EFFECTS OF COMPETITION AND SIMULATED HERBIVORY ON
PINUS STROBUS L. SEEDLINGS

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ABSTRACT.—Severe browsing by white-tailed deer can inhibit growth of white pine regeneration and lower forest productivity over the long term. We installed a factorial experiment in a 3-year-old underplanting in northern Minnesota to investigate the influences of overstory and understory competition, and clipping intensity and frequency on the growth and survival of white pine seedlings. Results indicated that after two years, light clipping (terminal and 50% of current year shoots removed) increased growth by 30%, but heavy clipping (terminal and 100% of current year shoots removed) decreased growth by 58% compared to controls. Diameter growth decreased by 29% and 65% for light and heavy clipping, respectively. Clipping frequency (1 or 2 years) had little effect on lightly clipped seedlings, but significantly reduced growth responses in heavily clipped seedlings. Increasing overstory density significantly decreased seedling height and diameter growth. Brush removal had no effect on height growth, but significantly increased diameter growth. Interactions were present only between clipping treatments and brush removal, with the benefits of brush control being lost at higher clipping intensities and frequencies. We feel that most growth responses to herbivory resulted from hormonal redistribution and resource reallocation in the seedlings. The data suggest that brush control and browsing protection go hand in hand to regenerate white pine.