



Barrens to Bayous
Fire Monitoring Network
2011



A. Summary

The year two-thousand-eleven presented challenges due to weather and tight budgets. Because of an unusually wet spring, many of the prescribed fire operations planned for the spring season were delayed and eventually abandoned for this calendar year in our Network's Parks. Only three of the eight planned parks were able to conduct normal prescribed fire operations. The crew provided qualified FEMOs for all operations within the Barrens to Bayous geographical response area this past year. Members of the Barrens to Bayous fire effects team actively participated in approximately twenty prescribed fires this last year. In addition to supporting prescribed fire operations, we provided support to multiple wildfire incidents in the Southern Area. Roles served on suppression incidents included: FFT2, FFT1(T), EMTB, and HECM. Carol Fields detailed with the Southeast Regional Helicopter as a Helicopter Crewmember during the prescribed fire season, and was dispatched with that resource to the West Texas IA incident. Falkey served as an EMT(B) and Burton served as an FFT1(T) on the West Texas IA in 2012. Rotter was dispatched to the Ogeechee Wildfire in Georgia as a FFT2.

The crew completed 50 annual reads, 23 post-burn reads, and installed 5 new monitoring plots for a total of 78 FMH plot or modified plot reads, roughly 40% of the network's inventory. Restrictions in the FY2011 fire effects travel budget constricted travel to some of the network's most remote plots, especially when there were only one or two plots due for a monitoring read. This resulted in a roughly 20% of scheduled monitoring plots to not be annually monitored in FY2011. The majority of these unread plots were within the Natchez Trace Parkway (exotic monitoring) and Vicksburg National Historic Park (photo monitoring). As of January 2012, all datasheets collected in 2011 have been entered and the majority of the data has been checked for errors.

We successfully conducted a growing season burn at Little River Canyon National Preserve in two endangered pitcher plant bogs with the invaluable planning and operational expertise of the NATR fuels crew. The objective was to generate enough heat to top-kill some of the under and mid story canopy shading the remnant pitcher plant populations.

We were enthusiastic to provided inter-regional cooperation with the Southern Great Lakes Area Parks Network by organizing a detail to Indiana Dunes National Lakeshore for Rotter during his furlough. The fire effects crew also assisted with plot installations and partial reads in the Northeast Region at SHEN during the Eastern NPS Fire Ecology Summit. We would like to thank the fire effects team at GRSM for their assistance multiple times during the 2011 monitoring season. Currently the crew has one vacant position as Michael Rotter resigned his position to return home to Michigan. NATR Fire Management anticipates having a new crewmember hired on early in the 2012 season.

Table 1 | Fire Effects Plot Workload 2011 and Total Plots Installed

Park	Monitoring Type	Type Code	Plot Type	Pre-burn 2011	Imme d. Post 2011	Post-burn/ Annual 2011	Annual Total (2011)	Total Plots
Gulf Islands National Seashore	Sand Pine - Scrub Oak	PICL	FMH Forest Plot	0	0	6	6	12
	Longleaf - Slash Pine	PIPA	FMH Forest Plot	0	6	3	9	12
	Pitcher Plant Savannah	SAAL	FMH Forest Plot	0	0	0	0	1
	Fuels Monitoring	FUELS	Fuel Plot	0	0	0	0	4
Mammoth Cave National Park	Redcedar – Oak Glade	JUVI	FMH Forest Plot	0	0	4	4	7
	Indiangrass Grassland	SONU	FMH Grass Plot	0	0	3	3	8
	Big Bluestem Grassland	ANGE	FMH Grass Plot	0	0	0	0	5
	Oak – Hickory Woodland	OAHI	FMH Forest Plot	0	0	0	0	9
	Chestnut Oak Woodland	QUMO	FMH Forest Plot	0	0	2	2	3
	Fuels Monitoring	FUELS	Fuel Plot	0	0	0	0	4
	Old Field	OLFI	FMH Forest Plot	2	0	0	2	2
Little River National Preserve	Shortleaf Pine Forest	PIEC	FMH Forest plot	0	0	6	6	12
	Green Pitcherplant Bog	SAOR	FMH Forest plot	0	2	1	3	6
	Chestnut Oak Forest	QUMO	FMH Forest plot	0	0	5	5	7
Natchez Trace Parkway	Oak – Hickory Woodland	OAHI	FMH Forest Plot	0	2	1	3	6
	Post Oak Savanna	QUST	Modified F. Plot	3	3	0	6	3
	Redcedar Encroached Prairie	JUVI	FMH Brush Plot	0	0	4	4	4
	Loblolly Pine Forest	PITA	FMH Forest Plot	0	4	5	9	14
	Redcedar Encroached Prairie	BLACK BELT	FMH Grass Plot	0	4	0	4	4
	Japanese Grass Invaded Streamside Forest	MIVI	FMH Grass plot	0	0	0	0	10
Horseshoe Bend National Military Park	Mixed Montane Longleaf Forest	PIPA	FMH Forest Plot	0	0	3	3	5
Stones River National Battlefield	Little Bluestem Fields	SCSC	FMH Grass Plot	0	2	2	4	15
	Central Basin Barrens	ANTE	FMH Grass Plot	0	0	0	0	9
	Grassland Restoration Areas	ANVI	FMH Grass Plot	0	0	5	5	10
	Fuels Monitoring	FUELS	Fuel Plot	0	0	0	0	3
	Redcedar Woodland	JUVI	FMH Forest Plot	0	0	0	0	1
Russell Cave National Monument	Chestnut Oak Forest	QUMO	FMH Forest Plot	0	0	0	0	1
Vicksburg National Military Park	Exotics Monitoring		Photo Plot	0	0	0	0	6
Total				5	23	50	78	183

Table 2 | Fire Ecology Staffing 2010

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified	Training and Development
Jesse Burton Ecologist	01/01/11	12/31/11	26	Yes	Intermediate Fire Behavior (S-290), FEMO Taskbook Completed, Faller-A Taskbook Completed, NPS NEPA/NHPA Training-Workshop, 4 th Annual Fire in Eastern Oak Forests Conference, Annual Southeastern Fire Interpretation Workshop, NPS Operational Leadership, ATV Operator Training
Carol Fields Lead Monitor	01/01/11	12/31/11	26	Yes	READ Training, Leadership Breakthrough I, LSU Grass Workshop, Southeastern Fire Interpretation Workshop, NPS Operational Leadership, ATV Operator Training
Jennifer Falkey Monitor	1/1/11 9/11/11	5/21/11 12/31/11	11 7 (18 total)	Yes	Emergency Medicine and Trauma Conference, Firefighter Type 1 (S-131), SE READ section instructor/participant, Red Cross CPR/AED instructor training update, SE Fire Interpretation Workshop, NPS Operational Leadership, Fundamentals 2
Michael Rotter Monitor	1/01/11 Change of 5/22/11	5/21/11 duty station 8/27/11	11 INDU 7	Yes	Intermediate Fire Behavior (S-290), FEMO Taskbook Completed, Faller-A Taskbook Initiated

Additional staff resources included well over 100 hours of volunteer work by Mackenzie Siglinsky. Help was also provided by both the NATR Fire Management Suppression and Fuels programs; GUIS, LIRI, and STRI Natural Resources; and the Southern Appalachian/Piedmont Fire Effects Monitoring Team. Their support greatly aided the crew this past year.



Figure 1 | Post-burn assessment of plot PIPA05 (Longleaf - Slash Pine Savanna) at Gulf Islands National Seashore.

Management Objectives and Monitoring Results 2011

The monitoring results for this report are broken down by park in the following pages. Data entry is current up to the end of calendar year 2011 and all analyses conducted this year have used the most recent data entered. Results are reported with 80% confidence intervals of the mean unless otherwise noted. Basic formulas for each analysis are now displayed in the management objectives column. Significant changes in monitoring results are in **bold** font. An underlined number of plots denote that minimum sample sizes have been achieved. Estimations of minimum sample size were completed with the 'SS Two Samples' tool created by Ken Gerow (available online at www.statsalive.com). Sample sizes needed with current variance are given in brackets when minimum size has not been achieved. When brackets are not given, variance and correlation of samples do not yet allow for an estimate of minimum sample size.



Figure 2 | Encountered during this fall's monitoring work at GUIS, Forked bluecurls (*Trichostema dichotomum*) inhabit the sandy openings provided by frequent burning in the sand pine – scrub oak monitoring type common throughout the Naval Live Oaks Units.



Figure 3 | This green tree frog (*Hyla cinerea*) seeks shelter from an early growing season burn just a couple feet off the forest floor. Taken within plot PITA 14 during the Needs Center prescribed fire conducted April 6, 2011.

