



National Park Service Fire Ecology Annual Report Calendar Year 2013

A. Summary

2013 was a productive year for the Northern Great Plains (NGP) fire ecology program. A total of 118 plots of various types were measured in nine park units, which included 51 installs in five park units. One prescribed fire which burned 4 plots, occurred in the NGP parks and these were measured immediately post-burn. Severe to exceptional drought enveloped all of the Northern Great Plains over the winter into early spring. A wetter weather pattern came to the region in April with a series of three major winter storms that blanketed western SD and the NE panhandle. The drought intensity and extent moderated from north to south from spring to fall as a wetter than normal moisture regime took continued. Plot monitoring in area parks indicated that the mixed-grass prairie ecosystem showed a positive vegetative response to the increase in precipitation and associated soil moisture. According to the U.S. Drought Monitor, by early November all Northern Great Plains parks were drought-free with the exception of Agate Fossil Beds N.M. and Scotts Bluff N.M. which were unusually dry.

This was the fourth field season in which the NGP fire ecology program collaborated with the Northern Great Plains Inventory and Monitoring Network (NGPN). The NGP fire effects crew and NGPN installed and read fifty-five upland forest, tall shrub, target invasive, and fuels plots and twenty riparian lowland plots at Devils Tower N.M. this summer which are spatially balanced throughout the park. The NGP fire ecology program continues to collaborate with the NGP I&M program in botany/field protocol training, field monitoring, and FFI database management. We continue to coordinate plot sampling visits as much as possible throughout our park network since both programs are using the same sampling design and monitoring protocols.

Due to cuts in fuels funding this fiscal year, this was the first field season in which the NGP fire ecology program was cut in seasonal pay periods. As a result, the NGP fire ecology program collaborated with the Black Hills fire use module and Wind Cave engine crew throughout the summer to bolster each other's programs during their critical work-load periods. Our lead monitor went out to the Snake Complex in WY for two weeks with the Black Hills module and also was an engine boss (T) on a Wind Cave N.P. engine for two weeks at the Standing Rock reservation in SD/ND. The assistant fire use module leader helped our fire effects crew read monitoring plots for one week at DETO and two Wind Cave N.P. crewmembers helped with data entry for a couple of days.

Table 1. Fire Effects Plot Workload (2013) and Total Plots Installed

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn 2013	Imm. Post 2013	Postburn (1-20 yrs) 2013	Annual Total (2013)	Total Plots
Agate Fossil Beds	Mixed grass prairie	Grassland Fuels Veg. (GFV)			4	4	4
	Mixed grass prairie	I&M Veg	5			5	11
Badlands	Mixed grass prairie	I&M Veg			12	12	39
Devils Tower	Ponderosa forest	FMH Forest		1	1	2	15
	Mixed grass prairie	FMH Grass					
	Ponderosa forest	Forest, Fuels, and Veg. (FFV)					2
	Ponderosa forest	Forest & Fuels (F&F)					3
	Mixed grass prairie	I&M Veg					9
	Ponderosa forest	I&M Forest	20			20	40
	Ponderosa forest	I&M Forest & Veg	4	4	3	11	15
Fort Union	Cottonwood forest	FMH Forest					1
	Mixed grass prairie	FMH Grass					2
Jewel Cave	Ponderosa forest	FFV			3	3	3
	Ponderosa forest	F&F			3	3	3
	Ponderosa forest	FMH Forest					3
	Ponderosa forest	I&M Forest			1	1	45
	Ponderosa forest	I&M Forest & Veg			1	1	15
Knife River	Mixed grass prairie	GFV					5
	Mixed grass prairie	FMH Grass			5	5	
	Green ash forest	FMH Forest					3
	Mixed grass prairie	I&M Veg	5		7	12	13
Mount Rushmore	Ponderosa forest	I&M Forest		6		6	45
	Ponderosa forest	I&M Forest & Veg		2		2	15
Scotts Bluff	Mixed grass prairie	FMH Grass			2	2	6
	Mixed grass prairie	I&M Veg					14
	Juniper Woodland	FMH Forest			2	2	2
	Shrubland	FMH Shrub					1
Theodore Roosevelt	Mixed grass prairie	FMH Grass			6	6	9
	Mixed grass prairie	GFV					2
	Mixed grass prairie	I&M Veg					7
	Juniper Woodland	I&M Veg					5
	Cottonwood Forest	FMH Forest					2
	Shrubland	FMH Brush					5
Wind Cave	Mixed grass prairie	FMH Grass			4	4	14
	Ponderosa forest	FMH Forest					5
	Ponderosa forest	FFV					3
	Ponderosa forest	F&F					11
	Ponderosa forest	I&M Forest & Veg					14
	Ponderosa forest	I&M Forest					90
	Mixed grass prairie	I&M Veg	5			5	5
	Ponderosa forest	CBI					48
Photo Points, various parks	Mixed grass prairie	Photo point			2	2	15
	Ponderosa forest	Photo point	7		3	10	13
	Juniper woodland	Photo point					7
Total			46	13	59	118	569

Table 2. Fire Ecology Staffing 2013

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ qualified	Training and Development
Dan Swanson	1/1/2013	12/31/2013	26	No	Black Hills Area Bot/Eco workshop, Wilderness First Aid, ATVO, botany training. Belle Fourche RX, Belle Fourche WF, French Creek 3 RXP. 5 fire operational periods
Phil Graeve	4/22/2013	10/18/2013	13	No	Black Hills Area Bot/Eco workshop, botany training, ATVO, L380, S-341. Chickasaw RX, Solen Jcn, Snake complex, & Cascade wildfires. FALB, ENGBT, FEMO, ENGB. 40 fire operational periods.
Valena Hofman	4/29/2013	9/12/2013	10	No	botany training, ATVO, Belle Fourche RX, Belle Fourche & Cascade wildfires. 6 operational fire periods.
Marcus Lund	5/13/2013	9/26/2013	10	No	botany training, ATVO, Strawberry complex, Cascade Wildfires, 15 operational fire periods.

Table 3. 2013 Management Objectives and Monitoring Results

All results shown are 80% confidence intervals of the mean. Fuel reduction objectives/results are mean percent reduction from pre-burn to immediate post-burn. Stand density objectives/results are for five-year post-burn mean stand density. An underlined number of plots indicates that the minimum sample size has been attained for that variable.

