Tallgrass Prairie and Oak Savanna Fire Science Consortium

JOINT FIRE SCIENCE PROGRAM

## *Research Brief for Resource Managers*

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# Differences between upland and lowland savannas may indicate need for different restoration strategies

*Dettman, Connie L., Catherine M. Mabry, and Lisa A Schulte. 2009. Restoration of Midwestern U.S. savannas: One size does not fit all. Restoration Ecology 17(6):772-783.*

Savannas (often referred to as oak savannas) in the upper Midwest are rare on the modern landscape and there is an effort to conserve existing sites and restore former savannas. Historically, savannas likely occurred across the landscape on both upland and lowland sites, which may have had different disturbance regimes, soil types, and community compositions. Additionally, human disturbances would differ between the upland and lowland sites. Upland savanna sites were commonly logged and converted to croplands. Savannas in low lying areas, which would have flooded, were more likely to be grazed.

The authors of this study wondered if upland savannas are a good reference surrogate for lowland savannas or if there are key differences in how these sites respond to restoration techniques. The authors point out that there is little information about the differences in historical disturbance regime between upland and lowland sites, or the interactions between flooding and fire in lowland savannas. There is more information about upland savannas, and often lowland savanna sites are managed the same way upland savanna sites would be and there is a need to evaluate if the uplands are a good reference for lowlands and if upland management guidelines apply. One restoration practice of interest was the reintroduction of frequent fire to eliminate shrubs and open the canopy and how fire and flooding in lowland sites may interact.

## Management Implications

- The use of upland savanna restoration strategies in lowland savanna sites may result in loss of unique lowland characteristics
- Multiple historical sources (e.g., maps, surveyor descriptions, tree density) provide a more comprehensive view of past conditions
- Use of historical data as a reference should be evaluated with future climate conditions in mind

The authors hypothesized that 1) savannas historically occurred on lowlands as well as upland sites, 2) lowland savannas were dominated by oaks, 3) both upland and lowland savannas had large widely scattered trees and a sparse understory, and 4) that flooding was the primary disturbance that maintained lowland savannas.

To test these hypotheses, the authors used public land survey records to create a map which represented the vegetation at the time of the surveys (1836-1838). They also used soil and

elevation data to determine flooding frequency. The region mapped was 18 townships in southeast Iowa within the Lower Cedar River Valley. Using the combination of public land survey descriptions and witness tree data to map vegetation helped the team to distinguish between 'forests' as any site with trees and those that were more likely to have been savannas with low tree density.

The authors found support for the hypotheses that savannas occurred in lowlands and were dominated by oak species. From the detailed notes of surveyors, the authors found support that upland and lowland savannas had similar structure. And surprisingly, the species composition between these two communities was very similar. The data also showed that there were mixed size classes and a robust shrub layer, not just widely spaced trees.

There was limited evidence that flooding was the primary disturbance in lowlands, but the uneven age structure indicated in historical accounts suggests periodic disturbances shaped these sites. The authors also point out that without information on fire frequency they were unable to determine what the role of fire, or potential interactions between fire and flooding, may have been.

The authors also caution that use of historical records as a reference may not be realistic, and that the vision of all savannas as widely spaced trees with a sparse understory is too simplistic. Changes in climate in the future could shift the distribution of ecosystems, limiting the use of historical maps to determine where lowland savannas can be restored.

This study points out some of the complexities of restoring a mosaic landscape after it has been severely altered. The lack of reference conditions and research into lowland savannas has led restoration efforts to make use of practices for upland sites. However, applying restoration methods for upland savannas to these lowland sites may lead to the loss of species unique to lowland savanna sites and conditions. While there is value in using historical records to gain insight into what the landscape was like, these cannot substitute quality reference conditions.