BURNING AND CHOPPING FOR WOODPECKERS AND WIREGRASS?

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To restore red-cockaded woodpecker habitat managers must reduce hardwoods while maintaining native ground cover. Fire, chemical, and mechanical methods are used alone or in combination to reduce oaks. Previous studies have reported selected single treatment effects (e.g., Outcalt and Lewis 1990, Robbins and Myers 1992, Glitzenstein et al. 1995, Provencher et al. 2001); however, no studies occurred in the range of northern wiregrass (*Aristida stricta*) and few evaluated treatment interactions (Brockway and Outcalt 2000). We conducted a study to determine the short-term effects of season of chopping and burning, and potential interaction, on turkey oak (*Quercus laevis*) and wiregrass.

STUDY AREA

The Carolina Sandhills National Wildlife Refuge (CSNWR) is located in Chesterfield County, South Carolina. Xeric to sub-mesic longleaf pine/wiregrass woodlands are the dominant natural communities (Peet and Allard 1993). In the absence of burning, dense turkey oak stands develop and wiregrass cover may decrease. From the 1960s through the mid-1980s CSNWR managers used primarily cool, dormant-season fires on 3-8-year rotations. Since then managers have burned more frequently and in the growing season (15 March 15 – 1 June). Through the 1990s low intensity drum-chopping (single drum, single pass) was used to reduce oaks, and followed by burning to prevent recovery. On some sites, lack of fine fuels resulted in oak re-establishment before the site could be burned, thereby necessitating repeated chopping.

METHODS

Three burn and 3 chop treatments were defined by season: dormant season (DS), growing season (GS), and not treated (that is, not burned [NB]; not chopped [NC]) (Table 1). Burn treatments were assigned randomly to large blocks available for burning in 1997, and chop

Table 1. Treatment and sampling dates for our research on the Carolina Sandhills National Wildlife Refuge, South Carolina. Prescribed burns were conducted on large burn blocks with spot ignition pattern, and chopping treatments consisted of a single pass with an unweighted drum chopper.

Action	Name		Date
Burning	Dormant Season	DS	14, 23 Jan; 5, 24 Feb 1997
	Growing Season	GS	14, 15 Apr 1997
	No Burn	NB	
Chopping	Dormant Season	DS	8, 16 Jan; 15 Feb 1997
	Growing Season	GS	26 Jun 1997
	No Chop	NC	
Sampling	Pre-treatment		Jan – Feb 1997
	Post-treatment 1		24 Oct – 10 Nov 1997
	Post-treatment 2		14 – 29 Dec 1998

treatments (single pass of an unweighted chopper) were randomly assigned to subplots within burn plots. Fire weather data were recorded for each burn (Table 2). Treatments were installed in pine saw timber or pine-scrub oak stands on Alpin soils. Pre-treatment densities of oaks >1 m tall ranged from 400 – 1500 stems/0.1 ha, and wiregrass basal area cover ranged from 1-3%.

We randomly located 4 50-m sampling transects within a 50-m x 50-m sampling area in the center of each treatment subplot. Visual estimates of the basal area of wiregrass clumps were made for each 1-m segment of a 1-m wide belt adjacent to each sampling transect. Data were recorded as percent cover. Mean transect cover was used as subplot basal area measure. Turkey oak stems >1 m tall were counted and tallied in 5-m segments along the 1-m x 50-m transect; transect totals were averaged to calculate mean stem density.

Data met the requirements for parametric statistical analyses. We used an analysis of variance model (ANOVA; model for randomized split-plot with repeated measures) to detect effects of treatment (BURN, CHOP), census (TIME) and interactions (SAS Institute Inc. 1989). We adjusted for pretreatment differences and analyzed adjusted values. Least square means were estimated and compared to determine significant differences among groups.

RESULTS

Analyses indicated significant ($P < 0.05$) effects of TIME ($F_{4,36} = 27.5$) and a BURN x TIME interaction ($F_{4,36} = 4.37$) on wiregrass. The pattern of wiregrass recovery differed among burn treatments: cover did not change through time in the NB treatment, while cover in DS-burned plots remained significantly less than pretreatment levels. In GS-burned plots, wiregrass was significantly reduced through the first season, but recovered to pretreatment levels. Although there was not a significant change in NB plots, wiregrass basal cover in chopped plots tended to be lower than in the no chop plots, with the DS-chop reducing cover more than GS-chop treatment.

Oak data analysis showed significant ($P < 0 .05$) effects of CHOP ($F_{2,12} = 23.49$), TIME ($F_{2,36} = 81.49$), BURN x TIME ($F_{4,36} = 2.66$), and CHOP x TIME ($F_{4,36} = 6.80$). At both post-treatment samples DS burn plots had fewer stems than GS or NB plots, which did not differ. At the end of the first growing season both DS and GS chopping reduced the number of stems present compared to NC plots, but by the end of the second season, DS chop plots were not different from NC plots. Late winter burns followed by June chopping most effectively reduced oak stems.

DISCUSSION

Low intensity chopping in dry sandy soils had no lasting effects on wiregrass basal area, consistent with previously reported minimal effects of light chopping on southern wiregrass (*Aristida beyrichiana*) (Outcalt and Lewis 1990). We caution that the effects of chopping are likely to vary with intensity; for example, increasing the number of passes or weight of the chopper are likely to have adverse impacts. Further, effects will vary with site conditions. We were surprised by the reduction in wiregrass following dormant-season burning in this

Table 2. Burn dates, maximum temperature (F°), minimum relative humidity (%), and maximum wind speed (mi/hr) recorded between 1230-1300 on burn day, and 10-hour fuel moisture (%) prior to ignition.

Date of Burn, 1997	Maximum Temperature Recorded between 1230 and 1300 (°F)	Minimum Relative Humidity between 1230 and 1300 (%)	Maximum Wind Speed (mi/hr)	Minimum Daily Temperature (°F)	1-Hr Fuel Moisture prior to Ignition (%)
14 Jan	47.1	29	3.3	20.7	6.6
23 Jan	68.7	52	2.9	44.8	16.0
5 Feb	68.2	67	5.4	45.9	11.1
24Feb	61.5	24	4.0	30.6	8.2
14 Apr	60.3	35	3.1	40.1	7.2
15 Apr	67.1	27	3.0	39.7	5.1
16 Apr	71.2	32	3.9	38.7	6.3

study. Extreme weather and burning conditions may have contributed to this result. December and November 1996 had below normal precipitation, perhaps stressing plants. Also, winter burns were conducted on very warm days (Table 2), a condition that may be associated with severe fire effects. Warm dry conditions persisted through March 1997, potentially exacerbating physiological stress.

The reduction in oaks following dormant-season burning was unexpected (Robbins and Myers 1992). Drought stressed trees and warm burning conditions may have contributed to the result; however, we have no explanation for the failure of growing-season burning to reduce oaks. The results suggest the need for a better understanding of the mechanisms for fire effects, requiring careful observations across sites and years and more information about fire behavior and plant physiological status. Chopping reduced oak density immediately; however, even in this xeric habitat, dormant-season chopped sites recovered to pretreatment levels within 2 growing seasons. The value of chopping may be to reduce oaks to sizes that can be killed with prescribed fire, and stimulating herbaceous species (fine fuels) production.

MANAGEMENT RECOMMENDATIONS

Low-intensity chopping may be used for immediate turkey oak control without reducing wiregrass cover. Note that oaks chopped in the dormant season are likely to sprout vigorously, and if wiregrass is missing from the system, the resulting dense oak coppice may be difficult to manage with prescribed fire.

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