



Implementation, Costs & Benefits of Patch-Burn Grazing

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Introduction

The use of rangelands for cattle grazing is the best way to convert forage, an unconsumable product for humans, to beef - a consumable and demanded product. Therefore, effective rangeland management is essential to profitable beef production. As of January 2023, approximately 28.9 million head of beef cattle rely on Oklahoma rangelands for sustainable nutrients, making up a \$1.97 billion industry (USDA, National Agricultural Statistics Service 2019) (USDA, National Agricultural Statistics Service 2023b). Effectively managed rangelands also contribute to positive environmental outcomes such as reduced soil erosion, more suitable habitats for wildlife and increased water holding capacity in a state prone to droughts.

One management practice that has historically shaped today's rangelands is pyric-herbivory. Pyric-herbivory, also known as patch-burn grazing, uses fire to influence grazing behavior, while preserving and improving the rangelands used for cattle production. When using patch-burn grazing, one or two patches are burned every year. Typically, for cow-calf producers, it is recommended to burn twice a year, early spring and early fall, to optimize continual grazing of high-quality forages. Research shows the benefits of patch-burn grazing from mitigating drought impacts, limiting woody plant encroachment (WPE) and controlling wildfires to diversifying habitats for wildlife and providing high quality forages for livestock (Duvall and Whitaker 1964; Fuhlendorf and Engle 2001; Fuhlendorf et al. 2009; McGranahan et al. 2012; Twidwell et al. 2021; Wilcox et al. 2022).

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Given these benefits of patch-burn grazing, why don't more cattle producers in the Great Plains utilize the practice? A recent study shows that a lack of awareness and resistance to management practice changes from seasoned producers are main reasons for lack of adoption (Adhikari et al. 2023). In this fact sheet, we examine the costs and benefits of patch-burn grazing in Oklahoma. Cattle producers may already use prescribed fire on their operation by following a more traditional approach of burning the entire pasture at one time every three years. So, the knowledge of utilizing fire to maintain rangelands already exists. However, maintaining a homogeneous landscape (uniform in appearance and plant growth) may be hindering the rangelands more than sustaining them (Fuhlendorf et al. 2017). While it may not be suitable for every operation, knowing the costs along with the economic and environmental benefits of patch-burn grazing can potentially provide long-term benefits on cow-calf operations in Oklahoma and across the Great Plains region.

Where to Start

Prior to changing over to patch-burning, whether transitioning from traditional burning management practices or starting from scratch, there are steps that need to be taken to ensure the process of pyric-herbivory is executed safely and used in a way to take advantage of its full potential. An overview of the necessary steps along with other Extension articles are listed below and summarized from an article from the Oklahoma State University Extension.¹

1. Develop a written burn plan²

A burn plan is a summary of the goals of and information about the burn that is to be conducted at a future date. A written plan is essential to have if the fire was to get out of hand or cause any damage. Additionally, a burn map also allows for any crew members involved to have a clear understanding of the sequence of fires started so that safety precautions can be made. Firebreak construction would be determined during this process.³

¹See <http://fireecology.okstate.edu/patch-burning/how-to-implement-patch-burning/>

²See <https://extension.okstate.edu/fact-sheets/burn-plan-for-prescribed-burning.html>

³See <https://extension.okstate.edu/fact-sheets/fire-breaks-for-prescribed-burning.html>

2. Create or join a local PBA⁴

A Prescribed Burn Association (PBA) is a partnership “between a group of landowners and other local citizens to conduct prescribed fires.” Benefits of being a member of a PBA include meetings and trainings to further grow local knowledge of and experience in burning. Also, the PBAs create a local network of members that can help each other conduct burns and share equipment. Requirements to join include a written burn plan and proof of insurance. Most farm and ranch liability policies include this coverage.

3. Calculate stocking rate and carrying capacity⁵

Overstocking is one of the biggest hindrances to successful burns because the land does not have enough fuel or accumulated forage to carry an adequate burn, influencing the carrying capacity of an area. Stocking rate is the number of animals in a land area over a certain period. Carrying capacity is the stocking rate that is sustainable over time or the amount of grazeable forage available in that area without depleting it. A compatible stocking rate and carrying capacity is essential in cattle production as well as rangeland management.