Table 3.1 | Summary of Long-term Monitoring Results at Gulf Islands National Seashore

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Sand Pine – Scrub Oak Forest (FPICL1D07)	20-40% litter and duff reduction immediate post-burn $\frac{\beta_{Post} - \text{before } \beta}{\text{before } \beta}$	Decrease of Duff = 14.9 % (± 26 %) after 1 st fire <i>n</i> =8 [32], 3 burn units 1.1 % (± 58 %) after 2 nd fire <i>n</i> =6 [25], 4 burn units 54.5 % (± N/A) after 3 rd fire <i>n</i> =1, 1 burn units Decrease of Litter = 42.0 % (± 19 %) after 1st fire <i>n</i>=8, 3 burn units +20.0 % (± 98 %) after 2nd fire <i>n</i> =6 [42], 4 burn units 8.7 % (± N/A) after 3 rd fire <i>n</i> =1, 1 burn units	Uncertain Data are highly variable, may be confounded by hurricanes Ivan, Dennis, & Katrina	2010
	40-60% reduction of pole-sized trees by 2 nd year after 3 rd burn $\frac{\beta_{YR02} - 00Pre}{00Pre}$	Pole density reduction= 9.6 % (± 4 %) after 1st fire <i>n</i>=10, 5 burn units 21.8 % (± 8 %) after 2nd fire <i>n</i>=3, 2 burn units	Uncertain Plots have not been burned three times and objective reduction has not been met	2010
	20-40% increase in herbaceous cover by 2 nd year after 3 rd burn $\frac{\beta_{YR02} - 00Pre}{00Pre}$	Increase in relative cover = 96.1 % (± 65 %) after 1st fire <i>n</i>=8 [80], 4 burn units 210.7 % (± 124 %) after 2nd <i>n</i>=3 [230], 2 burn units)	Yes/Uncertain Plots have not burned three times	2010
Longleaf – Slash Pine Savanna (FPIPA1D07)	50-90% hardwood pole reduction by one Year after the 3 rd burn. $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = 59.3 % (± 15 %) after 1st fire <i>n</i>=9, 4 burn units 67.6 % (± 15 %) after 2nd fire <i>n</i>=9, 4 burn units 82.6 % (± N/A %) after 3 rd fire <i>n</i> =1, 1 burn units	Yes All plots have not burned three times	2010
	20-40% litter and duff reduction immediate post-burn $\frac{\beta_{Post} - \text{before } \beta}{\text{before } \beta}$	Decrease of Duff = 16.7 % (± 17 %) after 1 st fire <i>n</i> =7 [18], 3 burn units 20.7 % (± 18 %) after 2 nd fire <i>n</i> =8 [18], 4 burn units 46.6 % (± 15 %) after 3rd fire <i>n</i>=5, 3 burn units Decrease of Litter = 59.1 % (± 5 %) after 1st fire <i>n</i>=7, 3 burn units 64.0 % (± 12 %) after 2nd fire <i>n</i>=8 [19], 4 burn units 49.1 % (± 23) after 3rd fire <i>n</i>=5 [68], 3 burn units)	Yes Reductions of litter with initiation of Rx fire and duff reductions occurred in later treatments	2010
	20-40% increase of herbaceous cover by 2 nd year after 3 rd burn. $\frac{\beta_{YR02} - 00Pre}{00Pre}$	Increase in cover = 36.9 % (± 32 %) after 1 st fire <i>n</i> =7 [13], 3 burn units 147.5 % (± 82 %) after 2nd fire (<i>n</i>=6 [191], 3 burn units)	Yes/Uncertain Increase in graminoid and forb cover by second burn; however, plots have not burned three times	2010
	Limit mortality of	Density Reduction = 12.0 % (± 13%) after 1 st fire	Uncertain Data are highly	2010

	longleaf and slash pine to 20%	$n=11$, 4 burn units 20.8 % (± 22 %) after 2 nd fire $n=6$ [22], 3 burn units	variable	
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			
Pitcherplant Savannah (FSAAL1G010)	Decrease litter and duff loading by 20-40% immediate post-burn	Decrease of Duff = 44.7 % (± N/A %) after 1 st fire $n=1$, 1 burn units 12.3 % (± N/A %) after 2 nd fire $n=1$, 1 burn units Decrease of Litter = 60.8 % (± N/A %) after 1 st fire $n=1$, 1 burn units 80.0 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	Yes/Uncertain* Only one plot is installed in this monitoring type	2010
	$\frac{\beta_{Post} - before \beta}{before \beta}$			
	Limit mortality of overstory pine trees to less than 20% measured 2 years post burn	Density Reduction = 4.5 % (± N/A %) after 1 st fire $n=1$, 1 burn units 25.0 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	Yes/Uncertain* Mortality after 2 nd fire is likely a result of hurricanes Ivan, Dennis, & Katrina	2010
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			
	Reduce pole tree density by 40-90%	Density Reduction = 0 % (± N/A %) after 1 st fire $n=1$, 1 burn units 16.7 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	No/Uncertain* Pole densities were very low at pre-burn levels (< 50 per/acre)	2010
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			
	Reduce shrub density by 40-90%	Density Reduction = +108 % (± N/A %) after 1 st fire $n=1$, 1 burn units +92.5 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	No/Uncertain*	2010
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			
Pitcherplant Savannah (FSAAL1G010)	Cause no net decrease in cover of yellow trumpets (<i>Sarracenia alata</i>)	Increase in cover = 100 % (± N/A %) after 1 st fire $n=1$, 1 burn units 100 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	Yes/Uncertain* Only one plot is installed in this monitoring type	2010
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			
	Increase herbaceous component of the understory by 20-40% measured 2 years after the 3rd burn	Increase in cover = -1.4 % (± N/A %) after 1 st fire $n=1$, 1 burn units -36.6 % (± N/A %) after 2 nd fire $n=1$, 1 burn units	No/Uncertain* Only one plot is installed in this monitoring type and plot has not burned three times	2010
	$\frac{\beta_{YR02} - 00Pre}{00Pre}$			

*No statistical analysis was conducted on the FSAAL1G01 plots because of the limited number of plots.

Table 3.2 | Summary of Long-term Monitoring Results at Horseshoe Bend National Military Park

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Mixed Montane Longleaf Pine Forest (FPIPA1D07)	Decrease density of all pole trees by 20-90% as measured 1 year post burn $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = 16.7 % (± 23 %) after 1 st fire <i>n</i> =5 [19], 4 burn units 59.0 % (± N/A %) after 2 nd fire <i>n</i> =1, 1 burn units	Uncertain	2010
	Decrease litter loading by 40-90% as measured immediately post burn $\frac{\beta_{Post} - before \beta}{before \beta}$	Decrease of Duff = 2.3 % (± 13 %) after 1 st fire <i>n</i> =5, 4 burn units +50.0 % (± 1 %) after 2nd fire <i>n</i> =2, 2 burn units Decrease of Litter = 38.5 % (± 16 %) after 1 st fire <i>n</i> =5 [6], 4 burn units 45.1 % (± 13 %) after 2 nd fire <i>n</i> =2, 2 burn units	Uncertain Reductions of litter do not yet meet objective and no reduction of duff	2010
	Limit mortality of overstory longleaf pine (<i>Pinus palustris</i>) trees to less than 10% as measured 2 years post burn $\frac{\beta_{YR02} - 00Pre}{00Pre}$	Density Reduction = 4.8 % (± 4 %) after 1 st fire <i>n</i> =2 [7], 2 burn units 18.2 % (± N/A %) after 2 nd fire <i>n</i> =1, 1 burn units	Yes/Uncertain Not all plots have been monitored two years post	2010
	Cause no net gain in percent cover of exotic plants as measured one year and five years post burn $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Increase in cover = 0.0 % (± N/A %) after 1 st fire <i>n</i> =5, 4 burn units 0.0 % (± N/A %) after 2 nd fire <i>n</i> =1, 1 burn units	Yes No exotic species have been detected in FPIPA1D07 plots and no plots have been monitored five years post-burn	2010



Figure 4 | PIPA02 (HOB-00PRE) prior to planned ignitions.



Figure 5 | PIPA02 two fires and six years later.

Table 3.3 | Summary of Long-term Monitoring Results at Little River National Preserve

