These data will be used to determine if, how, and when ELT 18 is considered suitable for timber management activities, and how ELT 18 will be considered during landscape assessment prior to Forest Plan implementation projects.

Minnesota Forest Resource Council Voluntary Forest Harvest Guidelines

The MFRC report on monitoring from 2004 to 2006 was available in the spring of 2008. MFRC monitoring looked at soil rutting, displacement, erosion, nutrient removal, slash retention and compaction.

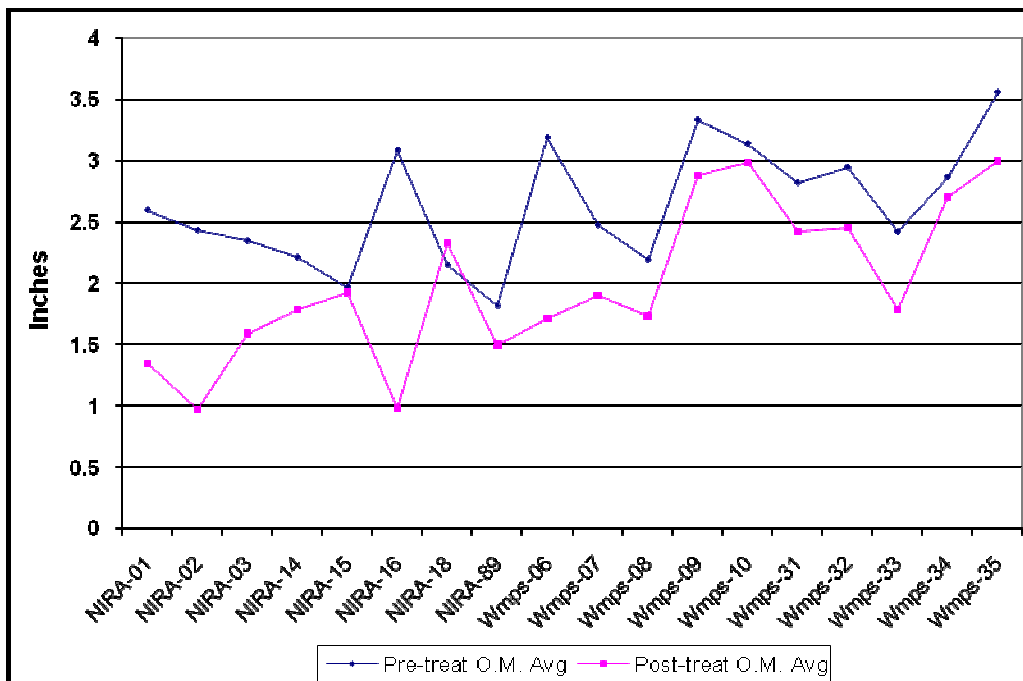
B. REFERENCES

Minnesota Forest Resources Council. 2005. Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines. Minnesota Forest Resources Council, St. Paul, MN.

Figure 3.1. Pear Lake boardwalk constructed to facilitate access to Pear Lake across a wetland while preventing damage to the wetland on the Superior National Forest.



Figure 3.2: Average organic matter both pre-treatment and post-treatment on all sites with post-treatment monitoring completed during 2008 on the Superior National Forest.



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Figure 3.3. The area burned over by Ham Lake Fire in the Boundary Waters Canoe Area Wilderness (BWCAW), picture taken after the fire (5/18/2007).



Figure 3.4. Thirteen months after the Ham Lake Fire in the Boundary Waters Canoe Area Wilderness (BWCAW), note the regeneration and the absence of erosion (6/29/2008).

