

Northern Great Plains Area Parks FIRE EFFECTS MONITORING PROGRAM - 2002 ANNUAL REPORT

INTRODUCTION

The Northern Great Plains Fire Monitoring Team had another busy year visiting 10 parks, measuring 108 plots, and monitoring 11 prescribed fires. Approximately 14 weeks of the season were spent on vegetation plot installation and re-sampling. The following tables will give a more complete picture of the network of fire effects plots installed, burned, and measured.

The burn program in many of our parks has dramatically increased due to concentrated efforts on the part of Fire Management and Resource Management staff members across the Northern Great Plains. Between April and November, the crew monitored 11 prescribed fires in 7 parks. Three prescribed fires did not have monitors. A total of 23 plots were burned in 14 burn units. This brings the number of plots that have burned to 86, meaning that over half of the 152 installed plots have been burned.

PLOT NETWORK INFORMATION

In the 2002 field season, we installed 22 plots in 5 monitoring types in 5 parks. Two new monitoring types were described this year in addition to the 35 monitoring types that had been previously described. The Northern Great Plains Group currently has 152 plots installed in 37 different monitoring types across the 10 participating parks.

Note: The following tables illustrate permanent plot installations. The exception is Table 2A, which illustrates non-standard sampling plots.

TABLE 1. Permanent plot installation by plot type (Grass, Brush, or Forest)

Park	Number of Plots Installed Previous Years				Number of Plots Installed 2002				Total Number Plots Installed			
	G	B	F	Total	G	B	F	Total	G	B	F	Total
AGFO	7	-	-	7	8	-	-	8	15	-	-	15
BADL	22	4	1	27	2	-	-	2	24	4	1	29
DETO	5	-	13	18	-	-	-	0	5	-	13	18
FOUS	2	-	1	3	-	-	-	0	2	-	1	3
JECA	-	-	3	3	-	-	2	2	-	-	5	5
KNRI	6	-	5	11	9	-	-	9	15	-	5	20
MORU	-	-	2	2	-	-	-	0	-	-	2	2
SCBL	12	3	2	17	-	-	-	0	12	3	2	17
THRO	10	8	4	22	-	-	-	0	10	8	4	22
WICA	15	-	5	20	-	-	1	1	15	-	6	21
Totals	79	15	36	130	19	0	3	22	98	15	39	152

Plot Installation and Measurement 2002

2002 plot visits were up 30% compared to 2001. We made 108 total visits this year versus 83 in 2001. Plots were installed or measured in 10 Parks.

- One-year postburn rereads constituted nearly one-third (35 of 108) of the measurements due to the large number of prescribed fires in the fall of 2001 and spring of 2002.
- Twenty two plots were installed this year compared with 15 installed in 2001.
- The few 2 Year postburn reads resulted from the Park Service burn ban between May 2000 and May 2001.
- The 22 Immediate postburn reads resulted from 8 burns conducted in 2002.
- We conducted our first 5-year postburn reads this year.

TABLE 2. Permanent Plot Measurements

Park	Number of Plot Visits 2002						Total
	Remeasurement	Installs	Immediate Post	1-Year	2-year	5-Year	
AGFO	6	8	0	0	0	0	14
BADL	11	2	6	7	0	0	26
DETO	0	0	1	8	2	0	11
FOUS	0	0	0	0	2	0	2
JECA	0	2	0	0	3	0	5
KNRI	0	9	2	3	0	2	16
MORU	0	0	0	0	0	0	0
SCBL	0	0	5	5	0	0	10
THRO	0	0	5	7	0	0	12
WICA	2	1	3	5	1	0	12
Totals	19	22	22	35	8	2	108

Plot Remeasurement - If plots are not burned within 2 years, enough vegetation changes will occur to justify remeasuring these plots. For example, plots installed in 1999 were reread in 2001 if they are in units scheduled to burn.

Installations - New plots added to the plot network.

Immediate Postburn - Fire severity, fuel consumption, and tree scorch and char are measured. Grass plots are typically measured 1 or 2 days after a burn; forest plots are measured 2 to 4 weeks after the burn.

