



**National Park Service
Northern Great Plains Fire Ecology
Annual Report
Calendar Year 2010**

A. Summary

2010 marked another diverse and productive year for the Northern Great Plains (NGP) fire ecology program. We worked in all ten of our National Park Service units, which had not occurred since 2007. This year, a total of 189 plots of various types were measured, an all time high for the program. Five prescribed fires occurred in the NGP parks, resulting in 24 plots being burned, 21 of which were measured immediately post-burn.

The Colorado State University-based graduate research project studying the effects of thinning and chipping continued at Mount Rushmore and Wind Cave, though the fire effects crew was less involved with direct plot measurement. Dan Swanson partnered with Amy Symstad of the USGS on a research project assessing burned areas for rapid invasion of non-native species. Two additional seasonal employees joined the group and stayed busy installing the research plots at Wind Cave, Jewel Cave, and Devils Tower. Both the Wind Cave and Jewel Cave plots burned this fall, providing Dan with 115 plots to base his analyses on.

This year the crew began a more significant collaboration with the NPS Northern Great Plains Inventory and Monitoring Network (I&M). Over the winter of 2009/2010 Dan began coordinating with I&M on the development of new protocols and delineating how the two programs would mutually benefit from a combined effort. The fire effects crew slightly modified data sheets and protocols and, as a result, our data will be compatible with I&M's, greatly increasing our sample size and statistical power. During the 2010 plot season, the fire effects crew also began co-locating new plot installs with I&M plot locations so that each time a plot is read, both programs benefit. The two crews also installed 60 forest and fuels-style plots at Mount Rushmore NM, a unit that previously lacked significant plot coverage. Now, in the event of a wildfire or prescribed fire, the pre-burn data will exist that will enable us to answer questions about the role of fire in the Rushmore area.

2010 was also the first year that long time crew lead, Andy Thorstenson was absent from the organization. Andy moved on for family reasons but made sure to leave the crew in good hands and in such a way as to provide for a smooth transition. Thanks for everything Andy! The 2011 crew will also be run by a new lead monitor, as Jon Freeman, the former assistant and currently detailed lead, will be moving on to run the Grand Teton fire effects crew.

Table 1. Fire Effects Plot Workload (2010) and Total Plots Installed

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn 2010	Imm. Post 2010	Postburn (1-20 yrs) 2010	Total Plots*
Agate Fossil Beds	Mixed grass prairie	Grassland Fuels Veg. Plot (GFV)			3	4
	Mixed grass prairie	I&M Plot	6			6
Badlands	Mixed grass prairie	FMH Grass Plot			7	26
	Mixed grass prairie	GFV Plot				3
	Mixed grass prairie	I&M Plot	21	7		21
	Shrubland	FMH Shrub Plot			2	4
Devils Tower	Ponderosa forest	FMH Forest Plot		1	5	15
	Mixed grass prairie	FMH Grass Plot			1	3
	Ponderosa forest	Forest, Fuels, and Veg. Plot (FFV)		2		2
	Ponderosa forest	Forest & Fuels Plot (F&F)			1	3
Fort Union	Cottonwood forest	FMH Forest Plot			1	1
	Mixed grass prairie	FMH Grass Plot			2	2
Jewel Cave	Ponderosa forest	FFV Plot			3	5
	Ponderosa forest	F&F Plot			3	5
	Ponderosa forest	FMH Forest		3	3	3
Knife River	Mixed grass prairie	GFV Plot			7	9
	Mixed grass prairie	FMH Grass Plot			6	6
	Green ash forest	FMH Forest Plot			1	3
Mount Rushmore	Ponderosa forest	I&M Plot	29			60
Scotts Bluff	Mixed grass prairie	FMH Grass Plot			2	12
	Mixed grass prairie	I&M Plot	7			7
	Juniper Woodland	FMH Forest Plot				2
	Shrubland	FMH Shrub Plot				3
Theodore Roosevelt	Mixed grass prairie	FMH Grass Plot			5	9
	Mixed grass prairie	GFV Plot				2
	Juniper Woodland	I&M Plot	5			5
	Cottonwood Forest	FMH Forest Plot				2
	Shrubland	FMH Brush Plot				5
Wind Cave	Mixed grass prairie	FMH Grass Plot				14
	Ponderosa forest	FMH Forest Plot			3	5
	Ponderosa forest	FFV Plot			3	3
	Ponderosa forest	F&F Plot		11		11
	Ponderosa forest	I&M Plot	15	8		15
Photo Points, various parks	Mixed grass prairie	Photo point	2		1	17
	Ponderosa forest	Photo point	3		5	11
	Juniper woodland	Photo point	5			5
Total	136		93	32	64	309



