



National Park Service Ozark Highlands Fire Ecology Annual Report Calendar Year 2014

A. Summary

A1. Staffing summary - The long overdue and highly justified promotion of our Lead Monitor Angela Sokolowski to a permanent full-time GS-9 position finally happened on August 10th. Unfortunately for NPS, Angela got her promotion by joining the USFS.

Fortunately, the 2 NPS seasonal staff on the Ozark Highlands Fire Effects Crew were supplemented by 2 Lincoln University volunteer botany interns for part of the summer. Ozark National Scenic Riverways (ONSR) is experiencing a severe housing shortage. Consequently, housing the botany interns proved so daunting that we will not utilize their availability in 2015.

In 2011, the Ozark Highlands Fire Effects Crew had 85 payperiods of funding supporting 2 permanent subject-to-furlough staff and 5 seasonal staff. At best, in 2015 the Ozark Highlands Fire Effects Crew will consist of 2 seasonal staff for a total of 20 payperiods, a 76.5% decline from the 2011 staffing level.

A2. 2014 ONSR data analysis summary – Ecologically, glade restoration is the highest goal of prescribed fire management at ONSR because some glade species can only survive in healthy glade habitat. Increasing native herbaceous plant species richness is currently our best measurement for determining if we are achieving our primary glade restoration goal. The latest ONSR glade data shows a 64.7% increase in native herbaceous plant species richness, a resounding success.

The second highest goal of prescribed fire management at ONSR is increasing native herbaceous plant species richness in the dry woodland habitat. The latest ONSR dry woodland data shows a 99% increase in native herbaceous plant species richness, an amazing success.

The third highest goal of prescribed fire management at ONSR is increasing native herbaceous plant species richness in the dry-mesic woodland habitat. The latest ONSR dry-mesic woodland data shows a 76.2% increase in native herbaceous plant species richness, another amazing success.

A3. 2014 Buffalo National River (BUFF) data analysis summary –Although several prescribed burns were completed on NPS lands in Arkansas in 2014, only 1 fire effects monitoring plot was burned and it was at BUFF. Consequently, the extensive data analysis from Arkansas NPS lands included in the 2013 Ozark Highlands Annual Report remains relevant.

A second customized fire effects monitoring plot was established at BUFF to monitor changes in a population of the nationally-rare and fire-benefitted Bush's poppy mallow (*Callirhoe bushii*) in the North River Road Rx unit. In comparison to data initially collected in 2012, the Bush's poppy mallow population appears to be struggling to produce mature-sized plants due to a combination of excessive shade and herbivory by deer or elk.

I recommended cutting 50% - 100% of the eastern red cedar trees in these plots that are less than 9 inches DBH during the dormant season, and pile burning them in the adjoining roadbed before green-up, in order to reinvigorate this population.

Table 1. Fire Effects Plot Workload (2014) and Total Plots Installed

Park	Monitoring Unit	Plot Type (FMH plot, fuels, rare plant, photo point, CBI, etc.)	Pre-burn 2014	Immed. Post 2014	Postburn (1-20 yrs) 2014	Annual Total (2014)	Total Plots by type not just 2014
Ozark NSR	Glade/Woodland Transition (SCSC)	FMH forest plot	2	5	7	14	25
Ozark NSR	Dry Mesic Woodland Oak/Hickory (QUAL)	FMH forest plot	0	2	3	5	14
Ozark NSR	Dry Woodland Oak/Hickory/Pine (QUVE)	FMH forest plot	2	3	3	8	21
Ozark NSR	Various (Brown's lines)	Fuels	0	0	0	0	58
Ozark NSR	Various	CBI	0	0	0	0	67
Ozark NSR	Tall larkspur*	Rare species count/photo points	0	0	8 + 1 control	9	9
Ozark NSR	Riddell's goldenrod*	Rare species count/photo points	0	0	2	2	2
Ozark NSR	Cedar removal	Photo point	0	0	0	0	3
Ozark NSR	Deer enclosure & open deer control	Species richness	0	0	0	0	6
Buffalo NR	Glade/Woodland Transition (SCSC)	FMH Forest plot	0	0	0	0	10
Buffalo NR	Dry Woodland Oak/Hickory/Pine (QUVE)	FMH Forest plot	0	1	1	2	17
Buffalo NR	Dry Woodland Oak/Hickory/Pine	Modified Forest plot (no herbaceous)	0	0	0	0	16
Buffalo NR	Various (Brown's lines)	Fuels	0	0	0	0	7
Buffalo NR	Bush's poppy mallow*	Rare species count/photo points	0	0	2	0	2