Park	Monitoring Unit	Management Objective	Monitoring Results (80% C.I.)	Objective Achieved	Year Last Analysis Completed (Range of data included in analysis)
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	5% Decrease	No; N=7	2008 (1998-2013)
		Increase the relative cover of native forbs by at least 30% within two growing seasons after the burn	No change	No; N= <u>7</u>	
		Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	23% Decrease	Yes; N=6	
	Non-native Grass Prairie	Increase the relative cover of native grasses by at least 20% within two growing seasons after the burn	59% Increase	Yes; N=5	2008
		Increase the relative cover of native forbs by at least 20% within two growing seasons after the burn	No change	No; N=5	
		Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn.	No change	No; N= <u>5</u>	
	Ponderosa Pine Forest	Increase the relative cover of native herbs by at least 25% within two growing seasons after the burn	17% Decrease	No; N= <u>5</u>	2008
		Decrease the relative cover of non-native herbs by at least 25% within two growing seasons after the burn	No change	No; N=5	
		Reduce the density of overstory ponderosa pine (≥ 14.9 cm dbh) by at least 30% two growing seasons after the burn.	6% Decrease	No; N= <u>9</u>	
		Reduce the density of pole-size ponderosa pine (2.5 – 14.8 cm dbh) by at least 50% two growing seasons after the burn.	No change	No; N=9	
		Reduce the density of seedling ponderosa pine by at least 70% one growing season after the burn	78% Decrease	Yes; N= <u>9</u>	
		Reduce total fuel loading by at least 30% following one prescribed burn	21% Decrease	No; N= <u>9</u>	
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	39% Increase	Yes; N=3	2008
		Increase the relative cover of native forbs by at least 20% within two growing seasons after the burn	74% Increase	Yes; N=3	
		Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	49% Decrease	Yes; N=3	
	Ponderosa Pine	Increase the relative cover of native grasses by at least 10% within two growing seasons after the burn	13% Increase	Yes; N=7	2008
		Increase the relative cover of native forbs by at least 10% within two growing seasons after the burn	36% Increase	Yes; N=6	
		Decrease the relative cover of non-native grasses by at least 30% within two growing seasons after the burn.	No change	No; N=7	
		Reduce total fuel loading by at least 30% following one prescribed burn	43-64% Decrease	Yes; N=11	2013 (1996-2013)
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	No change	No; N= <u>45</u>	2013 (1998-2013)
		Increase the relative cover of native forbs by at least 30% within two growing seasons after the burn	No change	No; N= <u>45</u>	
		Decrease the relative cover of non-native grasses by at least 20% within two growing seasons after the burn.	38-60% Decrease	Yes; N= <u>45</u>	

	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 N.P.	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% 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.	57% Increase No change 3% Decrease	Yes; N=3 No; N=3 No; N=3	2008
	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.	51- 71% Increase 64 – 82% Decrease	Yes; N=3 Yes; N=3	2013 (2008-2011)

Badlands N.P.

The 2237 acre Castle prescribed burn was completed on September 9, 2011, in a vegetation type consisting of native perennial and non-native annual grasses. This was the first entry of fire into this unit. Seven plots were installed within the unit in June 2010 and post-burn monitoring indicated that the majority of the transect points had a light burn severity. Plots were monitored in 2012 and 2013, the first two growing seasons following the prescribed fire. Primary objectives included increasing native grass and forb cover while decreasing non-native grass cover.

The paired fire effects data was analyzed for relative change from pre-burn to second growing season after prescribed fire using ratio of means (RoM) at an 80% confidence level. There was between a 53 and 69% decrease in non-native forb cover (Figure 1). Native forb cover did not significantly change from preburn to year two postburn, but is trending upward. Non-native grass cover significantly decreased between 79 and 86%, while native grass cover significantly decreased between 16 and 24%.

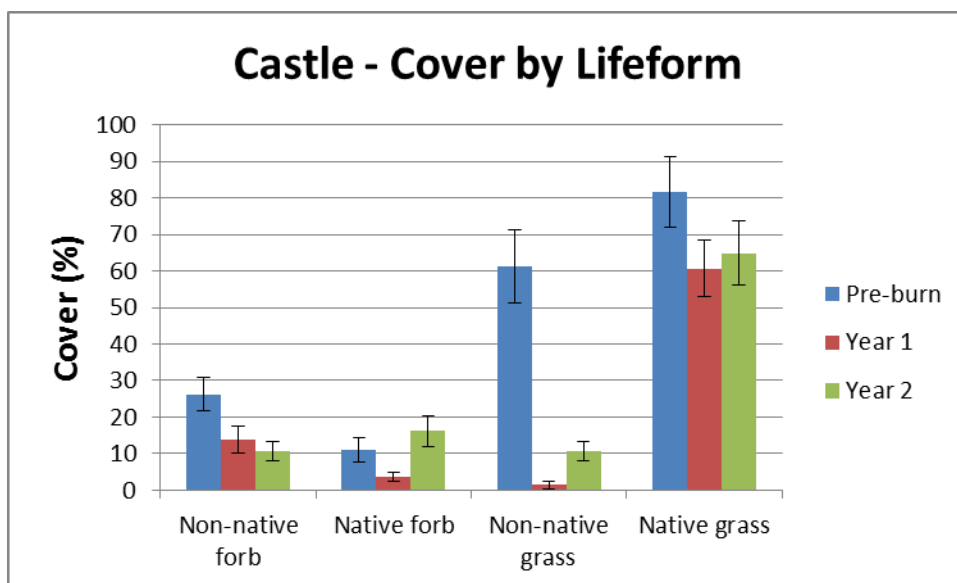


Figure 1 Changes in vegetative cover by lifeform for seven plots within the Castle unit after the first prescribed burn. Values represent means $\pm$ standard errors.

Western wheatgrass significantly decreased between 8 and 29%. Yellow sweetclover decreased between 19 and 61% while Japanese brome decreased between 84 and 91% respectively from preburn to 2nd season postburn (Figure 2). Blue grama significantly increased between 13 and 62%.

