

Cherrybark and Shumard Oaks Successfully Planted on Eroded Ridges

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Eroded ridges were planted with Shumard and cherrybark oaks. Shumard had greater diameter growth and cherrybark appeared to have better form. Contour ditching to allow for added infiltration had no effect on growth.

The Brown Loam Bluffs adjacent to the Mississippi River Delta were farmed for several decades following the Civil War. Poor farming practices resulted in severe erosion. Many ridge areas completely lost their topsoil. Now abandoned, these areas are generally stocked with medium- to poor-quality timber. Loblolly pine has been widely used in reforestation programs for these types of eroded areas. Recent concern has been expressed about obtaining adequate oak regeneration after cutting (3). This study tested hardwood alternatives for planting on eroded ridges as one of its objectives; two of the species studied were cherrybark (*Quercus falcata* var. *pagodifolia* Ell.) and Shumard (*Q. shumardii* Buck.) oaks.

The characteristic soil, classified as Loring silt loam, has a weak fragipan at 20 to 35 inches (51 to 89 cm). Memphis, a similar soil, but without a fragipan, has a cherrybark oak site index of about 100 feet (30 m) (2). The pan on these ridgetops has a low permeability; and after the upper horizons are filled, much of the precipitation is lost to runoff. Ditching on the contour to

catch and allow added infiltration of rainwater was proposed and tested as an aid to plantation establishment and site amelioration.

Methods

Three similar old-field ridge sites near Vicksburg, Miss., were prepared for planting during the winter of 1961. Half of each site (90 by 90 ft (27 by 27 m), chosen at random), was disked and served as a control. The other half was ditched on the contour with a dozer blade. The ditches, which were discontinuous to prevent lateral movement of water, were 2 feet (61 cm) deep and spaced approximately 10 feet (3 m) apart. The berm was thrown downhill.

Seedlings were handplanted March 1 and 2 on the berm side next

to the ditch on within-row spacings of 8 feet (2.4 m). Control plots were similarly spaced. The species tested were cherrybark oak, Shumard oak, sycamore (*Platanus occidentalis* L.), yellow-poplar (*Liriodendron tulipifera* L.), and cottonwood (*Populus deltoides* Bartr. ex Marsh.). All but the cottonwoods, which were planted as cuttings, were 1-0 stock grown at the research unit nursery from local seeds. Hoeing was done as needed to control weeds during the first growing season.

Survival was recorded and height measured annually for 5 years. At 20 years in the field, diameter and height were measured and survival recorded (fig. 1). Data were evaluated by a least-squares analysis



Figure 1.—Twenty-year-old Shumard oak planted on an eroded ridgetop site.

of variance ($\alpha = 0.05$) weighted for number of surviving trees.

Results

Except for occasional survivors, sycamore and cottonwood failed on all sites. The cause of their failure is unknown. Yellow-poplar averaged 47 feet (14 m) high and 5.6 inches (14 cm) in diameter at breast height (d.b.h.) at 20 years. Survival was about 60 percent. This rate of growth was faster than that of the oaks on the plots, but poor for yellow-poplar, which usually does not occur on ridgetops in the area, preferring more mesic sides and bottoms. For this reason, the species was not included in the following comparisons.

After 20 years, the contour ditches were still intact and still caught and held rainwater. Their worth, however, was another matter. During the first growing season after establishment, soil moisture in the ditched and control areas was not significantly different. Ditching did not affect survival or height of oaks at 5 years or their survival, height, or diameter at 20 years. The interaction of treatment and species was not significant.

Comparisons of species within treatments are given in table 1. Note that Shumard oak was significantly taller than cherrybark oak at 5 years on the control (flat) plots, but not on the ditched plots. The diameters of Shumard oak at 20 years on both

control and ditched plots were significantly greater than those of cherrybark oak.

Cherrybark oak appeared to have a stronger apical dominance, longer central bole, and more slender branches than Shumard oak. Thus, the slight diameter advantage of Shumard oak may be offset by better form in cherrybark oak.

Although an effort was made to select similar planting sites for this study, the height and diameter growth differences at 20 years between planting blocks (locations) are an indication of site variation. While soil tests showed N reserves to be low, there was little difference between plots. Other nutrients and soil pH appeared to be adequate. Soil

texture was similar for all blocks. Soil structure or other environmental causes may have been responsible for the block differences.

