To burn or not to burn: balancing societal risk perceptions and ecological needs of fire adapted systems

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INTRODUCTION

Historically, the episodic occurrence of wild fires was a key driver for maintaining many open grassland and savannas systems (fig. 1). Lack of fire in systems that have typically evolved with fire has contributed to brush encroachment and ecological degradation of many areas (fig.2).

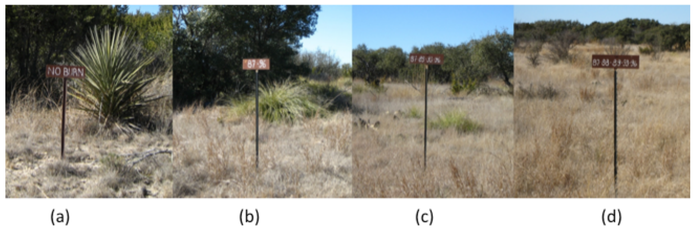

Figure 1. A visual comparison of adjacent experimental burn plots on the Texas AgriLife Research Station at Sonora, Texas. From left to right (a) has not been burned, (b) has been burned twice since 1987, (c) has been burned four times since 1987, and (d) has been burned five times since 1987 .

Information on the socio-ecological effects of prescribed fire application exists but there is no integrative framework that simultaneously considers the interplay between social and ecological factors affecting the use of prescribed fires. To address this deficiency, this study focuses on identifying specific socio-ecological factors affecting these systems (fig. 3) and, by extension, the effects of these factors on the function, conservation and restoration of ecosystems.

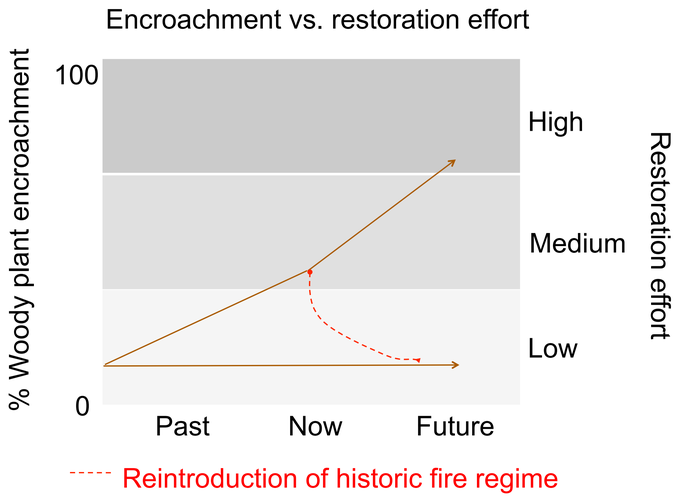

Figure 2. Effects of reintroducing historic fire regimes and implications for restoration on grassland and savanna systems.

METHODS

A landowner survey was conducted in three eco-regions of Texas to determine attitudes and perceptions of landowners towards the use of low and high intensity fire as a rangeland management and restoration tool. Our study included the Rolling Plains, Edwards Plateau and South Texas Plains. The sample contained members and non-members of prescribed burn associations (PBAs). PBAs consist of voluntary groups of individuals who work together to promote the safe and effective use of prescribed fire.