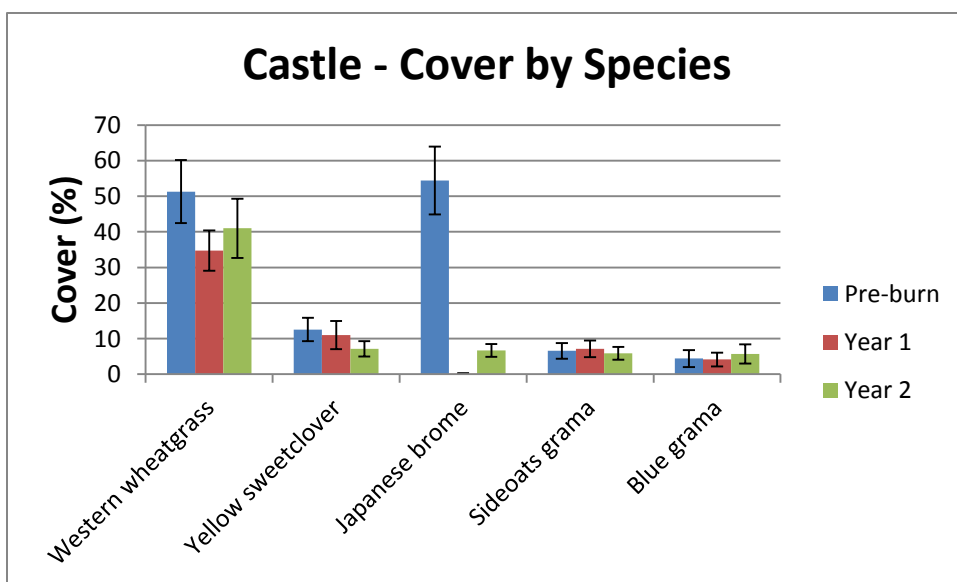


Figure 2 Changes in vegetative cover by dominant species for seven plots within the Castle unit after the first prescribed burn. Values represent means $\pm$ standard errors.

The 580 acre Pinnacles prescribed burn was completed on April 24, 2012, in a vegetation type consisting of native and non-native perennial grasses and non-native annual grasses. This was the first entry of fire into this unit. Seven plots were installed within the unit in June 2010 and post-burn monitoring indicated that the majority of the transect points had a light burn severity. Plots were monitored in 2012 and 2013, the first two growing seasons following the

prescribed fire. Primary objectives included increasing native grass and forb cover while decreasing non-native grass cover.

The paired fire effects data was analyzed for relative change from pre-burn to second growing season after prescribed fire using ratio of means (RoM) at an 80% confidence level. Non-native forbs had an average decrease of 43%, however it was insignificant. Native forbs significantly decreased between 24 and 38% (Figure 3). Non-native grasses significantly decreased between 34 and 56%. Native grasses did not significantly change in cover from preburn to year 2 postburn.

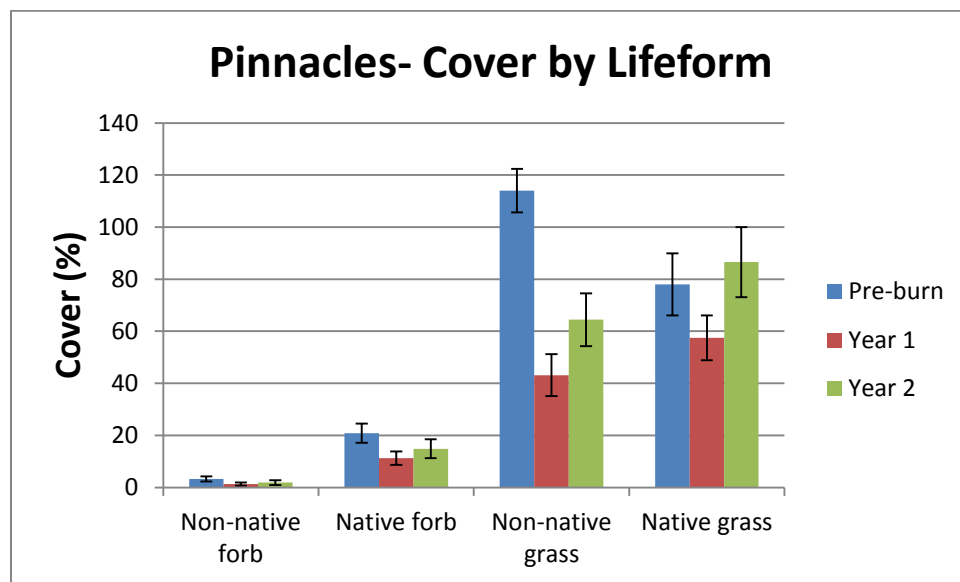


Figure 3 Changes in vegetative cover by lifeform for seven plots within the Pinnacles unit after the first prescribed burn. Values represent means $\pm$ standard errors.

Kentucky bluegrass and Japanese brome were the two most dominant grass species in 2010 with average cover values of 59% and 49% respectively. Although there was a significant decrease in Kentucky bluegrass cover from preburn to first growing season after the burn, by year 2 there was no significant difference to preburn conditions (Figure 4). Japanese brome significantly decreased to less than 2% cover at year 2 postburn. Western wheatgrass, threadleaf sedge, needle & thread, needleleaf sedge, and Junegrass rebounded in cover from year 1 but were not significantly different than at preburn conditions.

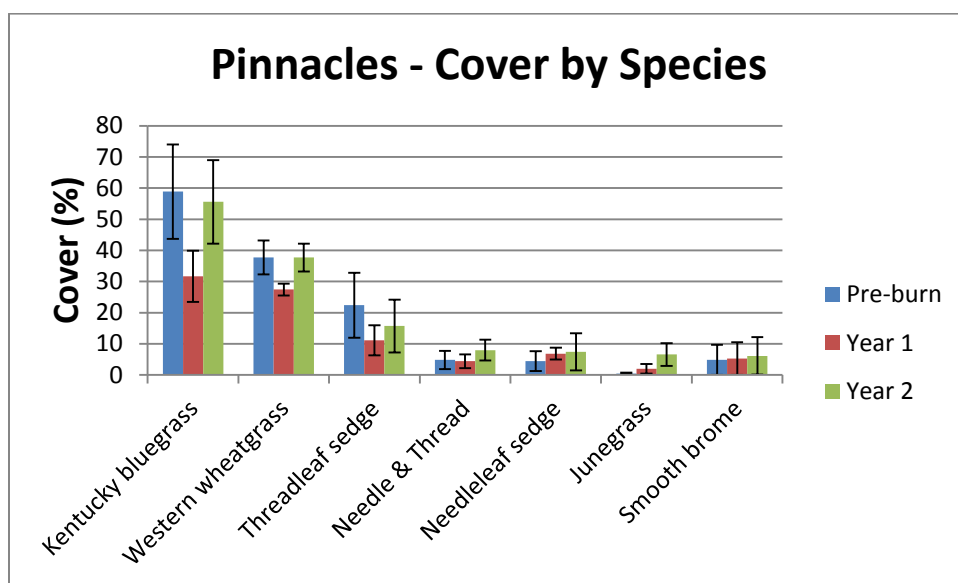


Figure 4 Changes in vegetative cover by dominant species for seven plots within the Pinnacles unit after the first prescribed burn. Values represent means + standard errors.

