

## **Plantation Management Research Cooperative**

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### **COASTAL PLAIN INTENSIVE CULTURE/DENSITY STUDY**

With intensive culture and improved genetics, we have increased the amount of wood that can be grown on an acre. With this increase in carrying capacity came the realization that all of our earlier studies on optimum stand density were probably incorrect. A series of studies was installed in 1995 which will allow us to evaluate the effect of very intensive culture (multiple fertilizations, complete weed control, some tip moth control) vs high intensity operational (fewer fertilizations and one year of banded weed control) that is operationally possible now. The interaction of the intensity of the culture with density is also being studied. The experiment has planting densities of 300, 600, 900, 1200, 1500, and 1800 trees per acre. There is also a slash pine component established at 300, 900, and 1500 per acre. There are 21 locations stratified over four soil groups. An installation takes up about 6 acres.

#### **Status**

- **This is an ongoing study. Measurements have been taken after the second, fourth, sixth and eighth (2004) growing seasons.**
- **The measurements were summarized in PMRC Technical Reports 1999-2, 2001-3, 2002-5, and 2004-1 for the two, four, six, and eight year measurements respectively.**

#### **Key Research Results**

**Any results after only eight years must be considered preliminary, but the following are offered:**

- **The potential growth rate of loblolly pine in the coastal plain has been underestimated even by intensive culture experiments in the recent past. Across all installations, loblolly pines average (not just dominant trees) 41 ft tall at age 8 for the most intensive culture. Densities of 1200+ have 155 to 165 ft<sup>2</sup> of basal area per acre at age 8.**
- **Slash pine is not growing as tall as loblolly on either level of intensity, but the slash pines look very healthy and are growing at a much faster rate than would be expected in non-intensive plantations. At the higher intensity slash averages about 6 ft shorter than loblolly across all soil types and densities and it has about the same average as the operational loblolly. In terms of dbh, slash pine has about the same dbh as loblolly on both the operational and intensive treatments.**
- **Slash pine has slightly less basal area per acre than loblolly at lower planting densities and about the same basal area per acre with 1500 trees per acre at age 8. Even so, obtaining a slash pine average basal area across nine installations of**

155 ft<sup>2</sup>/ac to match the loblolly average with intensive management is unprecedented.

- For loblolly percent fusiform rust infection decreased with increasing density from a high of 23% on intensive loblolly to a low of about 9%. Especially at the three lower densities (in the range where most plantations are established), the increase in management intensity increased infection levels by about 5-6%. For slash pine the same trend was evident with larger differences in management at the lower densities (a drop from 27% for intensive management to 17% with operational management at 300 trees per acre). CRIFF soil groups A and B2 for loblolly and B2 for slash had the highest infection levels at all planting densities, followed by CRIFF groups B1 and C. There were no slash installations on A group soils. The D groups had single digit infection levels at all densities.
- At the highest management intensity combined with high density, loblolly is growing at a rate of 10 green tons/yr through age 8. By contrast the more operational management loblolly is growing at about 6 1/2 tons/ac/yr. The comparable numbers for slash pine are 8 tons/ac/yr and about 5 tons/ac/yr.
- Stand density index and relative spacing calculations at age eight indicate that many of the intensively managed plots for both species are rapidly approaching their pulished limiting densities. Over the next two years we should get some indication of whether that level will be breached, the stand will stagnate, or heavy mortality will occur.
- Loblolly, especially on some soil types, did not look healthy at age 2 even though it was growing in height and dbh at very fast rates. A foliar analysis made at age 2 indicated that it was marginally N deficient on some sites even though it had been fertilized at planting. Loss of tops in some trees and defoliated buds, which later flushed in others, may have indicated a micronutrient deficiency. More fertilizer, including micronutrients, was provided before the beginning of the 3rd, 4th, 6th, and 8th growing seasons. The loblolly plots now look much healthier. The experience is an indication, however, that intensive culture may bring new problems, as less obvious factors become limiting to growth, even as productivity increases.
- At one location, on a CRIFF soil group D, the most intensive plots with the exception of the 300 trees per acre plot, were destroyed by currently unknown agents (possibly a root rot) after the 3rd growing season. The high intensity operational trees were not visibly damaged.