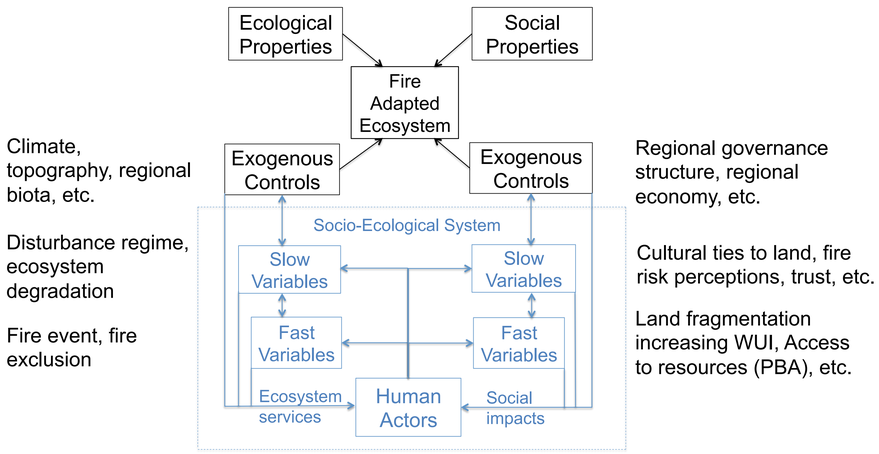

Figure 3. Fire adapted socio-ecological systems are affected by ecological and social properties. Modified from Chapin et al. 2009.

Data from the survey were analyzed descriptively and using structural equation modeling (SEM). These data together with ecological data from the literature are being used to create simulation models that will provide a tool to test different brush management scenarios.

RESULTS

Prescribed fire is generally an accepted brush management tool, especially among PBA members. A majority of survey respondents (71%) indicated that they would be willing to apply high intensity prescribed fire if it benefited their land, although they were more cautious about this than the use of milder fires based, in part, on risk (fig.4).

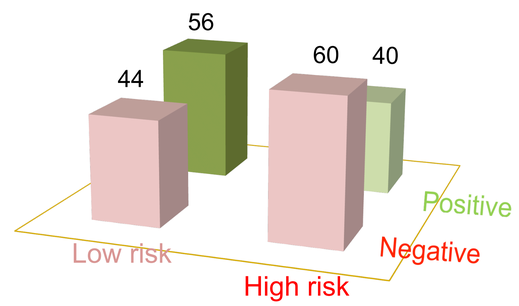

Figure 4. Attitude toward prescribed fire considering risk level

SEM results show that risk taking orientations and perceived support from others are important factors to consider regarding landowner attitudes towards high intensity prescribed burns (fig. 5).

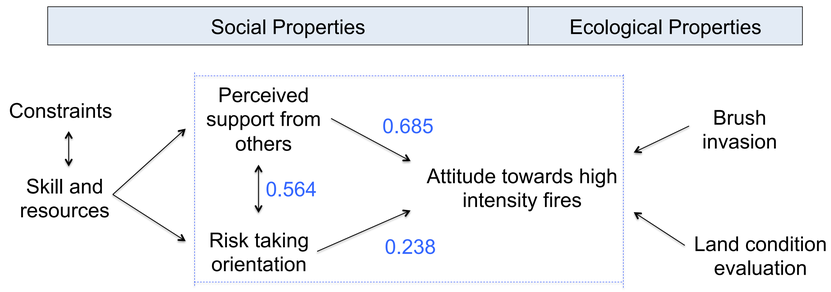

Figure 5. SEM highlighting the effects of risk taking orientation and perceived support from others on attitude towards high intensity prescribed fires. Standardized coefficients are all statistically significant at $P < 0.001$.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

This study suggest that the primary obstacles to the application of fire by land managers appear to be their perceptions that deliberately igniting fire is risky and because their actions might not be supported by others. If woody plant invaded rangelands that are generally characterized by private landownership are to be restored to open grasslands and savannas, the broad-scale reintroduction of periodic fires is necessary. To accomplish this objective, promoting the establishment and support of PBAs appears to be a critical approach to increasing landowner willingness and ability to apply prescribed fires. PBAs help reduce physical risks by enhancing training, access to shared fire management equipment, and labor on burn days. Most importantly, by building and strengthening landowner networks, trust and reciprocation, PBAs can change attitudes towards prescribed burning at a landscape scale and enhance the social acceptability of prescribed burning as a management practice.

REFERENCES

Chapin, S. F. III, G. P. Kofinas, and C. Folke. 2009. Principles of ecosystem stewardship: resilience-based natural resource management in a changing world. Springer Verlag, New York, NY.

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