Agate Fossil Beds N.M.

The 500 acre Carnegie prescribed burn was completed on May 28 & 29, 2009, in a vegetation type consisting of native mixed grass prairie. This was the first entry of fire into this unit. Three plots were installed within the unit in June 2008, and were monitored in 2009, 2010, 2011, and 2013, the first first, second, third, and fifth growing seasons following the prescribed fire. Primary objectives included increasing native grass and forb cover while decreasing non-native grass cover.

The paired fire effects data was analyzed for relative change from pre-burn to fifth growing season after prescribed fire using ratio of means (RoM) at an 80% confidence level. There was between a 58 and 74% decrease in non-native forb cover (Figure 5). Native forb cover significantly decreased by an average of 69% from preburn to year two postburn. Non-native grass cover didn't change from preburn levels, while native grass cover significantly decreased between 22 and 55%.

Needle & Thread significantly decreased between 51 and 72% from preburn to fifth growing season postburn (Figure 6). Several native perennial grass species including Needle & Thread, prairie sandreed, and slender wheatgrass decreased in cover from year three most likely from the extreme drought that encompassed the area in 2012 through 2013. Kentucky bluegrass which was not present at preburn increased to 10% cover at year three and by year five was back at 0% cover. The extreme drought was most likely the reason for this steep decline from year three to year five since this species is not drought tolerant.

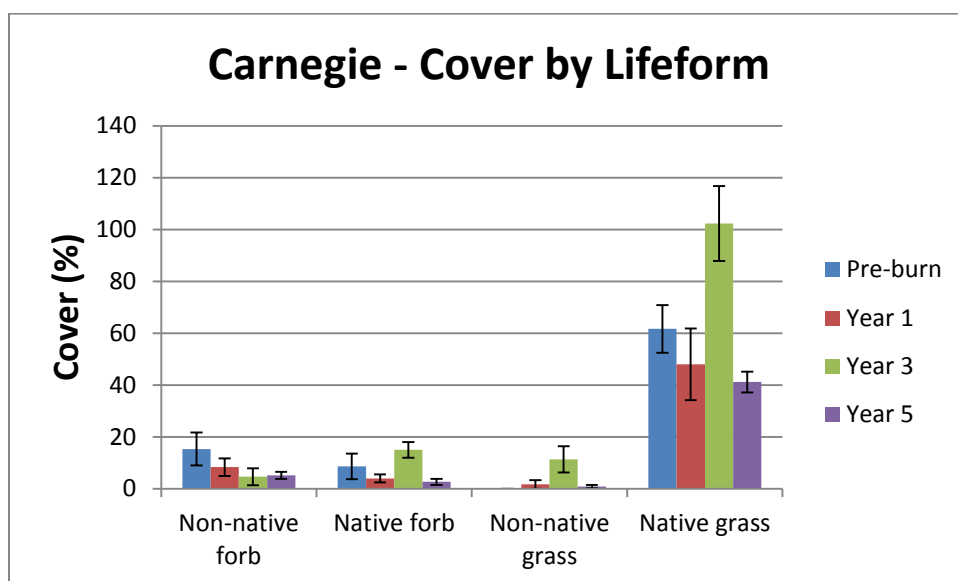


Figure 5 Changes in vegetative cover by lifeform for three plots within the Carnegie unit after the first prescribed burn. Values represent means $\pm$ standard errors.

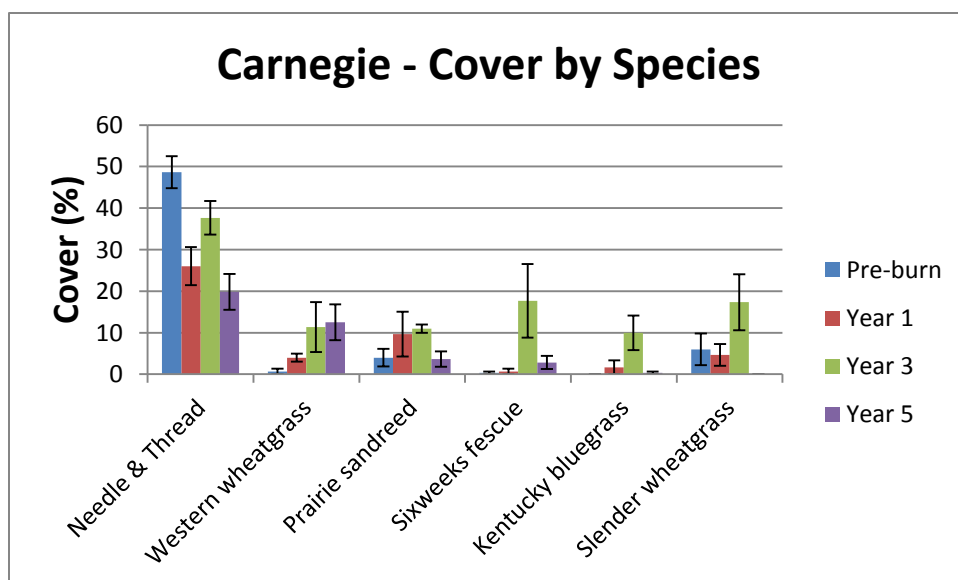


Figure 6 Changes in vegetative cover by dominant species for three plots within the Carnegie unit after the first prescribed burn. Values represent means $\pm$ standard errors.

Devils Tower N.M.

The 300 acre Belle Fourche prescribed burn was completed on May 7, 2013, in an open ponderosa pine community with an understory consisting of mixed-grass prairie species. This was the second entry of fire into this unit. Specific burn objectives included achieving at least a 50% reduction in the 1 & 10 hr fuels, 20% reduction in the 100 & 1000 hr fuels, and greater than 20% decrease in non-native herbaceous cover two growing seasons after the burn. Five plots were installed within the unit in July 2012 with four of them being burned during the fire and were revisited first growing season after the burn in July 2013. Post-burn monitoring showed predominantly a light severity on the substrates indicating that the litter was partially to entirely consumed. Specific substrate burn severity classes were 69% light, 23% moderate, and 6%

heavily. Vegetation severity was predominantly light indicating the foliage and smaller twigs were partially/completely consumed. Specific vegetation burn severity classes were 68% light, 27% moderate, and 6% heavily. Fuel's objectives were met in three out of the four fuel classes (Figure 7). Fuel loading decreased by approximately 70% in the 1 and 10 hr fuel size class which exceeded the objective of a 50% decrease. Although the 100 hr fuels did not change following the burn, they comprised a very small amount of fuel loading at preburn levels. 1000 hr fuels comprised the largest woody fuel size class and decreased by 66% which far exceeded the objective of a 20% reduction.

