INFLUENCE OF ESTABLISHMENT TIMING AND PLANTING STOCK ON EARLY ROTATIONAL GROWTH OF LOBLOLLY PINE PLANTATIONS IN TEXAS

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Abstract—Planting container seedlings, which have relatively fully formed root systems encased in a soil-filled plug, may improve loblolly pine plantation productivity by increasing early survival and growth relative to that of conventionally planted bareroot seedlings. Planting seedlings in fall may also confer productivity increases to loblolly pine plantations by giving seedlings more time to form root systems and accumulate nutrients before onset of droughty conditions in summer months. Potential productivity increases associated with container seedlings and fall planting may be most pronounced on well-drained sites that exacerbate the effects of drought. The objective of this study was to determine loblolly pine survival and growth in response to seedling type and planting date.

At the Texas A&M University Florey Research and Demonstration Forest near Overton, TX (32° 16' 28" N, 94° 58' 42" W), a loblolly pine plantation was established as a research site in 2002. Soil of the study site was of the U.S. Department of Agriculture Natural Resource Conservation Service Kullit series (a fine, mixed, semiactive thermic Typic Hapludults very fine sandy loam). Average annual precipitation of the site was 114 cm, and its average annual temperature was 19 °C. Seedling type and planting date treatments, each replicated three times, were applied to 0.5-ha plots in a randomized complete block design. Seedling type treatments consisted of either bareroot or container seedlings of the same family. Planting date treatments consisted of planting in either fall (October 2002) or spring (March 2003). Seedling survival, height, and volume were determined annually at the end of the first through third growing seasons. In 2005, subsamples of seedlings were excavated to determine root growth form.

Survival of the container seedlings significantly ($P > 0.10$) exceeded that of the bareroot seedlings in all years, with survival 23 percent greater than that of bareroot seedlings. Volume of seedlings planted in fall was significantly greater than those planted in spring in all measurement years, with volumes 30 percent greater than those of spring-planted seedlings. The seedling type by planting date interaction significantly influenced stand volume. In 2003, stand volume of all container seedlings was significantly greater (by 25 percent) than that of bareroot seedlings. In 2004, all fall-planted seedlings had significantly greater stand volumes than spring-planted seedlings. In 2005, fall-planted container seedlings had stand volumes significantly greater (by 49 percent) than all other treatment combinations.

The seedling type by planting date interaction significantly influenced root system architecture. Fall-planted container seedlings had greater total root system length and tap root length than fall-planted bareroot seedlings. Bareroot seedlings had greater (by 26 percent) total root system diameter than container seedlings.

These results indicate that planting container seedlings and fall planting increased early-rotation productivity on this well-drained site. Planting container seedlings improved survival rates, and fall planting increased seedling volumes. As such, the greatest increases in stand volume came from combining these treatments by planting container seedlings in fall. The survival and growth advantages of fall-planted container seedlings may have been due to their development of the deepest and most compact root systems. This root architecture may be physiologically advantageous on a well-drained site such as the one observed in this study by fostering water uptake.

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