AGE STRUCTURE OF A SOUTHERN PINE STAND FOLLOWING 72 YEARS OF UNEVEN-AGED SILVICULTURE

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Work on uneven-aged silviculture in southern pine stands on the Crossett Experimental Forest (CEF) began in the 1930s, when a number of 16.2-ha compartments were placed into a series of demonstration projects and studies (Reynolds 1980). Two of these compartments, the Good and Poor Farm Forestry Forties, have been maintained continuously in this silvicultural regime since 1937. However, for all of the long history of the CEF, we have not systematically aged the loblolly (*Pinus taeda*) and shortleaf (*Pinus echinata*) pine-dominated Farm Forestry Forties. Rather, we have accepted decades of continuous sawtimber production as de facto evidence of uneven-aged structure.

Because a functional uneven-aged forest requires more than the simple appearance of multiple age classes (Smith and others 1997), measurements were undertaken in 2009 to document the age structure of the Farm Forestry Forties. This paper reports on the Poor Forty, a parcel originally designated as "poor" because of its low initial pine stocking, not site quality (Reynolds 1980). Five pines were randomly selected (4 overstory and 1 seedling/sapling) for sampling on each of 25 plots systematically established in this stand. An increment borer was used to core trees at least 6 cm in diameter at breast height (d.b.h.); cores were taken at 50.8 cm above ground line, and were then dried, mounted, sanded, and ring-counted (no cross-dating was done, so these are only approximations of actual age). For pines less than 6 cm d.b.h., trees were felled, and a 50.8-cm long bolt was sawn from the base of the stem, starting at groundline. Ring counts were taken at both ends of this bolt, allowing for the estimation of how long it took pines to grow from 0 to 50.8 cm in height. This value (on average, approximately 2 years) was then added to the ring counts of the larger trees to provide a final age estimate.

Of the 125 pines aged, 119 were loblolly (95.2 percent). Pines as young as 4 years old were sampled, with diameters as low as 0.5 cm d.b.h. (Figure 1). Pine reproduction is present in this stand, clustered around canopy openings (gaps) and on substrates that were favorable shortly after they formed (most recently, following a timber harvest in 2002-2003). Only 7 (5.6 percent) pines were over 72 years old, with the oldest one having an estimated age of 86 years (Figure 1). This stand is managed under a prescription that greatly reduces the number of pines greater than 50 cm d.b.h., and therefore limits the abundance of older trees.

Not surprisingly, the Poor Forty has a diffuse age distribution that reflects 30 annual harvests from 1938 to 1968 and 7 periodic harvests since 1969 (Table 1). In addition to old pines, two other deficiencies in the Poor Forty age class data are notable—the first arises from the lack of pines 30 to 40 years old, a likely consequence of inadequate timber harvesting which limited pine regeneration during the temporary closure of the CEF in the 1970s. The second is apparent over the last 5 years, attributable to a recent lack of pine recruitment.

Similar to uneven-aged forests dominated by shade-tolerant species, there was only a moderate relationship between d.b.h. and age (Figure 1). Small-diameter (less than 10 cm d.b.h.) pines varied the least in their age range, followed by intermediate size classes (10 to 25 cm d.b.h.), and then the largest trees. The oldest individual, an 86-year-old, 41.2 cm d.b.h. loblolly pine, was noticeably older than most other stems in the 40 to 42 cm range—the 5 other pines in this class had the following ring counts: 47, 52, 62, 63, and 67 years.

Though not as well-structured as an idealized uneven-aged stand would be, it is quite apparent from these data that the pine component of the Poor Farm Forestry Forty on the Crossett Experimental Forest is composed of multiple size classes of spatially intermingled individuals. This textbook definition (see Baker and others 1996) arose from decades of selection harvests, and given the current size and age structure of this stand, should be sustainable well into the future.

LITERATURE CITED

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Table 1—Age class structure from the uneven-aged, loblolly pine-dominated Poor Farm Forestry Forty on the Crossett Experimental Forest in Arkansas

Age class	Count	Fraction of total	Cumulative total
-- years --	-- trees --	-- % --	-- % --
0 - 4	1	0.8	0.8
5 - 9	14	11.2	12.0
10 - 14	8	6.4	18.4
15 - 19	13	10.4	28.8
20 - 24	13	10.4	39.2
25 - 29	5	4.0	43.2
30 - 34	3	2.4	45.6
35 - 39	4	3.2	48.8
40 - 44	3	2.4	51.2
45 - 49	6	4.8	56.0
50 - 54	9	7.2	63.2
55 - 59	16	12.8	76.0
60 - 64	13	10.4	86.4
65 - 69	9	7.2	93.6
70 - 74	4	3.2	96.8
75 - 79	3	2.4	99.2
80 - 84	0	0.0	99.2
>84	1	0.8	100.0
TOTALS	125	100.0	100.0

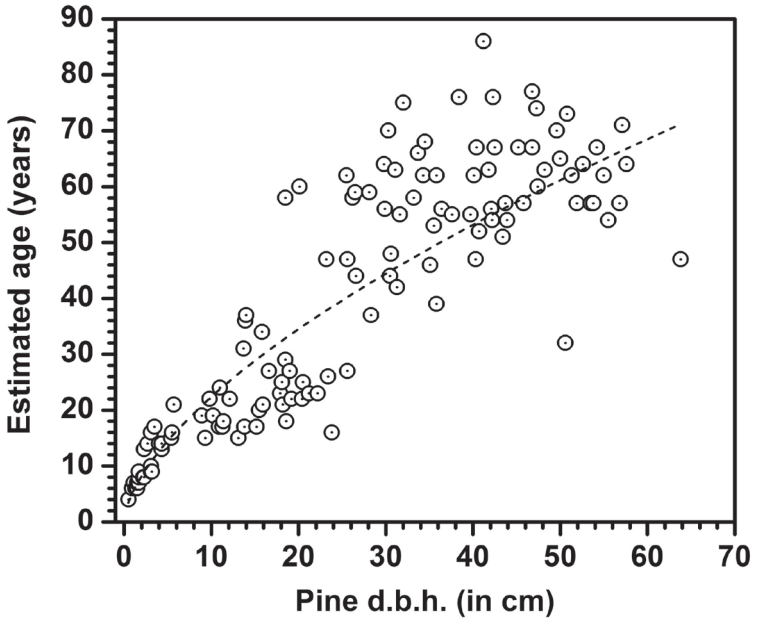

Figure 1—Relationship between estimated age and d.b.h. from the Poor Farm Forestry Forty on the Crossett Experimental Forest. The dashed line was fit using ordinary least squares nonlinear regression (estimated age = $5.313 d.b.h.^{0.6244}$, pseudo-R^2 = 0.8675).