



# Monitoring Fire Effects in Grasslands on National Park Units

## of the Northern Great Plains

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### Introduction

Prescribed fire is commonly used as a resource management tool at National Park units across the western United States. Since 1997, the National Park Service Fire Ecology program has monitored cover of plant species in 117 permanent plots in 8 National Park units. Twenty seven of these plots in 9 prescribed fire units have burned and been measured at preburn, one year, two years, and five years following treatment. These 27 plots are located in 5 National Park Units within the Northern Great Plains: Badlands National Park, South Dakota; Devils Tower National Monument, Wyoming; Knife River National Historic Site, North Dakota; Scotts Bluff National Monument, Nebraska; and Wind Cave National Park, South Dakota.

### Location of Park Units



### Methods

Monitoring plots are distributed using a stratified random approach. A GIS application is used to generate random points within known vegetation types. Plots are located based on predefined written criteria (dominant vegetation, slope, burn unit, etc.) and the plot orientation is based on a random azimuth.

All plant species within the 30m x 10 m plot are recorded.

Plots are photographed from either end of a 30 meter transect at each plot visit. Point intercept data is collected at 100 points (every 30 cm) along the transect using a 0.5 cm diameter range pole. Height is recorded for the tallest species, each subsequent species is recorded but no height is collected. Subsequent intercepts of the same species are not recorded at a point.



Nine monitoring plots occur in grasslands dominated by needle-and-thread grass (*Hesperostipa comata*) and threadleaf sedge (*Carex filifolia*) at Scotts Bluff National Monument and Knife River National Historic Site. Though geographically distant, these parks share similar upland plant species composition.

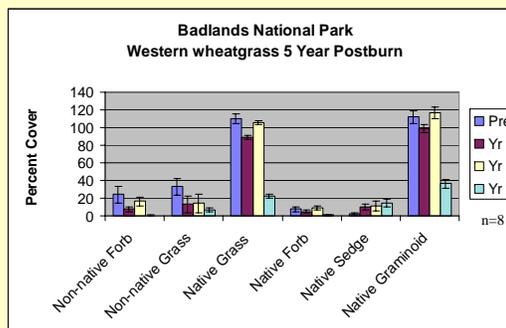
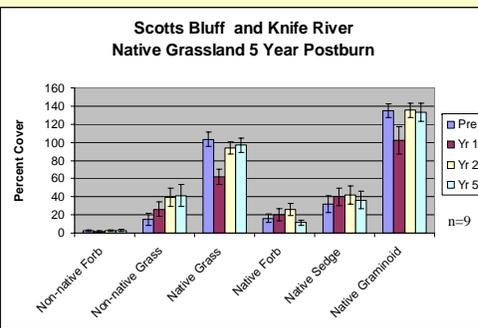
The prescribed fires had stated management objectives of reducing cover of non-native grass and increasing cover of native grass and forbs.

The first 2 years of sampling showed increases in native forbs. By year 5, native forbs returned to levels similar to preburn values.

Predominantly perennial native grasses showed a decline at 1 year postburn but little change at 5 years postburn.

The non-native grasses show an increase in all postfire measurements. Non-native grasses in these areas are predominantly annual Bromegrass, *Bromus japonicus* and *B. tectorum*. Both of these early seral species were present in plots preceding fire.

### Native Mixed Grass Prairie

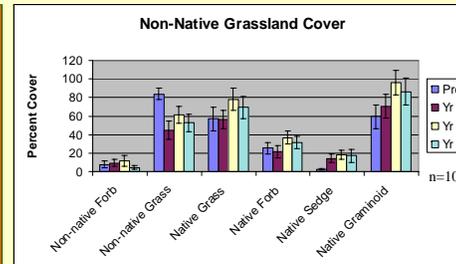


### Non-native Mixed Grass Prairie



Grasslands dominated by non-native cool-season grasses occur in all Park units of the Northern Great Plains. Prescribed fires at Badlands, Devils Tower, Theodore Roosevelt, and Wind Cave occurred early in the growing season (late-April to early-May). The stated objectives of these burns were to reduce cover of cool-season grass and increase cover of native grass and forbs. Sample size is 10, with 2 or 3 plots installed within four prescribed fire areas. Species were grouped by guild and nativity for analysis.

As cover of non-native grass decreased, several native species increased. The greatest increase in cover was seen in the sedges, (*Carex spp.*). Other increasing species included the grama grasses (*Bouteloua spp.*) western wheatgrass (*Pascopyrum smithii*), and big and little bluestem (*Andropogon gerardii* and *Schizachyrium scoparium*). As a guild native forbs also showed an increasing trend at 5 years postburn.



Eight monitoring plots at Badlands National Park in western wheatgrass, (*Pascopyrum smithii*) burned in 2 prescribed fires. Cover of native graminoid and forb species remained relatively unchanged for the first 2 years following fire. Non-native grasses (primarily *Bromus tectorum* and *B. japonicus*) declined over the same time period.

These 8 monitoring plots were measured in 2004 at 5 years postburn during a severe drought. As a result, percent cover at year 5 is substantially lower than other plot measurements. Though there were no true control plots in this monitoring protocol, other unburned plots measured that same year exhibited similarly low graminoid and herbaceous cover.

### Conclusion

National Park Service personnel in Resource Management and Fire Management use this data to assess the effect of management actions on grassland species. Following prescribed fire in non-native grasslands, monitoring plots consistently showed declines in non-native cool-season grass and increases in native sedge and grass species. In predominantly native grasslands, native perennial grasses as a group are mostly unchanged at five years following fire. Fire effects monitoring in grasslands has led to the creation of a database tracking changes in vegetative cover at 5 years beyond treatment with prescribed fire. Monitoring will continue for these plots at 10 and 20 years following fire or resume with subsequent fire occurrence. The plots represented in this poster are a part of a large dataset covering 10 National Park Units. This dataset will continue to grow as more monitoring plots burn in prescribed fires.

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