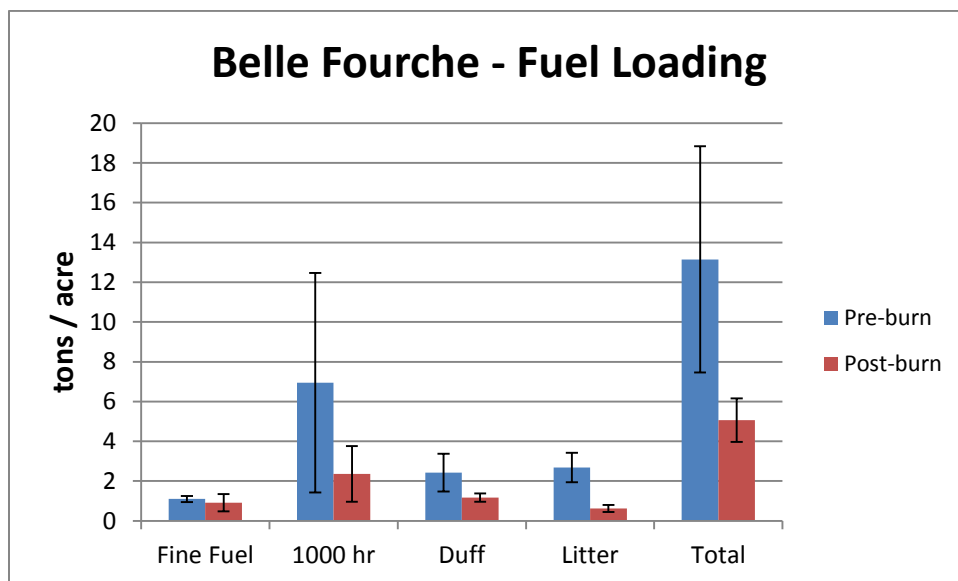


Figure 7 Changes in fuel loading by fuel class for four plots within the Belle Fourche unit after the second prescribed burn. Values represent means $\pm$ standard errors.

The paired fire effects data was analyzed for relative change from pre-burn to first growing season after prescribed fire using ratio of means (RoM) at an 80% confidence level. There was no significant change in non-native forb cover preburn to year one (Figure 8). Native forb cover significantly increased between 28 and 125% from preburn to year one. Non-native grass cover significantly decreased between 26 and 84%, while native grass cover significantly decreased between 9 and 40%.



Immediate post-burn read and smoke plume from Belle Fourche prescribed burn May 7, 2013.

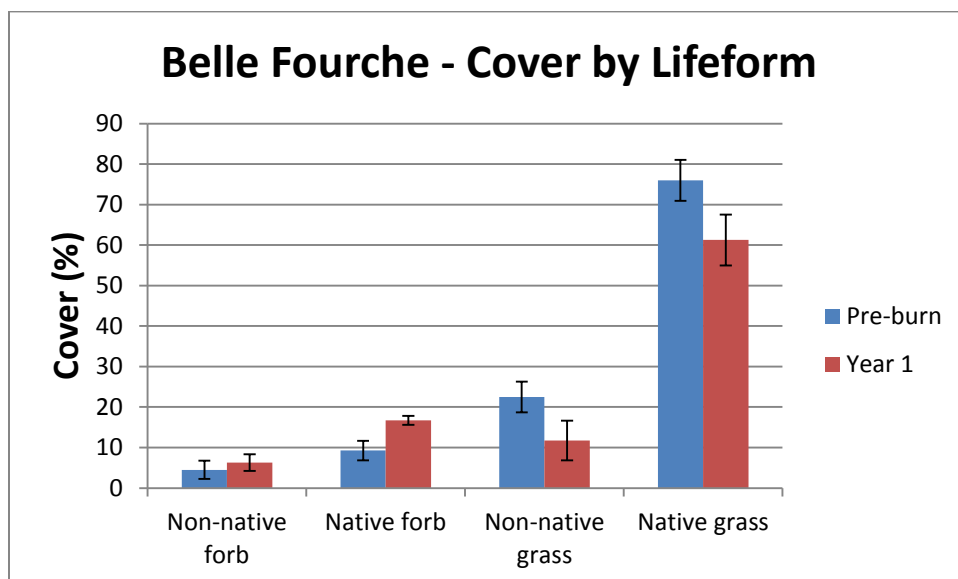


Figure 8 Changes in vegetative cover by lifeform for four plots within the Belle Fourche unit after the second prescribed burn. Values represent means $\pm$ standard errors.

Only two dominant herbaceous genres or species significantly changed in cover from preburn to first growing season after the May 2013 prescribed fire. Sedges significantly decreased between 4 and 100% while Kentucky bluegrass significantly decreased between 13 and 77% (Figure 9).

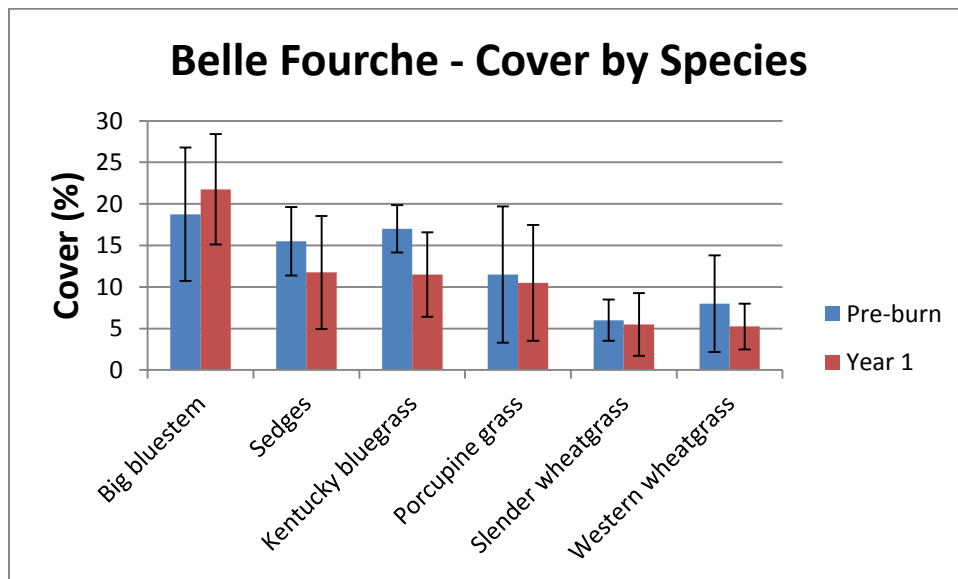


Figure 9 Changes in vegetative cover by dominant species for four plots within the Belle Fourche unit after the second prescribed burn. Values represent means $\pm$ standard errors.