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Shortleaf Pine Forest (FPIEC1DG09)	25-80% reduction in pole-sized trees by 3 rd burn <i>$\beta YR01 - 00Pre$ 00Pre</i>	Density Reduction = 6.2 % (± 4 %) after 1 st fire <i>$n=11$, 4 burn units</i> 36.0 % (± 20 %) after 2 nd fire <i>$n=9$ [27], 4 burn units</i> 69.1 % (± 20 %) after 3 rd fire <i>$n=4$ [14], 2 burn units</i>	Yes	2010
	25-50% increase native grass and forb cover <i>$\beta YR02 - Earliest Read$ Earliest Read</i>	Increase in Cover = 225.2 % (± 103 %) after 1 st fire <i>$n=5$, 2 burn units</i> 194.5 % (± 136 %) after 2 nd <i>$n=6$, 3 burn units</i> 418.2 % (± 129 %) after 3 rd <i>$n=2$, 1 burn units</i>	Yes	2010
	50% reduction in duff, litter, and downed woody fuel by 3 rd burn <i>$\beta Post - 00Pre$ 00Pre</i>	Decrease of Duff = 0.6 % (± 12 %) after 1 st fire <i>$n=12$, 6 burn units</i> 43.6 % (± 8 %) after 2 nd fire <i>$n=6$, 2 burn units</i> 37.4 % (± 23 %) after 3 rd fire <i>$n=5$, 3 burn units</i> Decrease of Litter = 51.3 % (± 6 %) after 1 st fire <i>$n=12$, 6 burn units</i> 56.6 % (± 14 %) after 2 nd fire <i>$n=6$, 2 burn units</i> 78.6 % (± 4 %) after 3 rd fire <i>$n=5$, 3 burn units</i> Decrease in Total Wood = +15.1 % (± 23 %) after 1 st fire <i>$n=12$, 6 burn units</i> +63.5 % (± 54 %) after 2 nd fire <i>$n=6$ [13], 2 burn units</i> +117 % (± 75 %) after 3 rd fire <i>$n=5$ [31], 3 burn units</i>	Uncertain Objective has been achieved for litter fuel loading; however, duff has had limited reductions and total woody debris is increasing during initial treatments	2010
Green Pitcherplant Bog Forest (FSAOR1G10)	30-90% decrease in shrub cover by second year after 3 rd burn <i>$\beta YR02 - Earliest Read$ Earliest Read</i>	Decrease in cover = 29.3 % (± 12 %) after 2 nd fire <i>$n=6$, 3 burn units</i> 32.1 % (± 25 %) after 3 rd fire <i>$n=2$ [3], 1 burn units</i> +61.6 % (± 56 %) after 4 th fire <i>$n=2$ [6], 1 burn units</i>	Uncertain All plots must burn 3 times	2010
	20% increase cover of green pitcherplant (<i>Sarracenia oreophila</i>) by second year after 3 rd burn <i>$\beta YR02 - Earliest Read$ Earliest Read</i>	Increase in cover = 21.4 % (± 26 %) after 2 nd fire <i>$n=6$ [18], 3 burn units</i> 80.1 % (± 26 %) after 3 rd fire <i>$n=2$ [26], 1 burn units</i> 70.1 % (± 90 %) after 4 th fire <i>$n=2$, 1 burn units</i>	Yes/Uncertain Plots have not burned 3 times and high variability due to low numbers of individuals along transects; additional methods have been added to these plots to address this issue	2010
	30-90% decrease in pole-sized trees by second year after 3 rd burn	Pole reduction = 13.2 % (± 21 %) after 1 st fire <i>$n=3$ [5], 1 burn units</i> 57.8 % (± 15 %) after 2 nd fire <i>$n=5$ [10], 3 burn units</i> 68.7 % (± 20 %) after 3 rd fire	Yes Local park staff is also applying mechanical treatment to pole size trees	2010

	<u>$\beta YR02 - 00Pre$</u> 00Pre	$n=3$ [20], 2 burn units 58.3 % (± 34 %) after 4 th fire $n=2$ [7], 1 burn units		
Chestnut Oak Forest (FQUM01G10)	20-60% reduction in pole-sized trees	Density Reduction = 37.6 % (± 14 %) after 1 st fire $n=4$ [19], 3 burn units 41.0 % (± 0 %) after 2 nd fire $n=2$ [6], 1 burn units 69.0 % (± 17 %) after 3 rd fire $n=2$ [7], 1 burn units	Yes/Uncertain	2010
	<u>$\beta YR01 - 00Pre$</u> 00Pre		All plots must burn and have annual read to reach minimum sample size	
	25-50% increase native grass and forb cover	Increase in Cover = 145.1 % (± 197 %) after 1 st fire $n=4$ [10], 3 burn units 383.7 % (± 105 %) after 2 nd fire $n=2$, 1 burn units 0.0 % (± 0.0 %) after 3 rd fire $n=2$, 1 burn units	Uncertain	2010
	<u>$\beta YR01 - 00Pre$</u> 00Pre		All plots must burn and have annual read to reach minimum sample size	



Figure 6 | PIEC22 (LIRI) prior to planned ignitions in 1999.



Figure 7 | PIEC22 after two fires and eleven years.



Figure 8 | First late-season fire was prescribed for this green pitcher plant bog (SAOR02) in order to combat the excessive amounts of resprouting hardwoods. Growing season fire should be more effective in killing the hardwoods that are excluding this endangered species.

Table 3.4 | Summary of Long-term Monitoring Results at Mammoth Cave National Park

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Oak-Hickory Forest (FOAHI1D09)	Decrease density of shade tolerant pole trees by 30-90% $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = 58.5 % (± 15 %) after 1 st fire <i>n</i> =7 [9], 5 burn units	Yes Density of shade intolerant species significantly reduced by > 30%, All plots must burn and be monitored during annual read to meet min sample size	2010
	Limit mortality of overstory trees to less than 20% $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = 7.4 % (± 5 %) after 1 st fire <i>n</i> =7, 5 burn units	Yes	2010
	Increase native herbaceous cover by 10-25% by 1 year after the 3 rd burn $\frac{\beta_{YR02} - 00Pre}{00Pre}$	Increase in cover = 148.3 % (± 63 %) after 1 st fire <i>n</i> =7, 5 burn units	Yes All plots have experienced increases in herbaceous cover; however, plots have not burned 3 times	2010
	Reduce total fuel load by 25-50% immediately postburn. $\frac{\beta_{Post} - before \beta}{before \beta}$	Decrease in total fuels = 33.3 % (± 10 %) after 1 st fire <i>n</i> =7, 5 burn units	Yes Reduction objective does not fall outside range of confidence	2010
Redcedar Glade Forest (FJUVI1D09)	Reduce litter, duff, and downed woody fuel load by 25-50% $\frac{\beta_{Post} - before \beta}{before \beta}$	Decrease of Duff = +24.1 % (± 32 %) after 1 st fire <i>n</i> =7 [9], 4 burn units 25.7 % (± 32 %) after 2 nd fire <i>n</i> =3 [25], 1 burn units Decrease of Litter = 46.3 % (± 10 %) after 1 st fire <i>n</i> =7 [21], 4 burn units 31.3 % (± 27 %) after 2 nd fire <i>n</i> =3 [27], 1 burn units Decrease in Total Wood = 3.4 % (± 19 %) after 1 st fire <i>n</i> =7 [8], 4 burn units 36.5 % (± 27 %) after 2 nd fire <i>n</i> =3 [4], 1 burn units	No/Uncertain Significant reductions in litter fuel loading; however, duff and downed woody fuels do not yet show responses to treatment	2010
	Reduce pole-sized trees by 40-60% $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = 12.3 % (± 12 %) after 1 st fire <i>n</i> =6, 3 burn units	No This objective is being reevaluated as very low fire intensities are advised for this ecotype	2010
	Limit mortality to overstory species to less than 20% $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density Reduction = +2.2 % (± 4 %) after 1 st fire <i>n</i> =6, 3 burn units	Yes	2010

Chestnut Oak Woodland (FQUMO1D09)	Decrease density of shade tolerant pole trees by 30-90 % ¹ $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction = 33.3 % (± N/A %) after 1 st fire <i>n</i> =1, 1 burn units	Yes/Uncertain Limited sample size	2010
	Limit mortality of overstory trees to less than 20 % $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction = 4.0 % (± N/A %) after 1 st fire <i>n</i> =1, 1 burn units	Yes/Uncertain Limited sample size	2010
	Reduce total fuel load by 25-50 % after 3 burns $\frac{\beta Post - before \beta}{before \beta}$	Decrease in total fuels = 20.2 % (± 7 %) after 1st fire <i>n</i>=3, 2 burn units +14.4 % (± N/A %) after 2st fire <i>n</i> =1, 1 burn units	Yes/Uncertain Significant reduction in total fuels; however, fuels not reduced by > 25% after first treatment	2010
	Increase native grass and forb cover by 10-25 % after 3 burns $\frac{\beta YR01 - 00Pre}{00Pre}$	Increase in cover = -68.3 % (± 18 %) after 1st fire <i>n</i>=2, 1 burn units 21.7 % (± N/A %) after 2 nd fire <i>n</i> =1, 1 burn units	Uncertain Limited sample size and plots have not burned three times	2010
Indian Grass Grassland (BSONU1T02)	Reduce density of shade tolerant seedlings 30% to 60% one year after second fire ² $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction = 39.1 % (±21 %) after 1 st fire <i>n</i> =3 [20], 1 burn unit 45.8 % (±25 %) after 2nd fire <i>n</i>=2 [4], 1 burn unit	Yes/Uncertain Reductions are occurring; however, >30% is not outside the confidence interval	2010
	Reduce density of shrubs 30% to 60% one year after second fire $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction = 35.3 % (±9 %) after 1st fire <i>n</i>=3, 1 burn unit 23.2 % (±54 %) after 2 nd fire <i>n</i> =2 [43], 1 burn unit	Uncertain Significant reduction occurred after first treatment; however, all plots must burn 2 two times	2010
	Cause no net gain in percent cover of exotic plants after five years of burning ³ $\frac{\beta YR02 - 00Pre}{00Pre}$	Increase in cover = 156.1 % (± 136 %) after 1 st fire <i>n</i> =3, 1 burn units 371.2 % (± 550 %) after 2 nd fire <i>n</i> =2, 1 burn units	Uncertain Plots have not burned 5 times and minimum sample size not met	2010
	Increase relative cover of Indiangrass (<i>Sorghastrum nutans</i>) 15% after five years of burning $\frac{\beta YR02 - 00Pre}{00Pre}$	Increase in cover = 534.6 % (± 319 %) after 1 st fire <i>n</i> =3, 1 burn units 81.9 % (± 142 %) after 2 nd fire <i>n</i> =2, 1 burn units	Uncertain Plots have not burned 5 times and minimum sample size not met	2010

¹ Shade intolerant species include *Carya*, *Pinus*, and *Quercus* genera. Density analyzed for all other species.

