Burning Costs in Oklahoma Rangelands

David M. Engle

Rangelands are a vital element of the Oklahoma economy. Beef cattle obtain the major portion of their nutrient requirements from range forages, and are a billion dollar industry in the state (Jobes 1986). The application of range management practices is, however, insufficient to support this grazing demand and to remedy current and emerging range management problems. Eastern redcedar encroachment, for example, is a major threat to the integrity of the state's rangelands that can be arrested with currently available prescribed burning technology.

Rangeland managers in Oklahoma have tended to ignore the subtle, early-stages of range deterioration. Maintenance treatments, including prescribed burning, and improved grazing management could prevent range deterioration at a low cost. These maintenance treatments are often overlooked in the early stages of deterioration, and as a result, high-cost intensive chemical or mechanical plant control is required to restore productivity.

Prescribed burning, long used as a species composition and forage quality management tool in the nearby Kansas Flint Hills (Launchbaugh and Owensby 1978), is a rarely used management technology in Oklahoma. Despite the production incentives for stocker cattle operations (Launchbaugh and Owensby 1978) and the economic incentives favoring periodic or annual prescribed burning (Scott et al. 1987, Bernardo et al. 1987), Oklahoma ranchers and land managers throughout the state have been reluctant to use this management tool.

The reluctance to use prescribed burning is partly a result of an ingrained fear of fire and a common misunderstanding of the beneficial role of fire in rangeland ecosystems. Sufficient information to alleviate these fears is available on fire ecology and prescribed burning techniques (Launchbaugh and Owensby 1978, Wright and Bailey 1982, McPherson et al. 1986). Oklahoma range managers should thus consider prescribed fire as a biologically and technically appropriate management tool for their rangelands.

When profitability or investment considerations are important, the decision to incorporate prescribed burning in the range management plan requires information on the benefits as well as the costs associated with the practice. Benefits associated with prescribed burning in Kansas have been reported (e.g., Launchbaugh and Owensby 1978). The costs associated with burning are not widely available for Oklahoma rangelands. Experience with prescribed burning has been relatively rare for virtually all Oklahoma range types. The data source for this report comes from four years (1984-1987) of burning in the tallgrass prairie and the Cross Timbers of northcentral Oklahoma. We have identified some of the sources and levels of costs associated with burning in two different range types. Although this information was obtained from a limited region in Oklahoma, it may have some applicability elsewhere.

Author is with the Department of Agronomy, Oklahoma State University, Stillwater, Oklahoma 74078. This is Journal Article No. 5247 of the Agricultural Experiment Station, Oklahoma State University, Stillwater, Oklahoma.

Cross Timbers

The Cross Timbers covers nearly 12 million acres of land in Oklahoma, Texas, and Kansas (SCS 1981). As the western extension of the Ozark Plateaus, the Cross Timbers is the western edge of the oak-hickory ecosystem (Figure 1) (Garrison et al. 1977). A mosaic of low-statured upland forest and prairie occupying soils derived from interbedded sandstone and shales is typical of much of the Cross Timbers. The forest overstory is dominated by dense stands of post oak and blackjack oak and the prairie openings are dominated by little bluestem (Rice and Penfound 1959, Dwyer and Santelmann 1964). The land is hilly and dissected by deep drainages. Because this land type does not produce economically important timber or wood products, livestock grazing constitutes the primary economical use of the land (Byrd et al. 1984).

Fig. 1. *The Cross Timbers (solid black) is the western extension of the Ozark Plateaus, (cross-hatched) a portion of the oak-hickory ecosystem.*

Maintenance burns were prescribed to control herbicide-resistant woody and vine species on the Cross Timbers Experimental Range in northcentral Oklahoma (Engle et al. 1987). A secondary benefit to the burning was an increase in weight gains of stocker cattle grazed season-long from mid-April to mid-September (McCollum et al. 1987).

Labor is the major cost associated with prescribed burning in the Cross Timbers (Table 1). To burn 80-acre pastures, our crews are usually composed of 7 or 8 personnel, 1 or 2 to ignite the backfire, 2 or 3 to ignite strip headfires, and the remainder serving as suppression-patrol crew and fire boss.

