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Oak Seeding on an Adverse Field Site

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SUMMARY

Direct-seeded Nuttall oak (*Quercus nuttallii* Palmer) and water oak (*Q. nigra* L.) acorns on an old-field site of Sharkey clay soil typifying marginal crop production sites gave a first-year seedling percentage of 55 and 49, respectively. Seedling percentage of acorns sown at a 2-inch depth was greater than that of acorns sown at 4- and 6-inch depths (63 vs. 47 and 46 percent).

Additional keywords: direct seeding, germination, Nuttall oak (*Quercus nuttallii*), old-field sites, water oak (*Q. nigra*).

INTRODUCTION

During the last 30 years (1955–85), millions of bottomland acres have been cleared of natural hardwood forest and planted to various agricultural crops, particularly soybeans. Some such areas have very poorly drained clay soil subject to growing season drought. At best, they have been marginal for crop production.

Several thousand acres of marginal fields are either being restored or are planned for restoration to trees, primarily by public agencies. Technology to successfully plant such areas with suitable bottomland hardwood species is available. However, recent work in cleared forested areas on both bottomland sites and brown loam uplands indicates that there may be another less expensive, and perhaps more flexible option—direct sowing of acorns (Johnson 1981, 1983, 1984). This method of direct-seeding acorns was tested during 1984 on a representative old-field site, and the results are reported herein. Also, water oak acorns were included for the first time along with Nuttall oak acorns.

STUDY AREA

The study area, located near Greenville, Mississippi, was a field that had been farmed for 15 to 20 years (fig. 1). The soil is poorly drained, essentially flat Sharkey clay having 12 percent sand, 75 percent clay, 13 percent silt, and a pH of 6.0. The Sharkey series is a member of the very fine montmorillonitic, nonacid, thermic family of Vertic Haplaquepts and has an average site index, at 50 years, of 91 and 85 feet for Nuttall oak (*Quercus nuttallii* Palmer) and water oak (*Q. nigra* L.), respectively (Broadfoot 1976).

Milo was grown the summer before direct seeding, but in most years the crop had been soybeans and returns were nominal. Through the previous 6 years, for example, there were two total crop failures, one due to drought and the other to growing-season flooding. The best crop yielded only 18 to 20 bushels of soybeans per acre, with a net return for the owner of $22.00/acre. In general, the characteristics and productivity of the study site are similar to those of many sites being considered for reforestation.

METHODS

Acorns were collected from three Nuttall oak and three water oak trees. Parent trees were selected to provide a range of acorn sizes—496, 400, and 280 acorns per gallon for the Nuttall and 1,556, 1,340, and 1,248 per gallon for the water oak. After a float test, sample acorns from non-floaters were cut and examined or germinated in the laboratory. The remaining acorns were stored at 35° to 40° F in polyethylene bags for about 3 months.

Within species, experimental design was a randomized complete block with nine treatments and four blocks. One combination of three sowing depths, 2, 4, and 6 inches, with one of three parent trees (acorn sizes), was assigned at random to each row within a

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Figure 1.—*General view of planting area in February 1984 (top), with flags marking sowing spots, and in August 1984 (bottom) showing vegetative competition.*

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block. For analyses, germination was summed over sizes for each depth, reducing the number of treatments to three. Between species, species were completely random major plots in a split-plot design, with minor plots being depth treatments.

Rows were spaced 10 feet apart, seed spots 4 feet. Three acorns were hand-sown in 50 seed spots per row in early February. Additional acorns of each treatment combination were sown for biweekly destructive samples. Randomly selected rows of each treatment combination were checked biweekly for germination.

Twice during the first year, on May 5 and September 12, strips between rows were bush-hogged in one direction.

RESULTS

Cutting and germination tests after seed collection showed that over 80 percent of the acorns from each tree were sound and viable.

On April 2, or about 7 weeks after sowing, destructive sampling showed that large water oak acorns were deteriorating; many subsequent sample acorns were dead, reflecting the condition of the test population, which essentially failed to produce seedlings. Sample acorns from other parent trees germinated in a normal fashion.

Moisture contents of ungerminated, field-sown water oak acorns in March and April averaged 58 or 59 percent (based on oven-dry weight), while small, medium, and large Nuttall oak acorns averaged 73, 80, and an unusually high 124 percent, respectively.

