Chisholm Fire Site Productivity **Quicknote #1**

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Fire, soils, and site productivity

Although stand-removing disturbances such as fire and harvesting may result in some similar site attributes, there may be different effects on soil properties and ultimately on site productivity. The Chisholm Fire of May 2001 provided an opportunity to examine differences in soil properties, particularly properties related to soil organic matter and nutrient cycling, under severe fire and harvesting scenarios.

In 2001 and 2002 long-term research installations were established in a study of disturbance effects on soil properties, woody debris, nutrient cycling, biological communities, and mechanisms of nutrient turnover in the Chisholm-Slave Lake area. Plots were established in four disturbance types: severe burn (Chisholm Fire), salvage-logging following the Chisholm Fire, clearcut harvesting, and undisturbed control stands. These treatments were replicated three times in each of two stand types: aspen-white spruce mixedwoods and white spruce.

Three main questions are being addressed in this study:

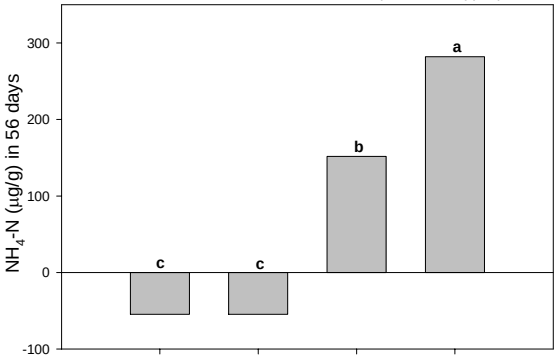
- Are there differences in soil organic matter properties and nutrient cycling processes among burned, clearcut harvested, salvage-logged, and undisturbed sites?
- Are there differences in the nutritional status and productivity of regenerating vegetation among these treatments?
- Do soil properties in mixedwood and coniferous stands respond differently to these disturbances?

Soils were sampled within the first year following disturbance. Results available to date indicate that there are differences in soil properties among the four disturbance treatments.

Net mineralizable ammonium nitrogen (NH_4-N) was lower in forest floor material in the clearcut treatment than in the uncut control but still showed positive net mineralization. In the burned and salvage-logged treatments, however, NH_4-N showed net microbial immobilization (Figure 1).

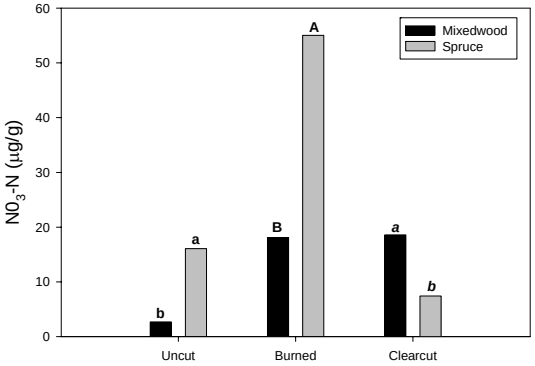
Forest floor extractable nitrate-N (NO_3-N) was greater in spruce stands than in mixedwood stands under undisturbed and burned conditions, but was greater in mixedwood stands than in spruce under harvesting (Figure 2).

Figure 1. Forest floor net mineralizable NH_4-N in burned, salvage-logged, clearcut, and uncut control treatments (both stand types)



Different letters indicate treatment differences at $\alpha = 0.05$.

Figure 2. Forest floor extractable NO_3-N in uncut, burned, and clearcut mixedwood and spruce stands



Different letters within a disturbance type indicate stand-type differences at $\alpha = 0.05$.

These results indicate that significant differences in soil properties under different disturbance treatments occurred in the first year following disturbance, and that disturbance affected soil properties differently in mixedwood and spruce stands. Further nutrient analyses are in progress. Longer-term monitoring will determine the duration of these changes, and whether there is an impact on the nutrient status and growth of regenerating vegetation.

This information will be used in determining how changes in surface organic materials under these disturbance types may alter soil organic matter properties, nutrient cycling, and site productivity. Identifying and quantifying changes in organic matter and nutrient cycling under different conditions of surface material treatment may have implications for management strategies involving fuel management, slash disposal, and emulation of natural disturbance in the boreal mixedwood.

For more information on this or other Chisholm Fire Site Productivity Quicknotes, please contact: Dr. Barbara Kishchuk, Canadian Forest Service, (780) 435-7336, BKishchu@nrcan.gc.ca, or visit www.fmf.ab.ca