Long-term (9-year) response of two semiarid grasslands to prescribed fire in the southwestern USA

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Keywords: arid grasslands, fire, soil fertility, drought

Introduction Historically, arid grasslands of SW USA experienced fire return intervals of 5-10 years. During the last 100 years, however, fire has been a rare event. Recent expansion of woody plants in arid grasslands has prompted managers to re-introduce fire as a tool to reduce abundance of woody plants and maintain perennial grass cover. The use of fire in desert grasslands poses unique challenges, however, due to extreme variability in rainfall patterns. Our research examines vegetation response to repeat fire in 2 desert grassland ecotones near Albuquerque, New Mexico (35.05° N 106.60° W).

Materials and methods Pre- and post-fire vegetation cover and soil fertility data were taken annually on 3 permanent transects within each of 8 X 1-ha plots located at the Bernalillo and West Mesa watersheds. In Nov 1995 and again in Jan 1998, 4 plots at the Bernalillo site were burned, 4 plots at West Mesa were burned once in February 1996. A wildfire burned all West Mesa plots in July 2001. Potentially mineralisable nitrogen (PMN) of surface soils collected under shrubs and grasses was determined by the sum of soil inorganic N following moist incubation (White & Loftin, 2000). Plots were inventoried for *Juniperus monosperma* (whole plots) and *Opuntia* spp. (belt transects) in February 2002.

Results Compared with unburned plots, burned plots at Bernalillo had fewer numbers of juniper ($p<0.0005$) and *Opuntia imbricata* ($p<0.001$), and smaller size patches of *O. phaeacantha* ($p<0.01$). Surviving junipers on burned plots were larger ($p=0.0463$), indicating that fire killed smaller trees. Burning reduced cover of woody shrubs and subshrubs for 2-3 years after fire at both Bernalillo and West Mesa sites (Figure 1). Perennial grasses recovered within 2 years given above-average precipitation (1996-98), but required 5-6 years to recover during a period of drought (1999-2003). After the wildfire of 2001, perennial grass cover was higher on previously-burned plots ($p=0.0286$), indicating that subsequent fires may have less detrimental effects than the initial reintroduction. Cover of fire-susceptible grasses was also higher on previously-burned plots. Soil fertility (PMN) under grass on twice-burned plots at both locations was higher than under shrubs for a brief window of 1-2 years after the second fire (significant cover type x collection date interaction; $p\leq0.0245$).

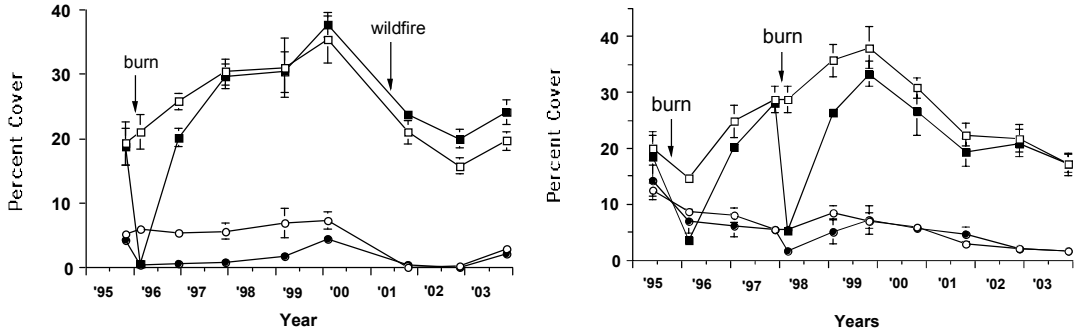

Figure 1 Perennial grass (□) and shrub (○) cover for West Mesa (left) and Bernalillo (right) sites. Filled symbols indicate prescribed burn treatment

Conclusions Fire successfully reduces woody plant and succulent cover and maintains healthy stands of native grasses. Recovery time depends on pre- and post-fire rainfall patterns that are very variable in desert grasslands. Repeat fire events may do less harm to grass regeneration than the initial fire reintroduction. This is especially important for fire-susceptible grasses such as *Bouteloua eriopoda*, a signature species of Chihuahuan desert. The well-documented pattern of greater soil fertility under shrubs may represent communities removed from the influence of fire. Repeat fire may increase soil fertility and stimulate below- and above-ground grass production.

References

White, C. S. & S. R. Loftin (2000). Response of 2 semiarid grasslands to cool-season prescribed fire. *Journal of Range Management*, 53, 52-61.