Science Societies

Prescribed burning in late summer benefits ranchers, air quality

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July 1, 2022



A prescribed burning crew member monitors a patch of burning rangeland. Photo courtesy of the USEPA.

> Fire is essential to the survival of the tallgrass prairies of Kansas and Oklahoma. To maintain the treeless prairie ecosystem, ranchers have historically burned pastures each spring from April to May. But when more than 500,000 acres are burned in a short period with slow winds and dense cloud, stagnant smoke can lead to unhealthy air quality in neighboring communities. The spring burning of rangeland coincides with weather patterns that create air quality issues (temperature inversions stemming from moderately warm days followed by cool nights). The solution to air quality issues is for ranchers to reschedule prescribed burnings for late summer or early fall when temperature inversions are less likely to occur.

Fire is essential to the survival of the tallgrass prairies of Kansas and Oklahoma. Research at Kansas State University says it can also be done without causing air quality issues for neighbors in metropolitan regions.

Stretching across about 6.5 million acres, the Flint Hills in Kansas and the Osage Hills in Oklahoma are the largest extant remnants of tallgrass prairie in the world. Survival of the native grasses and forbs that populate the region requires fire—a natural phenomenon that existed prior to European settlement that kept trees and shrubs at bay and allowed grazing animals like bison to populate the region.

“It has to have fire,” explains Dr. KC Olson, professor of range beef cattle nutrition and management at Kanas State University (K-State) who has studied the impacts of moving prescribed burns from spring to later in the year. “If we exclude fire from this landscape, not only do we increase the odds of wildfire, but in less than 25 years, it converts to a scrub forest of no economic value. Most folks don’t appreciate it, but tallgrass prairie is the best water filter and the best carbon sink on planet earth.”



Animal performance is not affected on pasture burned in summer versus spring, according to K-State research although summer-prescribed fire may maintain cattle growth performance better than fall burning. Photo courtesy of Adobe Stock/michael langley.

Without routine prescribed burns, the tallgrass prairie would be overtaken by cedar forest within 30 years, according to K-State research.

“There are watersheds on the Konza Prairie Biological station that have had wildfires purposefully excluded for between 25 and 40 years,” Olson notes. “The results are plain to the eye. It’s no longer a prairie. It’s a forest. In the short term, species like eastern red cedar and honey locust invade. Because of the overarching canopy they provide, the native grasses and forbs just go away.”

To maintain the treeless prairie ecosystem made possible with fire, ranchers have historically burned pastures each spring from April to May, allowing new growth of grass and forbs to replace dead plant material. The vigorous spring regrowth that results from the burning of rangeland has proven economic benefits to ranching with grazing cattle seeing a substantial increase in daily gain. Research dating as far back as the 1960s argues that burning in April promotes growth of desirable native grasses

ideal for grazing and maximizing cattle growth performance.

But when more than 500,000 acres are burned in a short period with slow winds and dense cloud, stagnant smoke can lead to unhealthy air quality in neighboring communities, according to USEPA Region 7 research.

The spring burning of rangeland coincides with weather patterns that create air quality issues in neighboring metro regions. In the traditional spring burning season, moderately warm days are followed by cool nights, creating a temperature inversion. When prescribed burning takes place in March and April, smoke lifts into the atmosphere as daytime temperatures warm. As temperatures cool in the evenings, smoke tends to descend to ground level. When this occurs over a metropolitan area, air quality can be seriously downgraded.

Air quality monitors across the U.S. Midwest frequently record ozone levels and fine-particulate matter concentrations that exceed the USEPA's National Ambient Air Quality Standards in the spring with these conditions causing health problems for people with asthma, children, older adults, or those who work outdoors.

Rescheduling Burnings for Late Summer, Early Fall

The solution to air quality issues, Olson notes, is for ranchers to reschedule prescribed burnings for late summer or early fall when temperature inversions are less likely to occur.

"When the days are warm and the nights are warm, the smoke doesn't descend," he says. "It dissipates into the atmosphere."

The USEPA estimates that roughly 300,000 acres were burned between August 1 and October 1 in the tallgrass regions of Kansas and north-central Oklahoma in 2020 with

acreage of late-season burns increasing to more than 1 million in 2021.



Sericea lespedeza, an invasive perennial legume native to Asia, has been a growing problem for ranchers across the tallgrass region. Livestock don't graze it, and mechanical and chemical control is costly. Photo courtesy of Wikimedia Commons/LionMans Account.

