TECHNICAL NOTE

Sixty Years of Management on a Small Longleaf Pine Forest

Rebecca Barlow, John S. Kush, and William D. Boyer

ABSTRACT

In 1948, the US Forest Service set aside a 40-ac tract on the Escambia Experimental Forest in South Alabama to demonstrate longleaf pine (*Pinus palustris* Mill.) management for the small landowner. At that time, the management goal for this "Farm 40" was to produce high-quality poles and logs on a 60-year rotation. The goal was to be accomplished entirely through management of the existing natural forest, with little to no capital investment other than the cost for prescribed burning, marking trees for cut, and limited control of cull hardwoods. Management of the forest has continued making the Farm 40 an excellent demonstration of small-scale longleaf pine management. Frequent harvests and small capital outlay continues to make this type of management strategy especially appealing to today's landowners with limited resources.

Keywords: Escambia Experimental Forest, forest management, longleaf pine

Charles Mohr wrote in 1897, "the Longleaf Pine is the tree of widest distribution and of greatest commercial importance in the Southern Atlantic forest region of North America, covering, with scarcely any interruption, areas to be measured by tens of thousands of square miles and furnishing material. . . . The greatest danger threatening the existence of the forests of Longleaf Pine must be ascribed to the agency of man, since their destruction is caused chiefly by the reckless manner in which they are depleted without heed to recuperation."

These words of caution are also reflected in the later writing of Wahlenberg (1946) indicating that mismanagement of longleaf pine (*Pinus palustris* Mill.) may have been the rule rather than the exception across much of its range. This was often due to ignorance of the unique life history of the species and lack of regard for regenerating the original longleaf pine forests over much of the South after they were cut over in the early 1900s. According to Outcalt and Sheffield (1996), longleaf pine stands cover some 3 million widely distributed and fragmented acres in the South, of which 2.7 million ac (91%) support natural stands and contain 94% of the growing stock volume of the species. These natural stands are a very important source of high-value wood products, provide unique multiple-use benefits, maintain biological diversity, and supply necessary habitat for several rare and endangered species.

In response to the decline in longleaf forest acres, the US Forest Service, in association with T.R. Miller Mill Company of Brewton, AL, established the Escambia Experimental Forest in 1947 to study several aspects of longleaf pine silviculture. One of the first projects undertaken was to install a demonstration of longleaf pine management for the small landowner. Returns were low from any forestry activity in the late 1940s, and as a result, many woodland owners were uncertain as to their land's best use. In 1948, the "Farm 40" was established as a 60-year demonstration of low-cost longleaf pine forest management for the small-scale private forest landowner.

Similar to their midcentury counterparts, nonindustrial private landowners of today continue to need information that will guide them in the management of their property. The Longleaf Alliance estimates that since 1996, 870 million longleaf pine seedlings have been produced, enough to plant 1.4 million ac (Dean Gjerstad, Vice President, The Longleaf Alliance, Inc., personal communication, May 12, 2009). There has been a 40% increase in longleaf pine acreage on public lands, a 10% increase on all lands, and an increase of 288,000 ac. However, on private lands the story is different. There has been a loss of 100,000 ac region-wide, or a 3.5% decline in total acreage. Even more drastic has been a 32% decline in natural longleaf pine forests; these are the stands that are ecologically of most concern, since they often contain the best structure and ground cover. Therefore, demonstration and research areas such as the Escambia Farm 40 continue to be critical to the preservation and establishment of functioning longleaf ecosystem with all associated plants and wildlife.

At the time of establishment, the Farm 40 supported an understocked, 35–45-year-old, second-growth longleaf pine forest that was common on many farm forests in the coastal plains of the Gulf South (Figure 1) (Boyer and Farrar 1981). The tract was predominantly longleaf pine (31 ac), with the remaining 9 ac composed of mostly slash pine (*Pinus elliottii* L.) in the creek bottom and flat. The site index for longleaf on the forest at the time was average: 70 ft at 50 years. The results of the first 30 years of management and demonstration on the Farm 40 were reported by Boyer and Farrar (1981). The current article highlights results from the entire 60 years of management, with special emphasis on lessons learned and

Manuscript received August 20, 2009; accepted November 3, 2009.

