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CONTAINER-GROWN LONGLEAF PINE SEEDLING QUALITY

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Abstract—This study examines the comparative hardiness of various classes or grades of container-grown longleaf pine (*Pinus palustris* Mill.) seedlings. Most container longleaf seedlings are grown in small ribbed containers averaging 5 to 7 cubic inches in volume and 3 to 6 inches in depth. Great variability is often exhibited in typical lots of container-grown longleaf pine seedlings. Longleaf seedlings are usually sold on a per-thousand basis and an average lot of 1000 seedlings will contain "good" or "target" seedlings, "doubles" (two seedlings per plug), "floppies" or "culls", and "sonderegger" (hybrid loblolly x longleaf) seedlings. This study examines the relative survival rates of these four seedling types in the first growing season.

INTRODUCTION

This study was initiated to determine the feasibility of increasing longleaf pine (*Pinus palustris* Mill.) planting success by visually sorting through given lots of container-grown longleaf pine seedlings and removing nontarget seedlings. Most container longleaf seedlings are grown in small ribbed containers averaging 5 to 7 cubic inches in volume and 3 to 6 inches in depth (The Longleaf Alliance 2003). Typical seedlings are sown in the spring and form a well-rooted "plug" by late fall or early winter. Herein, these seedlings are referred to as "target" seedlings. Target seedlings met seedling quality standards as defined by Barnett and others (2002).

Some nurseries double-seed containers to insure an optimum percentage of cells are filled with viable seed, often resulting in two live seedlings per plug. These seedlings are herein referred to as "doubles." Other seedlings are suppressed in the container by surrounding seedlings that exhibit faster growth. Suppressed seedlings usually do not develop sufficient root collars or fine root systems to form a good plug and are typically referred to as "culls" or in this study as "floppies." Seedlings that did not meet the interim standards because of inadequate plugs were selected as floppies for this study. A final category of seedlings is hybrids between longleaf and loblolly. These hybrids are historically referred to as "sondereggers" (Walker and Wiant 1966). Sonderegger seedlings typically exhibit height growth while still in the container.

Longleaf seedlings are usually sold on a per-thousand basis, and an average lot of 1000 seedlings will contain target, double, floppy, and sonderegger seedlings. This paper examines relative survival rates of these four seedling types in the first growing season.

METHODS

Studies were installed on the Samson Site in southeastern Alabama and the Monroe Site in southwestern Alabama. A randomized complete block study design was utilized on both sites. Four replications of each block were planted with 20 longleaf pine seedlings per treatment. Seedlings were grown in 6-inch styroblock containers by two nurseries in south Georgia. Seedlings were separated into classes to examine survival and growth for different container-grown seedlings classifications. Seedlings classes were:

1. Good quality—seedlings with firm plugs and no visible diseases on the foliage
2. Floppies (culls)—seedlings whose plugs were not firm or solid enough to remain straight when held in a horizontal position. When held horizontally by the terminal bud, the seedling "flopped" over
3. Doubles—two seedlings per plug
4. Sondereggers—potentially hybrid seedlings that exhibited some stem elongation in the plug.

All four seedling types were utilized at the Samson Site. Doubles were not included at the Monroe Site. Prior to planting, both sites were scalped. Scalping was done with a three-point hitch fire plow. The scalped area was approximately 30 inches in width and 4 inches deep.

Seedlings were assessed for percent survival and overall appearance. Health was assessed based upon aboveground foliage. Scores were on a scale of 0 to 6. A perfect seedling scored 0, while a dead seedling scored 6. Average scores are given for surviving seedlings only: the lower the average score, the healthier the appearance of seedlings in a given treatment.

Samson Site

The study site had been unsuccessfully planted to bareroot longleaf seedlings 2 years prior to the study installation. The landowner and county forester attributed the previous planting failure to a spring drought following planting. Prior to the first longleaf planting, the site had been in cotton and peanut production. Seedlings were provided by Meek's Farms of Kite, GA. Seedlings were shipped to The Longleaf Alliance and planted within a few days of extraction and shipping. Seedlings were hand planted on December 14, 2001. Seedlings were band-sprayed with 2 ounces of Oust in April.

