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# Grasslands: Benefits of management by fire

U.S. Fish and Wildlife Service  
South Dakota Cooperative Fish and Wildlife  
Research Unit  
South Dakota Cooperative Extension Service  
South Dakota State University  
U.S. Department of Agriculture

# Grasslands: Benefits of management by fire

Michael L. Kjellsen and Kenneth F. Higgins  
South Dakota Cooperative Fish and Wildlife Research Unit  
South Dakota State University

When you do it right, burning is one of the cheapest and most effective ways to rejuvenate pasture, rangeland, or wetland.

"Doing it right" is prescribed burning; you know which plants the fire will harm and which it will encourage; and you've timed the burn for the most impact.

(There are many more decisions to be made before doing prescribed burning; this discussion only introduces you to managing grasslands and wetlands with fire and describes some benefits of the practice.)

The abundant and nutritious native grasses and their associated birds, animals, and soils of the Northern Great Plains developed hand in hand with fire. Lightning was responsible for most burns in the past, but prairie fires were also set by Plains Native Americans, mainly to attract game into a particular area. Fire was a natural part of a healthy grassland environment.

Our grasslands are not so healthy today. They have been overgrazed, overtilled, and under-burned.

However, landowners and researchers now know that fire can reclaim or maintain prairie grasslands. Fire can improve wildlife habitat, decrease hazardous fuels by reducing litter accumulation (dead plants), and

decrease undesirable woody shrubs and "invader" plants. At the same time, fire improves the productivity and nutritive quality of forage grasses for livestock.

Prescribed burning can be especially important for maintaining Conservation Reserve Program (CRP) grasslands. Contact your local Agricultural Stabilization and Conservation Service (ASCS) office for prescribed burning guidelines on CRP lands and the U.S. Fish and Wildlife Service before burning wetlands that are under their easements.

## **Timing and effects of prescribed burning**

Whatever the objectives of a prescribed burn, the most important thing is to time the burn correctly.

Timing determines which plants will put on new growth after the burn, how abundant they will be, and their subsequent forage yield. To hit the right time, you first need to know something about the differences in plants.

Plants are either cool- or warm-season, based on their season of growth. Species of cool- and warm-season plants growing together may respond very differently to the same fire.

Cool-season plants are the first to actively grow and use up their

stored food reserves in the spring. Undesirable introduced cool-season grasses such as annual brome grasses and Kentucky bluegrass, which did not evolve under natural fire conditions, may be controlled or reduced by a late May or early June fire. Smooth brome grass (a perennial) may also be reduced by two or three consecutive late spring burns, but it can also be enhanced by an early spring burn.

Warm-season plants are either dormant or have not used up their food reserves in the spring. Therefore, late spring and early summer fires usually help along any warm-season plants that are just beginning to grow.

The key is to burn undesirable plants when they are at the weakest point in their growth stage. This is usually when plants are actively growing and around the time of flowering, when their food reserves are at or near their lowest levels.

Food reserves are stored in the underground parts of cool-season grasses and in both the underground parts and the lowest few inches of the stems of warm-season grasses.

Desirable plants should be just starting to green up (about 1 to 2 inches of new growth) when they are burned. This is generally in the early spring for cool-season plants and late spring or early summer for warm-season grasses. At this stage plants

still have some food reserves and are able to grow quickly after burning.

Actively growing annual plants may be killed by a fire. Perennial grasses will be weakened.

### Native prairie

Burning native prairie will reduce ground litter, suppress or eradicate woody or weedy species, change species composition, and increase forage production. Burning can also increase germination and production of seeds from native prairie plants.

Native prairies in South Dakota are of two general types: tallgrass and mixed-grass (Fig 1). A list of dominant grass species in each native prairie type is in Table 1.