Hot Springs NP	Dry Woodland Pine-oak (HOSP)	FMH Forest plot	0	0	0	0	7
Hot Springs NP	Dry Woodland Pine-oak (HOSP)	Modified Forest plot	0	0	0	0	8
Hot Springs NP	Ouachita blazing star*	Rare species count/photo points	0	0	0	0	3
Pea Ridge NMP	Oak Hickory forest/Woodland (OAH)	FMH Forest plot	0	0	0	0	6
Pea Ridge NMP	Post Oak – Black Jack Oak Woodland (QUMA)	FMH Forest plot	0	0	0	0	6
Total	* Pilot sampling plots		4	11	25	40	288

Table 2. Fire Ecology Staffing 2014

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development completed in 2014
Dan Drees Fire Ecologist	1/1/14	12/31/14	26	Yes	Resource Advisor (READ), Ozark Botany, Red-carded, Fire Safety refresher, USERRA, FISSA, Discrimination & Whistleblowing in the Workplace (No FEAR Act), VET-FHM, Approving Official and Cardholder mandatory charge card trainings, mandatory 10 hours of annual training for Supervisors, EEO course,
Angela Sokolowski, promoted from Asst. Lead to Lead Monitor	1/13/14	8/8/14	15	Yes	2-day Rare Mo. plant ID workshop, ENOP task book development, Ozark Botany, Red-carded, Fire Safety refresher, USERRA, FISSA, Motor boat operator training.
Asst. Lead Monitor	Held vacant				
JoAnn Miller, monitor	5/19/14	9/20/14	9	No	S- 130/190, Red-carded, Fire Safety refresher, USERRA, FISSA
Ashley Dang, monitor	5/5/14	8/21/14	8	No	S- 130/190, Ozark Botany, Red-carded, Fire Safety refresher, USERRA, FISSA
GS-5 FEMO	Held vacant				
GS-5 FEMO	Held vacant				
Derick Asahl, volunteer botany intern	5/12/14	8/8/14	6, but not paid	No	Ozark Botany, USERRA, FISSA,
Lyndsey Downing, volunteer botany intern	5/12/14	7/31/14	6, but not paid	No	Ozark Botany, USERRA, FISSA,

Table 3a. 2014 Management Objectives and Monitoring Results for ONSR glade, dry woodland, and dry-mesic woodland plots.

