

OAK PLANTINGS AND NATURAL INVASION OF TREE SPECIES ONTO FORMER AGRICULTURAL FIELDS IN THE LOWER MISSISSIPPI RIVER VALLEY

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POSTER SUMMARY

Greater than 80 percent of the bottomland hardwood forests of the Lower Mississippi Alluvial Valley (LMAV) have been lost to conversion over the past 100 years. Of the forests that remain, most are highly fragmented and degraded. Attempts to reforest some of this area over the past 15-20 years have highlighted the need for more information on the relative success of various planting techniques. Controversies still clouds the merits of direct seeding versus planting bare rootstock, and information on broadcast seeding is also lacking. Very little information exists on natural invasion dynamics that are often expected to provide additional tree species and increase diversity. To test a variety of planting methods, the U.S. Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries, and the Louisiana State University initiated a study during the fall of 1993. Researchers from the Louisiana State University and the U.S. Geological Survey sampled the plots six years later, during the fall of 1999. This poster presented an overall summary of the study. Two additional papers on the study are included in these proceedings and several other manuscripts are planned for future publication (see below).

At each of four locations (Lake Ophelia National Wildlife Refuge [NWR], Tensas River NWR, Bayou Macon Wildlife Management Area [WMA], and Ouachita WMA) 14 treatment combinations were established in a randomized complete block design on 0.4 ha (1 -acre) permanent study plots. Treatments consisted of 6 combinations of direct seeding using no till, single disking, double disking, strip disking, and rolling (table 1). Planting was accomplished by using a maximerge planter or a cyclone broadcast planter. Each treatment was further replicated with a fall (1993) and spring (1994) planting. In addition bareroot seedlings were planted by hand and machine during the winter (January/ February 1994).

Three oak species were used in the study (table 2); Nuttall oak (*Quercus texana*), water oak (*Q. nigra*), and willow oak (*Q. phellos*). Each treatment was replicated 3 times for each

oak species for a total of 84 plots each at Tensas River NWR and Bayou Macon WMA where two species of oaks were planted, and 42 plots each at Lake Ophelia NWR and Ouachita WMA where only one species of oak was planted.

After the 6th growing season (fall 1999) 4 subplots (100 m² each, 20 m in toward the center of the main plot from each corner) were sampled in each plot to determine the number and heights of planted oaks and any woody invaders. All tree seedlings/saplings greater than 30 cm tall were identified and categorized by height class (30-50 cm tall, 51-100 cm tall, 101-140 cm tall, greater than 140 cm tall, and greater than 2.5 cm DBH).

Overall, 16,511 seedlings and saplings (greater than 30 cm tall) were recorded in this study. This number included 7,022 planted oaks for an average of 697 oaks and 941 woody invaders per ha. Oak survival was mixed with respect to species and location. Nuttall oak survival was

Table I-Planting treatments and season of planting

Treatment	Season
Double Disk, Maximerge Direct Seed	Fall, Spring
Double Disk, Maximerge Direct Seed, Roll	Fall, Spring
Strip Disk, Maximerge Direct Seed	Fall, Spring
No-Till, Maximerge Direct Seed	Fall, Spring
Single Disk, Cyclone Broadcast Seed, Single Disk	Fall, Spring
Single Disk, Cyclone Broadcast Seed, Single Disk, Roll	Fall, Spring
Hand Plant Bare Root Seedlings	Winter
Machine Plant Bare Root Seedlings	Winter

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Table 2-Oak species planted at each refuge/wildlife management area

Species	Tensas River NWR	Lake Ophelia NWR	Ouachita WMA	Bayou Macon WMA
Nuttall Oak	X	X		X
Willow Oak			X	X
Water Oak	X			

higher at Bayou Macon WMA and Tensas River NWR compared to Lake Ophelia NWR, while willow oak survival was much better at Ouachita WMA compared with Bayou Macon WMA.

Species composition of the invaders varied significantly by site, probably being affected by the species composition of the adjacent forests. The highest densities were at Bayou Macon where more than 1,200 stems/hectare were recorded. Both Bayou Macon WMA and Tensas River NWR were dominated by 3-4 species (sugarberry, ash and elms) with lesser amounts of several other species. The lowest densities were found at Lake Ophelia NWR, where a broad mixture of species and no overall dominant was found, and at Ouachita WMA where one species, saltbush, dominated.

Planting treatments had significant effects on natural invasion by woody species. Greater numbers of invaders were found on the no-till and strip disk treatments than on treatments that were more thoroughly disked. This effect, however, was caused by the combined responses of the ashes, sugarberry and elms. Invasion rates of most other species were not affected by disking.

OTHER RELATED MANUSCRIPTS PRESENTED AT THE 11TH ANNUAL BSSRC

Michalek, Alexander J., Brian Roy Lockhart, Thomas J. Dean, Bobby D. Keeland and John W. McCoy. 2001. Comparison of hand planting versus machine planting of bottomland red oaks in former agricultural fields in Louisiana's Mississippi Alluvial Plain: Sixth-year results.

McCoy, John W., Bobby D. Keeland, Brian Roy Lockhart, and Thomas J. Dean. 2001. Pre-planting site treatments and natural invasion of tree species onto former agricultural fields at Tensas River National Wildlife Refuge, Louisiana.

ANTICIPATED FUTURE MANUSCRIPTS

Broadcast Seeding in Bottomland Hardwood Reforestation Spring versus Fall Planting of Red Oaks in the Lower Mississippi Alluvial Valley
 Comparison of Planting Bare-Root Seedlings versus Direct Seeding of Bottomland Red Oaks.
 No-till, Strip Disking and Double Disking: A Comparison of Effects on Natural Invasion and Red Oak Survival.