Tree survival and establishment in the 10 years after the variable-retention harvests at the EMEND experiment.

Lead by: Kevin Solarik

Theme: Silviculture

Status: Continuing

Start: 2008

Participants

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Background

The forestry industry is considering using partial harvesting techniques as a strategy for emulating natural disturbance in order to maintain ecological functions and habitat stability within a forest ecosystem. EMEND, offers us the ability to study features of forest stand dynamics at both a long-term and operational scale. Although, increasing in popularity within the last couple decades, partial harvesting systems still remain poorly understood in regards to health of residual trees a decade after logging and seedling establishment. In our two studies we attempt to answer these two major overlying questions: (1) what factor(s) influence residual tree mortality and health following variable retention harvests, (2) what affects the natural regeneration of white spruce 10 years following harvesting?

Objectives

Mortality Study: To determine which factors best influence and allow the predictability of overall residual tree health and mortality by assessing: (1) skid trail proximity, (2) species, (3) harvesting intensity (0%, 10%, 20%, 50%, 75% and 100%) (4) overstory canopy composition ((a) deciduous dominated (D) (>70% of basal

area composed of aspen and/or balsam poplar), (b) deciduous dominated with an extensive conifer understory (Du) (conifer understory at least 50% of canopy height), (c) mixed (Mx) (~35-65% of basal area composition of deciduous and conifer), (d) conifer dominated (C) (>70% of basal area composed of white spruce (5) height (6) diameter at breast height (DBH) (7) crown class, (8) basal area, (9) stem volume. Regeneration Study: To determine the conditions that provide the highest densities, tallest seedling height and greatest stocking rates of natural white spruce regeneration by: (1) harvesting intensity (see above) (2) overstory canopy composition (see above) (3) distribution of white spruce seed trees (4) the influence of soil disturbance in relation to logging equipment, (5) competition from trees, shrubs and grasses and (6) presence of fresh and decomposed logs.

Key Results

October 2009: Mortality Study: Results for this study have yet to be analyzed at the time of this report; however it should be assessed and completed by the spring of 2010. Regeneration Study: Results show that harvest intensity had a slight affect on seedling densities and stocking rates, as higher retentions resulted in lower regenerations numbers in general (Objective 1) and had no effect on the height of the seedling. Overstory canopy composition was a strong indicator of seedling densities and stocking rates as C-stands experienced the highest densities and rates, while Mx and Du provided similarly mid-range densities and D-stands the poorest. These results were similar for seedling height as C-stands provided the tallest seedlings, while D-stands the shortest (Objective 2). Although contrary to popular scientific belief, grass and deciduous competition was not found to be a strong inhibitor of seedling presence (Objective 5). Although the presence of highly decomposed logs provides a good location for seedling recruitment (i.e. moist, nutrient rich), on the operational scale of this study, no increase in densities was identified in its presence (Objective 6). Seed source trees were strongly correlated with seedling density. However, establishment was 3.5 times higher in the places with physical disturbance (corridors) than the undisturbed interiors (Objective 3 and 4). Ultimately, it was found that the regeneration of white spruce was highest when the following occurred: (1) seed source trees present (i.e. C-stands) (2) a disturbance of the forest floor (machine corridor) (3) lower over story retention (i.e. higher cut intensities).