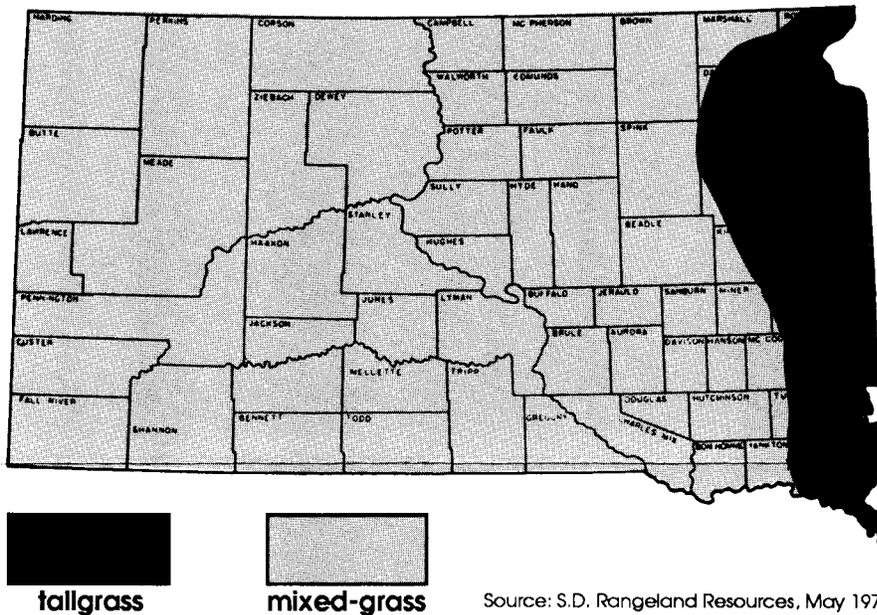
Burns are categorized as reclamation or maintenance burns. Which you choose depends upon the condition of the native prairie prior to burning.

Reclamation of abused or long-rested lands may require two or three fires over a 5-year period. Maintenance of native grasslands in good range condition may require only one fire every 3 years or so, depending on annual precipitation.

Generally, frequent spring burns in a tallgrass prairie can increase the height and the density of warm-season species such as big bluestem, little bluestem, indiangrass, and switchgrass. They should be burned between May 15 and June 15 for best response. In warm springs, burn earlier because the plants begin growth sooner.

Do not burn in a drought year, however. The loss of vegetative cover will magnify drought conditions by exposing bare soil to the sun and possibly increasing wind or water erosion.

Figure 1. Relative locations of tallgrass and mixed-grass prairie in South Dakota.



Because mixed prairie receives less precipitation than tallgrass prairie, results of prescribed burning are less predictable. However, most studies indicate that prescribed burning to enhance mixed-prairie cool-season plants should be done between late March and mid-May or from about August 15 to September 15.

Fall burning a mixed prairie, however, will usually reduce the ground cover which would have trapped snow. Consequently, the spring moisture content of the soil may be lower.

Of the mixed-prairie grasses, yields of sideoats grama are unchanged by spring burns. Blue grama responds better to early spring burns than to fall burns and generally increases with spring burns.

The Stipa species (needle-and-thread, green needlegrass, and porcupine grass) do not respond consistently to spring burns. Response depends on growth stage and soil moisture. These species come back better after spring burning than after fall burning if there is adequate soil moisture.

Western wheatgrass may be maintained with an early spring or fall burn but declines with a late spring burn.

Generally, cool-season plants are more productive after early spring burns than after fall burns. Some cool-season grasses, particularly the Stipa grasses, tend to decline after a sequence of 5 years or more of spring burns in the same area, however.

Buffalograss, a short- and mixed-grass prairie species, declines with late spring burns and remains stable after early spring burns.

Shortgrass prairie should be burned only during moist periods, and then infrequently. Little benefit can be expected unless excessive litter buildup has occurred.

### Tame grasses and legumes (CRP and forage crops)

The majority of tame grasses and legumes are cool-season species (Table 1). They respond best in

growth and vigor to early spring burns soon after snow melt, approximately March 15 to about May 1. In some years you can burn as early as February 15.

Wheatgrasses (tall, intermediate, slender, and pubescent), smooth brome grass, and alfalfa all respond well to early spring burns (March-April).

Burning legumes in spring or early summer after they have reached 4-5 inches of growth may reduce yields or delay harvest. Burning legumes in fall may greatly harm them.

### Wetlands

Many wetlands in the northern prairie region are choked with emergent vegetation, especially during low-water years when muskrat populations are low. Prescribed burning is one way to reduce the accumulation of dead vegetation and to create openings in dense stands of marsh vegetation.

Phragmites (*Phragmites australis*), bulrushes (*Scirpus species*), and cattails (*Typha species*) are the worst offenders, but they can be burned in winter over the ice or in early spring or late fall.

The most effective fire to control or reduce phragmites, cattails, and bulrushes is a slow moving "root" burn in July or August. The soil must be dry 3 to 6 inches below the surface for this type of burn. This type of burn will encourage other more desirable forage plants and will enhance the palatability of all plants for grazing.

