Effects of 10 years of fire and climate variability on perennial grass cover in shortgrass steppe

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Introduction The objective of this study is to examine the effects of 10 years of fire and climate variability on perennial grass cover in shortgrass steppe . The research is part of a long-term , 18-year study examining effects of fire in the growing *vs* . dormant season at return intervals of 3 , 6 and 9 years . In general , the response of grasslands to fire seems to depend primarily on pre-and post-fire levels of precipitation (Ford , 1999) . The southwestern United States has experienced drought 9 of the past 10 years , with an extreme drought occurring in 2002 .

Materials and methods The study site was located in semi-arid shortgrass steppe in the southern Great Plains of northeastern New Mexico , USA (36° 31′ 20″ N , 103° 3′ 30″ W) . The site has mostly native vegetation with *Buchloë dactyloides* and *Bouteloua gracilis* being the dominant plant cover . The majority of precipitation occurs from May through September , with peak rainfall in July . Thirty-year mean annual precipitation (MAP) for the site was 356 mm . Total precipitation was slightly below average in 1996 , the year prior to fire treatments , as well as for 1997 , the first year fire was applied . Total precipitation in 1998 was 50 percent below MAP and drought conditions also existed in 2003 , and was again below average in 2006 (Figure 1) . The experimental design was completely randomized , with 7 treatments replicated 5 times on 2-ha plots/treatment . The treatments discussed here are (1) **D** , dormant-season fire applied April 1997 and (2) **U** , unburned . Live perennial grass cover was measured annually from 1996-2006 .

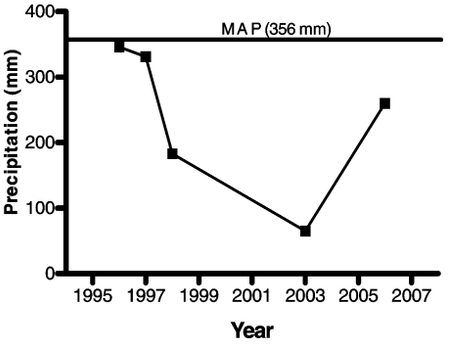

Figure 1 *Total annual precipitation .*

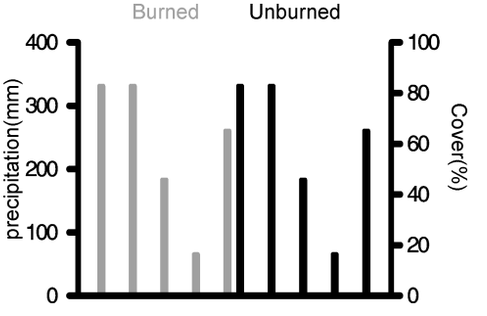

Figure 2 *Perennial grass cover .*

Results D and U perennial grass cover (percent) and total annual precipitation (mm) were plotted over 5 sample periods (pre-treatment 1997 , and post-treatment 1997 , 1998 , 2003 , 2006) . There appeared to be a direct positive relationship between perennial grass cover and precipitation , and precipitation appeared to override fire effects (Figure 2) .

Conclusions Though the MAP for the site was 356 mm , most actual total annual precipitation for the site over the 10-year period was generally lower than MAP , and in some cases as much as 50 percent lower . For management purposes , the frequency and severity of drought are more important than long-term average climate conditions . Too often , land managers plan for average climate conditions , rather than the climatic extremes that can be expected (Potter and Ford , 2004) . Since this and other studies have indicated weather patterns can supersede fire effects in shortgrass steppe (Ford and Johnson , 2006) , the use of fire as a management tool in a drought year should be carefully considered and aligned with management goals (Ford *et al* . , 2004) .

References

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