



Effects of late growing-season and late dormant-season prescribed fire on herbaceous vegetation in restored pine-grassland communities

Jeffrey C. Sparks, Ronald E. Masters, David M. Engle, Michael W. Palmer, and George A. Bukenhofer, *Journal of Vegetation Science* 9: 133-142, 1998

In this study, the authors compare the effects of growing-season and dormant-season prescribed fires of different frequencies on herbaceous vegetation richness, diversity, and abundance in previously restored pine-grasslands in the Ouachita Mountains of western Arkansas. It is widely documented that fire played an important role in shaping the pine-grasslands of the southeastern United States. Fires ignited by Native Americans and lightning maintained open 'park-like' stands of trees, which allowed sufficient accumulations of herbaceous materials (light fuels). Fire suppression after European settlement led to dense forests which allow scant amounts of light to reach the forest floor. These conditions lead to a reduction in herbaceous plants, thus decreasing the understory forage and wildlife habitat quality.

Different burning regimes (seasonality and frequency treatments) were applied to 12 stands that had similar management histories and overstory compositions. This research was divided into two studies: Study 1 considered effects of dormant vs. growing-season fires; Study 2 looked at the effects of frequent vs. infrequent fire application. Growing-season fires occurred in the late growing-season (September and October) because poor burning conditions prevailed earlier in the season. Study sites were located in areas under active management (thinning and burning) for the endangered red-cockaded woodpecker (*Picoides borealis*) within

MANAGEMENT IMPLICATIONS

- Pine-grassland communities were historically exposed to both dormant and growing season fires
- Both seasons of burning resulted in an increase of species richness, diversity and abundance, as well as higher legume and forb densities
- Frequent fires resulted in increased species diversity, *Panicum* and legume densities, and stable species richness while no-fire treatment decreased species richness and diversity

Growing and dormant season fires in pine-grassland ecosystems were both present historically. Prescribed burns in growing and dormant seasons were shown to increase species richness, diversity, and abundance, as well as legume and forb densities.

the Pine-bluestem Ecosystem Renewal Area on the Poteau Ranger District of the Ouachita National Forest. Prior restoration management consisted of mechanically thinning stands to pre-settlement basal areas, and prescribed fire applied every 3 years during the dormant season. Study treatments included: no fire, late growing-season, late dormant-season, frequent dormant-season, and infrequent dormant-season fires. The frequent dormant-season burn treatment consisted of two successive years of dormant season fires. For all stands, shortleaf pine (*Pinus echinata*) was the dominant tree species, with various oak and hickory species in co-dominant and/or intermediate canopy positions.

Pre- and post-burn herbaceous vegetation data was collected in thirty



Photo by Jeff Sparks, Texas Parks and Wildlife Department

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1 m² plots per stand in the month of July. For each herbaceous species observed, percent frequency of occurrence and stem density were recorded. Percent cover for vascular plant groups was estimated. Herbaceous plants were classified by growth form (forb, legume, grass, and sedge) and season of growth (cool vs. warm). Species richness and diversity were calculated at the stand and sample (m²) scale. Percent change in herbaceous density and frequency was calculated by growth form and season of growth per treatment.

At the sample scale, both dormant and growing-season fires increased species richness and diversity. Seasonality had little effect on individual herbaceous species occurrence (< 10% of the 150 species identified) though it had significant effect if considered by major plant categories. *Panicum* (grasses with a well-developed head of flowers/seeds) density increased with dormant-season fires and decreased with growing-season fires. Grasses in general decreased in percent cover and density with growing-season fires. Legume density increased with both seasons of fire. Forb density and frequency increased with both seasons of fire. Warm season herbaceous species densities decreased in response to late growing-season fires. A larger increase in species richness was observed from fires conducted in the dormant-season compared to growing-season. Dormant-season fire resulted in more exposed rock and bare ground. The authors suggest that these differences are likely related to fire intensity being greater during the dormant season.

In general, *Panicum* frequency increased with frequent dormant-season fires. Legume density also



Photo by Jeff Sparks, Texas Parks and Wildlife Department

*The authors examined the effects of frequent vs. infrequent fires and found that frequent fire increased *Panicum* species, legume density, and stand level species diversity. Species richness remained stable with frequent fire. No fire decreased species diversity and richness.*

increased with frequent fire. For both season and fire frequency treatments, stand species richness remained stable, though decreased in no-burn stands. Both season treatments resulted in increased stand level species diversity and richness, while they decreased in no-burn stands.

The authors conclude by discussing the point that pine-grassland ecosystems developed under fire regimes which included both dormant and growing-season fires. Both seasons of fire spurred increases in herbaceous species diversity, richness, and total abundance of forbs and legumes, while decreases in richness and abundance were observed in the no-burn stands. Interestingly, the authors note that species richness decreased in the infrequent dormant-season fire treatment, indicating that the benefits to species richness by burning may be

short-lived. Additionally, the authors relate that no significant changes in species composition occurred in these previously treated stands. Adjacent stands with no history of prescribed fire have dense mid-stories, and much lower herbaceous species richness and abundance.

FOR FURTHER READING

[Burton, J.A., S.W. Hallgren, S.D. Fuhlendorf, and D.M. Leslie, Jr. 2011. Understory response to varying fire frequencies after 20 years of prescribed burning in an upland oak forest. *Plant Ecology*. 212: 1513-1525.](#)