Rebecca Barlow (rjb0003@auburn.edu), School of Forestry and Wildlife Sciences, Auburn University, 3301 Forestry and Wildlife Building, Auburn University, Auburn, AL 36849-5418. John S. Kush, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849-5418. William D. Boyer, US Forest Service, retired. *The US Forest Service and T.R. Miller Mill Company are acknowledged for establishing the Escambia Experimental Forest and conducting 60 years of research. Dr. Thomas Croker, Jr., had the insight to establish the Farm 40, which is still demonstrating longleaf pine management for the small landowner. Dr. William Boyer and Dr. Robert Farrar, Jr., kept the Escambia Experimental Forest going in the 1970s when the interest in longleaf pine was decreasing and wrote about the first 30 years of this demonstration. Jim Elledge remeasured the Farm 40 in 2007.*

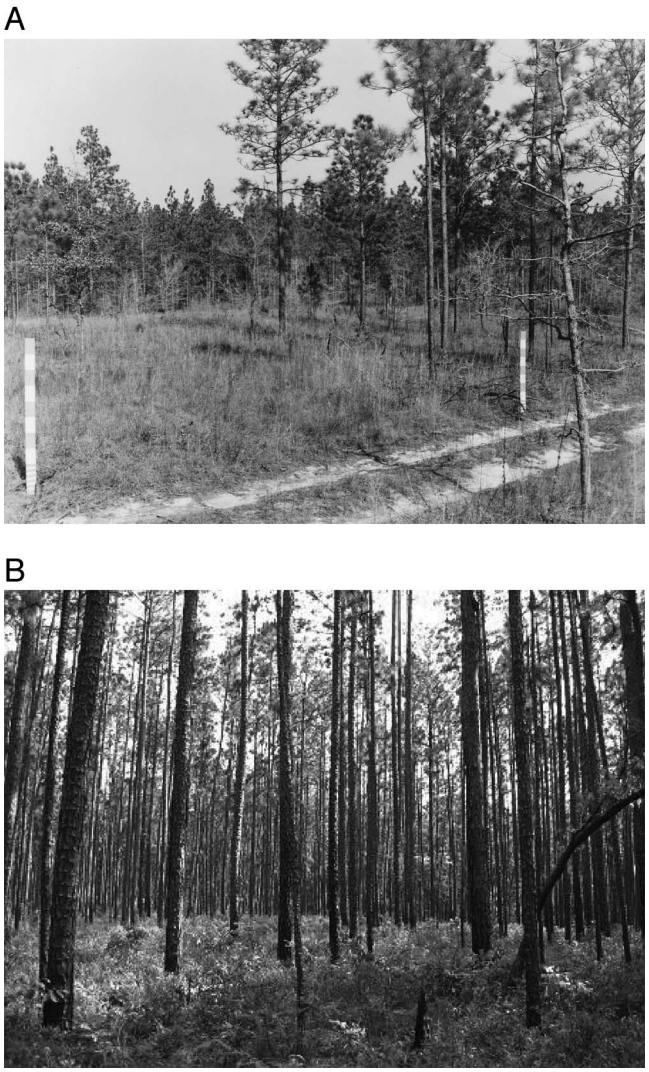

Figure 1. A, The Farm 40 as it appeared from an established photo point in 1952. B, The Farm 40 as it appeared from the same photo point in 2008.

resulting inventories from this unique long-term management effort.

Management

The long-term management goal of the forest was to grow high-quality sawtimber and poles on a 60-year rotation (Boyer and Farrar 1981). With the private landowner in mind, this goal was to be accomplished through management of the existing forest with little to no additional investment or expense. Expenses were primarily from the cost of prescribed burning and control of hardwoods. Regeneration and intermediate cuts provided regular income from the forest; however, removals were not to exceed growth until full stocking, and a balanced distribution of age classes was achieved.

