



# Dormant season wildfire effects on forage production and plant composition

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## INTRODUCTION

Wildland fires in the southern plains may occur any time of year, but especially have a high occurrence in late winter and early spring when humidity is low, temperatures are increasing, and fuel from the prior growing season is abundant and dry.

Fires that occur at this time before the growing season greatly reduce litter cover and may leave the soil surface bare for several weeks before the onset of new pasture growth.

Information gathered from some wildfires that occurred during this time period showed that forage production was significantly reduced for two years following the fire. However, timing and conditions leading up to the fire and conditions following the fire may allow pastures to respond to each fire differently.

## LOCATION

This study was conducted in the mixed-grass prairie region of west-central Kansas. The site is characterized by calcareous soils and steep topography. Vegetation is largely composed of sideoats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), and big bluestem (*Andropogon gerardii*).

## TREATMENTS

A total of sixteen transects, each approximately 100 yards in length, were established on north, south, east, and west facing slopes in two 800 acre pastures for the purpose of monitoring rangeland production and plant composition.

Along each transect, pasture biomass was estimated by dropping a calibrated circular, weighted plate meter in the canopy, and measuring the height of the plate to which the forage held the plate above the soil surface.

For each year, all plate height readings for burned transects were averaged, and the average height was used to estimate available dry matter.

In alternating years, a modified step point method was used to record bare soil, litter, plant basal cover, and the nearest plant species from 100 points along each transect to estimate ground cover and plant species composition.

Pastures with transects were grazed starting in May with the same stocking density all five years of data collection, although stocking was deferred until June after a wildfire in 2017.

Data had been collected for two growing seasons before the wildfire occurred.

The wildfire ignited on March 7, 2017 in northeast Ellis County, Kansas. Humidity was near 10% and winds were gusting over 30 mph when the fire started, and approximately 6500 acres of Ellis County rangeland was consumed by the quickly spreading fire.

## RESULTS

In the two years prior to the fire, growing season precipitation was just below average in 2015 and well above average in 2016. Available forage in late July averaged across both years was 1770 lb/acre.



**Figure 1. Pasture site one month following an early March wildfire.**



**Figure 2. The same pasture site two months following an early March wildfire.**

In 2017, the year of the wildfire, available dry matter was just over 1330 lb/acre in late July. Dry matter was reduced about 25% compared to the average of 2015 and 2016 even though similar precipitation occurred in the spring of 2017.

In 2018, available dry matter once again was near 1770 lb/acre, even though precipitation in April, May, and June was less than 65% of 2016 and 2017 during the same months. In 2019, dry matter production by the end of July reached 2055 lb/acre with precipitation in April, May, and June similar to 2018.

Year	Average Yield (lb/acre)	Pre- and Post-Fire 2 year yield average
2015	1583	
2016	1963	1773
2017	1335	Fire Year
2018	1772	
2019	2056	1914

**Figure 3. Average annual dry matter production yields before and after the wildfire.**

In 2015, litter covered 59% of the soil surface, but following the wildfire litter cover was reduced to 23% of the soil surface. Plant basal cover was reduced by just under 1%, from 7% to near 6% of the soil surface.

Big bluestem, western wheatgrass (*Pascopyrum smithii*), and buffalograss (*Boutleoua dactyloides*) all increased their plant composition in the stand. Little bluestem, blue grama (*Boutloua gracilis*), sedge (*Carex* spp.), and western ragweed (*Ambrosia psilostachya*) all slightly declined in plant composition.

Soil Cover %	2015	2017	Change
Bare soil	34	71	37
Basal	7	6	-1
Litter	59	23	-37
Plant Composition %			
Big bluestem	14	19	5
Western wheatgrass	2	4	2
Buffalograss	7	8	2
Sideoats grama	27	27	0
Blue grama	4	2	-2
Western ragweed	6	3	-3
Little bluestem	28	24	-4

**Figure 4. Plant composition changes after wildfire.**

### MANAGEMENT IMPLICATIONS

Even though timely precipitation occurred in the spring directly following the wildfire, forage production was reduced that season, although not to the extent of previous wildfires.

The substantial loss of litter cover and consequential loss of water from runoff and evaporation prior to the onset of new growth is a likely reason that forage production is reduced in the first season. Negative effects on forage production will be lessened with shorter time frames between burning and new growth emergence and with greater precipitation following the fire.

Forage production may not be affected past the first growing season. Bunchgrass species such as little bluestem and blue grama are most susceptible to stand reductions following dormant season wildfires, while rhizomatous and stoloniferous grass species are most likely to be unaffected following wildfire.