

More days were available for prescribed burning in short-leaf pine between April 1-20 than at any other period from January 1 to April 20, 1994 to 1998. In mixed prairie, more burn days were available in either January or February from January 1 to April 20, 1994 to 1998.

Weather Constraints to Scheduling Prescribed Burns

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Too frequently we hear about prescribed burns that escape control. Planning and successfully executing a prescribed burn requires considerable education and experience, but it sometimes seems that successfully scheduling a prescribed burn requires incredibly good fortune. Erratic weather combined with fire weather forecasts that are not completely dependable complicate scheduling a burn. Fire managers need greater reliability in assessing burning conditions going into the traditional fire season.

Prescribed burning is an economically efficient practice in our rangeland region that can be used to maintain grassland productivity and enhance livestock performance.

Burning is also an essential tool for managing critical habitats for native plants and animals.

We evaluated historical fire weather to determine when burns are more likely to be successful and when to avoid scheduling burns in periods with marginal weather conditions that increase the risk of fire escape. We selected four native ecosystems in Oklahoma and used a 5-year (1994-1998) fire weather data set spanning the customary dormant season burning period of January 1 to April 20.

The weather data were collected from the Oklahoma Mesonet, an environmental monitoring network of 114 weather stations that relays weather observations to a central computer every 15 minutes. We chose four of these stations to reflect the extremes in climatic and vegetation (climate-vegetation types) in Oklahoma. A Mesonet weather station was selected within the semi-arid shortgrass prairie, the semi-arid mixed prairie, the sub humid tallgrass prairie, and the humid short-leaf pine forest. Each Mesonet station records a suite of weather parameters at fifteen-minute intervals, which we used to determine the number of acceptable burn days in each of 4 burning periods (January, February, March, April 1-20). The five years of burning-season data included a wide variety of weather conditions. During the period Oklahoma experienced above and below average annual rainfall coupled with below and above average temperatures. We think the results of our investigation are applicable to conditions encountered in most years.

Determining Acceptable Burn Days

We used prescriptions for burning in Oklahoma native ecosystems as a basis to constrain the weather conditions we considered suitable to accomplish most burning objectives as well as to insure fire containment (Table 1). Using a

Table 1. Conditions suitable for conducting prescribed burns in grasslands and forests in Oklahoma that were used to constrain days selected as acceptable for burning. Conditions are derived from Bidwell and Masters (1993), Wade and Lunsford (1988), and Launchbaugh and Owensby (1978).

Factor	Conditions
Time period	Minimum window of 3 consecutive hours between 0900 and 1700
Temperature (°F)	≥ 35 and ≤ 80
Relative humidity (%)	≥ 25 and ≤ 75
Wind speed (mph)	≥ 5 and ≤15
Precipitation	None

Table 2. The number (average and range over a 4-year period) of unacceptable burning days, the primary weather parameter responsible for limiting burning, and the average number of days in which burning conditions, constrained by wind direction, are acceptable in 4 vegetation types over the period of January 1 through April 20.

		Unacceptable burning days			Acceptable burn days	
Vegetation type	Month	Average	Range	Limiting weather factor	South wind	North wind
Shortgrass prairie	January	14	11-16	High winds	6	8
	February	12	10-14	High winds	4	6
	March	18	16-20	High winds	3	5
	April (1-20)	11	7-17	Low humidity	2	4
Mixed prairie	January	13	5-22	High winds	9	6
	February	11	6-14	High winds	7	7
	March	17	16-19	High winds	7	6
	April (1-20)	11	9-13	High winds	5	4
Tallgrass prairie	January	14	12-16	Low temperature	7	5
	February	9	5-13	High winds	7	7
	March	14	12-17	High winds	7	7
	April (1-20)	10	8-11	High winds	6	5
Pine forest	January	26	21-28	Low winds	4	1
	February	25	23-26	Low winds	4	2
	March	22	16-25	Low winds	8	3
	April (1-20)	14	9-17	Low winds	6	2

computer spreadsheet we enumerated the number of days falling outside the range of suitable conditions. We also determined the most frequent weather condition associated with unsuitable conditions for each of the 4 dormant-season-burning periods. In doing so, we could predict the primary reason burning days were lost for each climate-vegetation type. Because burning a land management unit is often possible only with wind from a specific direction, we also constrained the data for wind direction and determined the number of acceptable burning days associated with either southerly or northerly winds. Some days were excluded for more than one factor (e.g., high winds and low relative humidity).

The Best Burning Period Differs Among Vegetation-Climate Types

Excessive wind speed was the primary weather constraint to prescribed burning in the vegetation-climate types we studied. Burning in March or April, which encompasses the preferred burning period to enhance livestock forage, presented problems for managers of shortgrass and mixed prairies because most days in these two periods experienced high winds (Table 2). Fewer days were outside prescription in January and February in the shortgrass prairie and mixed prairie, but high winds remained the primary weather constraint for these periods. Burning in the tallgrass prairie would be constrained less by weather during the month of February, when as few as 5 days were unacceptable during the 5 years of study. Burning in the pine forest was limited in each period by low wind speed, which is made even more difficult in this mountainous region because of topographic influences on local wind direction. Only in the pine forest did April 1–20 provide more acceptable burning days than the other three periods.

Adding wind direction as a constraint to acceptable burning conditions greatly reduced the number of acceptable days for burning, but the influence was most dramatic in the shortgrass prairie and pine forest. Requiring a south wind in the April 1-20 period resulted in only 2 acceptable burn days in the shortgrass prairie. Requiring a north wind for a January or February burn in the pine forest resulted in only 1 or 2 acceptable burn days, respectively. Managers of public forests consider January and February the most desirable burning periods because earlier dormant-season burns are less likely to disrupt nesting of ground-nesting birds. In the tallgrass prairie, where annual burning is an acceptable practice, constraining wind direction reduced acceptable burn days to no more than 7 for any burning period.

These data indicate that even though burning in a certain period may best meet management objectives, scheduling a burn is often complicated by weather limitations in this same burning period. Also, **managers should consider burning during alternative burning periods especially if the opportunity and relative advantages of burning in the particular year outweigh the relative advantages of burning in a particular burn period.** Finally, the burning period most likely to afford the greatest number of acceptable burn days differs among vegetation-climate type. Generalizations about appropriate dates of prescribed burning windows should account for these differences.

Literature on Fire Prescriptions

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