Management over the last 30 years continued with periodic shelterwood harvests, in which stands were thinned to approximately 30 square feet of basal area, creating openings in the canopy to promote regeneration, and tracts were burned on a 2–3-year cycle (Boyer and Farrar 1981). Shelterwood systems create small even-aged patches throughout the forest that mimic the natural regeneration process that evolved with the species, and they eventually make the forest an uneven-aged system. The burns were shifted from winter to spring during this time to improve hardwood control. Additional benefits from the spring burns included better control of hardwoods in low-lying areas and reestablishment of native cane breaks (*Arundinaria gigantea*) and pitcher plants (*Sarracenia* spp.) in the flats.

Growth and Harvest

Sixty-year growth and removal of pine volumes on the Escambia Farm 40 are summarized in Table 1. The initial inventory was taken in 1947 and at 15-year intervals for the first 30 years (Boyer and Farrar 1981). After the 1977 remeasurement, the Farm 40 was inventoried at 5-year intervals.

During the period from 1977 to 2007, standing volume of pine timber increased more slowly as the stand aged and thinning was curtailed. Following the first 30 years of management, it was decided to extend the 60-year rotation to promote areas of older timber, especially as the Forest Service was looking to manage longleaf to older rotations, up to 120 years. Harvest was slowed, and today there are areas with trees over 100 years old. Overall volume per acre increased 22% and sawtimber volume increased 15% to 1,084 cubic feet per acre from 1977 to 1997 (Table 1). Gains in total volume per acre slowed through the 2002 inventory period, with a slightly less than 5% increase to 1593 cubic feet per acre.

On Sept. 15, 2004, Hurricane Ivan made landfall and affected much of the Escambia Experimental Forest, including 10 ac of timber in the Farm 40. Salvage harvests were conducted over the following year. Unfortunately, records of timber volumes harvested during these operations were not maintained for individual stands, making it impossible to know exactly what volume was lost on the Farm 40 as a result of the hurricane. The 2007 inventory showed that there was a 9% volume decrease in total standing timber volume from the 2002 inventory (Table 1). Decreases occurred in both sawtimber and pulpwood, as standing volumes were reduced to 1,034 and 422 cubic feet per acre, respectively. Figure 2 illustrates what the changes were in the diameter distribution between the 2002 and 2007 inventories.

Diameter class distributions of merchantable pine from 1947 and 2007 inventories are illustrated in Figure 3. As with the comparison of the 1977 inventory (Boyer and Farrar 1981), increased recruitment in smaller diameter classes continued as the shelterwood regeneration system was used to reestablish the forest. For trees that were 8 in. dbh and greater, distribution of diameters was approximately the same in 2007 as in 1947.

Discussion

With the exception of salvage harvests that were a result of Hurricane Ivan, harvests from the Escambia Farm 40 have been thinnings and shelterwood regeneration harvests from stands that were poorly stocked in 1947. The initial goal was to have harvest volumes that were less than total growth and to establish a range of age classes across the forest on a 60-year planning cycle. Documented harvests from 1948 to 1998 yielded almost 1,400 cubic feet per acre removed from the forest, with 75% of all volume removed in high-quality sawlogs and poles.

Using the shelterwood method, stands were thinned and naturally regenerated to mimic natural processes on a small scale. Eventually, older stands were removed as the new stand matured. Over time, a number of age classes were developed within the Farm 40, so there were always mature stands to be harvested, providing periodic revenue from the forest with minimal cost to the landowner. An

Table 1. Sixty-year total stand per acre volumes in cubic feet, sawtimber stand per acre volumes in cubic feet, and International ¼-in. and Doyle log rules for the Escambia Farm 40 from 1947 to 2007.

