

EFFECTS OF GAP SIZE, DURATION OF DAYLIGHT, AND PRESENCE OF LEAF LITTER ON FOREST REGENERATION

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ABSTRACT.—Selection systems are used to manage multi-cohort forest stands by removing individual and/or groups of trees to create 0.01- to 1.0-ha openings in the canopy. Inherent in the selection system are the dual roles of tending the residual trees and regenerating a new cohort of tree seedlings. Research of silvicultural selection systems has historically focused on the ability to maintain an appropriate residual stand structure (number of trees per cohort) in perpetuity. However, few studies have specifically addressed the regeneration phase raising questions about controlling species composition and development within the new cohort. The goal of this research was to determine if

- 1) the size of a forest gap,
- 2) the duration of daylight on areas within the gap, and
- 3) the presence or absence of leaf litter on the forest floor affected tree species recruitment and growth.

Two pairs of four different sized openings (0.02 ha, 0.04 ha, 0.10 ha, 0.20 ha) were created in a 4.5 ha, mixed hardwood, multi-cohort stand located at Penn State's Stone Valley Experimental Forest in central Pennsylvania. Recruitment inventory plots were located in each gap so that three areas of duration of daylight within each gap (0 to 1 hour, 2 to 3 hours, 4 to 5 hours) were sampled. The inventory plots were further divided into four sub-plots, two with leaf litter present and two without leaf litter. Results from the first growing season following harvest indicated that forest gap size and the duration of daylight within the gap significantly affected the stem density, average height, and average leaf spread of recruited shade intolerant tree species. Previously, only gap size had been considered important to the regeneration of multi-cohort stands. The recognition of duration of daylight effects implies that tree species stratification within a gap may occur along light exposure gradients not previously recognized. Future research will attempt to better explain the effect of daylight on regeneration through

- 1) continued measurements within the treated stand,
- 2) repeated experimentation in an additional stand, and
- 3) controlled light exposure experiments.

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