² Density analyzed for *Acer*, *Juniperus*, *Sassafras*, and *Ulmus* genera.

³ Exotics in SONU plots include; *Digitaria* spp., *Kummerowia* spp., *Lespedeza cuneata*, *Lonicera japonica*, *Microstegium vimineum*, *Ligustrum* spp., and *Setaria* spp.

Big Bluestem Grassland (BANGE1D02)	Cause no net gain in percent cover of exotic plants as measured one year and five years post burn $\frac{\beta YR01 - 00Pre}{00Pre}$	Decrease in cover = 56.4 % (± 12 %) after 1 st fire <i>n</i> =2, 1 burn units 96.3 % (± 1 %) after 2 nd fire <i>n</i> =2, 1 burn units	Yes Limited sample size and all plots must burn	2010
	Decrease invading woody species by 30% as measured 1-year post burn $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction = +38.5 % (± 135 %) after 1 st fire <i>n</i> =4 [13], 1 burn unit 49.7 % (± 5 %) after 2 nd fire <i>n</i> =2 [4], 1 burn unit	Yes/Uncertain Limited sample size and all plots must burn	2010
Old Field (FOLFI1D08)	Increase density of oak and hickory seedlings after three burns, as measured one year post-burn $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Increase =	Uncertain Plots have not yet burned	2011
	Reduce density of shade tolerant pole by greater than %50 after three burns $\frac{\beta YR01 - 00Pre}{00Pre}$	Density Reduction =	Uncertain Plots have not yet burned	2011
	Reduce total fuel load by >25 % after 3 burns $\frac{\beta Post - before \beta}{before \beta}$	Decrease in total fuels =	Uncertain Plots have not yet burned	2011



Figure 9 | QUMO31 (MACA) prior to planned ignitions.



Figure 10 | QUMO31 after two fires and ten years.



Figure 11 | Old field monitoring at MACA (OLFI02) within the Crystal Cave Prescribed Fire Unit.

Table 3.5 | Summary of Long-term Monitoring Results at Natchez Trace Parkway

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Mixed Loblolly Pine Forest (FPITA1D09)	Reduce total fuel load by 20-40% immediately post-burn $\frac{\beta_{Post} - \beta_{before}}{\beta_{before}}$	Total fuel reduction = 40.2% ($\pm 5\%$) after 1st fire $n=12$, 7 burn units 2.0 % ($\pm 15\%$) after 2 nd fire $n=6$ [9], 2 burn units 4.6 % ($\pm 17\%$) after 3 rd fire $n=6$ [8], 2 burn units 28.4 % ($\pm 14\%$) after 4th fire $n=4$ [7], 2 burn units	Yes Significant reduction after 1 st and 4 th burns; however, only first treatment exceeds 20 % reduction	2010
	Reduce conifer poles (2.5-15.0 cm dbh) > 25% one year after 3 rd fire $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Density reduction = 8.3 % ($\pm 10\%$) after 1 st fire $n=4$ [10], 3 burn units +12.5 % ($\pm 14\%$) after 2nd fire $n=4$ [11], 2 burn units 41.7 % ($\pm 29\%$) after 3rd fire $n=4$ [34], 2 burn units 33.3 % ($\pm 33\%$) after 4 th fire $n=3$ [15], 2 burn units	Yes/Uncertain Significant reduction after 3 rd treatment and few plots now contain conifer poles	2010
	Cause no net gain in percent cover of exotic plants after 5 burns ⁴ $\frac{\beta_{YR01} - \text{earliest read}}{\text{earliest veg. read}}$	Average reduction = +10.0 % ($\pm 3.1\%$) after 1st fire $n=2$, 2 burn units + 1.5 % ($\pm 1.5\%$) after 2nd fire $n=2$, 1 burn unit 5.8 % ($\pm 3.4\%$) after 3 rd fire $n=4$, 2 burn unit	Uncertain All existing plots must burn to meet sample size and plots containing exotic species have not experienced five treatments	2010
Black Belt Prairie (BJUVI1D06)	25-50% reduction of redcedar (<i>Juniperus virginiana</i>) density after 5 years of burning $\frac{07YR01 - 00Pre}{00Pre}$	Density reduction = 86.2 % ($\pm 17\%$) after 7th fire $n=4$ [18], 1 burn units	Yes Significant reduction after 7 th burn, data not available immediately after 5 th burn	2011
	20-40% reduction in woody exotic species density by 4 th burn $\frac{07YR01 - 00Pre}{00Pre}$	Density reduction = +1580 % ($\pm$ N/A %) after 7th fire $n=4$, 1 burn units	No Plots are highly variable in exotic species density and plots that did not have exotics now do	2011
Black Belt Savanna (FQUST1D09)	Increase cover of native herbaceous plants by >200% after three burns $\frac{\beta_{YR01} - 00Pre}{00Pre}$	Native Herb Cover =	Uncertain Plots have not yet been monitored one year post burn	2011
	Reduce mean density of pole-sized trees by >50% after 3 burns $\frac{\beta_{YR01} - Pre00}{Pre00}$	Density reduction =	Uncertain Plots have not yet been monitored one year post burn	2011

⁴ Exotics in PITA plots include; privet (*Ligustrum spp.*), Japanese honeysuckle (*Lonicera japonica*), & and others.

Oak-Hickory Woodland (FOAH1D09)	Reduce litter and duff load by 30-40% after 3 burns $\frac{\beta Post - 00Pre}{00Pre}$	Duff Reduction = 52.1 % (± 8) after 1 st fire $n=3$, 2 burn units Litter Reduction = 66.3 % (± 21) after 1 st fire $n=3$ [7], 2 burn units	Yes All plots must burn three times to meet minimum sample size requirements	2010
	Reduce mean density of pole-sized trees by 20-30% after 3 burns $\frac{\beta YR01 - Pre00}{Pre00}$	Density reduction = 19.8 % (± 7 %) after 1 st fire $n=3$ [5], 2 burn units	Yes/Uncertain Plots have not been burned three times and all plots must burn to meet minimum sample size requirements	2010
Japanese Grass Invaded Streamside Forest (FMIVID09)	Decrease percent cover of Japanese grass (<i>Microstegium vimenium</i>) by 50% one year post treatment $\frac{\beta YR02 - Pre00}{Pre00}$	Cover reduction = 90.0 % (± 4 %) 1 st treatment $n=10$, 1 burn units	Uncertain A significant reduction occurred; however, there was no significant difference in the control and the experimental plots	2010



Figure 12 | PITA12 (NATR) prior to planned ignitions.



Figure 13 | PITA12 after one fire.



Figures 14-16 | Black Belt Prairie restoration site prior to treatment, after thinning, and after thinning & one Rx fire. Data not reported above.

Table 3.6 | Summary of Long-term Monitoring Results at Stones River National Battlefield

Vegetation Type	Management Objectives (Restoration)	Monitoring Results (80% Confidence Intervals)	Objective Achieved?	Year Last Analysis Completed
Little Bluestem Grassland (GSCSC1G02)	Reduce exotic ⁷ species cover by 20-70% after 5 burns $\frac{\beta YR01 - 00Pre}{00Pre}$	Exotic Cover Reduction = 42.5 % ($\pm 17\%$) after 1 st fire <i>n</i> =11 [27], 3 burn unit	Yes/Uncertain Significant reductions in exotic species after one burn; however, plots have not been burned five times and include additional treatments such as mowing and herbicide	2010
	Increase native grass and forb cover by 20-50% after 3 fires $\frac{\beta YR01 - 00Pre}{00Pre}$	Native Herb Cover = 14.1 % ($\pm 18\%$) after 1 st fire <i>n</i> =11 [21], 3 burn unit	Uncertain All plots must burn three times	2010
Central Basin Glades (GANTE1D05)	Reduce exotic ⁵ and eastern redcedar cover by 20% by 5 years post-burn $\frac{\beta YR01 - 00Pre}{00Pre}$	Exotic Cover Reduction = 0.0 % ($\pm 23\%$) after 1 st fire <i>n</i> =8 [41], 1 burn unit -11.5 % ($\pm 25\%$) after 2 nd fire <i>n</i> =8 [104], 1 burn unit Redcedar Reduction = 82.4 % ($\pm 11\%$) after 1 st fire <i>n</i> =8 [23], 1 burn unit 73.1 % ($\pm 17\%$) after 2 st fire <i>n</i> =8 [22], 1 burn unit	Yes/Uncertain Redcedar is being reduced; however, significant reductions in exotic cover have not yet occurred Plots have not been monitored five years post burn	2010
	Increase native herbaceous species cover and diversity ⁶ by 20-75% $\frac{\beta YR01 - 00Pre}{00Pre}$	Native Herb Cover = -16.7 % ($\pm 8\%$) after 1 st fire <i>n</i> =8, 1 burn unit -26.1 % ($\pm 10\%$) after 2 nd fire <i>n</i> =8, 1 burn unit Native Herb Richness = -37.4 % ($\pm 4\%$) after 1 st fire <i>n</i> =8, 1 burn unit -38.2 % ($\pm 8\%$) after 2 nd fire <i>n</i> =8, 1 burn unit Native Herb Diversity = -15 % ($\pm$ N/A%) after 1 st fire <i>n</i> =1, 1 burn unit -15.5 % ($\pm$ N/A%) after 2 nd fire <i>n</i> =1, 1 burn unit	No/Uncertain Native species have not increased in cover; however, this may be a result of changes in the seasonality of monitoring and misidentification of species in the past Native herbaceous cover, richness, and diversity was reassessed during the growing season in 2010 resulting in increases of -14.8%, +5.7%, +12.6% respectively	2010

⁵ Exotics include *Albizia julibrissin*, *Kummerowia* spp., *Leucanthemum vulgare*, *Ligustrum sinense*, *Lonicera japonica*, *Paspalum dilatatum*. *Lespedeza cuneata* is present at the site(s) but is not included in the current analysis as it may have been misidentified in previous reads.