1-Year Postburn - For grass plots, the 1-Year Postburn happens the first growing season after a burn (i.e. summer 2002 for a fall 2001 or a spring 2002 burn). In forest plots, the 1-Year Postburn happens in the calendar year following the burn.

2-Year Postburn - Occurs the calendar year after the 1-Year.

Non-FMH plots Measurements

We have developed alternative protocols to answer concerns in our parks that fall outside the realm of standard sampling. Those included in this type of sampling are the Composite Burn Index (CBI) severity sampling, rapid assessment tree plots installed at Mount Rushmore, and tree mortality plots at Devils Tower. We will continue to develop and use alternative monitoring where it will address fire effects concerns.

TABLE 2A. Non-FMH Plot Measurements

Non-FMH Plot Visits 2002						
Park	Remeas- urement	Installs	Immediate Post	1-Year	2-year	Total
BADL	0	54	0	0	0	54
DETO	0	0	0	0	0	0
JECA	0	74	0	0	0	74
MORU	0	20	0	0	0	20
WICA	0	11	0	0	0	11
Totals	0	159	0	0	0	159

Plot Installation and Measurement 2003

Fire Management has scheduled 12 prescribed fires in 7 parks for 2003. These 12 units currently contain 29 Fire Monitoring Handbook (FMH) plots with the anticipation of installing more plots for units scheduled for fall 2003 and spring 2004. Burn plans and schedules are still tentative for most of our park group so numbers and types of plots for 2003 burns are estimates based on the best available information to date.

- Two-year postburn measurements will be a significant part of our workload.
- Plots that have not burned within 2 years of establishment will be remeasured next year.
- We expect to install plots in the upcoming field season for Fall 2003 and Spring 2004 burns.
- Immediate postburn rereads will be numerous in 2003 given the current burn schedule.
- One-year postburn plots will be numerous in 2003. We conducted 9 immediate postburn reads in the fall of 2002 and expect 30 plots to burn in the spring of 2003, thus anticipate 39 one-year reads for 2003.
- We will measure 26 5-year postburn plots.

TABLE 3. 2002 Estimated Plot Measurements

Park	Expected Number of Plot Visits 2003						
	Remeasurement	Installs	Immediate Post	1-Year	2-year	5-year	Total
AGFO	0	0	13	13	0	0	26
BADL	0	4	3	6	7	0	20
DETO	0	0	5	0	8	12	25
FOUS	0	2	0	0	0	0	2
JECA	0	1	0	0	0	0	1
KNRI	0	0	9	11	3	0	23
MORU	0	0	0	0	0	0	0
SCBL	0	0	2	2	5	10	19
THRO	0	4	7	4	7	2	24
WICA	0	8	8	3	5	2	26
Totals	0	19	47	39	35	26	166

Expected Non-FMH plot work 2002

In 2002 we will continue monitoring smooth brome at Badlands associated with the multi-year Roadside project. We have 10 tree mortality plots at Devils Tower that will be read and the rebar removed. Mount Rushmore is scheduled for mechanical thinning in the Lafferty Gulch area. If this project is completed we may return to sample tree density and fuel loading post-treatment. We expect to have significantly less CBI severity work.

We also expect to continue long-term photo-monitoring by retaking existing photos and establishing new photopoints for scheduled prescribed fire projects.

TABLE 4. Three-year projected number of plot re-measurements by year

Type of Read	Number of Plots		
	2003	2004	2005
Remeasure	0	?	?
Immediate	47	?	?
1 Year	39	18	?
2 Year	28	39	18
5 Year	26	27	21

Prescribed Fires in the Northern Great Plains

In 2002, fourteen prescribed fire units and 23 FMH plots were burned in 7 parks (Table 6).