Wind Cave N.P.

The 4200 acre Red Valley prescribed burn was completed on April 15, 2004, in a vegetative type consisting of native mixed grass prairie and open to closed ponderosa pine forest communities. This was the first entry of fire into this unit. Specific burn objectives included

increase native grasses to > 75% of grass cover in areas of cool season grass and >95% of grass cover in areas of warm season grass two years after the burn. Reduce Kentucky Bluegrass to < 20% of the grass cover in areas of cool season grasses. Four plots were installed within the unit in August 2003 and were revisited one, two, five, and ten growing seasons after the prescribed burn. Non-native forb, non-native grass, and native grass cover decreased from preburn to year 1, followed by an increase in cover at year 2, however not quite returning to preburn levels. Relative cover for native and non-native grasses was 90% versus 10% at year 2 for plots in the cool season western wheatgrass vegetation type which exceeded burn objectives. Kentucky Bluegrass cover was on average 11% at preburn and was unchanged at the year 2 read. In 2013 at the year 10 read, Kentucky Bluegrass cover was down to approximately 1%. Wind Cave N.P. was experiencing drought from 2002 through 2007 and this probably had a major influence on the vegetative recovery of the mixed-grass prairie ecosystem following the prescribed burn. Native forb cover was unchanged from preburn to year 2 conditions and then significantly decreased at year 5.



Western wheatgrass mixed-grass prairie monitoring plot in Red Valley burn unit.

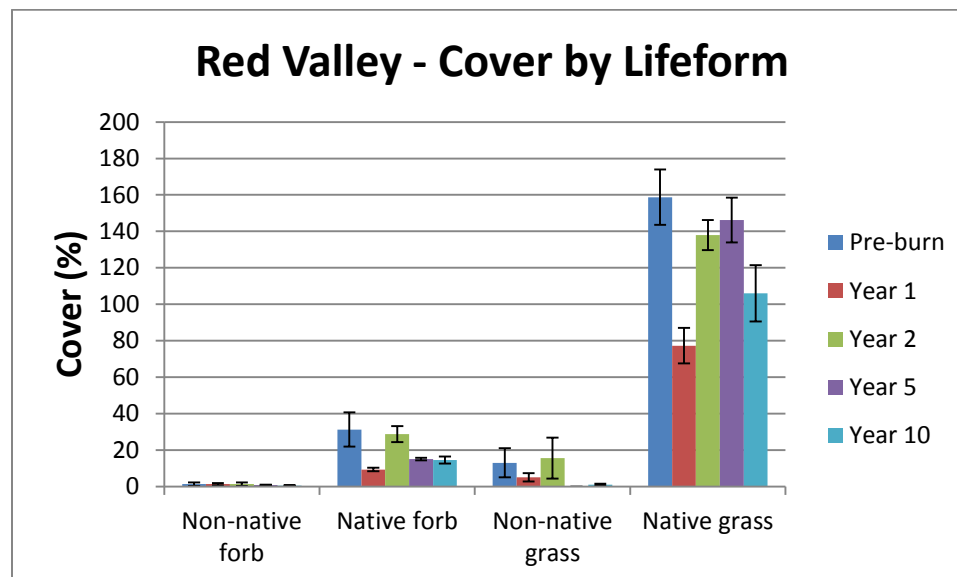


Figure 10 Changes in vegetative cover by lifeform for four plots within the Red Valley unit after the first prescribed burn. Values represent means $\pm$ standard errors.

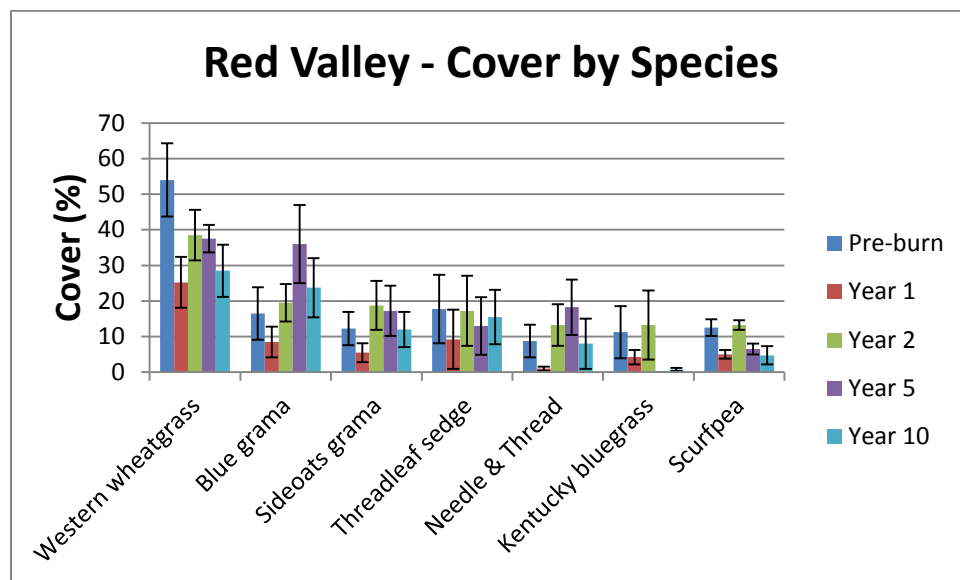


Figure 11 Changes in vegetative cover by dominant species for four plots within the Red Valley unit after the first prescribed burn. Values represent means $\pm$ standard errors

B. Fire ecologist accomplishments and areas of focus

Dan edited the following documents: Plant Community Composition & Structure Monitoring Protocol for the Northern Great Plains I&M Network – Standard Operating Procedures, Condition Status & Trends of Streambeds of Wind Cave N.P., and Cheatgrass Adaptive Management PMIS proposal. He also wrote two articles regarding the reduction of crown fire potential and mountain pine beetle infestation at Mount Rushmore National Memorial using mechanical treatments that were included in *RX Effects* and on-line as an NPS Cohesive Strategy Success story.

From February to April, Dan gave presentations at the Black Hills Area botanist & ecologist workshop, Northern Great Plains Superintendent's meeting, and to staff at Wind Cave N.P. He also presented monitoring results from recent prescribed burning projects to park superintendents, resource management, interpretation, and maintenance staff at our annual winter/spring park meetings.