Table 1. Costs per acre of burning herbicide-treated 80 acre pastures in the Cross Timbers of northcentral Oklahoma.

Activity	Cost/Acre
Fireline preparation and suppression	
Mowing, 1.5 hr @ $15.00/hr	$0.28
Pumper/sprayer, 3 hrs. @ $14.00/hr	0.53
Labor, firing crew and fireline patrol[1]	
20-man hours @ $5.00/hr	1.25
Equipment depreciation[2]	
15% per annum on $1400 replacement value, spread over 8 pasture burns per year	0.33
Drip torch fuel, 10 gal @ $1.00/gal	0.13
TOTAL COST PER ACRE	$2.52

[1]Does not include travel time to and from burn site.
[2]Equipment includes belt weather kit, drip torches, backpack pumps and 2-way radios.

As many as 12 crew members have been used when burning under conditions which favor fire escape, such as with volatile woody fuels and with low humidity and high winds. Pastures larger than 80 acres may require more personnel if rough terrain restricts travel for ignition and patrol. On the other hand, a 400-acre pasture was burned with three crew members in previously untreated Cross Timbers when the escape risk was minimal (E.C. Snook, pers. comm.). The costs associated with additional standby fire suppression and fireline patrol personnel may be less than the cost associated with risk of escape when spot fires are a danger. The major source of firebrands which ignite spot fires in the Cross Timbers is the dead and dry leaves of eastern redcedar.

Dozing or blading firelines to mineral soil creates erosion problems on the steep slopes of most rangelands of central Oklahoma. Mowing a 6- to 12-foot wide strip around the pasture boundary to reduce the height of the fine fuel has been a satisfactory alternative method of fireline preparation (Figure 2). It is possible to backfire from the mowed line by laying a wetline with a pumper unit or other suitable water sprayer.

A sprayer which can negotiate rough terrain is essential for wetline placement and for standby suppression. Cattle sprayers, including small low-pressure and low-volume slip-on and trailer-mounted pumpers, have been successfully used. Vehicular travel along firelines is sometimes limited because the Cross Timbers soils are often saturated during the spring burning season. Fire trucks or 4 × 4 pickups carrying pumpers with more than 100 gallons of water can become stuck at critical times, which makes them more of a liability than an asset. For greater versatility and maneuverability, all-terrain vehicles including 3- and 4-wheel motorcycles, jeeps, 4×4 pickups, and tractors equipped with small electronic or gasoline pumps and 10 to 50-gallon water tanks are very effective.

Fireline preparation on well-maintained fence right-of-ways which are free of brush is inexpensive and easy to accomplish. Clearing the brush along fencelines has the additional benefit of increased access for fence maintenance and can facilitate livestock handling.

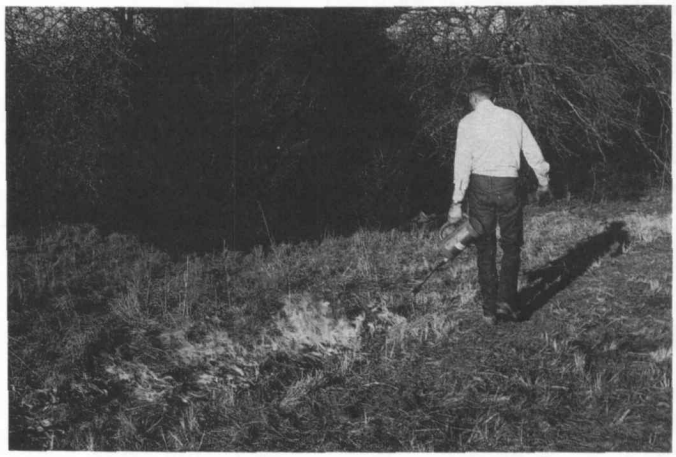

Fig. 2. *Setting a backfire from a mowed line in the Cross Timbers.*

Burning equipment and drip torch fuel are minor cost items, especially if the cost of burning equipment can be spread over other pasture units or the cost shared with other operators. Our equipment costs reflect an inventory that took several years to accumulate. While burning can be conducted with less equipment, backup drip torches and backpack pumps are an incalculable advantage to safety and convenience.