Height growth and survival of the two species during the first 5 years are shown in figure 2. Initially, survival of Shumard oak was better than cherrybark oak; but by 5 years, it had decreased below that of cherrybark oak. At 20 years (table 1), there was little difference in survival of the two species. Height growth began slowly, but increased to a little over 2 feet per year (61 cm) after the third growing season. This compares favorably with growth rates reported for cherrybark elsewhere (1, 4, 5).

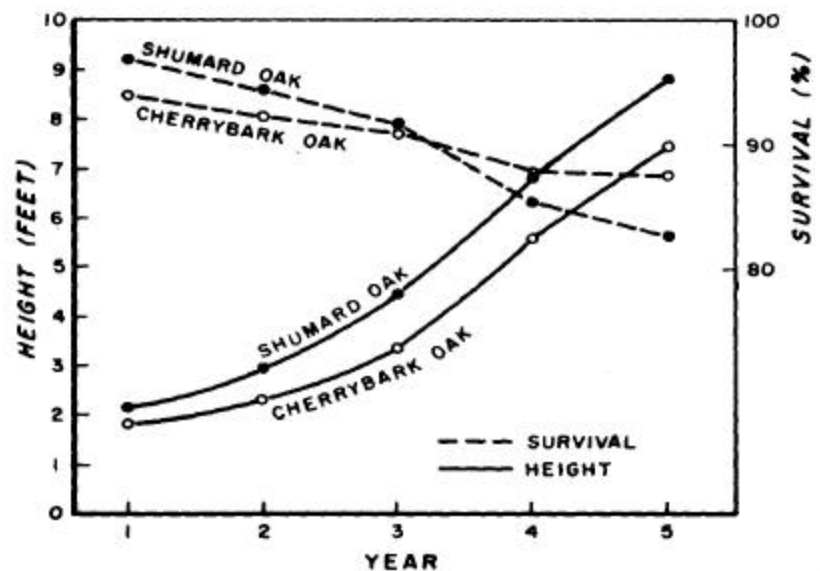


Figure 2.—Height and survival of cherrybark and Shumard oak seedlings during the first 5 years in the field.

Table 1.—*Survival, diameter, and height of cherrybark and Shumard oaks at 5 and 20 years with two site preparation treatments*

Treatment	Species	Survival		D. b. h.		Height	
		5 yrs	20 yrs	5 yrs	20 yrs	5 yrs	20 yrs
		----- % -----		--- -Inches ---		----- Ft -----	
Disked (Control)	Cherrybark	89a ¹	76a	_2	4.4b	6.5b	41a
	Shumard	80a	73a	—	5.1a	8.4a	40a
Ditched	Cherrybark	86a	81a	—	4.2b	8.2a	39a
	Shumard	85a	83a	—	5.2a	9.3a	41a

¹Weighted least-squares means within the same treatment and age followed by the same letter are not significantly different ($\alpha = 0.05$).

²_ = no measurement taken.

Conclusion

Hardwoods, as well as pines, can be grown on eroded sites in the Brown Loam Bluffs along the Mississippi River. Although Shumard demonstrated greater diameter growth and cherrybark appeared to have better form, both are excellent choices. The construction of water-trapping structures during site preparation does not pay off in better growth.

Literature Cited

1. Applequist, M.B. Growth of planted cherrybark oak in southeastern Louisiana. For. Note 26. Baton Rouge, LA: Louisiana State Univ.; 1959. 2 p.
2. Broadfoot, Walter M. Hardwood suitability for and properties of important Midsouth soils. Res. Pap. SO-127, New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1976. 84 p.
3. Johnson, R.L. Adequate oak regeneration-A problem without a solution? In: Management and utilization of oak: Proceedings of 7th annual hardwood symposium of the Hardwood Research Council; 1979 May 1-4; Cashiers, NC. Asheville, NC: Hardwood Research Council; 1979: 59-65.
4. Krinard, R.M.; Kennedy, H.E., Jr.; Johnson, R.L. Volume weight, and pulp-ing properties of 5-year-old hardwoods. For. Prod. J. 29: 52-55; 1979.
5. Stubbs, Jack. Planting hardwoods on the Santee Experimental Forest. South. Lumberman 207: 135-136, 138; 1963.