Dan also inputted/edited all NFPORS fire effects monitoring activities for the ten parks in the NGP park group. He continues to be the primary FFI database manager for the fire ecology program and works closely with the NGP I&M database manager throughout the year ensuring the shared FFI databases are accurate and up to date.

Dan continues to provide resource management objectives to personnel writing prescribed burn plans. He also helped out Wind Cave N.P. resource management staff on a mechanical treatment project this summer clearing out high concentrations of shrubs that had encroached in Wind Cave canyon due to lack of disturbance for over fifty years.

Table 4. Fire Ecologist 2013 Accomplishments/Focus Areas

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. Developing burn unit objectives for area parks
Presentations	6%	Scientific meetings, park staff, public, etc. Wrote two articles regarding the reduction of crown fire potential and mountain pine beetle infestation at Mount Rushmore National Memorial using mechanical treatments that were included in <i>RX Effects</i> and on-line as an NPS Cohesive Strategy Success story.
NPS Meetings/ task groups	6%	Park & I&M meetings; NGP Technical Committee meeting;
Interagency work	1%	Black Hills Area Ecologist & Botanist Workshop; Southern Rockies Fire Science Consortia meeting
Wildfire assignments	1%	Belle Fourche WF
Prescribed fire projects	1%	FEMO on Belle Fourche RX fire (2 operational periods)
Non-fire fuels projects	1%	I helped out on a restoration project in Wind Cave Canyon in which we mechanically cleared out high concentration of shrubs that had encroached in the area due to over fifty years without a disturbance.
Research	1%	Invasive plant species research project – writing CBI methodology
Data collection	19%	AGFO, SCBL, BADL, DETO, MORU, WICA, THRO, & KNRI fire effects & I&M plot work; This included approximately 60 forest & fuel plots installed/read with the NGP I&M program at DETO in September.
Data entry, check	4%	DETO data entry; KNRI, MORU, WICA data checking
Data management & analysis	32%	Northern Great Plains area parks fire effects database management and analysis
Supervision/Admin	15%	Hiring, supervision, payroll, travel authorization/vouchers, etc.
Training	3%	Botany, Wilderness First Aid, Supervisory, EEO training
Travel out-of-park for plot or project work	2%	Travel to AGFO, SCBL, BADL, KNRI, & THRO for monitoring and RX fires
Miscellaneous	1%	NGP fire management web site, Writing burn reports

C. Fire effects crew accomplishments and areas of focus**Table 5. Fire Effects Crew 2013 Accomplishments/Focus Areas**

Category	Percent Time	Notes
FMH plots	8%	Re-reading of FMH plots (Forest, Grass, and Brush)
NGP plots	9%	Re-reading of burn-unit specific plots (FFV, GFV, photo points)
I&M plots	32%	Installing & rereading I&M style plots. At DETO these were installed park-wide. All other parks' installs fell inside active burn units.
Wildfire assignments	11%	Wildfire assignments, including local I.A., details with the Black Hills Wildland Fire Module and with Standing Rock Indian Reservation. Phil: ENGB(T) Solen Jct, ENGB Cascade WF, and FEMO Snake Complex. Valena: FFT2 Belle Fourche & Cascade WF, Marcus: FEMO Strawberry Complex, FFT2 Cascade WF
Prescribed fire projects	2%	Phil: FALB Chickasaw, Valena : FFT2 Belle Fourche WF
Non-fire fuels projects	2%	Crew helped out on a restoration project in Wind Cave Canyon in which we mechanically cleared out high concentration of shrubs that had

		encroached in the area due to over fifty years without a disturbance.
Travel out-of-park for plot or project work	4%	Travel to AGFO, SCBL, DETO, BADL, THRO, & KNRI for monitoring and RX fires
Data entry	12%	100% of plot data entered & 100% checked in FFI as of 10/25/13
Data analysis	0%	
Supervision/Admin	11%	Travel, payroll, field season preparation, equipment upkeep and repair, end of season closeout
Training	6%	Each crewmember had botany training. Phil: L380, S-341. Valena: D110
Miscellaneous	3%	physical training, fuel sampling, herbarium updates.

D. Additional Program Information

Table 6. Planning - 2013

Park	Does Park have written DFCs? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans (not just 2013)	Assisted with how many BAER plans in 2013?
Agate Fossil Beds N.M.	no	2004	0	0
Badlands N.P.	no	2003	0	0
Devils Tower N.M.	yes	2004	0	0
Fort Union Trading Post NHS	no	2007	0	0
Jewel Cave N.M.	no	2004	0	0
Knife River Indian Villages NHS	no	2007	0	0
Mount Rushmore N.M.	yes	2007	0	0
Scotts Bluff N.M.	yes	2004	0	0
Theodore Roosevelt N.P.	no	2007	0	0
Wind Cave N.P.	no	2005	0	0

Table 7. Monitoring – 2013

Park	% 2013 Data Entered	% 2013 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Agate Fossil Beds N.M.	100%	100%	3	0	0	0
Badlands N.P.	100%	100%	2	0	0	0
Devils Tower N.M.	100%	100%	10	0	0	0
Fort Union Trading Post NHS	100%	100%	0	0	0	0
Jewel Cave N.M.	100%	100%	1	0	1	0
Knife River Indian Villages NHS	100%	100%	6	0	0	0
Mount Rushmore N.M.	100%	100%	1	1	0	0
Scotts Bluff N.M.	100%	100%	2	0	0	0
Theodore Roosevelt N.P.	100%	50%	2	0	0	0
Wind Cave N.P.	100%	0%	4	0	0	0

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

Table 8. Communicating Results - 2013

Park	# of Project Monitoring Reports completed in 2013	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Agate Fossil Beds N.M.	0	1	1	Yes
Badlands N.P.	0	1	1	Yes
Devils Tower N.M.	1	1	1	Yes
Fort Union Trading Post NHS	0	0	1	Yes
Jewel Cave N.M.	0	0	1	Yes
Knife River Indian Villages NHS	0	0	0	Yes
Mount Rushmore N.M.	1	0	1	Yes
Scotts Bluff N.M.	0	1	1	Yes
Theodore Roosevelt N.P.	0	0	0	Yes
Wind Cave N.P.	0	1	2	Yes

* This information will help to assess Minitab multi-user license needs.