American Elk prescribed fire, Wind Cave National Park – photo Dan Swanson

Table 2. Fire Ecology Staffing 2010

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ qualified	Training and Development
Dan Swanson	1/1/2010	12/31/2010	26	No	Savannah Fire Ecology Conference, NPS FAM conference, NPS MWR GIS Conference, NATR Ecologist Mentoring, 5 fire operational periods
Jon Freeman	2/1/2010	11/6/2010	20	No	S-230, S-231, L-280, S-211, PFTC March session, NPS FAM Conference, NPS MWR GIS Conference, Mt. Rushmore MPB RRAT team member (GISS), completed ENOP, worked on FALB, opened FIRB, ENGB, CRWB, 16 fire operational periods
Valena Hofman	4/12/2010	10/23/2010	14	No	S-131, L-280, 2-week assignment with BLHI WFM, NPS MWR GIS Conference, worked on FALA, FFT1, 18 fire operational periods
Marcus Lund	4/26/2010	10/23/2010	13	No	Three 2-week assignments with BLHI WFM, worked on FALB, ENOP, 42 fire operational periods
Jess Stiles	5/17/2010	8/19/2010	7	No	S-260, S-290, botany training, worked on FALA, 3 fire operational periods
Todd Stahl	5/17/2010	8/19/2010	7	No	S-260, S-290, botany training, opened FFT1, FALA, 3 fire operational periods
Justin Ziegler	5/17/2010	8/19/2010	7	No	S-260, botany training, opened FALA

Table 3. Management Objectives and Monitoring Results

Park	Monitoring Unit	Management Objective	Monitoring Results (80% C.I.)	Objective Achieved	Year Last Analysis Completed
Wind Cave N.P.	Native Mixed-grass Prairie	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn Increase the relative cover of native forbs by at least 30% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	5% Decrease No change 23% Decrease	No; N=7 No; N=7 Yes; N=6	2008
	Non-native Grass Prairie	Increase the relative cover of native grasses by at least 20% within two growing seasons after the burn Increase the relative cover of native forbs by at least 20% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn.	59% Increase No change No change	Yes; N=5 No; N=5 No; N=5	2008
	Ponderosa Pine Forest	Increase the relative cover of native herbs by at least 25% within two growing seasons after the burn Decrease the relative cover of non-native herbs by at least 25% within two growing seasons after the burn Reduce the density of overstory ponderosa pine (≥ 14.9 cm dbh) by at least 30% two growing seasons after the burn. Reduce the density of pole-size ponderosa pine (2.5 – 14.8 cm dbh) by at least 50% two growing seasons after the burn. Reduce the density of seedling ponderosa pine by at least 70% one growing season after the burn Reduce total fuel loading by at least 30% following one prescribed burn	17% Decrease No change 6% Decrease No change 78% Decrease 21% Decrease	No; N=5 No; N=5 No; N=9 No; N=9 Yes; N=9 No; N=9	2008
Devils Tower N.M.	Non-native Grass Prairie	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn Increase the relative cover of native forbs by at least 20% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	39% Increase 74% Increase 49% Decrease	Yes; N=3 Yes; N=3 Yes; N=3	2008
	Ponderosa Pine	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn Increase the relative cover of native forbs by at least 10% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn. Reduce total fuel loading by at least 30% following one prescribed burn	13% Increase 36% Increase No change 38% Decrease	Yes; N=7 Yes; N=6 No; N=7 Yes; N=7	2008
Badlands N.P.	Western wheatgrass Mixed-grass Prairie	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn Increase the relative cover of native forbs by at least 30% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	6% Decrease 4% Increase No change	No; N=20 No; N=18 No; N=19	2008
	Non-native grass Prairie	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn Increase the relative cover of native forbs by at least 10% within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn.	30% Increase 37% Increase No change	Yes; N=4 Yes; N=4 No; N=4	2008
Theodore Roosevelt	Kentucky Bluegrass Non-native Prairie	Increase the relative cover of native grasses by at least 20% within two growing seasons after the burn Increase the relative cover of native forbs by at least 20%	57% Increase No change	Yes; N=3 No; N=3	2008

N.P.		within two growing seasons after the burn Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn.	3% Decrease	No; N=3	
	Crested Wheatgrass Non-native Prairie	Increase the relative cover of native grasses by at least 20% within five growing seasons after the burn Decrease the relative cover of non-native grasses by at least 20% within five growing seasons after the burn.	No change No change	No; N=3 No; N=3	2008
	Native Mixed-grass Prairie	Increase the relative cover of native grasses by at least 20% within five growing seasons after the burn Decrease the relative cover of non-native herbs by at least 20% within two growing seasons after the burn.	8% Increase 8% Increase	No; N=3 No; N=3	2008
Agate Fossil Beds N.M	Native Mixed-grass Prairie	Increase the relative cover of native grasses by at least 20% within two growing seasons after the burn. Decrease the relative cover of non-native herbs by at least 20% within two growing seasons after the burn.	5% Increase (Yr 1) 31% Decrease (Yr1)	TBD TBD	2009

B. Fire ecologist accomplishments and areas of focus

Dan Swanson partnered with Amy Symstad of the USGS on a three year research project assessing the relationship between prescribed fire burn severity and target invasive plant species abundance taking into account a variety of pre- and post-fire environmental characteristics at Wind Cave N.P., Jewel Cave N.M., and Devils Tower N.M. This was the first year of the project and we trained a two person crew in the field protocols and invasive plant species identification. One hundred and fifteen plots were installed and read June through August. The two main questions this project hopes to answer include: 1.) Does prescribed fire promote target invasive plant species in Black Hills ponderosa pine forest? 2.)What is the most efficient way to search for invasive plants affected by prescribed fire in this ecosystem?