	Total stand/acre (>3.5 in. dbh) Cubic feet	Sawtimber stand/acre		
		Cubic feet (stem only)	Board feet (International ¼-in.)	Board feet (Doyle)
		.....(>9.5 in. dbh).....		
Inventory 1947	846	508	3,559	1,841
Inventory 1962	933	722	4,449	2,474
Increase 1947–1962	87	214	890	633
Cut 1947–1962	515	402	2,482	1,409
Growth 1947–1962	602	616	3,372	2,042
Inventory 1977	1,194	855	5,408	3,268
Increase 1962–1977	261	133	959	794
Cut 1963–1977	275	219	1,351	768
Growth 1963–1977	536	352	2,310	1,562
Inventory 1987	1,392	1,003	6,417	4,022
Increase 1978–1987	198	148	1,009	754
Cut 1978	159	89	537	281
Growth 1978–1987	357	237	1,546	1,035
Inventory 1992	1,426	1,010	6,455	4,072
Increase 1988–1992	34	7	38	50
Cut 1988	140	119	748	446
Growth 1988–1992	174	126	786	496
Inventory 1997	1,533	1,084	6,914	4,334
Increase 1993–1997	107	74	459	262
Cut 1993	47	38	211	112
Growth 1993–1997	154	112	670	374
Inventory 2002	1,593	1,137	7,226	4,491
Increase 1998–2002	60	53	312	157
Cut 1998	261	184		
Growth 1998–2002	321	237		
Inventory 2007	1,457	1,034	6,529	3,979

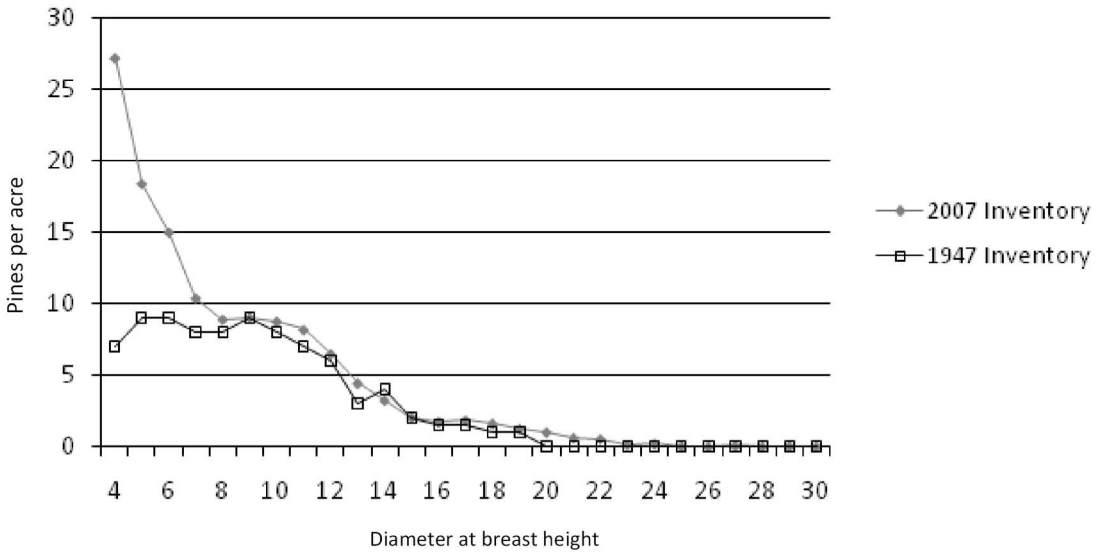

Figure 2. Diameter distribution of pines per acre on the Escambia Farm 40 in 2002, prior to Hurricane Ivan and 2007.

additional benefit of this method is that while a stand reestablishes itself, high-value wood can be grown on the remaining large, seed-bearing trees.

Longleaf pine is well suited to small-scale forest landowners and those who are interested in reestablishing this native ecosystem on their land. According to a recent survey of forestland managers in the southeastern United States, almost 3% of all acres planted during the 2008 planting season were longleaf pine (Barlow et al., 2009). Through restoration efforts and sustained improvements in planting techniques, it is projected that acres planted in longleaf pine will continue to increase. These plantations may be converted through time to uneven-aged systems through use of the low-cost techniques demonstrated on the Farm 40.

