



Great Plains Grassland Extension Project: Tackling big conservation challenges through collaboration and cooperation

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Abstract

Grassland biomes are often extensive, and challenges such as invasive species can span multiple jurisdictions and ownerships. How can conservation efforts be scaled up to make a meaningful difference on such a large landscape? When an entire biome is in distress, what can be done to address the conservation need? Woody encroachment is threatening the North American Great Plains ecosystem, replacing old-growth rangelands with a mix of undesirable brush and trees causing a loss of ecosystem services including habitat loss, soil hydrologic alterations, and drastic reductions in grazing capacity. Conservation efforts in the past have been fragmented between agencies and individual landowners without making impact at the needed scale and have failed to halt rangeland losses. New mapping tools allow more precise location of problem areas, and recent research provides a new approach to tackle the problem.

The Great Plains Grassland Extension Partnership offers an example of how conservation efforts can expand across a biome. Range management specialists within each state's Cooperative Extension System have united to coordinate outreach efforts to ranchers, share new management techniques, report success and challenges, and assist and coordinate other conservation agencies such as the Natural Resource Conservation Service and state wildlife agencies. A single message incorporating the urgent need and a new approach to tackling the woody encroachment problem at greater than the individual property size has provided hope for reversing the degradation of North American rangelands. The partnership allows each state to engage with local partners who can forward the same conservation message. Working together, there is hope for melting the "green glacier" of advancing woody encroachment covering the Great Plains (Engle et al. 2008).

Imperiled Biome

Grasslands cover up to 41% of the world's land area (Petermann and Buzhdygan, 2021) and support goods, services, and cultural values that contribute to human well-being. Grasslands also provide food and fiber production and ecological and biological services including freshwater supply, biodiversity, cultural diversity, belowground carbon storage, and the regulation of natural hazards (Havstad et al., 2007).-Nearly half of global grasslands have been converted to other land cover types and remaining grasslands remain vulnerable to future loss.

The Great Plains of North America is among the largest temperate grasslands in the world. Woody plant encroachment is driving a biome-scale transition from grassland to woody dominance (Figure 1) (Briggs et al. 2005; Engle et al. 2008; Twidwell et al. 2022; Morford et al. 2022). Causes include a lack of prescribed fire (Twidwell et al. 2013), introduction of seed sources (Johnson 1923), small scale approaches to control (Fogarty et al. 2022), and a carbon-enriched atmosphere (Blair et al 2014). Woody encroachment includes both brush and tree species. Junipers, especially eastern redcedar (*Juniperus virginiana*), while native, have been continually planted where they were historically scarce (Ganguli et al., 2008; and have rapidly spread.

Woody encroachment in the Great Plains can lead to a potential 75% reduction in rangeland production and escalating costs of brush management that can easily exceed annual revenues generated from rangelands (Fuhlendorf et al. 2008; Natural Resources Conservation Service 2021). These losses are resulting in a decline in ecosystem function and services that benefit communities in the Great Plains and throughout North America (Twidwell et al. 2013).

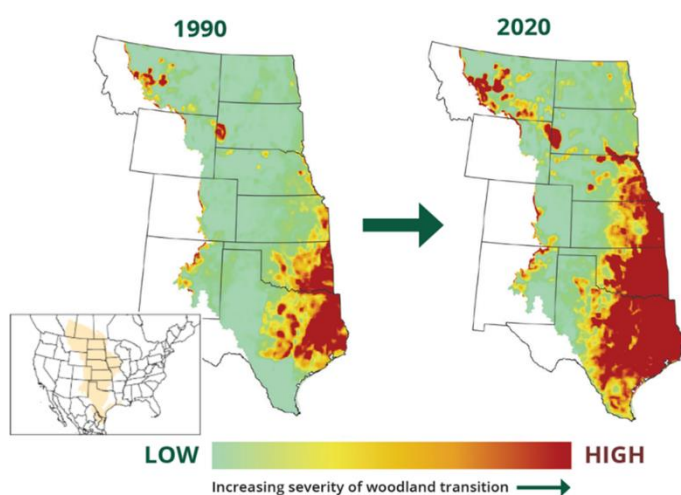


Figure 1. Woody plant encroachment is driving a large-scale transition from grassland (in green) to woody dominance (in red) in Great Plains grasslands from 1990-2020. Adapted from Fogarty et al. (2023).