⁶ Calculations conducted on relative changes in plots' herbaceous species richness and then on total change in diversity utilizing Shannon's diversity index.

B. Fire ecologist accomplishments and areas of focus

Table 4 | Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	20%	Reviewed 2012-2015 HOBE Omnibus Rx Fire Plan Reviewed 2011-2013LIRI Omnibus Rx Fire Plan Reviewed 2012 NATR Burn Plans Provided guidance and review of FMP for MACA Wrote 2012 MACA Fire Monitoring Plan Wrote and Maintained Sec. 7 (ESA) Compliance concerning Rx Projects Assisted with PEPC compliance documentation Consultation & compliance for Rx burns
Presentations	<5%	Attended scientific conferences concerning regional fire ecology topics Presented at and assisted with SER Fire Interpretation Workshop Assisted with local high school field trips discussing succession & fire ecology
NPS Meetings/ task groups	5%	Attended park meetings with resource management staff at local and network parks Attended regional and national fire conference calls Eastern NPS Fire Ecology Summit at SHEN
Interagency work	<5%	Served on Educational Committee for Mississippi Rx Fire Council Member of Tennessee and Mississippi Rx Fire Councils Reviewed manuscripts for 4 th Fire in Eastern Oak Forests Conference Proceedings
Wildfire assignments	<5%	Served as FFT2 and FFT1(T) - NATR wildfire incidents - West Texas IA (Hillsboro, TX)
Prescribed fire projects	5%	Served as FFT2, FEMO, and FFT1(T) - NATR & GUIS Assisted with burn unit preparation, mapping, etc. - MACA, STRI, NATR, LIRI, HOBE, GUIS, & JELA
Non-fire projects	<5%	Assisted with exotic and hazard fuels removal projects at NATR
Research	5%	Reviewed literature for historical and recent ecological studies
Data collection	15%	Assisted with the collection of FMH data Installed FMH and modified fire effects plots
Data entry	5%	Assisted with entering backlogged data Made corrections to erroneous data in FFI Troubleshooting database issues
Data analysis	10%	Performed statistical tests and analysis of fire effects data Prepared Fire Ecology Annual Report Prepared handouts with summaries of fire effects for field tours & resource management meetings Summarized and shared fire effects data with USGS and NPS I&M Networks
Supervision/Admin	10%	Supervised fire effects monitors Timesheets, travel, and other administrative paperwork
Training	10%	S-290 Intermediate Fire Behavior ATV Rider Course S-212 Wildland Fire Chain Saws Firefighter Refresher Physical Training NPS Operational Leadership NEPA/NHPA Compliance Workshop
Miscellaneous	5%	Collected, identified, and preserved plant specimens for long-term data collection consistency and reference Served as Fire Ecology Associate Editor for Natural Areas Journal Reviewed manuscripts concerning fire ecology, disturbance, and fire management in a diversity of peer review journals

C. Fire effects team accomplishments and areas of focus

Table 5 | Fire Effects Team Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	25%	Monitored over 75 FMH Plots
WUI plots	0%	No scheduled WUI plots for 2011
CBI plots	0%	No known dNBR maps were generated for 2011 projects
Other plot work	0%	N/A
Wildfire assignments	<5%	Served in variety of roles including: FFT2, FEMO, HECM and EMT(B) - NATR wildfire incidents - West Texas IA, TX - Ogeechee Wildfire, GA
Prescribed fire projects	15%	Served in variety of roles including: FFT2, FFT1, FEMO, ENB(T), EMT(B) Assisted with burn unit prep work Consultation for Rx burns Detailed with Southeast Helicopter
Non-fire fuels projects	<5%	NATR Blackbelt Restoration, exotic and hazard fuels removal projects
Travel out-of-park for plot or project work	5%	Assisted the Northeast Region with plot installations and reads for new project Traveled to GUIS, HOBE, LIRI, MACA, NATR, & STRI for FMH plot reads
Data entry	25%	Entered and scanned FMH and other fire effects data
Data analysis	<1%	
Supervision/Admin	5%	Payroll, travel authorization/voucher, etc.
Training	10%	Firefighter Refresher BAER Webinars READ Training Leadership Breakthrough I Grass Identification Workshop ATVO Training First Aid/CPR & First Aid/CPR Instructor Training Physical Training
Miscellaneous*	15%	Attended local and Satellite park meetings Co-Instructed in house First Aid/CPR course for fire management Instructed segments of READ course Collected, identified, and preserved plant specimens for long-term data collection consistency and reference Fire ecology presentation to local community college students Recycling Committee Demonstration for Fire Interpretation Workshop Southeast Fire Ecology Summit

*All members of the NATR team received 8-hour time off safety award for FY2011

D. Additional Program Information

Table 6 | Planning - 2011

Park	Does Park have written DFCs? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Number of Project- or Community-level Monitoring Plans	BAER Plan Assists in 2011
Abraham Lincoln Birthplace NHP	No	N/A	0	0
Chickamauga and Chattanooga NMP	No	N/A	0	0
Fort Donelson National Battlefield	No*	N/A	0	0
Gulf Islands National Seashore	No*	2010 (Draft)	0 (3)†	0
Horseshoe Bend National Military Park	No	N/A	0 (1)	0
Jean Lafitte NHP and Preserve	No	N/A	0	0
Little River Canyon National Preserve	No	N/A	0 (3)	0
Mammoth Cave National Park	No	2012 (Draft)	0 (6)	0
Natchez Trace Parkway	No	2007	0 (5)	0
Russell Cave National Monument	No	N/A	0 (1)	0
Shiloh National Military Park	No*	N/A	0	0
Stones River National Battlefield	No*	N/A	0 (3)	0
Vicksburg National Military Park	No*	N/A	0	0

*Does not have written DFCs that have measurable objectives for park vegetation, but does have general desired landscape goals.

†Number in brackets represents number of Monitoring Type Descriptions (FMH 4).

Table 7 | Monitoring - 2011

Park	% 2011 Data Entered	% 2011 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Gulf Islands National Seashore	100%	50%	6	0	0	0
Horseshoe Bend National Military Park	100%	0%	2	0	0	0
Little River Canyon National Preserve	100%	0%	7	0	0	0
Mammoth Cave National Park	100%	40%	3	0	0	0
Natchez Trace Parkway	100%	40%	8	1	0	0
Stones River National Battlefield	100%	100%	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. (Most fire effects monitoring is conducted on previous year's projects)

Table 8 | Communicating Results - 2011

Park	# of Project Monitoring Reports completed in 2011	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Gulf Islands National Seashore	1	1	1	Yes
Horseshoe Bend NMP Park	0	0	0	Yes
Jean Lafitte NHP and Preserve	0	1	0	No
Little River Canyon National Pres.	1	1	0	Yes
Mammoth Cave National Park	0	1	0	Yes
Natchez Trace Parkway	0	0	0	Yes
Stones River National Battlefield	0	1	0	Yes
Vicksburg National Military Park	0	0	0	No

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

Table 9 | Research - 2011

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2011	# of Proposals Funded in 2011	# of Research Projects Supported in 2011*	Additional Comments
Gulf Islands National Seashore	Yes	0	0	1	USGS vegetation mapping project/LIDAR
Horseshoe Bend National Military Park	No	0	0	0	
Jean Lafitte NHP and Preserve	N/A	0	0	1	Ongoing research concerning fire effects on floatant marshes and Chinese tallow
Little River Canyon National Preserve	No	0	0	0	
Mammoth Cave National Park	Yes	0	0	3	Ongoing research concerning fire and Indiana bat habitat, smoke impacts to caves and local air quality, and presettlement vegetation and fire ecology mapping
Natchez Trace Parkway	Yes	0	0	1	Success of varying treatments in restoring Black Belt Prairie vegetation and invertebrates
Stones River National Battlefield	No	0	0	0	
Vicksburg National Military Park	No	0	0	0	

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

E. 2012 Direction

Crew

Having recently filled our vacant fire monitor position, we will be operating with a full crew in 2012. The personnel change will allow an alteration to our traditional furlough period. The new crew member will likely work a schedule similar to that of the Appalachian/Piedmont fire effects crew, in pay status during the growing season and furloughed during the dormant season.

Budget

Considering the present budgetary constraints, the Barrens to Bayous fire effects crew will continue to strive to implement cost saving measures such as consolidated monitoring trips, utilizing alternative housing when available, and limiting purchases. Other options that will have to be visited with be the prioritization of Parks and/or monitoring types. All members of the crew will be working closely with both fire management and local Park staff to ensure management objectives are being met and the adaptive management process is being implemented.