The major factors that will affect the success of a wetland burn are (1) water level or moist soil conditions at the time of burning and (2) water level following the burn. If wetland water levels rise enough (6-12 inches) to cover the burned over

**Table 1. Common native and tame grasses and legumes, their annual cycles, and seasonal growth patterns.**

Species	Annual Cycles <sup>a</sup>	Seasonal Growth Patterns
NATIVES:		
big bluestem ( <i>Andropogon gerardii</i> )	PN	warm
little bluestem ( <i>Schizachyrium scoparium</i> )	PN	warm
indiangrass ( <i>Sorghastrum scoparium</i> )	PN	warm
switchgrass ( <i>Panicum virgatum</i> )	PN	warm
sideoats grama ( <i>Bouteloua curtipendula</i> )	PN	warm
porcupine grass ( <i>Stipa spartea</i> )	PN	cool
green needlegrass ( <i>Stipa viridula</i> )	PN	cool
wheatgrass ( <i>Agropyron species</i> )	PN	cool
needle and thread ( <i>Stipa comata</i> )	PN	cool
blue grama ( <i>Bouteloua gracilis</i> )	PN	cool
buffalograss ( <i>Buchloe dactyloides</i> )	PN	warm
TAME:		
smooth brome ( <i>Bromus inermis</i> )	PN	cool
other bromes (cheatgrass) ( <i>Bromus species</i> )	AN	cool
wheatgrasses ( <i>Agropyron species</i> )	PN	cool
Kentucky bluegrass ( <i>Poa pratensis</i> )	PN	cool
alfalfa ( <i>Medicago sativa</i> )	PN	cool-warm <sup>b</sup>
sweetclover ( <i>Melilotus alba</i> )	BI	cool-warm <sup>b</sup>

<sup>a</sup> PN=perennial; AN=annual; BI=biennial

<sup>b</sup> South Dakota, North Dakota and Nebraska range and pasture judging guides refer to these as warm season species; however, they grow continuously from spring through summer.

basin, the burn will have an even longer lasting impact.

Whitetop grass (*Sclochioa festucacea*) and several sedges (*Carex species*) are commonly found in the shallow marsh zones of prairie wetlands. These species are good for duck nesting and brood rearing and for livestock forage. Prescribed burning can increase yield, density, and vigor. Fall

burning is generally best, but spring burning is also effective.

Burning wetlands during fall or spring will have little positive effect on vegetation when wetlands are dry the following spring.

### Planning a prescribed burn

The major objectives of prescribed burning may include increasing

quality and quantity of grasses, improving wildlife habitat, or weed suppression. Planning is especially important when there are multiple objectives, because burning to achieve a specific objective may conflict with another objective.

Pre-burn fuel conditions will significantly affect your plans. An adequate amount and continuous layer of fuel must be present for the fire to move. In some instances you may need to eliminate haying or grazing for a time during the growing season to ensure that enough fuel will be present to carry a fire.

Most burning should be done when the soil profile is filled with water and the mulch is damp. If soil moisture levels are too low, soil erosion may increase because no, or little, duff may be left and plants will not regrow enough to cover and hold the soil.

Sandy soils are vulnerable to wind erosion after a burn because plant density is low and plant cover is temporarily lacking. Loam to clay soils are less prone to erosion.

Slopes steeper than 30% are subject to soil loss from water erosion regardless of soil type, and should not be burned.

### **Livestock forage**

If your objective in burning is to enhance grasslands for grazing, burn the whole pasture unit. Smaller burns within a pasture will attract livestock and be more easily overgrazed than larger burns.

Defer grazing until grasses are capable of withstanding grazing pressure. New growth is more palatable and could be cropped so closely that, ultimately, forage yields and livestock carrying capacity could be less than before the burn.

### **Wildlife cover**

Grasslands and wetlands are frequently hayed or grazed by livestock. These areas also provide food and winter cover for wildlife.

More often than not, proper timing of a prescribed grassland burn will benefit both wildlife and cattle.

The burn should be done in early spring (before April 15) or in the fall. The spring burning will be before ground-nesting birds such as ducks and pheasants begin incubating eggs. Enough cover will regrow in time to provide protection during the following seasons.

Nesting will be over by any burn after July 15. Fall burns will reduce the amount of winter cover for wildlife but will enhance plant growth the following spring.

The closer you get to actually striking that match, the more specific and careful your planning must become. Contact your local county Extension agent or fire control officer for information on how to burn, safety requirements, equipment, personnel requirements, legal obligations, and notification requirements. "Guidelines to Burning," EC 760, and "Effects of Fire in the Northern Great Plains," EC 761, can also be obtained from the Bulletin Room, SDSU, Box 2231, Brookings, SD 57007.

Material for this fact sheet was obtained from EC 760, "Prescribed Burning Guidelines in the Northern Great Plains" and EC 761, "Effects of Fire in the Northern Great Plains," U.S. Fish and Wildlife Service and Cooperative Extension Service, South Dakota State University, U.S. Department of Agriculture.

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