In addition, recent outreach, educational, and extension programs by the Longleaf Alliance (Gjerstad and Johnson 1999) have been effective in communicating new information and technology and new management options to landowners and managers in the

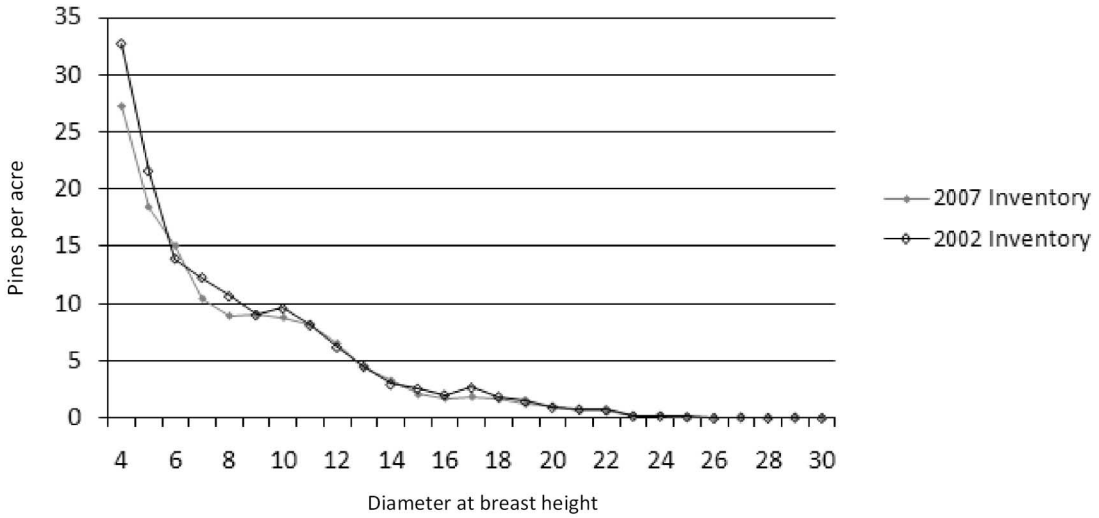

Figure 3. Diameter distribution of pines per acre on the Escambia Farm 40 in 1947 and 2007.

former longleaf range. Alternative revenue streams from nontraditional forest values, such as wildlife and hunting leases, pine straw harvesting, and the current potential for carbon credits, are providing new opportunities for private owners for managing longleaf pine over longer rotations. Sustaining the interest of the nonindustrial private forest landowners in longleaf pine management must ultimately overcome the cash flow problem associated with longer rotations. Several surveys have shown that most of these nonindustrial private owners are not seeking to maximize growth and yield but are interested in a range of stewardship objectives that integrate commodity (forest products) values with noncommodity values (wildlife, water, aesthetics etc.). Managing for value, not volume, has become the new paradigm for these owners.

Conclusions

The original longleaf pine forest was self-perpetuating. It reproduced itself by regenerating in gaps created in the overstory. The result was a parklike, uneven-aged forest composed of many even-aged stands of varying sizes. The character of the ecosystem is best maintained with natural regeneration, using management techniques that simulate processes that have long maintained longleaf ecosystems over the millennia. The Farm 40 illustrates to landowners how they can effectively manage their tracts with limited monetary input. Over 60 years of research on the Farm 40 has provided information vital to the southern landowner and timber manager. The Farm 40 is a much-used outdoor demonstration area for the education and enjoyment of a host of visitors including schoolchildren and forestry students. It is a real world, living demonstration of proven techniques that will continue to be used by forest researchers to examine topics important to forest landowners and land managers.

Literature Cited

Barlow, R.J., M.F. Smidt, J.Z. Morse, and M.R. Dubois. 2009. Cost and cost trends for forestry practices in the South. *For. Landowner*. 68(5):5–12.

Boyer, W.D. and R.M. Farrar, Jr. 1981. Thirty years of management on a small longleaf pine forest. *South. J. Appl. For.* 5(2):73–77.

Gjerstad, D., and E. Johnson. 1999. The Longleaf Alliance: A regional longleaf pine recovery effort. *Alabama's Treasured Forests* 18(4):22:27.

Mohr, C. 1897. *The timber pines of the southern United States.* Bulletin No. 13, US Division of Forestry. p. 29.

Outcalt, K.W. and R.M. Sheffield. 1996. *The longleaf pine forest: Trends and current conditions.* Resour. Bull. SRS-9. US For. Serv., Asheville, NC.

Wahlenberg, W.G. 1946. *Longleaf pine: Its use, ecology, regeneration, protection, growth, and management.* Charles Lathrop Pack Forestry Foundation, in cooperation with the US Forest Service, Washington, DC. 429 p.