Wildland Fire Planning

Ongoing projects include revising Fire Management Plans for Mammoth Cave National Park, Natchez Trace Parkway, and Jean Lafitte NHP and Preserve. Nearly all FMPs for parks in this monitoring network are either expired or will expire in the near future. During this update period Barrens to Bayous Fire Monitoring Network will continue to provide resources when available to assist with these plans. In addition, many parks are also in need of Fire Monitoring Plans. As time allows, these plans are being revised and/or drafted.

Fledgling Fire Programs

With the addition of several new parks to our network, we anticipate a busy season. Environmental Assessments and Fire Management Plans are in the works for many parks in the SER. Parks that are anticipated to have new programs first are Jean Lafitte NHP and Preserve (JELA) and Cumberland Island National Seashore (CUIS).

Our monitoring network will utilize pre-burn monitoring plots installed as part of a JFSP research project conducted by Southern Illinois University's [Battaglia Wetland Ecology Lab](#) within JELA. This will greatly reduce the amount of monitoring resources needed prior to implementing prescribed fires within an incredibly unique fire dependent community, flotant marshes. Developing strategies for monitoring in this new and distinctive terrain is ongoing.

Barrens to Bayous Fire Monitoring Network will also assist with the installation and monitoring of fire effects plots at CUIS. A joint effort with the other eastern NPS fire monitoring networks, this will likely be the site for the 2012 Eastern NPS Fire Ecology Summit.



Figure 17 | Part of the Eastern NPS Fire Ecology Summit, fire effects monitors and ecologists from the Barrens to Bayous, Southern Appalachian/Piedmont, and Mountains-to-the-Sea Fire Monitoring Networks conduct a safety and planning briefing before starting FMH plot installation work at SHEN.



F. Optional Information

Summarized below is additional information concerning modified monitoring, fuels constants, and prescribed fire reports for the parks within the network that were able to conduct prescribed fires.

F.1 Black Belt Savanna (FQUST1D09) Modified Fire Effect Plot

One of the most demanding issues concerning NPS fire effects monitoring at this time is budgetary constraints. One of the most time consuming responsibilities for fire effects monitors is the installation (and resultant monitoring) of standard FMH plots. The amount of precision and variables monitored on these standard plots is exceptionally invaluable. However, it is apparent in certain situations this level of monitoring is no longer practical or feasible. The alternatives to no longer monitoring at such an intensive level are either no longer installing plots or the modification of a plot to only capture needed variables.

This spring 2011 efforts were undertaken to introduce fire back into Blackland Prairie restoration sites within NATR. In previous years prescribed fire was limited to specific mechanically thinned area areas (see figure 13). However this year firing included adjacent hardwoods surrounding the mechanically thinned areas. Little information exists on the historic structure of savannas and woodlands that would have adjoined prairies in this part of the country. The primary variables of interest are to increase herbaceous plants in the understory, remove shade tolerant tree sprouts and saplings, and maintain dominant overstory of fire tolerant oaks. Time and resources were limited; however, the knowledge gained from having permanent monitoring was certainly needed.

A combination of a variety of monitoring protocols was borrowed to create this modified fire effects plot (figure 16). A panoramic photo is taken from the origin. Tree- and pole-sized trees are monitored throughout the 10 meter radius and ground cover vegetation is monitored along a standard 30 meter transect. All gathered information still uses standard FMH datasheets and is entered into FFI. Unlike the previously used FMH plots at NATR, these plots take minutes instead of hours to install and require 2 rebar instead of the usual 17. However, many variables such as fuel loading, shrub density, seedling density, and a greater capture of herbaceous data are not collected. The ecologist and fire effects crew will thoroughly evaluate the usefulness of such a design for future monitoring types as this protocol could be very limiting when utilized for adaptive management specified by RM-18.

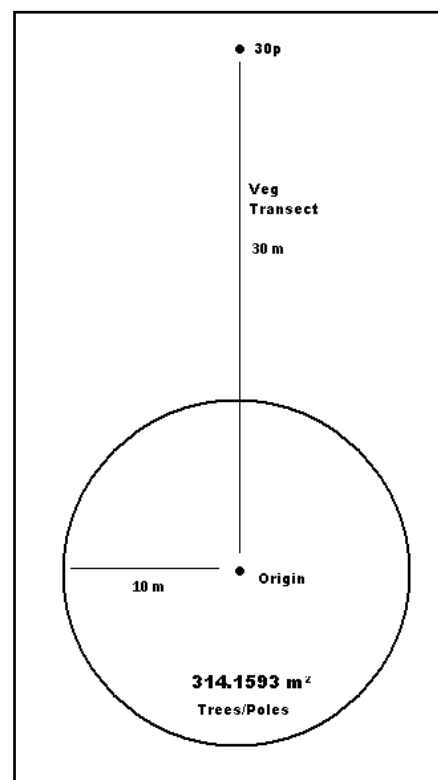


Figure 17 | Modified QUST Fire Effects Plot

F.2 Revised Fuels Constants

Concerns have been present in this region for some time regarding the accuracy of the default fuel constants utilized in FEAT/FIREMON Integrated (FFI). These constants are based on references far outside the fuel types monitored by the Barrens to Bayous Fire Monitoring Network. These values were never intended to be applied broadly over a multitude of fuel types, and more specific constants should be developed for each fuel type, and its associated overstory species composition and even seasonality.

This last year a multitude of references were utilized to generate a few fuel constants that should provide meaningfully improved results for reporting fuel loads within our network. In these tables, the values for the four newly created fuel constants are given. The monitoring types that utilize each of these new constants are also listed in the below table. The sources for these modified constants are listed below (table 10).

		QMD 1-hr	QMD 10-hr	QMD 100-hr	SG 1-hr	SG 10-hr	SG 100-hr	NHC (all)
FWD	Hardwood	0.018	0.272	3.179	0.53	0.48	0.44	1.13
	Mixed	0.019	0.28	3.328	0.53	0.48	0.44	1.13
	Longleaf/Slash	0.02	0.31	3.457	0.53	0.48	0.44	1.13

		SG Sound	SG Rotten
CWD	Hardwood	0.41	0.19
	Mixed	0.36	0.19
	Longleaf/Slash	0.32	0.17
	Oldfield	0.35	0.18

		Litter Bulk Density	Duff Bulk Density
Litter	Hardwood	1.16	4.84
and	Mixed	2.04	6.41
Duff	Longleaf/Slash	2.22	6.88

Admin Unit	Project Unit/Plot	Litter Duff	FWD	CWD
GUIS	PICL	Mixed	Mixed	Mixed
GUIS	PIPA	Longleaf/Slash	Longleaf/Slash	Longleaf/Slash
GUIS	SAAL	Longleaf/Slash	Longleaf/Slash	Longleaf/Slash
GUIS	FUELS	Longleaf/Slash	Longleaf/Slash	Longleaf/Slash
HOBE	PIPA	Mixed	Mixed	Mixed
LIRI	PIEC	Mixed	Mixed	Mixed
LIRI	QUMO	Hardwood	Hardwood	Hardwood
LIRI	SAOR	Mixed	Mixed	Mixed
MACA	JUVI	Mixed	Mixed	Mixed
MACA	FUELS	Mixed	Mixed	Oldfield
MACA	OLFI	Mixed	Mixed	Oldfield
MACA	OAH1	Hardwood	Hardwood	Hardwood
MACA	QUMO	Hardwood	Hardwood	Hardwood
NATR	PITA	Mixed	Mixed	Mixed
NATR	OAH1	Hardwood	Hardwood	Hardwood
RUCA	QUMO	Hardwood	Hardwood	Hardwood
STRI	FUELS	Mixed	Mixed	Mixed
STRI	JUVI	Mixed	Mixed	Mixed

Table 10 | Fuel constants developed for monitoring types within Barrens to Bayous Fire Monitoring Network.



Figure 18 | A prime example of longleaf – slash pine savanna within the NLO Rx fire units, GUIS.

- Adams, M.B.; Owens, D.R. 2001. Specific gravity of coarse woody debris for some central Appalachian hardwood forest species. Res. Pap. NE-716. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 4 p.
- Harmon, Mark E.; Woodall, Christopher W.; Fasth, Becky; Sexton, Jay. 2008. Woody detritus density and density reduction factors for tree species in the United States: a synthesis. Gen. Tech. Rep. NRS-29. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 84 p.
- Maier, Brian; Ottmar, Roger. 2004. Forest Floor Bulk Density and Depth at Savannah River. Draft Final Report. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Fire and Environmental Applications Team. 42 p.
- Ottmar, Roger; Andreu, Anne. 2007. Litter and Duff Bulk Densities in the Southern United States. Final Report. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Fire and Environmental Applications Team. 40 p.
- Woodall, Christopher; Monleon, Vicente. 2010. Estimating the quadratic mean diameters of fine woody debris in forests of the United States. Forest Ecology and Management 260, 1088–1093.



Figure 19 | One of only a few remaining Black Belt Prairies, Chickasaw Village Prairie is a small remnant of what once was a 200,000 acre prairie spreading from northeast Mississippi through central Alabama. In the distance are the Black Belt Prairie (BJUVI1D06) FMH plots where only a few eastern redcedars remain, the namesake of those plots.

