A LOOK BACK ON 26 YEARS OF HARDWOOD DEVELOPMENT AFTER AFFORESTATION ON FLOOD-PRONE AGRICULTURAL LANDS IN THE LOUISIANA DELTA

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EXTENDED ABSTRACT

Over the last half-century, thousands of acres have been afforested in the Mississippi Alluvial Valley (MAV) with projections of nearly 30 million acres by 2040 (Wear 2002). This is after a previous 2 centuries where nearly 75 percent of the original hardwoods were removed from the MAV (Nature Conservancy 1992). Establishment of new stands across this large area has resulted in a wide variety of survival and growth characteristics across soils, topography, and silvicultural techniques (Cunningham and Stuhlinger 2018, Self and Willis 2022)

In 1996, an 80-acre site located on the Bouef River Wildlife Management Area between the Ouachita and Bouef Rivers was planted in hardwood tree species. The site from west to east was composed of Alligator clay in the lowest elevation, Perry clay in the middle of the site, and Hebert silt loam on the highest part of the site. Each soil type composed roughly a third of the site and there was a 3- to 4-foot rise from west to east. Approximately 439 trees per acre were planted at 10-foot by 10-foot spacing. Further details on establishment of this study are reported by Patterson and Adams (2003).

In 2022, 88 tenth-acre plots were established across the 3 soil types. While the original study included a bedding treatment, this study randomly distributed plots across each of the three soil types. In each plot, total number of trees that were ≥4 inches in diameter at breast height (d.b.h.) were recorded and classified as overcup oak (*Quercus lyrata*), Nuttall oak (*Q. texana*), willow oak (*Q. phellos*), or other. The other grouping included species such as Chinese tallow tree (*Triadeca sebifera*), bitter pecan (*Carya aquatica*), baldcypress (*Taxodium distichum*), honey locust (*Gleditsia triacanthos*), and others that occurred in low numbers. Total height and d.b.h. were recorded for each tree.

Tree density across the three soil types averaged 106, 84, and 87 trees per acre for the Alligator, Perry, and Hebert soils types, respectively (table 1). Though Alligator soils had a greater number of trees per acre, trees on Alligator and Perry soils were not significantly different in either height or d.b.h. However, trees on the Hebert soil were significantly different (*P*

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<0.01) than trees on the other two soil types and were much larger overall with a 41 percent larger diameter and 43 percent greater height than the average of the other two soil types. Trees per acre in conjunction with basal area resulted in the Hebert soil type having 69 square feet of basal area per acre compared to 40.5 and 31.5 square feet for the Alligator and Perry soils, respectively (table 1). When plotted on an established stocking guide (Goelz 1995) both the Alligator and Hebert were above the C-10 line but had still not reached the B-line, although the Hebert was the closest. The Perry soil stocking was slightly below the C-10 line (fig. 1).

Distinguishing these three soil types was a change in the suite of species represented. All sites were dominated by Nuttall oak with a 36, 70, and 75 percent representation within the Alligator, Perry, and Hebert soils, respectively. The lowest site and most westerly, Alligator clay, was composed of 36 percent overcup oak but had no willow oak. This shifted immediately to the east, with the slightly higher-elevated Perry soil having greatly reduced overcup oak representation of 12 percent while having a slight 1.2 percent representation of willow oak. The Hebert soil had only 2 percent overcup oak representation with 12.7 percent willow oak. Across the three soils types there were only 1.5–3.6 percent in the other category. Notably, the absence of green ash (*Fraxinus pennsylvanica*) that was specifically planted in this study is glaring (Patterson and

Table 1—Diameter at breast height, height, basal area per acre, and trees per acre on the three soil types at the Bouef River Wildlife Management Area study site

Soil type	d.b.h.	Height	Basal area	Trees
	inches	*feet*	*square feet per acre*	*per acre*
Alligator clay	8.15	39.41	40.6	342
Perry silt loam	8.05	54.49	31.5	244
Hebert clay	11.46	36.70	69.1	236

d.b.h. = diameter at breast height.

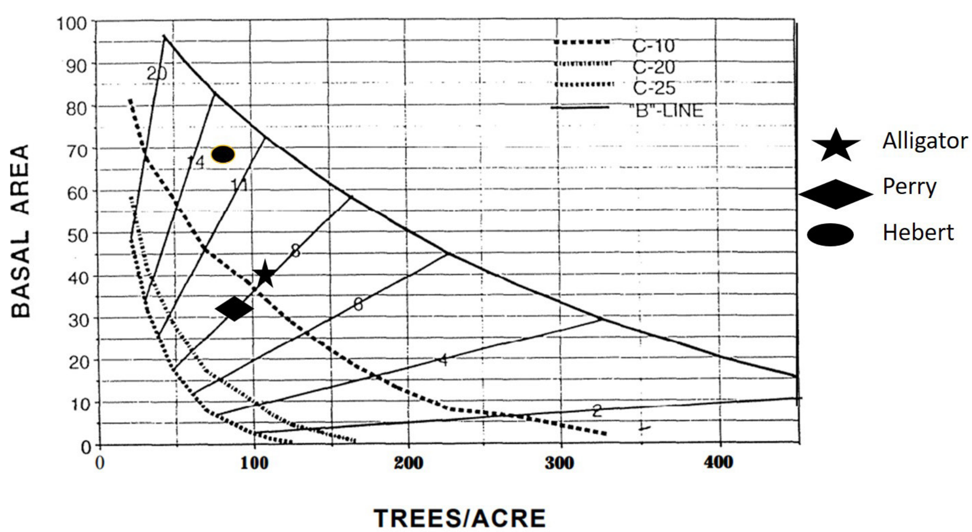

Figure 1—Basal area in square feet per acre and trees per acre estimates across species for each soil type on the Goelz (1995) stocking guide.

Adams 2003), though there are no specific reasons apparent, and ash was assumed to be less competitive on this particular site. Similar to other studies, there was a narrowing in species number representation as the stand aged (Lockhart and others 2006) in which one or a few species exerted dominance. This supports the difficulty observed in other studies for the establishment of stands immediately after afforestation. Furthermore, attempts to devote resources (i.e., seedlings representing many species) to promote diversity is not effective. Rather, attempts to plant a small number of species that will survive in the first few decades may be prioritized. However, if such a route is taken, success will depend on correct species selection.

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