Monitoring Unit	Management Objective (Restoration)	Monitoring Results <i>Results in italic show data in relation to the written objectives of the original Fire Monitoring Plan.</i> Results in bold show data in relation to the latest data.	Original written Fire Monitoring Plan objective achieved?	Year Last Analysis Completed (Range of data years included in analysis)
ONSR, Glade/Transition	Reduce the density of pole trees (2.5-15 cm dbh) by at least 40% within two growing seasons after 2 nd burn ; (80% C.I.)	<i>Total pole tree reduction = 30.1% decrease (n=19 plots, 2 fires)</i> Total pole tree reduction = 44.6% decrease (n=20 plots, 2 to 5 fires)	No, but analysis of latest data shows success.	2014 (1999-2014)
	Increase the average number of native species (per quadrat) in the herbaceous layer by at least 40% within two growing seasons after the second burn (90% C.I.)	<i>Total increase in avg. # of native herbaceous species (per quadrat) = 35.2% (n=19 plots, 2 fires)</i> Total increase in avg. # of native herbaceous species (per quadrat) = 64.7% (n=20 plots, 2 to 5 fires)	No, but analysis of latest data shows success	2014 (1999-2014)
ONSR, Dry Woodland (Oak/Hickory/Pine)	Reduce the density of pole trees (2.5-15 cm dbh) by at least 30% within two growing seasons after 2 nd burn; (80% C.I.)	<i>Total pole tree reduction = 53.3% (n=19 plots, 2 fires)</i> Total pole tree reduction = 62.6% (n=19 plots, 2 to 5 fires)	Yes	2014 (1999-2014)
	Increase the average number of native species (per quadrat) in the herbaceous layer by at least 40% within two growing seasons after the second burn (90% C.I.)	<i>Total increase in avg. # of native herbaceous species (per quadrat) = 57.7% (n=19 plots, 2 fires)</i> Total increase in avg. # of native herbaceous species (per quadrat) = 99% (n=19 plots, 2 to 5 fires)	Yes	2014 (1999-2014)
ONSR, Dry-Mesic Woodland (Oak/Hickory/Pine)	Reduce the density of pole trees (2.5-15 cm dbh) by at least 30% within two growing seasons after 2 nd burn; (80% C.I.)	<i>Total pole tree reduction = 57% Decrease (n=14 plots, 2 fires)</i> Total pole tree reduction = 72% Decrease (n=14 plots, 2 to 5 fires)	Yes	2014 (1999-2014)
	Increase the average number of native species (per quadrat) in the herbaceous layer by at least 20% within two growing seasons after the second burn (90% C.I.)	<i>Total increase in avg. # of native herbaceous species (per quadrat) = 47.4% (n=14 plots, 2 fires)</i> Total increase in avg. # of native herbaceous species (per quadrat) = 76.2% (n=14 plots, 2 to 5 fires)	Yes	2014 (1999-2014)

A4. ONSR data analysis interpretation

ONSR is meeting goals to reduce pole trees in dry woodlands and moist woodlands. ONSR is also meeting goals to increase native herbaceous plant species richness in dry woodlands and moist woodlands. ONSR is not quite meeting the initial lofty goals targeted for glades by the second year after the second burn.

On many glades, eastern red cedars were too dense and big to kill with fire alone. Consequently, mechanical removal of cedars was initiated. Mechanical cedar removal and/or 3rd, 4th, or 5th burns have subsequently accomplished the initial glade restoration goals. Based on the latest data, pole-sized trees in 20 glade plots have been reduced on average by 45%.

More importantly, the latest data shows a 64.7% increase in native herbaceous plant species richness. This measurement of ONSR fire management success is presently the best data that

ONSR staff collects for analyzing whether ONSR glades are losing or recovering their indigenous biodiversity. For some of this biodiversity, healthy glade natural communities are their only habitat or their best habitat.

The following tables (2, 3, and 4) show fire effects results on a plot-by-plot basis at ONSR in relationship to management goals.

Table 3b. 2014 ONSR glade mgmt. objectives & monitoring results from individual plots.

