SAWTOOTH OAK PLANTING TRIALS WITH SITE PREPARATION

JOHN J. STRANSKY, USDA Forest Service, Southern Forest Experiment Station, Wildlife Habitat and Silviculture Laboratory, Nacogdoches, TX 75962[1]

Abstract: Data are presented on the survival and growth response of planted 1-0 sawtooth oak seedlings to 4 site preparation treatments on loamy and sandy soils following clearcutting of the residual forest stands. The 4 site treatments were: (1) control, (2) burn, (3) chopping with a Marden chopper, and (4) KG blading followed by disking. In early April 1975, 12 sawtooth oaks were planted in each treatment plot. In October 1980, 6 growing seasons after planting, the average tree survival dropped from 76% in 1978 to 68% on the sandy soil, but remained at 84% on the loamy soil. Average tree height was 111 cm on the sandy soil and 156 cm on the loamy soil. There were no significant survival or height differences between site treatments. At age 7 years from seed, there was no indication of flowering or fruiting. Recurrent attacks by leaf miners and twig girdlers appeared to have lessened tree growth and the capability to produce acorns.

Proc. Ann. Conf. S.E. Assoc. Fish & Wildl. Agencies 35:197-200

Sawtooth oak (*Quercus acutissima*) has been praised as a promising mast producer for wildlife (Sullivan and Young 1961, Mercer 1969, USDA Soil Conservation Service 1970). The oak was reported to produce highly palatable acorns by age 7 and to be a consistent producer year after year. Thousands of acorns and seedlings have been given to landowners by various agencies that emphasized the oak's usefulness as a wildlife food plant. Most of the promising plantings were under nursery conditions or had cultivation and fertilizer supplements. Experience showed that plantings in the wild without cultivation survived poorly (Sullivan and Young, 1961, Hopkins and Huntley 1979). Coblentz (1981) questioned the advisability of sawtooth oak plantings because of its possible spreading, hybridization with other oaks, and its reluctant acceptance by wildlife.

The objectives of this study were to measure survival and growth responses of planted 1-0 sawtooth oaks using 4 site preparation methods on loamy and sandy soils following clearcutting of residual pine-hardwood stands.

International Paper Company provided land, manpower for establishment, pine and sawtooth oak seedlings, and financial aid for mechanical site treatments.

METHODS

Study Sites

Both planting sites are in east Texas, within the loblolly-shortleaf pine-hardwood forest type that covers nearly 28 million ha in the South, and reaches its westernmost extension in east Texas. Both sites supported mature pine-hardwood stands

[1] Maintained in cooperation with the School of Forestry, Stephen F. Austin State University.

before clearcutting in the fall of 1972. Topography is nearly level to gently sloping. Summers are hot and humid, and winters are mild. Mean annual rainfall is about 130 cm.

One site is on the Stephen F. Austin Experimental Forest near Nacogdoches, Texas. The area has not been cleared for agricultural use, and has not been grazed for the past 25 years. Soils belong to the Bernaldo-Elysian complex and the Sacul series, which are moderately well-drained fine sandy loams.

The other site is near Wells (Cherokee County) and is owned by International Paper Company. The area was cleared for cultivation around 1890 and was cultivated until about 1930. The abandoned land was invaded by pines. Soils belong mostly to the Fuquay and Kirvin series, which are mostly well-drained loamy sands.

Treatments and Design

Merchantable trees were cut and removed from the planting sites in the fall of 1972. Each of the following site preparation treatments was applied to triplicate 0.6 ha plots on each area in a randomized block design during August and September 1974:

Control — No site preparation, all woody stems greater than 2.5 cm in diameter at breast height (dbh) were cut.

Burn — All stems greater than 2.5 cm dbh were cut and burned along with the logging slash.

Chop — Logging slash and all stems were cut with a chopper and burned. The chopper resembles a huge lawn roller equipped with cutting blades parallel to the long axis of the cylinder. Pulled by a large tractor, the chopper cut non-merchantable trees and shrubs in small pieces and crushed the debris into the soil.

KG — All stems were cut with a KG blade, and the logging slash was raked off the plots and burned. The blade resembles a straight razor mounted at an angle on the front of a tractor. The blade sheared off all stems in its path, and pushed some litter and topsoil off the planting site. After having been KG bladed, the sites were cultivated with a heavy-duty disk.

The areas were handplanted with 1-0 loblolly pine (*Pinus taeda*) seedlings in January and February 1975.

Twelve 1-0 sawtooth oak seedlings were planted in each plot. The seedlings were handplanted about 3 m apart in single rows on 10 April 1975.

Measurements and Data Analyses

In August 1978 and in October 1980, 4 and 6 growing seasons after planting, the following data were recorded: (1) survival, (2) diameter at breast height, (3) number of stems per tree, (4) height of tallest stem, and (5) number of acorns. In addition, observations were made on insect, disease, and drought damage. Survival and height data were tested separately for each area by analysis of variance at the 0.05 level of significance.

