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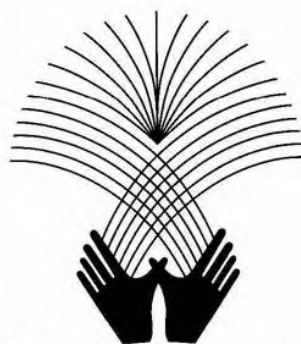


Longleaf Pine: *Making Dollar\$ and Sense*



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THE LONGLEAF ALLIANCE

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COMPETITIVE RESPONSES OF SEEDLINGS IN LONGLEAF PINE WOODLANDS: SEPARATING ABOVE AND BELOW GROUND EFFECTS

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Abstract: Recent interest in restoring greater age structure to even-aged longleaf pine (*Pinus palustris* Mill.) stands has led to the exploration of overstory retention approaches that resemble the complex structure of natural disturbance. However, the benefits of overstory retention are tempered by increased competition between seedlings and the overstory. We conducted a study to quantify above- and belowground effects on the responses of planted longleaf pine seedlings and understory plants in a second-growth longleaf pine savanna. Resource competition was studied by severing overstory root connections with the understory plant communities through trenching in three locations within the study site: within the savanna matrix, at gap edges, and in the center of gaps. Paired control plots with no root disturbance were also located in similar overstory conditions. The understory was removed in one-half of each plot by an herbicide treatment (glyphosate). Container-grown longleaf pine seedlings were planted. Pine survival and growth (total biomass after 3 years), as well as productivity of herbaceous and woody understory components were recorded. Light reaching the understory was estimated by hemispherical photographs (gap fraction), and soil resources (soil moisture and N) were measured using time domain reflectometry and ion-exchange membranes, respectively. Light reaching the understory increased as overstory stocking decreased (light gaps). We found no evidence of belowground gaps due to overstory mortality if the understory community was intact; however, removing the understory increased soil N and water, and trenching amplified this effect. Longleaf pine seedling survival increased with greater shade when the understory and belowground communities were intact. Understory herbaceous productivity increased with light, and hardwood plant response to gaps was explained primarily through decreased belowground competition with adult pines. Longleaf pine seedling growth followed opposite patterns of survival. Longleaf pine seedling growth increased with increasing light when the understory community was left intact. In the absence of an understory longleaf pine seedling growth was controlled by both above- (light) and belowground (soil N) sources. These data suggest that care be exercised to ensure the presence of advanced regeneration of longleaf pine grass-stage seedlings before artificial gaps are created when uneven-aged approaches to management are considered.