



Research Brief for Resource Managers

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Response of tallgrass prairie to fire frequency

Marlin L. Bowles and Michael D. Jones. 2013. Repeated burning of eastern tallgrass prairie increases richness and diversity, stabilizing successional vegetation. Ecological Applications 23:464-478.

The response of tallgrass prairie plant communities to fire may not be uniform across the extensive east to west range of the ecosystem. This study was focused on eastern tallgrass prairie sites and examines how fire frequency influences the plant community.

To investigate how fire frequency affects eastern tallgrass prairie, sites surveyed in 1976 were revisited in 2001 (25 years later). Sites ranged from those rarely (or never) burned to some which had been burned almost annually. Half of the 34 sites were categorized as mid-successional in 1976, and the other half late-successional. The successional stages were identified by relative abundance of plant species known to increase or decrease in response to moderate disturbance. Management records indicated that prescribed fires were conducted in either the spring or fall and sites were not grazed between 1976 and 2001.

Fire frequency in the 25 years between sampling events did influence prairie plant communities. In general, sites managed with frequent fire had greater plant diversity. Summer forbs and C₃ (cool season) grasses increased in species richness at sites with high fire frequencies. Spring forbs, C₄ (warm season) grasses, and nitrogen fixing species decreased in richness when fire was infrequent, while the abundance of woody species increased when fire was infrequent or absent. Fire

Management Implications

- Frequent fire maintains species richness in eastern tallgrass prairies
- Isolation of prairie ecosystems may reduce flow of late successional plant species
- Effects of grazing found in western tallgrass prairie ecosystems may not be expected for eastern tallgrass prairie sites

frequency did not have an influence on species evenness at these sites.

Frequent fire, that is fire every 2-3 years, appears to have a stabilizing effect on plant communities by holding woody and invasive species in check. Mid-successional communities responded similarly, but the authors point out that isolated sites may require introduction of late-successional species. Additionally, this study reports that herbaceous cover increases across an increasing soil moisture gradient.

In this study, frequent fire was associated with **increased diversity in the absence of grazing, which has not been observed in western tallgrass prairie.** Implementing high frequency prescribed burning may also maintain the richness of C₄ grasses, nitrogen fixing species, and spring forbs. The authors suggest that eastern tallgrass prairie sites require frequent fire (>50% of years/2 year return interval), in either the spring or fall, to maintain richness and stabilize late-successional communities.