- Badlands conducted 3 prescribed fires this year. The Roadside project continued for the 3rd consecutive spring as a method to reduce smooth brome grass, the Pinnacles unit also burned in the spring designed to reduce non-native cool season grass, the Dillon unit burned in November to maintain native prairie.
- Devils Tower continued the Meadow project following a prescription to treat all areas of the unit twice.
- Fort Union continued their restoration project with a spring burn in reseeded areas and a 9-acre fall fire to maintain riparian grassland.
- Knife River conducted the Peninsula project in spring to reduce smooth brome in the riparian forest area and completed a second treatment of the North Prairie area to maintain native grassland.
- Scotts Bluff burned the Scott Spring unit as part of a grassland restoration project.
- Theodore Roosevelt finished the Northwest corner unit and conducted the Little Missouri burn in the spring. The two fall fires were the Skyline Vista unit and a portion of I-94.
- Wind Cave conducted the Highland Creek fire with a portion completed in the spring and completion in the fall.

TABLE 6. Number of plots that have burned.

Park	Total Plots Burned 2002				Total Plots Burned to Date			
	G	B	F	Total	G	B	F	Total
AGFO	-	-	-	0	-	-	-	0
BADL	6	-	-	6	16*	4	-	20
DETO	1	-	-	1	3**	-	7	10
FOUS	1	-	-	1	2*	-	-	2
JECA	-	-	-	0	-	-	3***	3
KNRI	2	-	-	2	6*	-	3	9
MORU	-	-	-	0	-	-	-	0
SCBL	4	1	-	5	11	2	2	15
THRO	1	2	2	5	7	5	2	14
WICA	2	-	1	3	10	-	3	13
Totals	17	3	3	23	55	11	20	86

* Badlands, Fort Union and Knife River each have 1 grass plot that has burned twice

** Devils Tower has 3 grass plots that have burned twice

*** Jewel Cave has 3 forest plots that have burned twice

TABLE 6A. Number of plots that have been treated mechanically

Total Plots Treated 2002					Total Plots Treated to Date			
Park	G	B	F	Total	G	B	F	Total
DETO	0	0	0	0	0	0	5	5

Fire Monitoring Plots in Postburn Status

The first Fire Monitoring plot was burned at Knife River in the fall of 1997. Since that time, the prescribed burning program has burned an additional 85 plots in eight Parks. Table 7 lists the total number of reads that have been done in each category. Keep in mind that some plots have burned more than once and that a few plots did not have an immediate postburn read due to time or weather limitations.

TABLE 7. Postburn plot summary

	Immediate Post				1 Year Post				2 Year Post				5 Year Post			
	G	B	F	Total	G	B	F	Total	G	B	F	Total	G	B	F	Total
AGFO	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0
BADL	17*	2	-	19	14	4	-	18	9	2	-	11	-	-	-	0
DETO	6**	-	7	13	6	-	12	18	3	-	5	8	-	-	-	0
FOUS	-	-	-	0	4	-	-	4	4	-	-	4	-	-	-	0
JECA	-	-	6***	6	-	-	6	6	-	-	4	4	-	-	-	0
KNRI	8*	-	3	11	6	-	3	9	6	-	-	6	2	-	-	2
MORU	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0
SCBL	11	2	2	15	11	1	2	14	7	-	2	9	-	-	-	0
THRO	5	5	2	12	6	5	2	13	3	3	-	6	-	-	-	0
WICA	10	-	3	13	8	-	2	10	4	-	1	5	-	-	-	0
Total	57	9	23	89	55	10	27	92	36	5	12	53	2	0	0	2

* Badlands and Knife River each have 1 grass plot that has burned twice

** Devils Tower has had 3 grass plots that have burned twice

*** Jewel Cave has 3 forest plots that have burned twice

Plots by Monitoring Type

The *Monitoring Type* is the baseline definition of the vegetation that we use to monitor fire effects on that vegetation community. Each park has specific vegetation types and specific management objectives that need to be addressed. After adding 2 Monitoring Types in 2001, we wrote two new monitoring types in 2002. We have a total of 37 types described in the Northern Great Plains (see Table 8).

