



Ten Years of Monitoring Fire Effects in National Parks of the Northern Great Plains



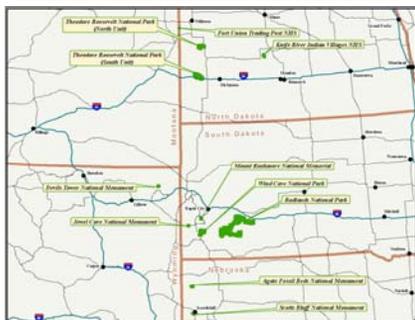
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Introduction

The Northern Great Plains (NGP) Fire Ecology program was established in 1996 and has since grown to a network of 287 plots in 10 NPS units. These plots are established in forest stands (ponderosa pine, *Pinus ponderosa*; plains cottonwood, *Populus deltoides*; green ash, *Fraxinus pennsylvanica*; Rocky Mountain juniper, *Juniperus scopulorum*), shrublands (silver sagebrush, *Artemisia cana*; wild plum, *Prunus americana*; western snowberry, *Symphoricarpos occidentalis*), and grasslands (native mixed-grass prairie, non-native grasslands).

The majority of our monitoring protocols follow those set in the NPS Fire Monitoring Handbook (2001), although we have used alternative protocols to answer some park-specific questions. The NPS standard monitoring protocols include measuring understory vegetation cover along a transect using a point intercept method, density of trees and shrubs in belt transects, diameter at breast height (DBH) of trees in belt transects, and downed fuels along fuel inventory transects. Alternative protocols used include measuring understory vegetation canopy cover with Daubenmire frames, understory species frequency in nested frames, and assessing landscape level changes with long-term photo monitoring points.

Park Units of the Northern Great Plains



Monitoring Plot Network

287 Monitoring plots and photo points in 10 parks

- 23 - Agate Fossil Beds National Monument
- 57 - Badlands National Park
- 24 - Devils Tower National Monument
- 5 - Fort Union Trading Post National Historic Site
- 6 - Jewel Cave National Monument
- 22 - Knife River Indian Villages National Historic Site
- 27 - Mount Rushmore National Memorial
- 21 - Scotts Bluff National Monument
- 44 - Theodore Roosevelt National Park
- 58 - Wind Cave National Park

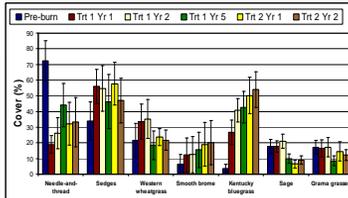
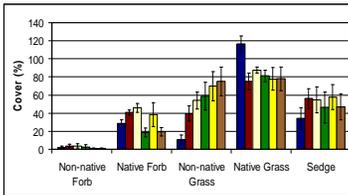
Results

The following section contains examples of the types of analyses that result from our monitoring efforts. Our new database software, Fire Ecology Assessment Tool (FEAT), provides us with the flexibility to complete analyses with data from a wide range of spatial scales as well as a combination of vegetation types.

Prescribed Fire Unit Analysis



Big Hidatsa Prescribed Fire Unit, Knife River Indian Villages NHS.



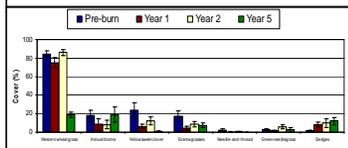
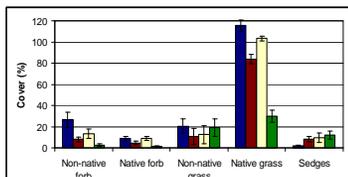
Four grassland monitoring plots were installed in the Big Hidatsa prescribed fire unit in July 1999. The unit was burned in September 1999 and again in April 2005. The objective of the first burn was to reduce cover of non-native herbaceous species by at least 25% one year post-burn. This objective was not met since there was a 233% increase in non-native cover one year post-burn.

