Analysis of prescribed burn costs and associated variables in the Great Plains

Maddie Watts, Aaron Russell, Omkar Joshi

Department of Natural Resources Ecology and Management, Oklahoma State University

Abstract

In the Great Plains, fire is an important land management tool essential to maintaining and preserving the region's ecosystems. Prescribed fire is critical in perpetuating regular fire return intervals and enhancing land characteristics. Since private landowners are the primary stewards of the forest and rangeland in this region, their decision to conduct burning is important for the sustainable management of natural resources. Subsequently, the cost is one of the major obstacles in the implementation of prescribed fire. Therefore, our study objective is to understand the factors that play a role in determining operational expenses while conducting a burn. In this project, we performed a descriptive analysis and a regression analysis of cost factors using data from a survey of prescribed burn professionals in the Great Plains region. The average cost of implementing prescribed fire in the study region was found to be $11.23 per acre. The results suggest that variables such as firebreak types, number of burns conducted, and the number of acres burned may play a role in determining the cost of burning. Identification of the cost of prescribed fire and the factors influencing it allows landowners, prescribed burn professionals, and government agencies in the Great Plains to better understand, implement, and facilitate prescribed burns as part of land management plans.

Photo: National Fish and Wildlife Foundation

Introduction

The Great Plains of the central United States are made up of prairie-grassland ecosystems, which are historically maintained by regular fire return intervals. Fire improves ecosystems by preventing the encroachment of woody plants on grasslands, enriching soils with nutrients, increasing livestock production, and maintaining wildlife habitats (Francos & Úbeda, 2021). Prescribed fire is a tool used by landholders of the Great Plains to achieve these benefits, but the associated costs can impact the decisions a landowner makes regarding the use of prescribed fire. There has been limited research conducted on the costs of prescribed fire in this region, therefore, we aim to identify the average cost of conducting burns along with the factors that influence costs. Our goal is to provide this information to landowners for them to utilize in their decision-making and land management planning.

Photo: The Oklahoman, Milton Paddelty

Photo: Texas A&M Natural Resources Institute

Method

Data was collected using an internet-based survey. A periodic mail reminder was sent to non-respondents following Dillman Tailored Design Method.

The survey data was analyzed using descriptive analysis and regression analysis to find the variables with the most significant effect on cost.

Photo: The Nature Conservancy

Results

Variable	Coefficient	P-value
ln acres	-0.04	0.000
ln burn count	0.54	0.000
Fuel proportion	-0.02	0.013
Food proportion	-0.02	0.000
Disked lines proportion	-0.02	0.002
Existing roads proportion	-0.03	0.000
Forest proportion	0.01	0.011

Fig 1. The most significant variables and their relation to cost

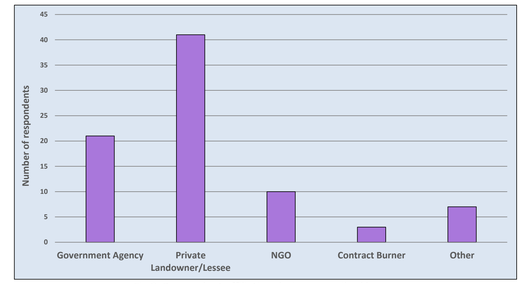

Fig 2. Respondent affiliation during prescribed burns

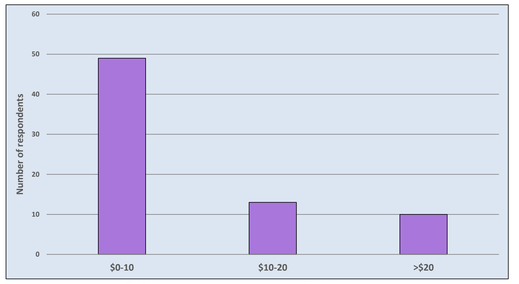

Fig 3. Average cost per acre reported by landowners

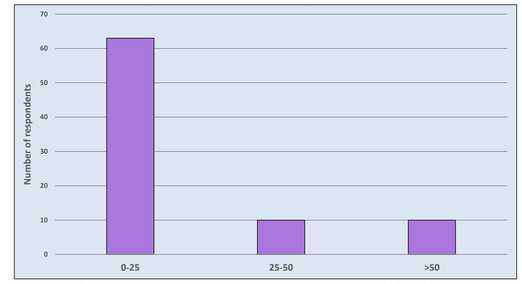

Fig 4. Number of burns conducted by each landowner from 2016 to 2020

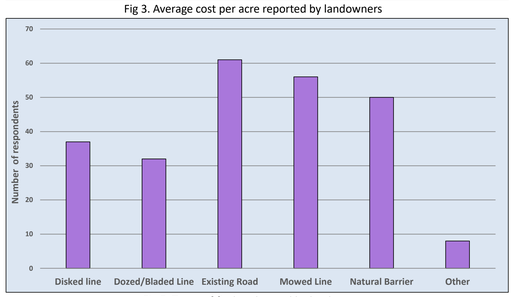

Fig 5. Types of firebreaks used by landowners

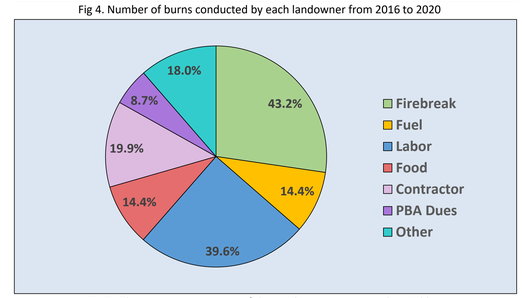

Fig 6. The average percentage of the total cost spent on each variable

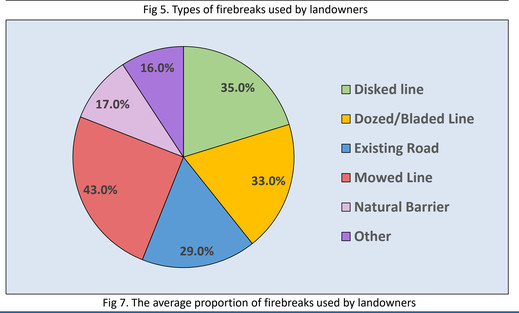

Fig 7. The average proportion of firebreaks used by landowners

Fig 8. Number of acres burned by landowners from 2016-2020

Major findings

- The average cost per acre for prescribed fire in this region was found to be $11.23, a lower average than found in other regions.
- Seven variables were found to have a significant relationship with the average cost of prescribed fire (Fig. 1).
- Firebreaks account for the largest proportion of total costs (Fig. 6).
- Economies of scale play a role in prescribed fire costs.
- Prescribed Burn Association members reported lower costs on average.
- The mean number of burns conducted over the five years was 22 fires; the average number of acres burned in all five years was 5,500.

Acknowledgment

This work was supported by Oklahoma State University and the Lew Wentz Foundation. Faculty sponsor Dr. Joshi received partial support from the U.S. Department of Agriculture Sustainable Agricultural Systems project (SRS 06-505941) and the Mc-Stennis project (OKL03229) to conduct this study.