FIELD RESPONSE OF RED OAK, PIN CHERRY AND BLACK CHERRY SEEDLINGS TO A LIGHT GRADIENT

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Abstract: The objective of this study is to determine the relationship between light conditions and the growth of natural seedlings of red oak (*Quercus rubra* L.), pin cherry (*Prunus pensylvanica* L.) and black cherry (*P. serotina* Ehrh.) growing under a range of canopy densities in northwestern Pennsylvania. Annual height growth, total height and photosynthetically active radiation (PAR) are being monitored for two growing seasons (1990-1991) on 1-year-old natural seedlings. Experimental plots were located in mature oak stands where understory trees (<5.3" dbh) were removed and the remaining overstory trees represented 100%, 60% and 40% residual relative densities. The areas also were fenced to exclude deer and eliminate the impact of browsing on seedling growth rates. The plots were variable in size up to a 50 foot radius, and contained at least six healthy seedlings of one of the target species. Ten plots that represented a range of canopy densities from complete canopy cover to large openings were established for each species. The plots were stratified into three canopy density levels: large openings, partial canopy, and complete canopy. In each plot, the six tallest 1-year-old seedlings of each species were selected for measurements. Only seedlings that were free of physical damage and that were free-to-grow (not overtopped by surrounding vegetation) were selected. Total integrated PAR was measured over a 24-hour period at least once in each plot in September, 1990, using six Li-Cor quantum sensors attached to a Li-Cor LI-500 integrator. Each sensor was placed on a platform directly above one of the six seedlings. All radiation values will be expressed as a percent of full sunlight received in the open. At the end of the 1990 growing season, the second year of seedling growth, stem elongation in the first and second year were measured on each seedling. Total seedling height was also measured. For red oak seedlings, the number of flushes in each year was recorded. These measurements will be continued during the 1991 growing season.

Preliminary results dealing with total seedling height as related to canopy density class are presented in this poster. Average total height was similar for the three species under the complete canopy, but differences among species became more pronounced as canopy density decreased. The height of red oak seedlings increased only slightly from the complete canopy to the large openings (0.7 ft. to 1.1 ft.), with no significant differences among canopy density classes ($p>0.05$). The mean heights of black cherry were 0.9, 2.7, and 5.9 ft. for the complete, partial and open canopy classes, and the heights of pin cherry were 1.2, 4.4, and 9.8 ft. for the three canopy density classes, respectively. For both pin cherry and black cherry, the

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differences among canopy density classes were significant ($p<0.05$). These results indicate that heavy cutting does not stimulate height growth of red oak seedlings, but does stimulate growth of the competing cherry species. The dramatic increase in height growth of pin cherry and black cherry under the partial and open canopy conditions creates intense competition for red oak seedlings. Under the full canopy, red oak seedlings would not be suppressed by pin cherry and black cherry, but seedling vigor is low and may result in poor long-term survival. If natural red oak regeneration is desired, limited overstory removal combined with control of competing vegetation will probably be required. The detailed measurements of PAR, when complete, will help define more precisely the light and canopy conditions that will favor the growth of red oak regeneration.