MODIFYING NATIONAL PARK SERVICE FIRE EFFECTS SAMPLING PROTOCOLS TO MEET THE NEEDS OF THE FIRE ECOLOGY, INVENTORY AND MONITORING, AND EXOTIC PLANT MANAGEMENT PROGRAMS

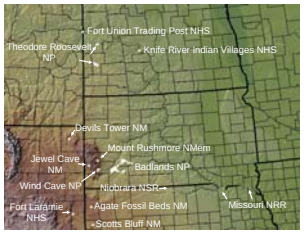
Cody L. Wienk, Amy J. Symstad, Andy Thorstenson, Dan Licht, Chad W. Prosser

Introduction

In 1997 the Northern Great Plains Fire Effects team began monitoring the effects of prescribed fire activities on vegetation in ten National Park Service units as part of the NPS' national Fire Effects program. In 1999, as a result of the Natural Resource Challenge federal legislation, the National Park Service established two new national programs interested in monitoring vegetation. The Exotic Plant Management Program is organized into regional teams (EPMTs) that map the extent of and treat invasive plant species, while the Inventory and Monitoring Program is organized into Networks charged with tracking the ecosystem health of NPS units by monitoring indicative "Vital Signs". In the northern Great Plains, the geographic overlap and mutual interests of these three programs has lead to a cooperative effort to design a vegetation monitoring protocol that will meet the needs of all three programs in ways that the individual programs' monitoring alone could not.

During summer 2005, the Northern Great Plains Fire Ecology and Inventory & Monitoring programs worked in cooperation with Dr. Amy Symstad, a research ecologist with the USGS Northern Prairie Wildlife Research Center, to initiate a pilot project to assess vegetation sampling protocols. Specifically, the pilot study was designed to compare the efficiency and efficacy of two methods of measuring plant community composition in the major vegetation types that will be monitored in the Northern Great Plains.

Northern Great Plains Network



Protocol Selection

The first task was to select monitoring protocols to use in the pilot project. There were several different factors that influenced our decision of which sampling protocols to use. First, we wanted a method with high repeatability among observers. In addition, the method must be efficient enough that a useful amount of data can be collected in a reasonable time, allowing for adequate sample sizes. Finally, because the data provided by this monitoring will be used by park staff to make resource management decisions, the data must be relevant to those decisions and relatively easy to comprehend. Using these guidelines, we evaluated the advantages and disadvantages of the four main ways of measuring the abundance of all species within a plant community. This evaluation was influenced by a desire to have the resulting methodology compatible with other long-term vegetation monitoring programs.

The four main methods of measuring the abundance of all species in a plant community are clipping and sorting biomass, counting stems, estimating cover, and calculating frequency of occurrence. Biomass and stem counts were eliminated from consideration for logistical reasons. We eliminated frequency as a measure of plant abundance because it is very difficult to interpret for management purposes. We selected cover measurements for estimating plant abundance, and there are many different ways to do this. The three primary methods are line-intercept, point-intercept, and ocular estimates. The line-intercept method is not useful for diffuse species, such as rhizomatous grasses. Because these species are often dominant in the vegetation that will be monitored for this program, we did not consider using this method. That left ocular cover estimates and point-intercepts, both of which have significant advantages and disadvantages.

How do I measure plant community composition?
Let me count the ways…

Measure	Pros	Cons
Stem Density	Tracks demographics	Very time-consuming
Frequency	Relatively fast, repeatable	Difficult to interpret, overemphasizes small species
Biomass	Reflects size and abundance	Logistical nightmare
Cover	Relatively fast, reflects size and abundance	Subject to observer error

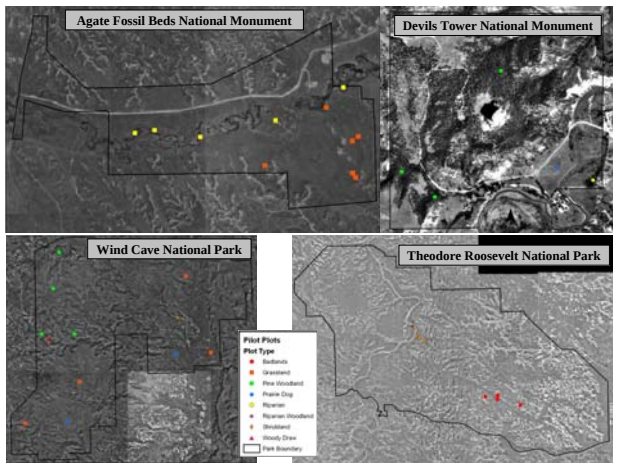
Objectives of Pilot Project

1. Compare the repeatability among observers of ocular and point-intercept cover estimates.
2. Compare the efficiency of ocular and point-intercept cover estimates.
3. Determine the number of subsamples (quadrats or points) necessary to adequately measure a small number of important plant community parameters at a site (e.g., native species cover, exotic species cover, and native species richness).

