A Historical Overview of Fire Seasonality in Tallgrass Prairie

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LIGHTNING III
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Native prairie vegetation is tolerant of fire at any time of the year, and although repeated burning in different seasons can eventually alter the abundance of some species, it does not fundamentally change the structural integrity of tallgrass prairie.

–Gene Towne

For thousands of years, lightning was the primary source of prairie fires in the Great Plains. Although lightning potentially can strike the ground at any time of the year, more than three-fourths of all lightning strikes in the grasslands occur in July and August.

Hot and droughty weather, coupled with low relative humidity and a flammable fuel load, creates favorable conditions for an ignition from dry lightning strikes. Sporadic lightning fires, occurring predominantly during the summer, were an influential component of prairie development. Anthropogenic fires, or those fires initiated by human influence, subsequently altered the frequency and seasonality of grassland burning.

Human occupancy in the Great Plains occurred at least 12,000 years BP (before present time), although populations were relatively sparse during the first 8,000 years of residency. Hunting large game on foot with primitive weapons was an arduous task for Stone Age hunters, and fire was an essential tool for survival. Broadcast burning to drive or maim

animals was likely a frequent hunting strategy. Burning practices became more refined once humans became cognizant of the relationship between fire and bison occurrence. Humans refined their burning practices when they recognized the relationship between fire, the subsequent new growth, and the increase in numbers of bison. Nutritious re-growth in recently burned sites attracted grazing animals, and covert hunting in those locations was more efficient than haphazard wanderings. Although fires could be set at nearly any time of the year, burning in autumn or early spring probably were the most common times for stimulating new grass growth. For several thousand years burning was an essential tool for most Indian tribes to facilitate hunting of bison and other game.

The importance of fire in hunting activities became less prominent after the Indians acquired horses in the late 16th century. Reliance upon horses rapidly increased through the 17th century, and by the early 1700s, chasing bison on horseback was ingrained in the hunting culture of most Plains tribes. Possessing horses was a status symbol of wealth and prestige, but an expanding horse population consumed large quantities of grass and necessitated a more nomadic lifestyle for the Indians. Intentional burning was not necessary to attract bison and was detrimental to the immediate forage supply for the horses.

By the mid-1800s decimated bison herds, forcibly displaced tribes, and the continual incursion of Eastern settlers interacted to produce the coup de grace in traditional burning practices. After thousands of years, the use of fire in Indian culture and bison procurement strategies faded into oblivion.

Without numerous large herbivores consuming the grass, immigrant settlers encountered vast expanses of ungrazed prairie. The high biomass was conducive to devastating wildfires that constituted a serious danger to pioneers. As the settlement population increased, roads, fences, and plowed land reduced the

PRAIRIE MEADOWS BURNING, 1861/1869
George Catlin
Courtesy National Gallery of Art

amount of free range and progressively limited the extent and severity of wildfires. The intentional burning of prairie generally was considered dangerous and unnecessary.

By 1880 the influx of transient cattle from Texas for summer grazing renewed the incentive for intentional burning. Pastures that were stocked season-long with steers were annually burned because animals gained more weight if the old grass cover was removed. Burning usually occurred in late winter or early spring to stimulate early green-up. In contrast, cow/calf pastures that were stocked year-long were infrequently burned because there was no direct benefit in livestock performance.

In the early 20th century, extended droughts and devastating forest fires

in other regions led to widespread fire suppression efforts that prejudiced the attitude of many academicians about pasture burning. Experiments from small plots in the 1930s by the College of Agriculture concluded that burning at any time reduced grass production (compared to an unburned plot that was mowed and raked) and should not be a part of normal range management practices. An ensuing barrage of anti-burn rhetoric persisted for more than three decades but was generally ignored by ranchers who grazed stocker cattle. Most of the defiant burning during this time occurred in early spring and many burns were conducted immediately after a rain, or even when there was snow cover, in an attempt to minimize reputed damage to the grasses.

Up through the mid 1960s, Kansas State University continued to adamantly oppose pasture burning but gradually modified its position that fire in late April would cause less damage than burning at other times. After decades of infrequent burning, however, there was an insidious encroachment of woody species (most notably eastern red cedar) into the prairies, and by the late 1960s, KSU reversed its policy and acknowledged that frequent burning was vital for the maintenance of tallgrass prairie. Burning at any time other than late April, however, continued to be vigorously denounced.

The concept that burning in late April was the only acceptable time to burn tallgrass prairie went unchallenged and became ingrained in the cultural practices of grassland management. By the turn of the 21st century, however, more extensive research revealed that repeated burning in different seasons did not cause the adverse repercussions that had been predicted from the preceding unreplicated studies.

Konza Prairie Biological Station, managed by the KSU Division of Biology, has subsequently emerged as the national leader in researching the effects of fire frequency and seasonality on tallgrass prairie. Long-term data indicate that the prairie is resilient to fire in different seasons, and it requires repeated annual burning to drive vegetational changes. Annual burning in autumn, winter, and spring increases the abundance of big bluestem and switchgrass and decreases annual forbs. Burning in autumn and winter increases little bluestem, sedges, prairie Junegrass, and some forb species (primarily aster and prairie lespedeza). Late spring burning increases the abundance of Indiangrass, and reduces sedges, prairie Junegrass, and most forb species (except goldenrod and prairie lespedeza). Summer burning increases total species richness by favoring annual forbs, sedges, and cool-season grasses. Infrequent burning promotes woody shrub (primarily dogwood) expansion that can eventually dominate the prairie. In areas that are not burned for extended periods of time, there is a decline in the abundance of all native grass species and a concomitant increase in eastern red cedar and other tree species that are characteristically associated with woodlands.

Tallgrass prairie is continually under assault from fragmentation, woody invasion, and aggressive exotic species. Although burning in any season has little influence on mitigating these threats, it does widen the window of opportunity for routine maintenance without detrimental consequences to the grassland. Tallgrass prairie has endured drought, grazing, and fire in different seasons for thousands of years and will persist as long as it is frequently burned, regardless of the specific timing of the burn.

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