To determine statistical validity of our fire effects information, we make a calculation known as a *Minimum Plot Calculation*. As a general rule, it requires at least 6 plots in each monitoring type to begin to develop realistic estimates of how many plots will be needed to reach valid conclusions. After the 2002 field season, 10 Monitoring Types had at least 6 plots installed in the type. For most monitoring types, we will not reach minimum plot numbers for several years.

The large number of monitoring types is cumbersome and increases the amount of time required to draw statistically valid conclusions. Unique monitoring types have been written for each park, even though some monitoring types are very similar between parks. The Northern Great Plains fire ecologist will examine the possibility of combining similar monitoring types. If it is determined that some of these types can be merged with no loss of data validity, we will group these plots.

TABLE 8. Number of plots installed by monitoring type 2002.

Park	Monitoring Type Code	Monitoring Type Name	2002 Installs	Total Plots
AGFO	GNMGP1D01	Native Mixed Grass Prairie	1	8
AGFO	GBRTE1D01	Downy Brome	7	7
BADL	GAGSM1D01	Western Wheatgrass	2	21
BADL	GBRJA1D01	Japanese Brome	-	1
BADL	GPOPR1D01	Kentucky Bluegrass	-	3
BADL	BSAVE1D04	Greasewood Community	-	2
BADL	BPRAM1D05	Woody Draw	-	2
BADL	FFRPE1D02	Woody Draw	-	1
DETO	GPOPR1D01	Kentucky Bluegrass	-	5
DETO	FPIPO1D02	Ponderosa Model 2	-	8
DETO	FPIPO1D09	Ponderosa Model 9	-	4
FOUS	GAGCR1D01	Crested Wheatgrass	-	1
FOUS	GSTVI1D01	Green Needle Grass	-	1
FOUS	FPODE1D02	Riparian Forest	-	1
JECA	FPIPO1D02	Ponderosa Model 2	-	2
JECA	FPIPO1D09	Ponderosa Model 9	2	3
KNRI	GSTCO1D01	Needle and Thread Grass	-	6
KNRI	GBRIN1D01	Smooth Brome	9	9
KNRI	FFRPE1D02	Green Ash Woodland	-	5
MORU	FPIPO1D02	Ponderosa Model 2	-	1
MORU	FPIPO1D09	Ponderosa Model 9	-	1
SCBL	GBOCU1D01	Sideoats Grama Restoration	-	2
SCBL	GSTCO1D01	Needle and Thread Grass	-	8
SCBL	BSYOC1D04	Snowberry	-	3
SCBL	FJUSC1D02	Juniper Draws and Slopes	-	2
SCBL	GBROM1D01	Brome	-	2
THRO	GSTVI1D01	Green Needle Grass	-	6
THRO	GAGCR1D01	Crested Wheatgrass	-	4
THRO	BARCA1D02	Sagebrush community	-	7
THRO	BSYOC1D04	Snowberry	-	1
THRO	FPODE1D09	Cottonwood Forest	-	3
THRO	FFRPE1D02	Green Ash Forest	-	1
WICA	GAGSM1D01	Western Wheatgrass	-	4
WICA	GANSC1D01	Little Bluestem Grassland	-	7
WICA	FPIPO1D02	Ponderosa Model 2	1	4
WICA	FPIPO1D09	Ponderosa Model 9	-	2
WICA	GPOPR1D01	Kentucky Bluegrass	-	4
		Total Plots	22	152

DATA ANALYSIS

The increased number of plots in postburn status allows analysis of more information. Two-year postburn information is available in the following Monitoring Types:

Badlands	Western wheatgrass
	Kentucky Bluegrass
Devils Tower	Ponderosa pine fuel model 2
	Kentucky Bluegrass
Fort Union	Native prairie
Knife River	Needle and thread grassland
Scotts Bluff	Needle and thread grassland
	Juniper draws
Theodore Roosevelt	Silver Sagebrush
	Snowberry
	Needle and thread grassland
Wind Cave	Kentucky Bluegrass
	Western wheatgrass
	Ponderosa pine fuel model 2

All parks received a data summary synopsis and presentation of fire effects results during an annual fire management meeting.