The motivation for ranchers to reschedule prescribed burnings to later in the year is largely economic, Olson notes. Sericea lespedeza, an invasive perennial legume native to Asia, has been a growing problem for ranchers across the tallgrass region. The drought-hardy broadleaf that can produce thousands of seeds per plant has now invaded more than 2.5 million acres across the region. Livestock, though, don't graze sericea lespedeza, and mechanical and chemical control is costly.

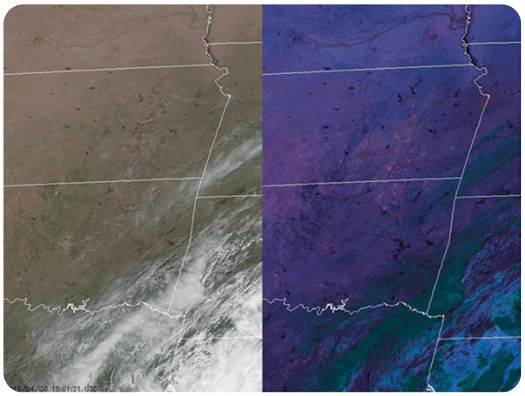
However, burning sericea lespedeza in August and September has proven to be a more cost-effective and cost-efficient method of control. In late-summer and early fall, when the plant is most vulnerable during blooming, fire reduces its seed count with the plant also losing vigor the following spring.

Controlling sericea lespedeza through burning costs about $0.75/ac, Olson explains, citing eight years of research conducted at K-State, while the least expensive herbicide option costs about $18/ac. Animal performance is also not affected on pasture burned in summer versus spring, according to K-State research although summer-prescribed fire may maintain cattle growth performance better than fall burning.

“We started that line of research not because of air quality, but because we needed to control certain noxious weeds that happen to be late blooming and vulnerable from about August 1 through the end of the growing season. That solves a multi-billion dollar problem,” Olson notes. “One of the happy consequences of that was not only did we improve botanical composition on the prairie, but we also tumbled to the idea that smoke from prescribed burning doesn’t necessarily need to downgrade air quality for human beings.”

Research on controlling sericea lespedeza at K-State is ongoing, but Olson notes that the findings have convinced ranchers and USEPA officials that rescheduling prescribed burns from spring to late summer or early fall have been a win-win for ranchers and municipal neighbors.

“Over the last three years, a significant amount of acreage has shifted from an annual spring burn to every other year, or late summer or early fall burn,” Olson says. “And not once during August or September has an air quality monitor in any nearby municipality alerted to a degradation in air quality. We’re talking about a significant number of acres here.”



Satellite imagery shows the smoke plumes from prescribed burning in the Flint Hills, which span from northern Kansas into Oklahoma. Photo courtesy of the Cooperative Institute for Research in the Atmosphere, supported by Colorado State University and the National Oceanic and Atmospheric Administration.

Additional Incentives

With more than 2.5 million acres affected by sericea lespedeza, Olson argues that many more acres of tallgrass prairie can be shifted from spring burns to late-season prescribed

burns just to control the noxious weed—with improved air quality being the additional benefit.

“Controlling sericea lespedeza needs to be the carrot for land owners to move their fire season,” he says. “There can be other kinds of motivations as well. Ranchers can better manage their labor force because when they’re trying to get yearling cattle in from all points of the compass in the spring, and they also all have to be doing prescribed burning, that’s two high-stress activities at once.”

Another side benefit of rescheduling prescribed burns for later in the year is a safer work environment on the ranch. Burning rangeland when the grass is still actively growing later in the season is safer and much less likely to get out of control, Olson points out, with fires moving more slowly at about one-quarter of the wind spread.

Research at K-State indicates that burning in the traditional season versus in August or September does not detract from livestock performance or weight gain, Olson notes. The benefits to ranchers, the tallgrass ecosystem, and urban neighbors from rescheduling burns for later in the year are obvious.

“We’ve got air quality, less work stress in the spring, fire safety, and we definitely have control over sericea lespedeza, and possibly two other noxious weeds, for a very low price,” Olson says. “That’s what’s going to change people’s minds. And I would prefer it to be an economic carrot rather than a stick from the American government.”

More information

For more information, see:

- https://www.epa.gov/ks/epa-region-7-research-spotlight-studying-fire-flint-hills
- https://krex.k-state.edu/dspace/handle/2097/40887

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