

Rangeland Production Lost to Woody Encroachment

Kansas Flint Hills

The Kansas Flint Hills is the last intact tallgrass prairie region in North America. Approximately 2.3 million acres of the Flint Hills is burned each year. These burns limit woody plant establishment and maintain open horizons of productive grassland. Compared to fire return intervals prior to European settlement, the Flint Hills is the only region in the Great Plains where the area burned has not decreased. Approximately one third of the region burns each year, compared to one-half to one-sixth of the region prior to European settlement.

Despite continued fire management in the Flint Hills, the region is currently experiencing unprecedented pressure from woody plant encroachment. Problematic and invasive woody plants have increased in and around the Flint Hills, thereby increasing the region's exposure to seed contamination and risk of grassland conversion. Grassland conversion to woody plant dominance is associated with severe consequences to the goods and services provided by grasslands. Rangeland production losses to woody plant encroachment is one of the most well studied impacts of encroachment. Left unchecked, woody encroachment can decrease rangeland production by 75%.

CONSEQUENCES OF WOODY PLANT ENCROACHMENT

- *Land is taken out of agricultural production*
- *Livestock production decreases up to 75%*
- *Reduced water supply*
- *Increased wildfire risk*
- *Collapses in grassland biodiversity*
- *Increased risk of species becoming threatened and endangered*

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In 2019, every county in the Flint Hills was on a trajectory of decreasing rangeland production due to woody plant encroachment. Production losses are expected to continue to increase in every county without changes in management that address underlying risks of encroachment.

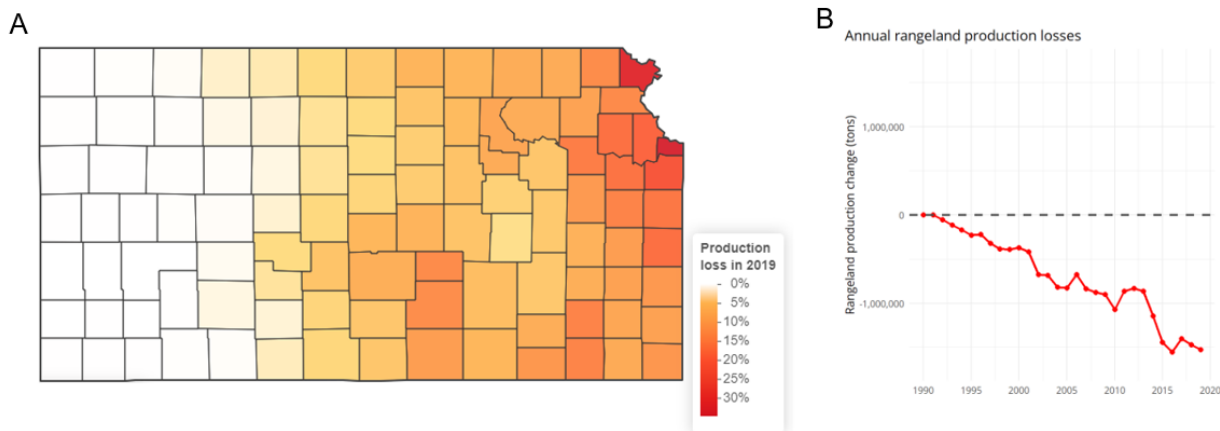


Figure 1. (A) Production loss in 2019 relative to what would have been achievable had woody plants not increased since 1990. B) Annual rangeland production losses in Kansas.

Table 1. Range production losses to woody plant encroachment in the Kansas Flint Hills.

County	Losses to woody encroachment in 2019 (tons)*	County level encroachment information
Butler	47,715	Production losses have been increasing since 1997 and are expected to continue increasing without management changes to stop encroachment.
Chase	7,973	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Chautauqua	68,703	Production losses have been increasing since 1992 and are expected to continue increasing without management changes to stop encroachment.
Clay	10,336	Production losses have been increasing since 1997 and are expected to continue increasing without management changes to stop encroachment.
Cowley	45,096	Production losses have been increasing since 1992 and are expected to continue increasing without management changes to stop encroachment.
Dickinson	11,554	Production losses have been increasing since 1996 and are expected to continue increasing without management changes to stop encroachment.
Elk	43,425	Production losses have been increasing since 1993 and are expected to continue increasing without management changes to stop encroachment.
Geary	19,671	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Greenwood	36,076	Production losses have been increasing since 1993 and are expected to continue increasing without management changes to stop encroachment.
Jackson	34,303	Production losses have been increasing since 1992 and are expected to continue increasing without management changes to stop encroachment.
Lyon	18,459	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Marion	15,478	Production losses have been increasing since 1995 and are expected to continue increasing without management changes to stop encroachment.
Marshall	18,733	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Morris	11,407	Production losses have been increasing since 1996 and are expected to continue increasing without management changes to stop encroachment.
Ottawa	9,514	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Pottawatomie	39,990	Production losses have been increasing since 1993 and are expected to continue increasing without management changes to stop encroachment.
Riley	31,494	Production losses have been increasing since 1993 and are expected to continue increasing without management changes to stop encroachment.
Saline	9,993	Production losses have been increasing since 2000 and are expected to continue increasing without management changes to stop encroachment.
Shawnee	37,416	Production losses have been increasing since 1991 and are expected to continue increasing without management changes to stop encroachment.
Wabaunsee	20,732	Production losses have been increasing since 1992 and are expected to continue increasing without management changes to stop encroachment.

*Range production losses are from Morford et al. (*in review*) and will be available later this year in an online database at the University of Nebraska-Lincoln. Productivity losses are derived from a 1990 baseline and are the result of increasing woody cover in 2019 versus 1990.