Variables analyzed in the grass types include percent cover of herbaceous species, relative cover of native versus non-native grass or forbs, and shrub density. Analysis in the forest types includes the above analysis as well as density of trees by size class and fuel loading.

PROGRAM INFORMATION

Staff Participants

We had no changes in the Northern Great Plains staff. The continuity of personnel has had an extremely positive impact on the quality and quantity of work that we were able to accomplish. All 4 seasonal staff members earned a National Park Service On-the-Spot Award for their outstanding performance.

TABLE 9. Number of pay periods in 2002 devoted to fire effects and wildfire.

Monitor	Starting Date	Ending Date	Fire Effects Pay Periods	Wildfire Pay Periods
Cody Wienk	Jan 1 st , 2002	Dec. 31 st , 2002	25	1
Andy Thorstenson	April 8 th , 2002	Dec 31 st 2002	21	1
Kevin Rehman	March 24 th , 2002	Dec 13 th , 2002	17	1
Julie Query	May 20 th , 2002	Aug 8 th , 2002	9.5	1
Martha Jakobek	May 13 th , 2002	Aug 8 th , 2002	6.0	0
Bob Kobza	May 13 th , 2002	Aug 10 th 2001	6.0	0
Jessyca Wilcox	May 6 th , 2002	Oct 31 st , 2002	10	1

EQUIPMENT INFORMATION

Major advances were made in the archiving of slides and photos. Julie Query and Jess Wilcox succeeded in labeling and filing all of the past years' slide images including some that predate the current fire effects monitoring program. Their dedication to this effort will allow long-term photographic comparisons to be made easily in the future.

Our primary field global positioning system (gps) unit is now the Garmin 3+ which is lighter, smaller, and more user-friendly than the Rockwell PLGR which we had used in the past.

INNOVATIONS and CHALLENGES

One significant change in the field protocols this year was the addition of 2 new types of plots. One was used at Mount Rushmore to document stand structure and fuel loading in Lafferty Gulch. These non-permanent plots are less time intensive to install than a standard FMH plot. The second protocol was implemented at Knife River and Agate Fossil Beds to measure areas dominated by non-native species. These plots entail nested frequency frames, Daubenmire frames, and photographs. Written protocols are available for each of these new plot types.

Software development has progressed at a national level. Ed Delaney, the former Wind Cave GIS Specialist is leading the program in his new role as Data Manager for the NPS Fire Management Center in Boise. We expect to be using a new Access-based database at the beginning of next field season. A rollout of this software is scheduled for January 7 in Boise with the software available in May 2003. Many details are not yet final, including the specific capabilities of the new software and the process of data conversion from the old DOS-based FMH software into Access.

We have refined our GIS database of all the plot locations in all of our Parks. This information has been incorporated into maps that include vegetation layers, burn boundaries, and other pertinent layers. These maps will be useful for writing prescribed fire burn plans, for locating plots in the field, and as a long-term record for understanding vegetative change over time. We had Ann Hebig, the Devils Tower Resource Management Intake Trainee, organize and catalogue this information in spring of 2002. Kevin Rehman has also made a significant contribution to improving the accuracy of this database. This will make the information more readily available to ecologists and managers in prescribed fire planning.

We have continued to use photo points to capture some of the larger scale changes that happen as a result of prescribed burning. Where the vegetation plots are capable of capturing the specific changes that occur at a specific point, they do not always capture the effects of fire on a larger scale. We have photographed areas of a fire, or entire prescribed fire units, before and after fire to document changes in vegetation communities over large areas. A written protocol for permanent photo-points coupled with an image filing system will aid in applying this method over the long term.

CONCLUSION

The fire monitors are looking forward to another busy and productive year in 2003. Continued input and feedback from Park Resource Managers has led to a successful prescribed fire program in the Northern Great Plains. As more monitoring plots are installed and burned in prescribed fires we can increase our knowledge of the associated effects. This knowledge will allow us to better understand the role of fire in the Northern Great Plains and achieve resource management goals for our parks.