Selecting Plot Locations

Data was collected for this study at five NPS units in the Network: Agate Fossil Beds National Monument (AGFO) in northwestern Nebraska, Wind Cave National Park (WICA) in southwestern South Dakota, Devils Tower National Monument (DETO) in northeastern Wyoming, Theodore Roosevelt National Park (THRO) in west-central North Dakota, and Fort Laramie National Historic Site (FOLA) in southeastern Wyoming.

For all sample locations, except grassland plots at AGFO, we used GIS to randomly select points within vegetation types of interest. We used existing plot locations for grassland plots at AGFO. Points were not considered if they met any of the following criteria: 1) > 35% slope (based on digital elevation models) for safety reasons, 2) < 100 m from a developed area, road, or park boundary, or 3) < 20 m from a developed trail. At THRO, two areas in the south unit of the park were chosen for potential plots to minimize the amount of travel time required to locate plots. Plot locations were randomly selected by vegetation type within the two areas.

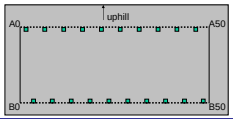


Sampling Methods

Each plot measures 20 X 50 meters, consists of two parallel 50-m transects, and was established with transects parallel to the contour of the slope. A list of all species within the plot was created at each plot. Ocular cover was estimated to the nearest percent in 10 0.5-m^2 frames on each transect. Cover was also estimated using the point-intercept method at 100 points along each transect. Time to collect data using each method was recorded.

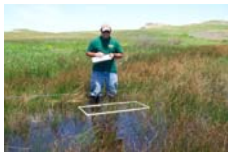
Twelve plots were double-sampled to compare the repeatability of measurements between observers for the two cover estimate methods. When a plot was designated for double sampling, the first team to sample the plot left the plot-marking rebar in place, but removed all tapes. A second team would then relocate and sample the plot. If any member of the first team was on the second team, care was taken to ensure that those members did not sample the same transect both times. The team did not discuss the plot with the other team prior to the second team's finishing their sampling of that plot.

Plot Design



Point-intercept along transects
100 points per transect, 0.5-cm diameter "point"

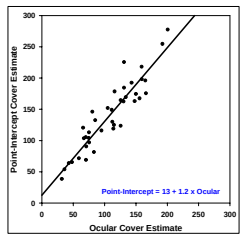
Ocular cover estimates in 1-m x 0.5-m frames
10 frames per transect, Cover to the nearest 1%

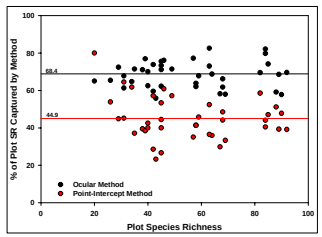


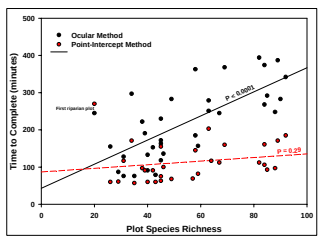
Number of Plots Sampled

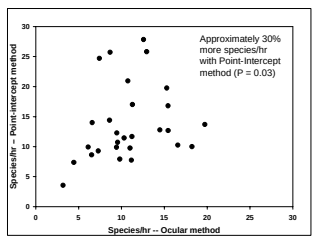
Vegetation Type	AGFO	DETO	FOLA	THRO	WICA	Total
Riparian herbaceous wetland	5 (2)					5 (2)
Grassland	6 (2)		6 (0)		4 (0)	16 (2)
Prairie dog town		1 (0)			2 (1)	3 (1)
Ponderosa pine woodland		3 (1)			4 (2)	7 (3)
Shrubland				4 (1)	1 (1)	5 (2)
Woody draw					1 (0)	1 (0)
Riparian forest		1 (1)	2 (0)	1 (0)		4 (1)
Badlands sparse vegetation				5 (1)		5 (1)
Total	11 (4)	5 (2)	8 (0)	10 (2)	12 (4)	46 (12)

Results









Lessons Learned

- **Accomplished approximately 2/3 of what we thought we would.**
- **Working with a crew of 10 people requires very specific logistical planning.**
- **It takes a while to get to sites, even in "moderately sized" parks. Therefore, it's very important to have scouts set up plots before reading.**
- **Herbaceous wetland sampled too early.**
- **Woody draws are icky to sample.**
- **Be meticulous about follow-up on unknown species soon after field collection.**
- **Lack of repeatability possibly due to "tape creep". Therefore more markers along transects may have helped.**

Acknowledgements

We would like to thank Tyler Schmitt, Katie Johnson, Martha Jakobek, Bob Kobza, Phil Graeve, Laura Divine, and Mike Bynum for all their hard work in the field.