The objectives of the second burn were to increase cover of native species by 20% two years post-burn and reduce cover of non-native grasses by 20% two years post-burn. Neither of these objectives were met on the second prescribed fire either. Cover of native species decreased by 2% while non-native grasses increased by 28%. This result was a little perplexing because most of the increase of non-native grass was Kentucky bluegrass and we have documented decreases in Kentucky bluegrass following fire in similar situations at other parks. We cannot explain why the response was different at Knife River.

Monitoring Unit Analysis

Western wheatgrass prairie, Badlands National Park.

10 monitoring plots in the western wheatgrass prairie monitoring unit have reached 5 years post-burn status. The objectives were to reduce cover of non-native grasses by at least 20%, increase cover of native grasses by at least 10%, and increase cover of native forbs by at least 30% by two years post-burn. In this case, we observed mixed results. Non-native grasses were down almost 40% at year two, while native forbs increased very slightly and native grasses were reduced 11% at year two. The response in sedges and the dramatic decrease in vegetation cover at year five were two notable observations. Increases in sedge cover following prescribed fire has been a response that has been fairly consistent across parks. The year five visit on 8 of the 10 plots occurred during the summer of 2004, which was an extremely dry year. This turned out to have a very large impact on vegetation cover.

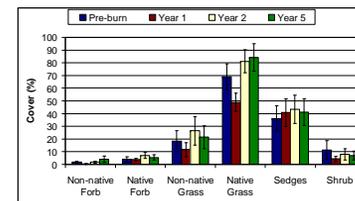


Park Unit Analysis

Scotts Bluff National Monument



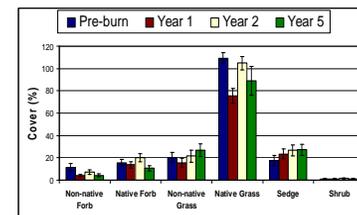
This analysis includes 10 monitoring plots from 3 native vegetation types (Rocky Mountain juniper woodland, snowberry shrubland, and needlegrass prairie). In the past, we were not able to easily complete this type of analysis, so no objectives were written at this spatial level. Nonetheless, the response appears to be favorable with little change in non-native cover while native grasses and sedges appear to be trending upward.



Multi-park Analysis

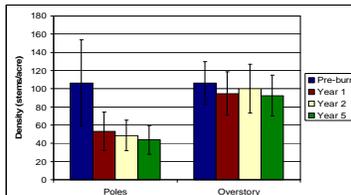
Native prairie, Badlands NP, Knife River Indian Villages NHS, Scotts Bluff NP, Theodore Roosevelt NP, Wind Cave NP

We have only recently begun to complete analyses combining data from multiple parks. This is another advantage of the FEAT database and we are excited about the possibilities. In our plot network, 26 native grassland plots have been written for this spatial level. It is interesting to see the upward trend in the sedge community. The decrease in cover of native grasses at year five may be drought related, since many of the plots were visited the past two years which have been dry years. The increasing trend of non-native grasses will be examined further.

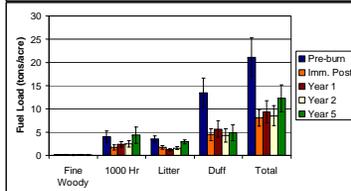


Monitoring Unit Analysis

Ponderosa pine forest, Devils Tower National Monument



Seven plots in three prescribed fire units are represented in this analysis. Objectives relating to trees and fuels for this monitoring unit were to limit overstory tree mortality to less than 30% two years post-burn, reduce pole-sized trees 30-75%, and reduce dead and down fuels 30-50% immediate post-burn. All of these objectives were met as fuels were reduced 62% immediate post-burn, poles were reduced by more than 50%, and overstory tree mortality was approximately 6%. It appears that we have had more success meeting objectives with prescribed fire in ponderosa pine forests than in any other vegetation type.



Acknowledgements

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