From Forest Nursery Notes Winter 2013

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Restoring Longleaf Pine on an Agricultural Site by Planting Alternating Rows of Slash Pine: A Case Study

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ABSTRACT

The cost of establishing longleaf pine (*Pinus palustris* Mill.) on agricultural sites is typically higher than that for slash pine (*Pinus elliottii* var. *elliottii* Engelm.). For some landowners, this cost might be reduced by establishing a two-species plantation (e.g., planting one-third to one-half of the rows with slash pine). To examine the potential benefits of a mixed-species stand, a replicated trial was established at the Solon Dixon Forestry Education Center in Alabama in 1997. Longleaf pine and slash pine were planted in alternating rows spaced 10 ft apart (within-row spacing varied from 4 to 8 ft). Initial survival of bareroot stock was <10% for longleaf pine but >75% for slash pine. Therefore, all bareroot longleaf pine seedlings were removed, and plots were replanted using container-grown longleaf pine. Fifth-year survival of the container-grown stock was >45%, but subsequent competition from adjacent rows of slash pine reduced survival to 20% by the age of 12 years. An estimate of the value of products from the mixed-species stand at the age of 12 years was $867/ac greater than that from the pure longleaf pine stand (planted at a 4 × 10-ft spacing). Results from this trial suggest that for a mixed-species stand to be successful in restoring longleaf pine, either the spacing between rows should be much wider than 10 ft or the ratio of longleaf pine to slash pine seedlings should be greater than 1.3 (either at planting or at a young age).

Keywords: *Pinus elliottii*, *Pinus palustris*, container, bareroot, seedling quality, economics

During the 20th century, the forest area in the South declined by about 21 million ac (Smith et al. 2001). More than half of the decline was due to a reduction in longleaf pine (*Pinus palustris* Mill.) and slash pine (*Pinus elliottii* var. *elliottii* Engelmann) forests, which decreased by 13.8 million ac between 1953 and 1997 (South and Buckner 2003). By 2007, only about 13 million ac of longleaf pine and slash pine forests remained, with the majority (about 58%) in plantations (Sheffield 2009). A recent survey by the US Forest Service (Miles 2010) suggested that across those plantations, slash pine occupies 8 times as much acreage as longleaf pine (6.6 million versus 0.8 million ac). Although there has recently been renewed interest in restoring longleaf forests, slash pine may be have been preferred in the past because of better survival rates, lower costs of establishment, and the higher economic benefits from a shorter rotation (Alavalapati et al. 2002). Although there has been much development in improving longleaf seedling survival, little research has been conducted with the goal of reducing overall costs of establishing a longleaf pine plantation.

Though some claim that it costs less to establish a bareroot longleaf pine plantation on cutover sites (Mills and Stiff 2009), others find that overall establishment costs are lower for slash pine and loblolly pine (Ledford 1999). For example, a longleaf pine seedling may cost $0.09 (bareroot) or $0.15 (container), whereas a bareroot slash pine seedling might cost $0.05 or less. In addition, on some pastureland sites, longleaf pine may require multiple attempts at suppressing competing vegetation. For example, on sites where perennial grasses are present, managers may need to treat the area with a broadcast herbicide and then scalp the rows to be planted. After planting, weeds should be treated with a broadcast treatment in March, followed by a banded herbicide spray in April (Franklin 2008).

Since 1980, much of the research on establishing longleaf pine plantations has focused on practices that increase transplanting survival and enhance emergence from the grass stage. For example, to improve seedling survival, there has been a gradual shift in stock type. In 1980, approximately 10 million longleaf pine seedlings were produced in bareroot nurseries in the South (Boyer and South 1984), with only a few researchers growing container stock (Goodwin 1976, Barnett 1979). By 2009, the practice was common, with more than 52 million longleaf pine seedlings produced in containers and 10.7 million grown in bareroot nurseries (Scott Enebak, Auburn University, Nov. 3, 2010). Planting container-grown stock has increased average survival of longleaf pine, but it also has increased the cost of planting stock. As a result, the cost of establishing a longleaf pine plantation (Table 1) may exceed $270/ac (Busby et al. 1995, VanderSchaaf et al. 2003, Barlow et al. 2009).

To reduce concerns over establishment costs for longleaf pine, the US government currently provides assistance with cost-share programs. In some cases, the government has paid 75% of the costs of establishing plantations. In part because of subsidy payments, the planting of longleaf pine has increased. For example, from 1997 to 2008, approximately 16,000 ac/year of longleaf pine plantations

Manuscript received September 13, 2010; accepted May 31, 2011. http://dx.doi.org/10.5849/sjaf.10-045.

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