North Central
Climate Adaptation Science Center

Informing adaptive grassland management in the North Central region where winds are strong, the grazers are good-looking, and the temperature… is above average.

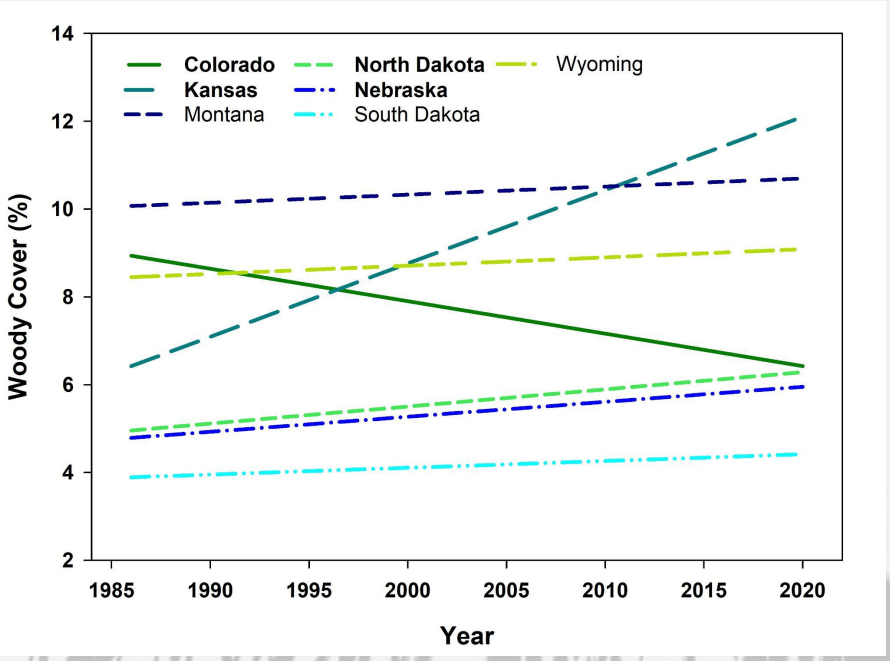
Prairie Climate Companion: Woody Encroachment

The Issue

Interacting effects of climate change, land-use change, and altered disturbance regimes (e.g., wildfire suppression) have facilitated an **increase in woody plants** in historically grass-dominated areas. This change is referred to as ***woody encroachment***, and it is a global phenomenon in nearly all grassland ecosystems.

Increased woody cover has led to a **direct loss of grasslands** and their ecosystem services – in particular, quality forage for livestock grazing – by reducing herbaceous cover, productivity, and species richness. It also decreases habitat for grassland birds, and it threatens public safety by increasing fire intensity.

Climate and disturbance drivers - including aridification, carbon dioxide fertilization, and changing fire regimes - are the **major pathways** by which woody encroachment threatens grasslands at both the wet and dry edges of the region.



Trends in woody (shrub and tree) cover in the North Central States from 1986 to 2020.

Lines are regressions, with the four states in **bold** significant at the 0.05 level.

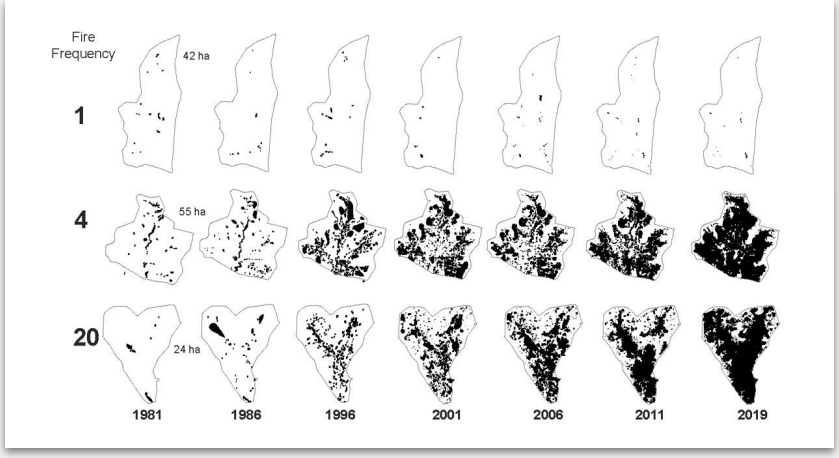
Data from the Rangeland Analysis Platform (https://rangelands.app; accessed February 24, 2022; Allred and others, 2021).

Figure created by Amy Symstad (USGS) for a forthcoming USGS Scientific Investigations Report, *Synthesis of Climate and Ecological Science to Support Grassland Management Priorities in the North Central Region*.

Implications for Grasslands Management

In much of the North Central region, potential woody cover **increases with increasing moisture availability**, but actual woody cover is **determined by disturbance**. For example, browsing and fire suppress the spread of woody species by killing or injuring tree saplings and small shrubs.

For the tallgrass prairie, **fire-free periods not exceeding 3 years** prevent woody encroachment. If fire frequency decreases and encroachment does occur, re-establishing the historical fire frequency is insufficient to remove woody species, further restrict encroachment, and maintain typical grassland processes. In short, once encroachment occurs, re-introducing frequent fire is **not sufficient** to reverse grassland-to-shrubland transitions.



Three watershed units at Konza Prairie with varying fire frequency (every year, every 4 years, every 20 years). Black shading shows increase in woody shrubs over time. Data at: http://doi.org/10.6073/pasta/27f25b28faeb185a0129c4629a87e9af

The most sustainable and efficient management strategy for woody encroachment is to **minimize the initial spread of woody species** into grasslands by using prescribed burns to kill seeds and seedlings.

Selected Resources

Rangeland Analysis Platform quickly visualizes and analyzes vegetation data for the United States. Managers can see abundance and distribution of shrubs and trees.

Great Plains Fire Science Exchange Prescribed Burn Associations Interactive Map allows managers to identify prescribed burn associations in their region and navigate to the associations' websites for more information.

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Check out the synthesis report here!

Miller Hesed, C. D., Yocum, H., Symstad, A., Nippert, J., Rangwala, I., & Peña, U. (2023). Prairie Climate Companion: Woody Encroachment. North Central Climate Adaptation Science Center, Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO.

Supported by Cooperative Agreement No. G20AC00075 from the United States Geological Survey. Contents do not necessarily represent the views of USGS.

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