

# STAND-LEVEL RESPONSES OF NORTHERN WHITE-CEDAR TO SILVICULTURAL TREATMENTS IN CENTRAL MAINE

Philip V. Hofmeyer<sup>1</sup>, Laura S. Kenefic<sup>2</sup> and John C. Brissette<sup>3</sup>

<sup>1</sup>Department of Forest Ecosystem Science, University of Maine, Orono, ME 04469

[Philip.Hofmeyer@maine.edu](mailto:Philip.Hofmeyer@maine.edu)

<sup>2</sup>USDA Forest Service, Northeastern Research Station, Bradley, ME

<sup>3</sup>USDA Forest Service, Northeastern Research Station, Durham, NH

Northern white-cedar (*Thuja occidentalis* L.) is arguably one of the least studied commercial tree species in the northeastern United States and adjacent Canada. Many cedar-dominated stands are being harvested without understanding likely treatment responses. Few studies on stand-level cedar responses to silviculture have been pursued, most of which have been in the Lake States or the boreal forests and have limited relevance to the Northeast due to soil and climate differences. Previous research has demonstrated that cedar regeneration and sapling recruitment are problematic in stands where cedar sustainability is not the focus of silvicultural treatment.

The Penobscot Experimental Forest (PEF) in central Maine has 50+ years of stand-level silvicultural research in which northern white-cedar is a small, but important component of the species composition. Changes in the proportions of stand basal area (BA, expressed as m<sup>2</sup>/ha, trees ≥1.3 cm dbh), density (number of stems ≥ 1.3 cm dbh per hectare), and volume (m<sup>3</sup>/ha, trees ≥ 11.4 cm dbh) comprised of cedar were analyzed for nine treatments, including selection cutting, modified and fixed diameter-limit cutting, shelterwood, and commercial clearcutting. There were no significant differences between treatments in the magnitude of change in the proportion of cedar density ( $p = 0.30$ ) or volume ( $p = 0.22$ ) during the first 45 years of the study. There were, however, significant differences among treatments in the magnitude and direction of the percentage of cedar BA change ( $p = 0.02$ ). The percentage change in BA was significantly different between the fixed diameter-limit (2% increase) and 5- and 20-year selection treatments (9% decrease) ( $p = 0.03$ ), and between the modified diameter-limit (<1% decrease) and the 5-year selection treatment ( $p = 0.09$ ). Other treatments did not differ from one another, and had a mean cedar BA decrease of approximately 4%.

Though the percent volume change was not statistically significant among treatments, this may be due to high within-treatment variability and low statistical power (only two replicates of stand-level treatments). In general, treatment prescriptions that ignored cedar have resulted in increases in mean volume of that species over time, whereas treatments that discriminated against cedar have decreased its volume. There has been a consistent decline in cedar density on the PEF in the past 45 years, although BA has remained fairly constant. This suggests existing trees are increasing in radial increment with little to no sapling recruitment. Browse effects on regeneration have not yet been evaluated on the PEF, though herbivory likely affects recruitment. Future research will address cedar growth patterns, age structures, regeneration and recruitment dynamics, and the impacts of site.