Dan worked with Kevin Stark, Saint Mary's University of Minnesota, on the fire ecology/fire regime portion of Wind Cave N.P., Jewel Cave N.M., and Devils Tower N.M. natural resource condition assessments throughout the year.

Wind Cave N.P.

This past fall was a very busy time with the completion of the largest prescribed fire in Wind Cave National Park's history on October 20-21. The 3450 acre American Elk unit was located primarily within forested communities of the park but also included mixed-grass prairie, prairie dog towns, and ponderosa pine encroached meadows. Dan was the fire effects monitor on this fire and also had a fire effects monitor trainee under him. In November and early December Dan, Amy Symstad, resource management staff and others helped collect post-burn data from over seventy five plots. Most of this unit hadn't been burned previously which resulted in dense, closed canopy stands consisting of unusually high numbers of small diameter trees. Therefore, the crown fire potential had dramatically increased and the forest was subject to a high severity stand-replacing fire. The large size of this unit allowed the prescribed fire to burn over multiple burn periods and weather conditions which replicates natural fire activity. The use of a helicopter allowed us to achieve variable fire severities across the landscape due to varied ignition patterns and provided fire fighter safety by eliminating the need for interior hand ignition. An objective for the unit was to reduce the 100 hr and 1000 hr fuels by at least 40%. Analyses of the seventy five monitoring plots indicate that 100 hr and 1000 hr fuels were reduced by 61% and 36% respectively. Total fuel load was also reduced by 59%.

Category	Percent Time	Accomplishments and/or areas of activities
Planning	7%	Determining fire effects travel costs to area parks, training of field crew in FFI
Presentations	5%	Scientific meetings, park staff, public, etc.
NPS Meetings/ task groups	10%	Park, I&M, & FESC meetings; NGP Technical Committee meeting; National FMO meeting; BADL Climate Change Vulnerability Assessment Workshop; Worked on WICA, JECA, and DETO Natural Resource Condition assessments
Interagency work	1%	Black Hills Mountain Pine Beetle workshop, Black Hills Area Ecologist & Botanist Workshop
Wildfire Assignments	0%	Slow fire season!
Prescribed fire projects	1%	FEMO on 3 RX fires (3 operational periods)
Non-fire fuels projects	1%	MORU hazardous fuel reduction project
Research	10%	Invasive plant species research project – training field crew
Data Collection	12%	Invasive plant species research project – WICA, JECA, and DETO
Data entry	3%	Immediate post-burn data entry for Lithograph and American Elk RX
Data management & analysis	30%	Northern Great Plains area parks fire effects database management and analysis
Supervision/Admin	15%	Hiring, supervision, travel, payroll, etc.
Training	3%	Botany, Supervisory, and EEO training
Miscellaneous	2%	NGP fire management web site, Writing burn reports

C. Fire effects crew accomplishments and areas of focus

Table 5. Fire Effects Crew Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH Plots	12%	Re-reading of FMH plots (Forest, Grass, and Brush)
NGP Plots	8%	Re-reading of burn-unit specific plots (FFV, GFV, photo points)
I&M Plots	27%	Installing I&M style plots. At MORU these were installed park-wide. All other parks' installs fell inside active burn units
Fire Assignments	10%	Wildfire assignments, including local I.A., details with the Black Hills Wildland Fire Module, Prescribed Fire Training Center detail
Prescribed Fire & Burn Unit Prep	7%	Prescribed fires in the NGP park group, calendar year 2010
Data entry, check	8%	100% of plot data entered and checked in FFI version 1.04
Supervision/Admin	13%	Travel, payroll, seasonal hiring, field season preparation, equipment upkeep and repair, end of season closeout

Training, Conferences	10%	Includes fire and ecology related training and conferences
Miscellaneous	5%	RRAT MORU Mountain Pine Beetle Project, physical training, fuel sampling, herbarium updates, NGP fire history project, annual leave



American Elk prescribed fire, Wind Cave National Park – photo WICA staff

D. Additional Information

Table 6. Data Entry and Projects Monitored

Park	% 2010 Data Entered	% 2010 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Agate Fossil Beds	100%	100%	0	0	0	0
Badlands	100%	100%	1	0	0	0
Devils Tower	100%	100%	1	1	0	0
Fort Union	100%	100%	0	0	0	0
Jewel Cave	100%	100%	1	0	0	0
Knife River	100%	100%	0	0	0	0
Mount Rushmore	100%	100%	0	1	0	0
Scotts Bluff	100%	100%	0	0	0	0
Theodore Roosevelt	100%	100%	0	0	0	0
Wind Cave	100%	100%	1	0	0	0

* Number of treatment units with treatment effects monitoring conducted. Include pre-burn and post-burn monitoring but not burn-day monitoring.