Final seedling percentage (No. seedlings/No. acorns sown) was 55 for Nuttall oak and 35 for water oak—if large acorns are considered—and 55 vs. 49 if they are not. Nuttall emerged 2 weeks earlier than water oak and germinated faster. Two-thirds of the Nuttall oak had germinated by mid-June and over 90 percent by late July. About one-third of the water oak germinated in June, one-third in July, and the rest in August and September.

Sowing depth affected seedling percentages for both species (table 1). Two-inch-deep acorns had a seedling percentage of 54 compared to 40 for those planted 4 and 6 inches deep. Excluding large acorns, 2-inch-deep water oak had 63 percent germination and the deeper ones 46 percent. Germination started at about the same time from all three depths; rate of emergence was similar for 2- and 4-inch-deep acorns but initially lagged for those planted 6 inches deep (fig. 2). The percentage of

Table 1.—*Seedling percentage for Nuttall and water oak acorns*

Depth	Nuttall oak	Water oak	Average
inches		*percent*	
2	65	43	54
4	51	32	41
6	50	30	40
Average	55	35	45

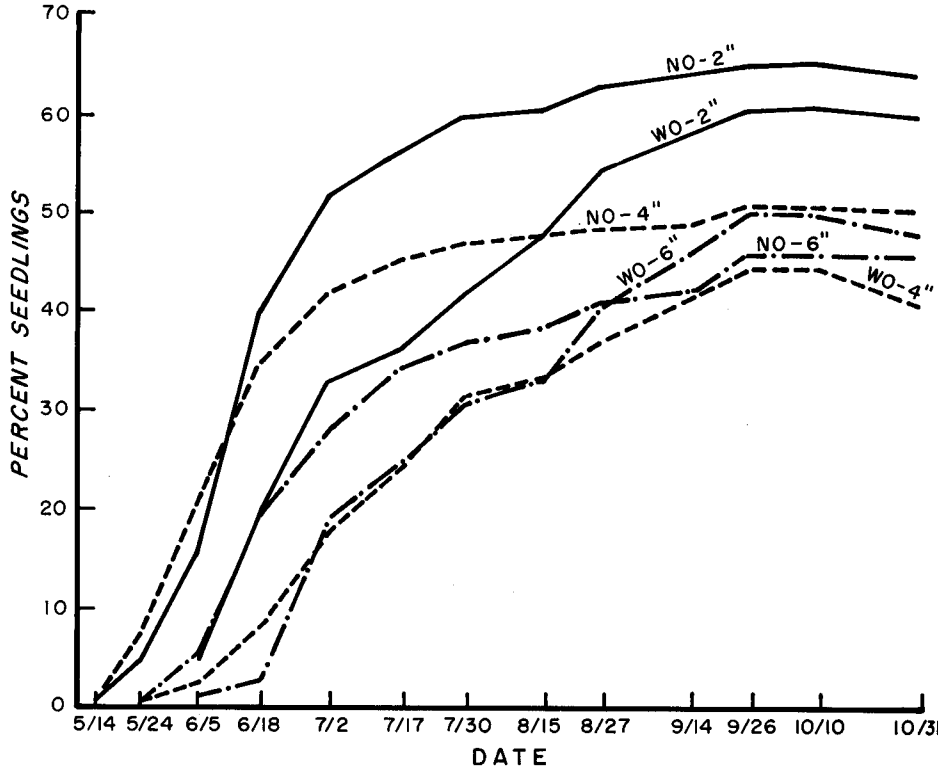

Figure 2.—*Percentage of seedlings from Nuttall oak (NO) and water oak (WO) acorns planted at 2-, 4-, and 6-inch depths.*

seed spots with one or more seedlings was higher for the 2-inch sowing depth, 92 vs. 82 and 83 for the 4- and 6-inch depths for Nuttall oak and 69 vs. 63 and 57 for water oak.

By fall, Nuttall oak seedlings, tallest per seed spot, were more than twice the size of water oak, 0.56 vs. 0.26 foot. Averaged over species, seedling heights by sowing depths were 2 inches > 4 inches > 6 inches, although actual differences between depths were less than 0.1 foot.

CONCLUSIONS

Direct sowing of Nuttall and water oak acorns is one way to establish trees on recently farmed, poorly drained Sharkey clay fields. Acorns can be sown as deep as 6 inches, but 2 inches gives better results. Acorns germinate throughout the summer, so results of direct seeding should be evaluated late in the growing season.

Visual examination of cut acorns, float tests, and even germination tests may not accurately predict the field germinability of some seed lots, as was demonstrated by the large water oak acorns.

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