ONSR Plot Type & #	Burn Unit	Dates of 1 st & 2 nd burns	% reduction of pole-size trees per hectare, 2nd yr after 2nd burn	% increase in avg # of native herbaceous species per 1 meter quadrat 2nd yr after 2 nd burn	Dates of 3 rd , 4 th , or 5 th Burn	% increase in avg # of native herbaceous species per 1 meter quadrat based on latest data
Glade 1	Brandewiede	3/?/2000 & 3/?/2003	goal is at least -40% from 920 to 1080 = up 17%	goal is at least +40% from 4.4 to 14.2 = up 223%	3/27/2009 4/5/2013	goal is at least +40% from 4.4 to 18.4 = up 318%
Glade 2	Brandewiede	3/?/2000 & 3/?/2003	from 1960 to 1000 = -40%	from 2 to 11.2 = up 460%	3/27/2009 4/5/2013	from 2 to 10.8 = up 440%
Glade 3	Little Booming Shoal	3/?/2000 & 3/?/2004	from 1880 to 1200 = -36%	from 2 to 5.6 = up 180%	plot did not burn in 07, but did 3/5/2010, 4/9/2014	from 2 to 8.4 = up 320%
Glade 4	Booming Shoal II	?/?/2001 & 3/?/2004	from 160 to 160 = no change	from 9.4 to 8.8 = -6%	plot did not burn in 07, but did 3/5/2010 4/9/2014	from 9.4 to 11.6 = up 23%
Glade 5	Booming Shoal II	?/?/2001 & 3/?/2004	from 1360 to 720 = -47%	from 9.2 to 10.6 = up 15%	3/24/2007 3/5/2010 4/9/2014	from 9.2 to 13.6 = up 48%
Glade 6	Booming Shoal II	?/?/2001 & 3/?/2004	from 600 to 560 = -7%	from 17 to 13.6 = -20%	plot did not burn in 07, but did 3/5/2010 4/9/2014	from 17 to 12.2 = down 28%
Glade 7	West Thorny	3/?/2001 & 3/?/2003	from 1920 to 680 = -65%	from 7.8 to 10.4 = up 33%	plot did not burn in 09, but did 4/3/2013	from 7.8 to 10.2 = up 31%
Glade 8	Quarry	3/?/2001 & 3/?/2005	from 640 to 440 = -31%	from 7.4 to 9.6 = up 30%	plot did not burn in 09,	from 7.4 to 8.4 = up 14%
Glade 9	Russell Mt.	?/?/2003 & 3/29/2006	from 2600 to 2040 = -22%	from 6.2 to 10 = up 61%	3/23/2010 4/5/2013	from 6.2 to 12.4 = up 100%
Glade 10	Lower Thorny	3/?/2002 & 4/3/2013	From 2160 to 360 = -83%	from 6.4 to 15.8 = up 147%		from 6.4 to 15.8 = up 147%
Glade 11	Chilton Creek	3/?/2003 & 4/4/2006	from 1360 to 160 = -88%	from 6.4 to 5.8 = -9%	3/18/2010	from 6.4 to 10.8 = up 69%
ONSR Plot Type & #	Burn Unit	Dates of 1 st & 2 nd burns	% reduction of pole-size trees per hectare, 2nd yr after 2nd burn	% increase in avg # of native herbaceous species per 1 meter quadrat 2nd yr after 2 nd burn	Dates of 3 rd , 4 th , or 5 th Burn	% increase in avg # of native herbaceous species per 1 meter quadrat based on latest data
Glade 12	Chilton Creek	3/?/2003 & 4/4/2006	from 1640 to 360 = -78%	from 6.8 to 9.4 = up 38%	3/18/2010	from 6.8 to 10.6 = up 56%
Glade 13	Russell Mt.	?/?/2003 & 3/29/2006	from 1800 to 800 = -56%	from 3.6 to 5.8 = up 61%	3/23/2010 4/5/2013	from 3.6 to 10.2 = up 183%
Glade 14	Russell Mt.	?/?/2003 & 3/29/2006	from 2960 to 2400 = -19%	from 6.2 to 9.0 = up 45%	3/23/2010 4/5/2013	from 6.2 to 9.0 = up 45%

