

**PRELIMINARY RESULTS FROM A RETROSPECTIVE STUDY OF HARVEST INTENSITY, SITE PRODUCTIVITY, AND RED SPRUCE GROWTH**  
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**Introduction**

Silvicultural treatments are disturbances that affect the availability and distribution of resources on a site. These disturbances can result in accelerated mineralization, nitrification and the mobilization of base cations and metals. If this pulse of mobile cations is recorded in the sapwood, it will provide a mechanism for evaluating historical responses of soils to harvesting disturbance. The objectives of this research are to (1) determine the effects of harvesting intensity on soil and red spruce (*Picea rubens* Sarg.) stemwood chemistry, and (2) define the relationships between measures of soil productivity and red spruce radial growth.

**Methods**

This retrospective study is being conducted in the Acadian forest of central and northern Maine on International Paper and Seven Islands Land Company forest land. Six stands with similar site properties and known historical harvest dates and intensities (removals ranging from 30% to >80%) were selected along with two unharvested control sites. Each stand was classified as a softwood stand (at least 75% softwood composition) dominated by red spruce and balsam fir (*Abies balsamea* (L.) Mill) with level terrain and somewhat poorly to poorly drained soils. On each site ten red spruce were randomly selected and cored using a 12-mm increment borer. The O and B horizons of the adjacent soils were sampled.

Dendrochemistry, tree vigor (as expressed by radial increment), and the chemistry of associated soils will be used to quantify harvest-induced changes in soil productivity. Data collection began during the summer of 2003 and will be completed during the summer of 2004. During the first field season all trees were cored and soil samples were obtained from half of the sites (one site representing each harvest intensity and a reference). Soil samples are currently being analyzed and the tree cores are being read, crossdated and prepared for dendrochemical analysis.

**Preliminary Results**

**Table 1.—Depth of the O horizon in four stands with different harvest intensities (defined as percent volume removal).<sup>1</sup>**

Harvest intensity (percent)	Number of samples	O horizon depth (cm)
0	10	2.2 a
30	10	2.2 a
50	10	2.4 a
80	10	1.9 b

<sup>1</sup>Means followed by the same letter are not significantly different (alpha=0.05). Standard error of the mean = 0.3.

Preliminary analysis of variance using Tukey’s studentized range test (HSD) was conducted with SYSTAT v. 10.2 (Systat Software Inc., Richmond, CA). A log transformation was applied to correct for non-normal distribution of the data. Results for O horizon depth from the four sites sampled

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thus far suggest that there is no relationship between depth of the organic material and intensity of harvest, up to 50% removal (Table 1). An increase in harvest intensity to 80% removal shows a significant decrease in O horizon depth. Because pre-harvest soil data are not available, we are unable to determine if harvest intensity is the causative factor in this relationship. Yet, the data are suggestive and warrant further investigation. Further analysis of this and other variables will be conducted when the data are available.

## **Conclusion**

This is the first study to utilize soil chemistry, dendrochronology and dendrochemistry in a single study of the effects of harvest-associated disturbance on soil productivity. The results will represent a significant advance in our understanding of tree growth and the impacts of harvesting, and will directly contribute to more sustainable management of red spruce dominated ecosystems.

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