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Research Note

Fire History of a Relict Oak Woodland in Northeast Texas

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Abstract

Empirical data generated from fire scars are a foundation for understanding fire regimes, designing land-management objectives, and addressing long-term land-use and climate-change effects. We derived precise dates of historic fires from fire-scar injuries occurring on trees growing in a relict post oak woodland in northeastern Texas. The fire-event chronology shows the last three centuries were marked with human influence, with an overall trend of decreasing fire occurrence through time. Thirty different fire events occurred between 1690 and 2007, of which 26 occurred prior to 1856. All fires occurred while trees were dormant. From 1690 to 1820, the mean fire interval was 6.7 yr. A 50-yr period without fire occurred in the latter 19th century (1855–1905) and coincided with the establishment of an oak cohort. A second extended period (80 yr) without fire characterized most of the 20th century. We hypothesize that the absence of fire during much of the last century has resulted in increased tree density and canopy closure, the establishment of fire-intolerant vines, shrubs, and trees, and likely the decline of fire-dependent plant species. Information describing long-term changes of fire regimes in oak woodlands in this region could aid in determining fire-management objectives with respect to prescribed fire implementation and community restoration.

Resumen

Los datos empíricos procedentes de cicatrices de fuego son la base para la comprensión de los regímenes de fuego y para diseñar objetivos del manejo de la tierra. De la misma manera, sirven para diseñar el uso a largo plazo de la tierra y los efectos del cambio climático. Fechas específicas de incendios forestales se obtuvieron a partir de cicatrices de fuego en una arboleda de robles remanente en el noroeste de Texas. La cronología de incendios demuestra la influencia humana en la tendencia a disminuir estos eventos en los últimos tres siglos. Treinta incendios forestales diferentes ocurrieron entre 1690 y 2007 de los cuales veintiséis se dieron antes de 1856. Todos los incendios ocurrieron mientras los árboles estaban en estado latente. El intervalo de incendios entre 1690 y 1820 fue de 6.7 años. Se detectó un periodo de 50 años sin incendios forestales entre 1855 y 1905 que coincide con el establecimiento de una cohorte de robles. Un segundo periodo (80 años) sin fuegos caracterizó la mayor parte del siglo 20. Planteamos la hipótesis que la ausencia de incendios durante el último siglo ha causado un incremento en la densidad de árboles y un cerramiento de sus copas, así como el establecimiento de especies de lianas, arbustos y árboles que no toleran al fuego con una disminución en especies dependientes de la incidencia de incendios forestales. Información que describa los efectos a largo plazo en cambios de los regímenes de incendios en arboledas de roble en la región puede ayudar a determinar los objetivos de manejo de incendios con relación a la implementación de fuegos prescritos y restauración de la comunidad.

Key Words: Caddo, dendrochronology, fire frequency, fire regime, fire scars, fire suppression

INTRODUCTION

Dendrochronological (tree-ring)-based records of fire occurrence are widely used for characterizing historic fire regimes throughout the world. Their precision and accuracy make them well suited for applications combining other high-precision data such as vegetation, climate, or historical records. In Texas, historic fire regimes have gone largely unquantified and are currently limited to conifer forests in mountainous regions located on the western border of the state (> 700 km from our study site; Moir 1982; Sakulich and Taylor 2007; Poulos et al. 2009). In the southern Great Plains only a few fire scar records

are available (Clark et al. 2007; Stambaugh et al. 2009; DeSantis 2010) and all describe a somewhat frequent fire regime (5–7 yr) occurring in oak–grassland ecosystems prior to Euro-American settlement. The value of these records pertains not just to describing fire regimes, but also toward understanding long-term vegetation change, drought–fire interactions, and the historical context for wildland and prescribed fire use in present-day natural resource management. The objective of this study was to reconstruct the long-term changes in fire occurrence from fire-scar injuries on trees at a relict oak woodland located in northeastern Texas.

METHODS

Study Site

The study site was located at Purts Creek State Park (lat 32°21'N, long 96°00'W) in Henderson and Van Zandt

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