4. Determine fire return interval and burning seasons

A fire return interval is the amount of time it takes for an adequate amount of dead plant material or litter to accumulate before the next burn. In higher precipitation areas (+30 inches), fire return interval is typically three years and four years for dryer areas. Once a fire return interval is determined, the pasture can be divided up into patches. Burns can be conducted in both the dormant and growing season, depending on the goals of the operation. Timing of burns also depends on annual precipitation levels and weather conditions at the time.

Burn Cost Per Acre

Cattle production involves making complex management decisions to reduce costs and increase revenue while enhancing stewardship of the land to continue to meet consumption demands. Financially analyzing a management change or the introduction of a new practice helps a producer understand the costs and potential benefits. Recording input costs for a cattle operation is necessary in calculating the profitability of the operation. Foundational operating costs in a producer’s budget may include feed, labor, processing and equipment costs.

A survey designed by the Department of Natural Resource Ecology and Management at Oklahoma State University was sent out in 2021 to landowners (37 responses) in the Great Plains who used prescribed fire on their operations over a 5-year period (2016-2020).⁶ The goal of the survey was to collect data and responses on what it is costing producers to utilize prescribed fire to manage their rangelands. Producers were asked to provide the number of burns conducted per year, an estimated cost per burn and to breakdown the cost of their burns. For the purpose

⁴See <https://extension.okstate.edu/fact-sheets/prescribed-burn-associations.html>

⁵See <https://extension.okstate.edu/fact-sheets/stocking-rate-the-key-to-successful-livestock-production.html>

⁶Survey created by John Weir, Omkar Joshi, and Aaron Russell

Table 1. Burn cost section example for operational budget

Burn Costs/Acre	Patch-Burn	Traditional
Firebreak Construction	\$1.77	\$1.12
Labor	\$1.37	\$0.34
Fuel	\$0.88	\$0.29
PBA Dues	\$0.25	\$0.16
Other	\$1.28	\$0.20
Equipment	-	-
Insurance/Permits	-	-
Average Cost/Acre	\$4.58	\$1.81

of comparing the costs of each management strategy, these responses were divided into producers who were assumed to use patch-burning management and those who were assumed to use a traditional approach.⁷ Based on survey responses, cost breakdowns were calculated based on the estimated average cost per acre for patch-burning and traditional burning in year one (Table 1).

Firebreak construction, fuel and labor show to be the highest costs for burning. However, firebreak construction costs, labor and fuel costs, could potentially decrease when utilizing patch-burning in the following years. The previously burned patch from year one will not contain enough fuel to carry a fire, so the construction of a firebreak for the second burn will not be necessary. Overall, results show a higher cost per acre when utilizing patch-burning rather than burning the entire pasture every three years. This is to be expected given that the amount of acreage being burned is smaller for patch-burning and many of the costs of burning are fixed. However, firebreak construction costs, labor and fuel costs could potentially be reduced in the following years if patches are burned into the previously burned patch (Figure 1).

Initially, patch-burning does not look like the obvious rangeland management practice when noticing the \$2.40 cost-per-acre difference between patch-burning and traditional management over three years (Table 2). However, these are only burn cost numbers. The benefits of patch-burning when used to influence grazing behavior, such as reduction in supplemental feed requirements (Limb et al. 2011) and drought impact mitigation (Allred et al. 2011; Allred et al. 2014; Spiess et al. 2020), serve as justification for the higher initial burn costs. Patch-burn grazing, if consistently and accurately executed, can be a cost-reducing and beneficial long-term investment practice for cattle producers in Oklahoma and the Great Plains.

⁷Assumed traditional if burns occurred more than twice in a year, did not burn every year or burned a consistent amount of land every year; assumed patch-burn if burns occurred once or twice annually, every year.

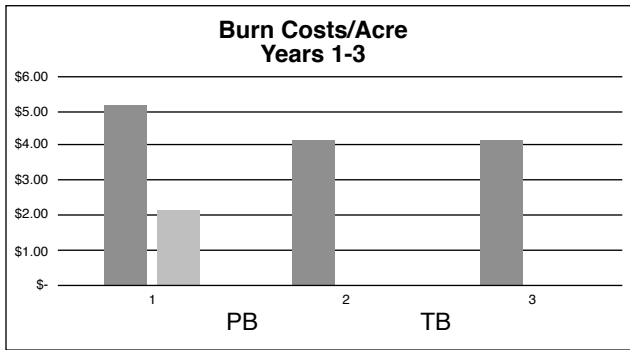


Figure 1. Burn costs per acre for patch-burning and traditional burning were estimated for three years. Estimates were based on burning 150 acres. Costs for patch-burning reduced in years two and three due to reduction in need for numerous firebreaks.

