UNDERPLANTED NORTHERN RED OAK 17 YEARS AFTER THINNING AND UNDERSTORY CONTROL AND 8 YEARS FOLLOWING OVERSTORY REMOVAL

Ron Rathfon and Wayne Werne[1]

Abstract—Thinning-from-below and understory vegetation control treatments were applied to an oak-dominated stand in 1981 and 1982. Northern red oak seedlings (*Quercus rubra* L.) were planted in the understory to determine whether artificial regeneration was a viable option in ensuring that oak remain a prominent component of the succeeding stand. The overstory was removed in a harvest in 1991. Eight years following overstory removal, the thinning plus understory control treatment combination had many more underplanted red oaks in a competitive position than either treatment alone. The underplanted red oaks made up 40 percent of the total oak regeneration in the thinning plus understory control treatment.

METHODS

The study was established on a south-facing, 6 to 20 percent slope site in the unglaciated region of southern Indiana. White Oak Site Index was 70 feet. Oak (white, red, black and scarlet) comprised 75 percent of the sawtimber basal area of the original stand. In 1981, a small feller-buncher was used to thin-from-below (THIN) one-half of the area of each of four two-acre blocks creating one-acre harvest units. In September 1982, an understory vegetation control treatment (VEGCON) was applied to a one-half acre area within each THIN treatment plot by mist-blowing herbicides (Wright and others 1985).

Northern red oak seedlings were planted on a 9.5 foot by 9.5 foot grid for a total of 96 seedlings per VEGCON split plot, or 432 seedlings per acre. Various types of planting stock were tested for suitability in underplantings (Wright and others 1985).

The overstory was removed in a harvest in early 1991. Underplanted red oaks were remeasured in 1998. Natural regeneration was also assessed. A 1-inch dbh tree was considered to be the minimum size for viable, competitive growing stock in 1998.

RESULTS

The THIN treatment produced far fewer underplanted red oaks meeting minimum size requirements (greater or equal to 4.5 feet in height) at the time of overstory removal than recommended by Sanders and others (1976) to ensure red oak prominence in the final stand (Table 1). VEGCON produced over 2-1/2 times more underplanted red oaks per acre meeting the minimum size criteria than did THIN. While THIN+VEGCON had over 5-1/2 times the number of

Table 1—Survival, mean height, and stocking of underplanted red oak just prior to overstory removal and 8 years after overstory removal

	1990			1998				
						Viable trees[a]		
Treatment	Survival	Mean height	Viable trees	Survival	Mean height	1-in d.b.h. class	2-in d.b.h. class	Total stocking
	Percent	*Feet*	*Stems/ac*	*Percent*	*Feet*	--------- *Stems per acre* ---------		
Untreated	46.6	1.32	0.0	-	-	-	-	-
VEGCON	58.3	2.63	101.1	30.7	10.1	38.3	5.6	43.9
THIN	30.2	2.48	38.6	19.8	9.2	20.3	2.3	22.6
THIN+VEGCON	52.9	3.25	216.7	38.5	13.4	72.1	27.0	99.1

[a] Stems greater than or equal to 4.5 feet in height.

[1] Extension Forester and Forestry Research Assistant, respectively, Purdue University, Department of Forestry and Natural Resources, 11371 Purdue Farm Road, Dubois, IN 47527.

Citation for proceedings: Stringer, Jeffrey W.; Loftis, David L., eds. 1999. Proceedings, 12th central hardwood forest conference; 1999 February 28-March 1-2; Lexington, KY. Gen. Tech. Rep. SRS-24. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 293 p. [Oral presentation abstract].

criteria-meeting trees than did THIN, it still did not meet the minimum stocking required to result in an oak dominated stand (Sanders and others 1976). Eight years following overstory removal, 99.1 underplanted red oaks per acre remained in a competitive position (greater or equal to 1 inch dbh) in THIN+VEGCON (Table 1). THIN+VEGCON had almost 4-1/2 times more competitive underplanted red oak stems than that of THIN and over twice that of VEGCON.

Natural oak regeneration (red, black and white oak) was a significant component of the stand. It comprised 9.4 percent, 18.9 percent and 12.1 percent of the total 1-inch-dbh-and-greater stocking for VEGCON, THIN and THIN+VEGCON, respectively (Table 2). The combined natural and underplanted oak in THIN+VEGCON accounted for one-third of all stems over 2 inches dbh. Forty percent of the total oak stocking in THIN+VEGCON was from underplanted red oaks.

REFERENCES

Sanders, IL; Johnson, P.S.; Watt, R.F. 1976. A guide for evaluating the adequacy of oak advance reproduction. Gen. Tech. Rep. NC-23. U.S. Department of Agriculture, Forest Service. 7 p.

Wright, G.M.; Pope, P.E. ; Fischer, B.C. [and others]. 1985. Chemical weed control to establish natural and artificial regeneration in a mechanically thinned upland hardwood stand. Proceedings third biennial southern silvicultural conference; Atlanta. Gen. Tech. Rep. SO-54. New Orleans: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 266-272.

Table 2—Stocking by species, treatment, and d.b.h. class 8 years after overstory removal

	VEGCON		THIN		THIN+VEGCON	
	D.b.h. class		D.b.h. class		D.b.h. class	
Species	1 in.	2 in.	1 in.	2 in.	1 in.	2 in.
	Stems per acre					
Oaks[a]	144.4	28.9	182.9	38.5	166.9	83.5
Tulip-poplar	447.7	86.6	0.0	9.6	70.6	32.1
Black cherry	43.3	67.4	57.8	67.4	32.1	70.5
Ash	9.6	0.0	19.3	9.6	19.3	6.4
Hickory	9.6	0.0	173.3	9.6	70.6	0.0
Sugar maple	115.5	24.1	163.7	19.3	218.3	6.4
Misc.	370.7	28.9	260.0	28.9	423.7	51.3

[a] Natural regeneration plus underplanted red oak.