Glade 15	Beaver Pond	3/?/2004, plot did not burn in 07, but did 3/19/2010	from 1840 to 1560 = -15%	from 12.2 to 11.2 = -8%		from 12.2 to 11.2 = -8%
Glade 16	Vance/Barnett Mts.	3/24/2011 & 3/22/2014	Data due in 2015	Data due in 2015		from 4 to 8.2 = up 105%
Glade 17	Mill/Buzzard Mts.	3/?/2004 & 3/24/2010	from 2600 to 2160 = -17%	from 8 to 9 = up 13%	4/13/2013	from 8 to 10.8 = up 35%
Glade 18	Mill/Buzzard Mts.	3/?/2004 & 3/24/2010	from 1200 to 680 = -43%	from 6.4 to 7.0 = up 9%	4/13/2013	from 6.4 to 11.0 = up 72%
Glade 19	Peavine	3/10/2009, 3/21/2012	from 600 to 480 = -20%	from 12.8 to 20.2 = up 58%		from 12.8 to 20.2 = up 58%
Glade 20	Peavine	3/10/2009, 3/21/2012	from 360 to 280 = -22%	from 8.8 to 9.0 = up 2%		from 8.8 to 9.0 = up 2%
Glade 21	Alley	3/13/2012 only	NA	NA		
Glade 22	Alley	3/13/2012 only	NA	NA		
Glade 23	Vance/Barnett Mts.	3/24/2011 3/22/2014	Data due in 2015	Data due in 2015		
This row sums glade recovery goals and avg. results		GOAL - Reduce the density of pole trees (2.5-15 cm dbh) by at least 40% within two growing seasons after 2 nd burn with a 80% confidence interval (C.I.)	RESULTS - Total pole tree reduction = 30% Decrease (N=19 plots with 2 fires)	GOAL - Increase the average number of native species (per quadrat) in herbaceous layer by at least 40% within 2nd growing season after 2nd burn	RESULTS - Total increase in average number of native species (per quadrat) in the herbaceous layer = 35.2% (N=19 plots with 2 fires, 90% C.I.)	RESULTS - Total increase in average number of native species (per quadrat) in the herbaceous layer based on latest data = 64.7% (N=20 plots with 2 or more fires, 90% C.I.)

Table 3c. 2014 ONSR dry woodland mgmt. objectives & results from individual plots.