Table 9. Research – 2013

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2013	# of Proposals Funded in 2013	# of Research Projects Supported in 2013*	Additional Comments
Agate Fossil Beds N.M.	no	0	0	0	
Badlands N.P.	no	0	0	0	
Devils Tower N.M.	no	0	0	1	Invasive Spp project
Fort Union Trading Post NHS	no	0	0	0	
Jewel Cave N.M.	no	0	0	1	Invasive Spp project
Knife River Indian Villages NHS	no	0	0	0	
Mount Rushmore N.M.	no	0	0	0	
Scotts Bluff N.M.	no	0	0	0	
Theodore Roosevelt N.P.	no	0	0	0	
Wind Cave N.P.	no	0	0	1	Invasive Spp project

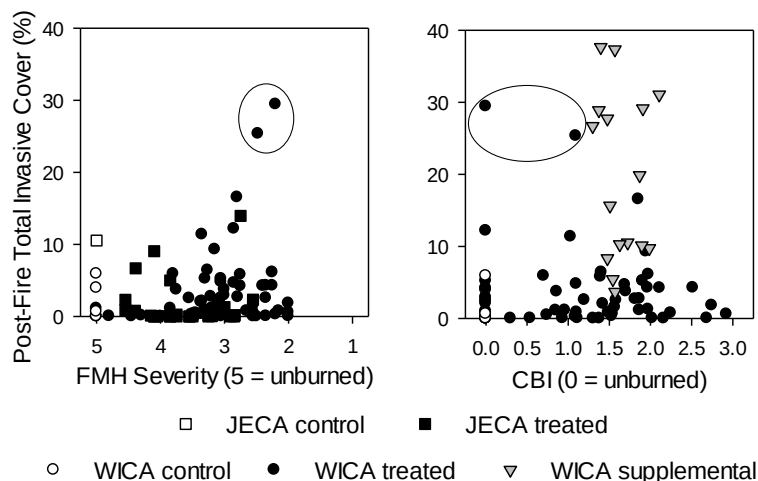
*Number of funded research projects, new or ongoing, supported by the fire ecology program including logistical info or support, staffing, etc.

Reserve Fund Research:

Many NPS burn unit prescriptions within ponderosa pine forest communities of the Black Hills include a mixed burn severity prescription to reduce ladder and ground fuels as well to create a more open heterogeneous forest structure. Natural resource managers in Black Hills NPS units sought information on the effects of prescribed fires on invasive plants to weigh the advantages and disadvantages of using mixed severity prescribed fires in overly dense forests. Previous experience led them to believe that prescribed fire may lead to an increase in some invasive plant species, so they also desired information that would lead them to know which particular species are of greatest concern and where those outbreaks were most likely to occur.

Research Reserve Funding was used on the project titled “Strategies to Quickly Find Invasive Plant Outbreaks after Prescribed Fire in Black Hills Ponderosa Pine Forest”. This three-year project was conducted at Wind Cave N.P. and Jewel Cave N.M. from 2010 to 2012¹. The goal of the research project was to help natural resource managers target their search areas of particular invasive plant species based on fire-related conditions and environmental attributes of the landscape. An information-theoretic model selection approach was used to determine which environmental and fire severity variables best explained individual invasive species and total invasive species cover two growing seasons after the fall 2010 prescribed burns.

Although there was not a statistically significant difference ($P>0.2$) in the pre- to postfire change in invasive plant cover between control and burned plots, the experimental design was not optimized for testing the general effect of prescribed fire on invasive cover, and other lines of evidence suggested that prescribed fire did promote invasive plant cover in some situations. Post-fire Canada thistle (*Cirsium arvense*) and total invasive cover were greater in areas with open pre-fire forest canopy, further from roads, and in higher burn severities. Post-fire common mullein (*Verbascum thapsus*) cover was higher in similar locations in the landscape except that pre-fire canopy openness was not important. The overarching message is that invasive plant management teams should concentrate their efforts in areas that were problem spots pre-fire and also in high burn severity areas.



Post-fire total invasive cover vs. fire severity for individual plots by plot type, measured at the ground level using Fire Management Handbook protocols (left) or at the canopy level via the satellite-derived composite burn index (right). Circled plots had unusually high invasive cover before the prescribed fires. Supplemental plots were selected two years post-fire specifically for their high cover of either Canada thistle or common mullein.

¹ Pre-fire data was also collected at Devils Tower N.M. but had to drop that one when the planned prescribed fire did not occur within the funded time period.

Deliverables will include a manuscript that was recently submitted to *Forest Ecology and Management*. Data, analysis, and report will reside on NGP Fire Management server. Amy Symstad, USGS research scientist and principal investigator, will submit a summary for the winter/spring 2014 RX Effects newsletter and will give a power point presentation to DETO, JECA, WICA park staff and the public at Wind Cave N.P. in winter/spring 2014. In addition she will provide a research summary for the Southern Rockies Fire Consortium and the Great Plains Fire Science Exchange.

E. 2014 Direction

Due to severe funding cuts for fuels accounts in the MWR slated for 2014 and beyond, the Northern Great Plains fire ecology program will be facing very difficult times. This past year our seasonal fire effects staffing was reduced to 24 pay periods and long-term budget cuts may cut the number of pay periods our program receives even further. In addition, it's likely that fire effects travel funds will not be given to fire ecology programs in the Midwest Region this year and into the future, so we hope that prescribed fire project funds will cover this expense. With Congress passing a favorable budget for fire and fuels funded accounts this December for FY 14 and 15, it looks like we may have a temporary reprieve. We are still awaiting how the budget will be appropriated down to the Midwest Region and then to the NGP Fire Management office. However, FY 16 could bring us right back to severely reduced funding in fuels funded accounts. The NGP fire ecology program has always been able to monitor plots throughout our network at the desired return interval (year1, year2, year 5, year10, etc.) but these days may be coming to an end. It's likely we won't be able to monitor as many prescribed fire projects in the future and may have fewer plots in those projects in which monitoring does take place. In 2014, the NGP fire ecology program successfully collaborated with the Black Hills fire use module and Wind Cave engine crew throughout the summer to help each other program's during their most busy times. We plan on continuing with this NGP Fire Management collaboration since each program will be impacted due to the budget cuts. Program leads thought it went quite well, and we will make some minor changes next year to make it work even better. The NGP fire ecology program and NGP I&M program will continue to collaborate into the future. This relationship has become stronger each year and the collaboration helps us especially during these tough times of budget cuts.

G. Metadata and FFI Database Update on NPS Data Store

All ten park FFI databases were uploaded to the NPS Data Store on January 30 & 31, 2014. All databases include NGP Fire Ecology and NGP I&M program data since we share databases for each park.