Chapter 8
Longleaf Pine Growth and Yield


Introduction

Across the historical range of longleaf pine (*Pinus palustris* Mill.), less than 10% of lands previously occupied by longleaf ecosystems are currently in public ownership (Johnson and Gjerstad 1999; Alavalapati et al., this volume). The remainder is owned by private entities ranging from the forest industry, to timberland investment organizations, to highly varied nonindustrial private landowners. Any significant recovery of longleaf is therefore dependent on the participation of the private sector. Certainly, for the forest industry, and many other investor-type groups, the need for competitive returns from forest management is extremely important. And although experience has indicated that economic return is often not the primary motivator for nonindustrial landowners, it usually plays some role in management decision-making.

One major area requiring more knowledge is the need for models to reliably project growth and, ultimately, economic value of longleaf pine. Some limited data are available for projecting natural stands of longleaf that may be extrapolated to yield estimates of potential growth in planted stands, but there is a great deal of uncertainty when gains in seedling quality, competition control, fertilization, and other silvicultural techniques are factored in. Much of the reestablishment of longleaf pine taking place today is occurring on old fields and pastures. At least half of that planted is done so using containerized seedlings, usually employing both intensive site preparation and follow-up herbaceous competition control to improve survival and accelerate growth.

Longleaf pine can grow competitively with, or even exceed, the growth of other southern pine species on many sites. If markets continue to award quality wood products, particularly utility poles, with premium prices, longleaf is highly competitive. Private industrial and nonindustrial landowners should therefore respond positively to that possibility and make longleaf a vital part of their portfolio.
Historical Perspective

The first European explorers to visit the southeastern U.S. Coastal Plain found a vast parkland of low ground cover growing under a relatively open canopy of pine (Bartram 1791; Schwarz 1907). Depending on the geography and/or soils, the dominant tree was longleaf pine.

Schwarz (1907) noted that within pure stands of longleaf pine, certain minor variations existed. The most important variation was in the density of trees. Ordinarily, the stand of trees did not maintain uniformity over more than a few hundred acres; often changing abruptly even within 50 acres. Schwarz (1907) gave this description:

Thus we may enter a stand of mature timber, with trees from 90 to 120 feet in height and with ample spaces here and there in the crown cover, giving entrance to the light from overhead. After walking perhaps only a few hundred paces, we may find the trees suddenly beginning to close up their crown spaces. They grow smaller and more numerous, until presently they form a tolerably dense grove; and then they open up once more into the original stand of mature, tall trees. Occasionally, too, a tract of old trees of fairly uniform height is replaced by one in which the trees show diversity in size, ranging from mere poles to veterans of the forest.

Although an extremely intolerant tree, which will thrive best in even-aged stands, the natural form of longleaf pine tends toward small, even-aged groups of a few hundred square feet. Being naturally resistant to fire, large clearings are never caused by fire. In regions of severe winds, or tornadoes, larger even-aged patches and strips are found, sometimes one-quarter to one-half mile in width, which have come in after blowdown. These are pretty well interspersed with patches or single survivors of the old forest, which have acted as seed trees. Fire always has and always will be an element in longleaf forests, and the problem is not how fire can be eliminated but how it can be controlled so as to secure reproduction; second, to prevent the accumulation of litter and reduce the danger of a disastrous blaze. The factor that probably determines growth and yield is root competition for soil moisture. Longleaf stands are subject to severe droughts. The slow juvenile growth and long taproot of the young tree indicate its adaptation to this condition. Very young stands of longleaf may be quite crowded and remain so for 50 to 80 years. But it was found that such stands, if closely crowded, fell off in growth so badly that there was a distinct loss of production. Trees less than 100 years of age continued to grow vigorously in diameter even in rather dense groups, provided such groups were isolated and did not form a complete stand. But above this age it was found that groups of several trees standing close together would have differentiated themselves into dominant and suppressed trees, one or two trees with large crowns showing continued growth, while the rest were almost stationary. These occurred in groups surrounded by open space and could not be accounted for by struggles for light. Root competition alone can account for the thinning out of mature longleaf forests and the wide spacing of veteran trees. It also accounts, to a greater extent than intolerance, for the absence of seedlings under the open crowns of veteran trees, and their appearance only in openings at some distance from such trees. The indicated management for longleaf pine is to avoid crowding and not to attempt rotations much longer than 100 years or the production of large sizes. The ideal form for young stands of longleaf would be to have them stocked at most with only about twice as many saplings as should be standing in the form of mature trees at the end of the rotation.

It is evident that under natural conditions, even in the presence of repeated fires, the longleaf pine forest renews itself, young trees coming in on areas left blank by the death of old timber. All trees in a stand do not grow equally fast, nor continue to grow at the same rate. In longleaf pine this is especially noticeable. Only the largest trees, with the biggest crowns, continue to grow at a rapid rate after a stand has reached merchantable size. After a longleaf pine stand reaches the age of about 120 years, the loss from red rot, fire, and suppressed growth increases so fast that the net gain in growth on the stand would not pay the