PRESCRIBED BURNING CONSIDERATIONS IN SAGEBRUSH ANNUAL GRASSLAND COMMUNITIES

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ABSTRACT

Prescribed burning can be an effective tool to manage sagebrush grasslands. However, burning prescriptions for sagebrush grasslands vary depending on the management objectives, species composition of the community, and location. To develop successful fire prescriptions in these communities, consideration must first be given to the management objectives. Second, the past and future management of the area has to be considered to determine if prescribed burning is a viable alternative. Once these have been established, the species composition, fuel load, fuel continuity, and weather are considered. These factors will determine the burning prescription used and follow-up management needed for prescribed burning to be successful in sagebrush-grassland sites with cheatgrass (Bromus tectorum). *Prescribed burning will only decrease cheatgrass in the short run, so it should only be used as a seedbed preparation technique where cheatgrass dominates the understory.*

INTRODUCTION

Prescribed burning has been defined as the judicious use of fire to achieve specific management objectives. However, research has found fire is one of the primary disturbance agents that has allowed cheatgrass (*Bromus tectorum*) to dominate many sagebrush (*Artimesia* spp.)-bunchgrass communities.

Many managers feel prescribed fire has no place in managing sagebrush-grassland communities. The objective of this paper is to discuss considerations that need to be addressed when using prescribed fire in sagebrush-grasslands and general prescriptions that could be used.

MEETING OBJECTIVES

The first step in determining when fire should be used would be to determine the objective for the area. Objectives range from maintaining or improving forage production for wildlife or livestock, to altering the plant community, to helping prepare the seedbed. The next step would be to determine the site characteristics.

Two important site characteristics are species composition of the current plant community and climatic conditions. The species composition should be inventoried to determine the possible plant community that would follow the prescribed burn. Fire acts as a top removal technique that can give the competitive advantage to resprouting species and annuals that have a seed reservoir in the soil (Wright and Bailey 1982). Some strong resprouting shrubs, for example, rabbitbrush (*Chrysothamnus* spp.) can easily dominate sagebrush communities following fire. Perennial herbaceous plants are affected by fire depending on their growth form (cespitose vs. rhizomatous), fuel load adjacent to the meristematic tissue, and phenological growth stage when the fire occurs (Wright and Klemmedson 1965). When precipitation is below 30 cm/yr caution should be used to ensure the desired plant response.

If fire can still meet the management objectives, the next step is to determine the fire prescription that would be most appropriate. General burning prescriptions tend to be very broad to allow flexibility. This flexibility is needed to overcome the variability in fuel loads, fuel moisture, fuel continuity, relative humidity, temperatures, and windspeed. However, experience with fire behavior and local conditions is required to determine when prescribed burning will meet the management objectives.

CHEATGRASS-DOMINATED SITES

Sites with cheatgrass as the dominant understory species generally have good fuel continuity following good precipitation years. The burning prescription can be fairly flexible since this good fuel continuity of cheatgrass will carry the fire. Prescribed burning can reduce cheatgrass the following year if the area is burned at the appropriate time.

Pechanec and Hull (1945) found that burning in the summer would decrease the cheatgrass seedlings the following year (table 1). The likely reason for fire reducing cheatgrass seedlings is that the plants have matured and senesced, but the seeds have not shattered. Since the seeds are still up in the fuelbed, heat from the prescribed burn can destroy the seeds. Heat from grassland fires is generally not of sufficient duration or high enough at groundline to damage seeds. Once the cheatgrass seeds have shattered and are on the ground, fire will have little impact on them.

Reducing cheatgrass densities with fire is only temporary. Observations suggest densities normally return within 2 years, provided weather conditions are favorable. Reseeding would be required to help reduce the density of cheatgrass.

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Table 1—Date of burn and number of cheatgrass plants the following spring (adapted from Pechanec and Hull 1945)

Month of burn	Cheatgrass plants per m^2
June	150
July	120
August	440
October	480
November	1,330

A disadvantage of summer burns is the damage to existing native perennial grasses. These grasses are at a susceptible phenological stage. If numerous desired perennial herbaceous plants are found on the area, early summer burns are not advisable (Wright and Klemmedson 1965). Prescribed burning should be carefully considered to ensure it would meet the desired objectives.

BURNING PRESCRIPTIONS

When considering prescribed burning prescriptions, the fine-fuel load and sagebrush canopy cover have a direct relationship with the prescribed burning success; this has been discussed by Britton and Ralphs (1979). In northern Utah, prescriptions have been developed for both spring and fall burns (table 2). Fall burns are the most common. These fall burns probably are favored because fire is not often used until the sagebrush canopy cover has increased to the point that fine-fuel loads are often below 250 kg/ha, and the sagebrush canopy must carry the fire. This generally requires a higher intensity fire and environmental conditions that occur in the late summer, early fall period. This has led to problems of soil erosion, generally when weather conditions were not favorable for revegetation. Spring burns allow the greatest flexibility to ensure a desired plant response to prescribed burning because the soil moisture is known before the burn is conducted. However, the window of opportunity is greatly reduced.

Table 2—General prescribed burning conditions for sagebrush-dominated rangeland in northern Utah

Condition	Acceptable	Ideal
1-h fuel moisture (pct)	5-12	5-8
Green herbaceous fuel	<5 cm new growth	
Cloud cover (pct)	0-60	<25
Temperature (°C)	10-35	15-32
Relative humidity (pct)	10-35	12-20
Windspeed (m.p.h.)	5-20	8-20

Spring burns have fewer days that meet the prescription and require the burn manager to be more aware of daily environmental conditions and flexible enough to burn when these conditions are appropriate. Because of cooler environmental conditions, spring burns require a better herbaceous fuel load and continuity to meet the burn objectives compared to summer and fall burns.

In northern Utah with spring burns, temperatures rarely get above 21 °C before the green herbaceous fuel dominates the understory. The most success has been found at temperatures between 15 and 18 °C when the relative humidity is less than 20 percent. However, in central Utah there is less effective moisture and lower herbaceous fuel loads for the corresponding canopy cover. This generally requires the temperature to be above 29 °C and the relative humidity to be less than 20 percent.

CONCLUSIONS

Prescribed burning can help alter sagebrush-annual grasslands. However, perennial herbaceous plants are at a susceptible phenological stage during early and mid-summer burns, which are most damaging to annual grasses in the Intermountain West. In most situations where annual grasses dominate the herbaceous understory there are not sufficient perennials available to take advantage of the reduced cheatgrass competition following prescribed burns or wildfires. Additional revegetation methods are required to supply the needed seed source for a perennial herbaceous plant community.

If the site objective is to maintain the perennial herbaceous vegetation, prescribed burning would be most effective if it was used before sagebrush dominates the site and effectively excludes the perennial herbaceous plants. This would reduce the need for reseeding following the burn. If the desire is to maintain the sagebrush, prescribed burning has very limited applicability.

REFERENCES

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