F.3 2011 Prescribed Fire Reports

Natchez Trace Parkway

Overview

The Natchez Trace Parkway (NATR) had an above average prescribed fire season with roughly 1,300 acres treated within at least 16 projects, in spite of regionally unfavorable weather conditions. These projects varied in size and objectives from the 330 acre oak-hickory woodland restoration work at Old Trace Drive, to pile burns. FMH or other long-term vegetation monitoring plots are installed in nearly all of the treatments of suitable size and are summarized in a selection of treatments below.



Figure 20 | Serving on a fuels management detail with Natchez Trace Fire Management, Jon Freeman, the lead fire effects monitor for Teton Interagency, lays down some fire at the Rocky Springs South Rx Fire.

Rocky Springs South, Mississippi – February 16th & 17th 2011



Figure 21 | Fire behavior as it passes through a FMH fire monitoring plot February 17.

This burn unit is a mixed forest, dominated by pines, oaks, and hickories. Elm, beech, and magnolias are common in the low-lying areas of the burn unit and expanding into the midstory throughout the area. Prior to prescribed fire operations these stands were overstocked and being invaded by fire intolerant species from the riparian areas. Fire management staff is using fire to restore and maintain these stands by consuming the forest floor fuels and removing mid- and lower-story trees. This is the second treatment for Rock Springs South. PITA11, 12

Forest restoration objectives for this mixed forest type include reducing total fuel loadings from pre-burn levels by >30% measured immediately post-burn, reducing mean density of pole-size trees (2.5-15cm dbh) by >20% by 3rd burn, and maintaining a pole density of 250 to 600 trees per hectare (100-250 poles/acre) after 3rd burn. Secondary objectives are to increase native herbaceous cover and reduce exotic plant cover.

During the briefing for this burn it was decided that the original burn unit of 232 would be divided in half and burned on separate days. The northernmost portion of the unit was burned on February 16 and the

southern portion was burned on February 17. Overall, the fire behavior was similar throughout the burns; however, consumption was likely higher towards the end of the first day and throughout the second. This was most likely a combination of a longer drying period and an increase in the pine component in the litter.

Two FMH plots are located in the Rocky Springs South prescribed fire unit. Immediate post-fire results indicate clear success in reaching fire management objectives (table 11). In areas represented by the Mixed Loblolly Pine Forest monitoring type, an estimated 9.1 tons/acre were consumed.

Table 11 | Treatment effects of the second Rocky Springs South prescribed fire. Reported results are from PITA11 and 12 (N=2). Percent fuel consumption values are comparisons between 01YR02 and 02Post reads.

Treatment	FWD	CWD	Duff	Litter	Total Fuels
2nd Burn	-37%	-46%	3%	-74%	-36%

Meriwether Lewis North, Tennessee – February 23rd 2011

This 278 acre prescribed fire unit is located in south-central portion of Tennessee near mileposts 385. This burn unit is dominated by white oaks (*Quercus stellata* & *Q. alba*) and to a lesser extent by red oaks and hickories, especially on southern slopes and ridge-tops. Elm, beech, poplar, and maple are not uncommon in the fire-sheltered drainages of the unit. Historically the upland sites, especially southwest slopes and ridges would have supported an open understory with abundant herbaceous plants. Fire is being utilized to restore these stands to a more open nature by removing mid and lower-story trees, especially shade tolerant species such as beech and maples and encouraging herbaceous development by consuming the forest floor fuels. The reduction of these fuels will also mitigate damage to mature trees and other park resources in the event of a wildfire.

The primary short-term ecological objective for this burn includes reducing total fuel loadings by greater than 30%, measured immediately post-burn. Another ecological objective is to reduce pole-sized trees (2.5-15cm dbh) by greater than 20% after the third treatment. Long-term objectives are to maintain a pole density of less than 600 trees per hectare (100-250 poles/acre) after the third burn.



Figure 22 | Backing fire on south facing slopes within the ML North burn unit.



Figure 23 | Photo monitoring point showing immediate pre- and post-burn effects along a ridge-top in ML North

This unit may have experienced above average fire intensities during its last prescribed fire in 2007. There was concern that a repeated treatment of similar intensity would damage some individual trees located within the campground. Therefore, to minimize further increasing hazards to the public, this unit's prescription in 2011 was to have a very low intensity fire.

The prescribed fire was initiated on February 23, 2011, just two days after over a quarter inch of rainfall. Even though many of the prescription parameters were same on the burn day, KBDI values were significantly lower. Throughout the burn fire behavior was minimal, with good litter consumption on South to Southwest slopes.

Objectives were likely achieved; however, no permanent FMH plots were burned during this operation. Long term monitoring plots are installed in the adjacent prescribed fire unit.

Old Trace Drive, Tennessee – March 3rd 2011

Natchez Trace Fire Management staff completed the 330 acre Old Trace Drive Prescribed Fire. This was the second prescribed fire for the burn unit. This burn unit consists of a series of ridges dominated by widely spaced oaks and hickories. This ridgetop would have historically received frequent fire return intervals helping to maintain an open canopy and oak dominance. As the ridges descend the plant communities gradually become more mesic and eventually run into Jacks Branch Creek on the West side of the unit. Although these areas are at the bottom of steep slopes, the vegetation here is only relatively mesic and still has a strong upland oak component. The present canopy composition of mainly Oak species with a few Hickory species, strongly suggests an active fire history for the site.

Ecological objectives for this site include reducing total fuel loadings from pre-burn levels by >30%, reducing mean density of pole-size trees by >20% by 3rd burn, and maintaining a pole density of 250 to 600 trees per hectare after 3rd burn. Increasing herbaceous cover and diversity is also a major goal for this woodland site.

Initial results from the post read, on FMH plot OAH1, showed that hourly fuel levels were reduced immediately post burn. Further analysis showed that all components of the fuels were reduced during this second treatment (table 12), an estimated 8.7 tons/acre reduction.



Figure 24 | Fire effects monitor (FEMO) Mike Rotter and fire ecologist Jesse Burton record fire behavior and fuel consumption as the fire moves through FMH plot OAH101.

Table 12 | Treatment effects of the Old Trace Drive prescribed fire. Reported results are from OAH101 (N=1). Percent fuel consumption values are comparisons between 01YR02 and 02Post reads.

Treatment	FWD	CWD	Duff	Litter	Total Fuels
2nd Burn	-76%	-40%	-56%	-25%	-54%



Figure 25 | West facing slope of Old Trace Drive Rx fire unit. Summer 2010.

Stones River National Battlefield

Stones River Complex Prescribed Burns, Tennessee – March 8th 2011

Seven prescribed burns were completed at Stones River National Battlefield on March 8, 2011. The units burned were Jim's Field (1 acre), Lake Garesche (11.3 acres), Michigan Marker (9 acres), Miller Tract (14 of 33 acres), Triangle Field (3 acres), Chicago Board of trade (3 of 5 acres), and Redoubt Brannan (3 acres) for a total of 44 acres treated. All of which are dominated primarily by grass monitoring types. The grasslands at Stones River are underlain by various limestone formations. Sites are primarily open and dominated with perennial grasses of varying heights. Dominant species include *Andropogon virginicus*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Panicum anceps*, *Chasmanthium* spp., *Lysimachia* spp., and various other *Andropogon* spp. In wetter areas, *Juncus* and *Carex* spp. are present. Exotics include *Festuca arundinacea*, *Lonicera japonica*, *Dioscorea oppositifolia*, *Ligustrum* spp., *Sorgham halepense*, and *Bromus* spp.

Stones River National Battlefield is currently using prescribed fire to manage grasslands and cedar glades. This was the second prescribed fire for the Redoubt Brannan unit and the third prescribed fire for the Michigan Marker unit. We were informed on the day of the prescribed fire that the Redoubt Brannan unit had an arson event in February 2011. Due to the arson event, there was less vegetation than usual within the unit.

The primary fire management goals for all the units are to provide for firefighter and public safety, provide training and developmental opportunities for park staff, and provide the public with an opportunity to learn about fire. The primary resource objectives are to reduce litter and duff by > 30% immediately post-burn, induce mortality in exotic species by >30% over 5 years post-burn, and increase native herbaceous species cover and diversity by > 20% over 5 years post-burn. Prior burning has resulted in a roughly 50% reduction in exotic cover and a 13% increase in native plant cover (figure 27).

Post-burn fire effects monitoring was done in the Redoubt Brannan unit (the only unit with fire effects plots) immediately following the burn. Based on the monitoring, it was determined that the unit was between moderately to lightly burned, with the duff primarily undisturbed. Subsequent annual monitoring will be necessary to determine if the other resource objectives (increasing native grass diversity and decreasing exotic species) was met with these burns.

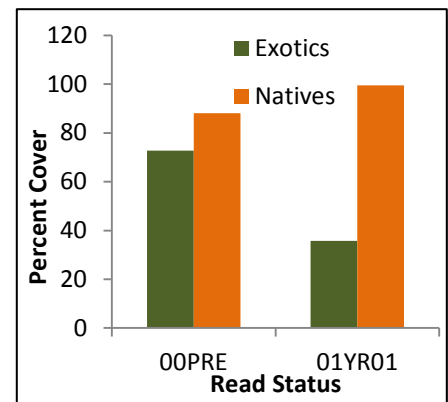


Figure 27 | Point intercept cover of native vs. nonnative plant species within the little bluestem grassland monitoring type (GSCSC1G02)



Figure 26 | Dominance of the little bluestem grassland (GSCSC1G02) is being maintained through the use of prescribed fire, preserving the historic landscape of this battlefield.