Past efforts to control and reduce woody encroachment in the Great Plains have relied heavily on brush management and have been unable to halt the loss of grasslands at large scales (Archer et al. 2011; Rheinhardt et al. 2021). Several challenges have contributed to this outcome: 1) brush management is a reactive conservation practice that consists of woody plant removal in areas that have already experienced losses due to woody encroachment. An over reliance on this expensive practice has limited opportunities for more cost-effective and proactive approaches (Twidwell et al. 2021). 2) Follow-up management to address the rapid reinvasion of woody plants after mechanical removal is often lacking and results in short-lived management treatments (Fogarty et al., 2021; Scholtz et al. 2021). And 3) management treatments are often scattered across the

landscape and lack spatial arrangement needed to benefit the broader landscape (Twidwell et al. 2021). There is a need for a more proactive and spatially targeted approach for reducing woody encroachment that addresses the underlying risks that drive woody encroachment (Twidwell et al. 2021).

New approaches for reducing woody encroachment

New approaches for reducing woody encroachment were designed to overcome key weaknesses of past approaches and better allow practitioners to scale up management over time (Twidwell et al. 2021). Management guidelines were built around a framework for reducing the risk of encroachment in grasslands. Management guidelines were then designed to 1) prevent risk from increasing in intact grasslands and 2) reduce the risk of encroachment by minimizing grassland exposure and/or sensitivity (Fogarty et al. 2023). For instance, prescribed fire can be used to manage the dispersal and recruitment stage of woody encroachment and prevent the loss of intact grasslands (Figure 2). In addition, restoration actions can be used to remove seed-producing woody plants, deplete the seedbank, and expand the extent of intact grasslands over time.

The workshop brought together scientists, extension specialists, and conservation practitioners from across the Great Plains region to improve the planning, design, and delivery of conservation investments. Ultimately, the workshop led to the development of an 85-page pocket guide (Fogarty et al. 2023) that serves as a resource for training the rangeland workforce on how to recognize and reduce grassland vulnerability to woody plant encroachment across a range of landscape contexts. With nearly 25,000 copies distributed in the first year of

publication, the pocket guide has supported local field trainings across Great Plains states as part of efforts to scale up the implementation of new management guidelines (Figure 3).

The Great Plains Grasslands Extension Partnership offers an example of how regional partnerships in extension and outreach can be created to address large-scale threats. Next steps include the formalization of training and professional development opportunities through extension- and agency-sponsored education programs. The Extension Partnership has supported an unprecedented level of collaboration among scientists, extension specialists, and practitioners to address the biome threat of woody encroachment.

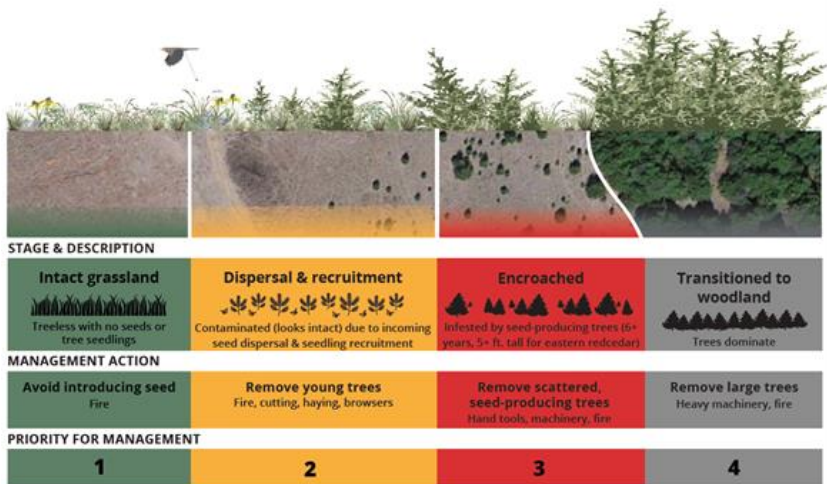


Figure 2. New management guidelines prioritize proactive management to prevent encroachment of intact grasslands and expand them over time through targeted management of encroached rangelands (Twidwell et al. 2021).



Figure 3. The Great Plains Grasslands Extension Partnership has supported a regional extension and outreach campaign to speed up the adoption of new management guidelines for reducing woody encroachment.

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