	Patch-Burning	Traditional Burning
3-Year Investment Cost	\$677.67	\$317.14
Difference	\$360.53	
Per Acre Difference	\$2.40	

Table 2. Total burn costs were estimated over three years for patch-burning and traditional burning. Estimates were based on burning 150 acres.

Supplemental Feed Costs Per Head

A research study conducted over the course of four years compared patch-burn grazing management to traditional management (burning every three years) for a cow-calf operation (Limb et al. 2011). Cow BCS and weaning weights of calves did not differ between the two management styles, but there was a 40% decrease in supplemental feed requirements for cows in the patch-burned pastures due to having access to high quality forages in the fall and early winter months. Combining these results with protein supplement costs⁸, it is estimated that patch-burn grazing can provide a savings in winter supplement costs of approximately \$20 per head per year, all else remaining constant. As we know though, the cattle industry is anything but predictable and constant.

The impacts of a drought year, for example, become very expensive for cattle producers who must supplement to compensate for limited forages. Patch-burn grazing offers mitigation for these impacts by providing stockpile forages in unburned and ungrazed areas (Allred et al. 2014). Historical weather data from the U.S. Drought Monitor and Mesonet along with range productivity measurements from Web Soil Survey were used to analyze and estimate the amount of days cow-calf pairs could rely on areas with stockpiled forages. Results indicate that utilizing patch-burn grazing before a drought, skipping a patch during the drought and

⁸See <https://extension.okstate.edu/fact-sheets/supplementing-beef-cows.html>

resuming after the drought is the most economical option when considering long-term supplemental feed costs (Figure 2). Total burn and feed costs over the course of six years with a drought year is estimated to be \$167.16 per head per year when using patch-burn grazing and \$170.66 per head per year when using traditional burning. On average, costs are reduced by \$3.50 per cow per year when utilizing this protocol for patch-burn grazing compared to burning an entire pasture every three years. On a per acre basis, this translates to about \$0.58/acre when using the average rental rate and stocking rate for native range in North Central Oklahoma for spring calving cows.⁹

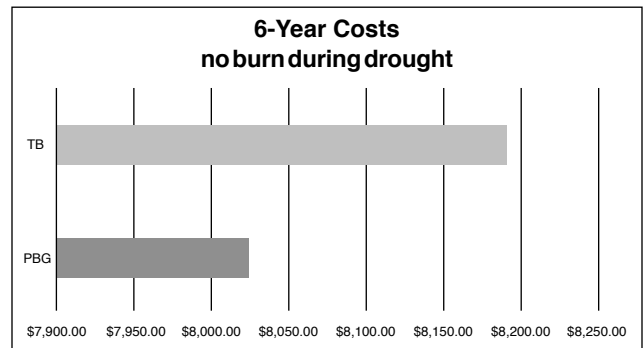


Figure 2. Total burn costs and feed costs for eight lactating cows grazing 150 acres of native range were estimated over the course of six years.¹⁰ A drought year is included in year four to resemble the flexibility and benefits of using patch-burn grazing as a preparation strategy for drought.¹¹

Conclusion

From these results, we can conclude that the higher costs of implementing patch-burn grazing can potentially be justified when looking at long-term supplemental feed costs. The estimates provided by this economic analysis can be used as a tool to create projections of what patch-burn grazing would cost on a specific operation. Factors affecting cattle production such as efficient stocking rates, precipitation and input costs¹² should all be placed into consideration when implementing patch-burn grazing as a management practice. Providing information about the costs and economic benefits of patch-burn grazing potentially improves awareness of and confidence in an alternative method of preserving rangelands while simultaneously benefiting overall beef production. To contact your county agricultural Extension educator to discuss customizing a patch-burn grazing plan for your operation and getting in

⁹See <https://extension.okstate.edu/fact-sheets/oklahoma-pasture-rental-rates-2020-21.html#pasture-rental-rates>

¹⁰Carrying capacity and stocking rates adopted from Limb et al. 2011 study

¹¹Feed costs include winter protein supplements for all six years. Supplementation during the drought year includes hay and protein supplement costs. Costs only account for burn and feed costs. Costs of destocking/rebuilding are not indicated.

¹²See <https://extension.okstate.edu/programs/farm-management-and-finance/budgets/sample-budgets/> for enterprise budgets.

contact with a PBA in your area, visit <https://extension.okstate.edu/county/>

Conclusion

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