Gulf Islands National Seashore

NLO 4 and 5, Florida – March 17th 2011

The Naval Live Oaks Units targeted on March 17, 2011 included NLO 4C, 4D, 4E and 5B. These units, totaling 185 acres, have previously been treated at various times since 2002, creating a mosaic of burned and unburned vegetation. Dominated by a longleaf – slash pine savannah, the project area also included a diverse mix of sand pine - scrub oak, live oak hammocks, and xeric sandhills. The burn area had been impacted by numerous hurricanes and tropical storms, leaving many standing snags.



Figure 28 | The bottlebrush stage of longleaf pine development fends off the intense heat generated during fire operations at GUIs. One of many adaptations plant species have to maintain their dominance in this pyrogenic community.

The goals of the burn were to reduce litter and duff by >20% immediately post burn, decrease pole sized trees by >50% 1 year post burn, limit mortality of overstory pines to 20% two years post burn, increase herbaceous component of understory two years post burn, provide for the safety of the public and firefighters, manage hazard fuels and to reintroduce the role of fire as an ecological process.

Fire burned very patchily in the shaded oak hammocks with poor consumption of the top litter layer. As the fuel type changed to more open pine savannah, fire intensity and rate of speed increased significantly. An additional 40 acres were added to the tally in NLO 6, due an unplanned ignition by the helicopter. This unit had been burned the previous year so; therefore, fire behavior was reduced and control with existing resources was not a concern. An intense fire raced through the interior of the unit dominated by longleaf pine savannah and quickly subsided once reaching oak scrub burned in previous years. However, the duff layer continued to smolder and creep for several days after the burn day. This caused some concern for longleaf feeder roots close to the surface of the soil. Subsequent monitoring will determine what the impacts of the sustained heat to the trees will be. However, monitoring this fall showed the dominant trees to be in excellent health. An analysis of immediate post burn data indicated that the treatment was successful in reducing the litter and duff by significant amounts; however, these results will not be reported until next year.

Figure 29 | Saw Palmetto (*Serenoa repens*) dominates much of the understory of NLO 5.



Little River Canyon National Preserve

Bog Burn, Alabama – August 17th & 18th 2011

Targeted for the 2011 Bog Burn Prescribed Fire were bog 7, bog 2 and 3. Bog 2 and 3 were combined due to their proximity, into one unit. Twelve acres in total were treated. These bogs were contained within a larger prescribed fire unit, Kral's. Bog 7 is in the interior of the Kral's unit and is bordered on the west side by a two track road and handline around the remainder of the unit. Bog 2/3 abuts Highway 35 on the north, a small section of Rd 176 on the east and handline around the remainder (figure 31).

The elevation gradients within the unit are quite small but have significant effects on the associated vegetation. Endangered pitcher plants (*Sarracinea oreophila*) are found in the lower elevation bogs, oftentimes with standing water. Shade tolerant midstory species, such as the invasive woody species *Acer rubrum*, *Liquidambar styraciflua*, and *Oxydendrum arboreum*, have colonized these bogs. These prolific resprouting species are rapidly excluding the endangered plant and its associated community. *Pinus taeda*,

Quercus falcata, and *Vaccinium* spp. are the dominant tree and shrub species.

The Kral's Complex Unit, which contains these targeted bogs, has been burned 4 times previously during the early growing season and is scheduled to be treated again Spring 2012. The Bog Rx Fire, conducted on August 17th and 18th was the first recorded late growing season burn, likely a first for the NPS in this part of the region. The primary intent for the late growing season burn was to target fire intolerant species that are encroaching on the pitcher plant populations. It is hoped that frequent late season burns will weaken root systems and diminish resprouting of these species. The pitcher plants require bare mineral soil and significant light in order to thrive.

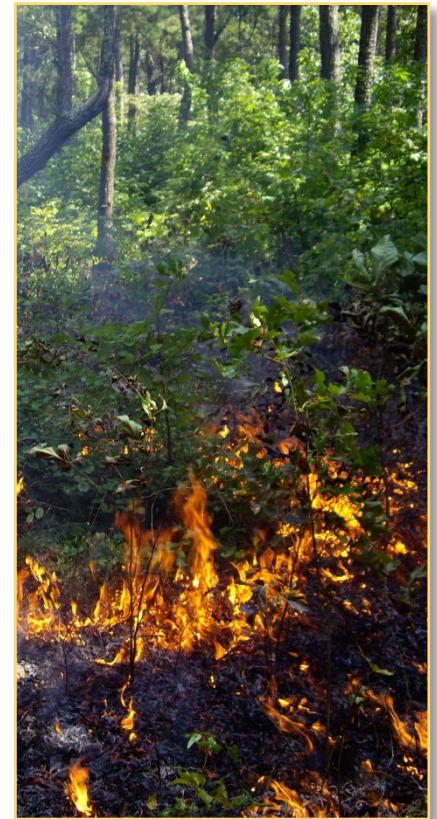


Figure 30 | Prescribed fire as it moves through a green pitcher plant bog, August 2011.



Figure 31 | Bog 2, 3, and 7 encompassed within the Kral's Complex Rx Unit.

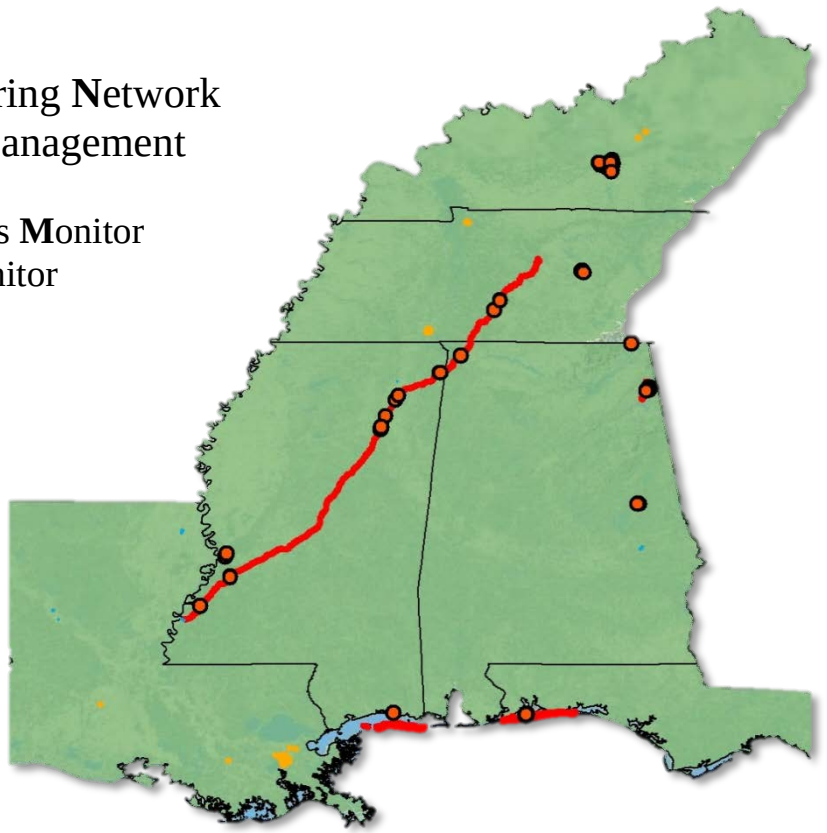
There were 2 FMH plots located within the burn unit. A full FMH forest plot is located in Bog 7 and a quarter FMH plot is located in bog 2. The immediate post burn effects indicated that pockets of vegetation burned lightly with some scorch and char heights of up to .5 meters. Small pockets of substrate burned to white ash when in conjunction with larger fuels. Over the unit, litter and duff were scorched to lightly burned. Fire intensities were great enough to either girdle or scorch numerous small pockets of the under/mid story canopy (figure 32). Further analysis of the data is necessary and only long-term monitoring will reveal the extent to this prescriptions success, but a preliminary look indicated that the Bog Burn was successful in setting back undesirable species and allowing light gaps to reach the endangered pitcher plants.



Figure 32 | 71 days post-burn, Bog 2 is showing signs of realized objectives. Noteworthy amounts of hardwood sprouts have been top-killed. One-year-post reads will reveal the degree of the success of this growing season burn.

Barrens to Bayous Fire Monitoring Network Natchez Trace Parkway Fire Management

Carol Fields	Lead Fire Effects Monitor
Jennifer Falkey	Fire Effects Monitor
Jesse Burton	Fire Ecologist



Map of the Barrens to Bayous Fire Monitoring Network in Kentucky, Tennessee, Mississippi, Alabama, and North Florida. Current fire parks are drawn in red, with active monitoring plots indicated with orange circles. Additional parks in Tennessee, Louisiana, and Georgia will be added to the network in the near future. These fledgling fire parks are drawn in orange, and our network hopes to make all of these parks both free of hazardous fuels and refugia of fire dependent communities.