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Monroe Site

This site is part of an Auburn University Agricultural Experiment Station and was in cotton production the year prior to study installation. Seedlings were provided by Simmons Tree Farm of Denton, GA. Seedlings were shipped to The Longleaf Alliance and planted approximately 1 week after extraction and shipping. Seedlings were hand planted on February 21, 2002, with dibble bars and plug tools. Seedlings were band-sprayed with 2 ounces of Oust in April.

RESULTS

Overall survival rates varied between the two sites (table 1). We attributed this to the earlier planting date on the Samson Site (December 14) as compared to the Monroe Site (February 21). Good quality seedlings excavated in April exhibited more developed root systems on the Samson Site, as compared to the Monroe Site.

Table 1—Percent surviving seedlings 6 months after planting

Site	Target/ good	Doubles	Sondereggers	Floppies
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Samson	91	96	81	80
Monroe	81	NA	65	30

Across both sites, floppies performed the poorest (table 1). Sondereggers, or seedlings classified as such, had lower survival rates than target seedlings. Some seedlings originally thought to be sondereggers turned out to be regular longleaf pine seedlings. Seedlings that were obviously sondereggers died at greater rates than did true longleaf seedlings. Doubles did better than expected on the Samson Site where 96 percent of the plugs had at least one surviving seedling.

CONCLUSIONS

- Removing floppies and sonderegger seedlings prior to planting may increase overall survival rates on some sites
- Floppies may exhibit good survival rates under optimal conditions. Conversely, poor quality seedlings may experience higher mortality under more adverse conditions
- Doubles appear to initially survive as well as target seedlings
- True sonderegger seedlings may suffer greater mortality rates than reported here since some seedlings included in hybrid plots turned out to be regular longleaf pine seedlings. Seedlings exhibiting minimal stem elongation (1 to 2 inches) in the container are often true longleaf seedlings.

ADDITIONAL STUDY

The Samson and Monroe Sites will be tracked for survival and growth for at least 2 years. In the winter of 2002–03, additional seedling quality studies were installed in Milledgeville, GA, Lexington, SC, Denton, GA, and on the Solon Dixon Forestry Education Center near Andalusia, AL. Treatments installed during the winter of 2002/03 on these subsequent sites include:

1. Target/good quality seedlings [> 6.0 mm root-collar diameter (RCD)]
2. J-rooted average (> 6.0 mm RCD)
3. Floppy small (< 4.75 mm RCD)
4. J-rooted floppy (4.75 to 7.00 mm RCD)
5. Floppy- large (4.75 to 7.00 mm RCD)
6. Co-dominant double—at least 1 seedling > 6.0 mm RCD. No more than 3.0 mm difference between seedlings)
7. Double—1 suppressed (at least 1 seedling > 6.0 mm RCD. No less than 3.0 mm difference between seedlings.)
8. Extra-large RCD (≥ 9.0 mm RCD)
9. Hybrids (Sondereggers).

SUMMARY

Visually sorting container-grown longleaf pine seedlings may result in the removal of numerous floppy, hybrid, and double seedlings. Removing floppies and sondereggers will likely result in an increased overall survival rate, especially when adverse environmental factors stress newly planted seedlings.

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Station ID: GTR-SRS-071

Description: Ninety-two papers and thirty-six poster summaries address a range of issues affecting southern forests. Papers are grouped in 15 sessions that include wildlife ecology; fire ecology; natural pine management; forest health; growth and yield; upland hardwoods - natural regeneration; hardwood intermediate treatments; longleaf pine; pine plantation silviculture; site amelioration and productivity; pine nutrition; pine planting, stocking, spacing; ecophysiology; bottomland hardwoods - natural regeneration; and bottomland hardwoods—artificial regeneration.