RESULTS AND DISCUSSION

Survival

Average sawtooth oak survival was 84% in 1978 and remained so on the loamy soil, but dropped from 76% in 1978 to 68% in 1980 on the sandy soil (Table 1). These figures are similar to the 2nd-growing-season survival (80%) reported for cultivated sawtooth oak transplants in South Carolina (Schoenike 1971), and to the survival of uncultivated and unfertilized transplants (78%) in Mississippi (Hopkins and Huntley 1979). Generally, the presence of good soils and the lack of overhead suppression from trees and shrubs benefited transplants on the loamy soil. There were no significant survival differences between site treatments on either soil.

Table 1. Average survival (%) of sawtooth oaks 4 and 6 growing seasons after planting.

		Site treatments				
Soil	Year	Control	Burn	Chop	KG	Mean
Sandy-loam	1978	69[a]	94	89	86	84
	1980	69	94	89	83	84
Loamy-sand	1978	92	72	61	81	76
	1980	78	72	58	64	68

[a] n = 36 for all site treatment and soil combinations.

Height and Diameter Growth

Average height of the transplants in 1978 was 106 cm on the loamy soil and 80 cm on the sandy soil. By the end of the 1980 growing season average heights increased to 156 and 111 cm, respectively (Table 2). Trees grew taller on the loamy soils than on the sandy soils.

Table 2. Average height (cm) of sawtooth oaks 4 and 6 growing seasons after planting.

		Site treatments				
Soil	Year	Control	Burn	Chop	KG	Mean
Sandy-loam	1978	95	113	117	100	106
	1980	130	153	183	158	156
Loamy-sand	1978	93	98	72	59	80
	1980	120	138	106	82	111

Height differences between site treatments were not significant on either location, though on the sandy soil trees on KG plots were smaller than those on the other treatments. This might be due at least in part to the almost complete absence of beneficial shading on the KG plots of the sandy soil.

Only 42 out of the 219 live trees had a dbh of 1 cm or more; 25% of the trees on the loamy soil, and 11% on the sandy soil. Many trees have not yet reached the height (130 cm) where dbh is measured.

The leaders died back on several trees in previous years on the sandy, more drought-prone soil. Although the trees have resprouted, this drought damage resulted in height growth losses. Generally, most trees were bushy and had crooked stems. Only 3 trees had more than 1 stem.

None of the trees bore acorns. According to Sullivan and Young (1961), the trees bear fruit at an early age. However, at age 7 years from seed, there was no indication of flowering or fruiting.

Insect Damage

Regardless of soils, site treatment, or position in the surroundings, many plants were attacked by the locust leafminer (*Xenochalepus dorsalis*). These attacks, when recurring, could possibly have had an adverse effect on height development. The sawtooth oak's leaves could be more susceptible to leafminers than leaves of the native deciduous species because sawtooth oak still had succulent leaves when the others had already toughened.

Leaders of several tall trees were girdled by the twig girdler (*Oncideres cingulata cingulata*). Most of the girdled trees have resprouted from the base but growth losses have been considerable.

CONCLUSION

Survival of planted sawtooth oaks was good; at least the same or better than that reported by other researchers. However, height growth was generally slow. Both survival and height growth were better on the loamy soil than on the sandy soil. Neither survival nor height growth was significantly affected by the site preparation treatments on either soil.

There is as yet no indication of fruit setting, even on the most vigorous specimens. Recurrent attacks by leaf miners and especially by twig girdlers appear to lessen tree growth and the capability to produce acorns. It seems that relying on native oak mast is safer and less costly than gambling on the questionable mast potential of another exotic oak species.

LITERATURE CITED

Coblentz, B. E. 1981. Possible dangers of introducing sawtooth oak. Wildl. Soc. Bull. 9:136-138.

Hopkins, C. R., and J. C. Huntley. 1979. Establishment of sawtooth oak as a mast source for wildlife. Wildl. Soc. Bull. 7:253-258.

Mercer, J., Jr. 1969. Sawtooth oak holds promise as wildlife plant for Southeast. Soil Conserv. 34:178.

Schoenike, R. E. 1971. Sawtooth oak a promising exotic tree species for the Piedmont. For. Bull. No. 6. Dept. For., Clemson Univ., Clemson, S.C. 2pp.

Sullivan, E. G., and W. C. Young. 1961. An exotic oak, *Quercus acutissima*, for wildlife food planting. Proc. Ann. Conf. S.E. Assoc. Game and Fish Comm. 15:136-141.

USDA Soil Conservation Service. 1970. Acorns by the ton — sawtooth oak for wildlife and beauty. GA-BIOL-3(16). Fort Worth, Tex. 1p.