We have found that labor costs can be substantially reduced for fireline patrol, suppression, and backfiring, by a combination of early fall fireline mowing and early turn-in of stocker cattle the following spring before burning. Mowing in August or September will encourage cool-season annual grass growth which is attractive to cattle and also serves as an effective firebreak. Burning with cattle in a pasture does not disturb the cattle if the cattle can move to natural fuel breaks and if they are accustomed to human presence and activity.

Tallgrass Prairie

Burning in the tallgrass prairies of Oklahoma is gaining attention because of the positive response of livestock gains to burning, and because burning is the lowest cost treatment for eastern redcedar control (Figure 3). Labor costs for burning tallgrass prairie are generally less than those for burning Cross Timbers, mostly because less strip headfiring is required (Table 2). Occasionally, a pasture unit is dissected by natural fuel breaks (e.g., gulleys and shallow claypans), roads or trails so that some strip headfiring is required. In contrast, a 160-acre pasture rested for several years previous to a burn required 80 to 90 man hours of labor. Most of this labor was necessary in the backfiring phase of the burn to prevent escape to adjacent pastures. Under normal burning conditions, other costs of burning tallgrass prairie are similar to that of burning in herbicide-treated Cross Timbers.

Other Factors Affecting Burning Costs

On most of the range types in the eastern two-thirds of Oklahoma, deferment is not normally necessary to accumulate fuel. A deferment after mid-July may provide a more uniform fuelbed, an advantage if weed or brush control are objectives of the burn. Intensive early stocking will provide

Fig. 3. *Burning tallgrass prairie for cedar control.*

Table 2. Costs per acre of burning 160 acre pastures in tallgrass prairie in northcentral Oklahoma.

Activity	Cost/Acre
Fireline preparation and suppression	
Mowing, 1 hr @ $15.00/hr	$0.09
Pumper/sprayer, 3 hrs. @ $14.00/hr	0.53
Labor, firing crew and fireline patrol[1]	
24-man hours @ $5.00/hr	0.75
Equipment depreciation[2]	
15% per annum on $1400 replacement value, spread over 4 pasture burns per year	0.33
Drip torch fuel, 20 gal @ $1.00/gal	0.13
TOTAL COST PER ACRE	$1.83

[1]Does not include travel time to and from burn site.
[2]Equipment includes belt weather kit, drip torches, backpack pumps and 2-way radios.

this kind of deferment without any reduction in stocking rate for the year. Deferment after a burn is not necessary for maintaining range condition (Launchbaugh and Owensby 1978) nor is it a viable alternative if an objective of the burn is to improve livestock performance on the high quality forage produced after the burn.

The risk of fire escape poses a financial risk which should be considered as an associated cost but is a difficult estimate to include in a cost analysis. Obviously, the costs can be substantial when a fire escapes to another pasture, especially to land on which the owner is unsympathetic to prescribed burning or if damages to structures and fences occur. Local fire departments in Oklahoma charge as much as $500 per call on wildfires, even if the dispatched pumper is of no benefit in suppressing the fire. For protection, the manager should check his insurance liability policy for coverage of damages from escaped fires.

Costs can also increase if inclement weather delays burning or completely precludes burning in a particular year. Standby time of both personnel and equipment when awaiting the prescribed burning window can be quite costly. Burning may add to the replacement or maintenance costs of fences and other structures. Burning off of roads or trails and through fences is a practice that is convenient but also reduces fence life, a cost that should be attributed to burning.

Finally, it should be emphasized that there is an economy of pasture size and pasture number. As pastures increase in size and number of pasture units burned increases, costs per acre will generally decrease. The costly backfiring phase is relatively less expensive on large regularly shaped pastures then on small, narrow or irregularly shaped pastures because of the effect of boundary length on the perimeter to area ratio. Also, when equipment costs can be spread to more pastures and to a larger acreage, burning cost per acre will decrease.

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