

Wilcox, BP, A Birt, S Fuhlendorf, SR Archer. 2018. Emerging frameworks for understanding and mitigating woody plant encroachment in grassy biomes. *Current Opinion in Environmental Sustainability* (In Press).

Grasslands and open savannas are transitioning to shrub- or tree-dominated landscapes. This phenomenon, often referred to as woody plant encroachment, is occurring globally. The outcomes of interactions among the various drivers of this change differ biogeographically; in semi-arid and subhumid regions they are often related to grazing- induced changes in fire regimes. Two important theoretical and conceptual frameworks are emerging that help us understand the underlying mechanisms of these transformations and inform approaches for maintaining and restoring grasslands and open savannas: alternative stable state theory (ASST) and pyric herbivory. Alternative stable state theory is a way of explaining, understanding, and predicting ecosystem state transitions in dual-life-form systems, and pyric herbivory is built on the notion that reciprocal, spatially distributed interactions between grazing and fire are a key to maintaining grassland and open savanna landscapes. Considered in tandem, ASST provides insights into rates and dynamics of grass–woody vegetation transitions, with pyric herbivory providing a conceptual basis for designing sustainable, site-specific management strategies. Future progress will hinge on experimental evaluations of these linked frameworks and their subsequent refinement over longer time frames in an adaptive management context.