ONSR Plot Type & #	Burn Unit	Dates of 1 st & 2 nd burns	% reduction of pole-size trees per hectare, 2nd yr after 2nd burn	% increase in avg # of native herbaceous species per 1 meter quadrat 2 nd yr after 2 nd burn		Dates of 3 rd , 4 th , or 5 th Burn	% increase in avg # of native herbaceous species per 1 meter quadrat based on latest data				
Dry woodland 1	Campbell Pt.	3/14/2000 2/20/2004	goal is at least -30% from 1320 to 600 = -55%	goal is at least +40% from 3.1 to 2.7 = -13%		3/26/2007 3/19/2010	goal is at least +40% from 3.1 to 3.3 = up 6%				
Dry woodland 2	Campbell Pt.	3/14/2000 2/20/2004	from 1520 to 400 = -74%	from 2.3 to 3.9 = up 70%		3/26/2007 3/19/2010	from 2.3 to 4 = up 74%				
Dry woodland 3	Little Booming Shoal	3/?/2000 3/?/2004	from 1080 to 160 = -85%	from 0.2 to 2.9 = up 1350%		3/24/2007 3/5/2010 4/9/2014	from 0.2 to 6.3 = up 3,050%				
Dry woodland 4	Campbell Pt.	3/14/2000 2/20/2004	from 1840 to 1320 = -28%	from 5.1 to 5.6 = up 10%		3/26/2007 3/19/2010	from 5.1 to 6.7 = up 31%				
Dry woodland 5	West Thorny	3/?/2000 3/?/2003	from 1080 to 680 = -37%	from 2.9 to 3.9 = up 34%		3/27/2009 4/3/2013	from 2.9 to 4.2 = up 45%				
Dry woodland 6	Booming Shoal II	?/?/2001 3/?/2004	from 800 to 120 = -85%	from 1.2 to 2.7 = up 125%		3/24/2007 3/5/2010 4/9/2014	from 1.2 to 6.7 = up 458%				
Dry woodland 7	Booming Shoal II	?/?/2001 3/?/2004	from 1200 to 440 = -63%	from 1.5 to 4.7 = up 213%		3/24/2007 3/5/2010 4/9/2014	from 1.5 to 7.3 = up 387%				
Dry woodland 8	Quarry	3/?/2001 3/?/2005	from 800 to 360 = -55%	from 0.9 to 0.9 = no change		3/12/2009	from 0.9 to 1.1 = up 22%				
Dry woodland 9	Chilton Creek	3/?/2003 4/4/2006	from 760 to 600 = -21%	from 1.8 to 2.1 = up 17%		3/18/2010	from 1.8 to 2.9 = up 61%				
Dry woodland 10	Chilton Creek	?/?/2003 4/4/2006	from 720 to 440 = -39%	from 3 to 2.8 = -7%		3/18/2010	from 3 to 5.5 = up 83%				
Dry woodland 11	Russell Mt.	?/?/2003 3/29/2006	from 1160 to 160 = -86%	from 0.6 to 0.6 = no change		3/23/2010 4/3/2013	from 0.6 to 3.1 = 417%				
Dry woodland 12	Beaver Pond	?/?/2004 3/27/2007	from 1200 to 360 = -70%	from 3.2 to 5.1 = up 59%		3/19/2010	from 3.2 to 6.8 = up 112%				
Dry woodland 13	South Chilton	4/4/2006 3/18/2010	from 440 to 0 = -100%	from 0.3 to 1.3 = up 333%							
Dry woodland 14	South Chilton	4/4/2006 3/18/2010	from 920 to 560 = -39%	from 2.9 to 4 = up 38%							
Dry woodland 15	Angel Ridge	3/22/2007 3/12/2011	from 840 to 640 = -67%	from 0.7 to 1.2 = up 71 %							
Dry woodland 16	Angel Ridge	3/22/2007 3/12/2011	from 920 to 560 = -94%	from 1.2 to 8.3 = up 592%							
Dry woodland 17	Peavine	3/10/2009 3/21/2012	from 120 to 40 = -67%	from 1.4 to 2.0 = up 43%							
Dry woodland 18	Peavine	3/10/2009 3/21/2012	from 240 to 160 = -33%	from 1.5 to 2.1 = up 40 %							
Dry woodland 19	Peavine	3/10/2009 3/21/2012	from 920 to 800 = -13%	from 7.5 to 7.7 = up 3%							
This row sums the dry woodland recovery goals and avg. results		GOAL - Reduce the density of pole trees (2.5-15 cm dbh) by at least 40% within two growing seasons after 2nd burn with a 80% confidence interval (C.I.)		RESULTS - Total pole tree reduction = 53% Decrease (N=19 plots with 2 fires, 80% C.I.)		GOAL - Increase the average number of native species (per quadrat) in herbaceous layer by at least 40% within 2nd growing season after 2nd burn		RESULTS - Total increase in average number of species (per quadrat) in the herbaceous layer = 57.7% (N=19 plots with 2 fires, 90% C.I.)		RESULTS - Total increase in average number of native species (per quadrat) in the herbaceous layer based on latest data = 99% (N=19 plots with 2 or more fires, 90% C.I.)	

Table 3d. 2014 ONSR dry-mesic woodland mgmt. objectives & monitoring results from individual plots.

ONSR plot type & #	Burn Unit	Dates of 1 st & 2 nd burns	% reduction of pole-size trees per hectare, 2nd yr after 2nd burn	% increase in avg # of native herbaceous species per 1 meter quadrat 2nd yr after 2 nd burn		Dates of 3 rd , 4 th , or 5 th Burn	% increase in avg # of native herbaceous species per 1 meter quadrat based on latest data
Moist woodland 1	Little Booming Shoal	3/?/2000 & 3/?/2004	goal is at least -30% from 1160 to 200 = -83%	goal is at least +20% from 2.6 to 3.9 = up 50%		3/24/2007 3/5/2010 4/9/2014	goal is at least +20% from 2.6 to 5.5 = up 112%
Moist woodland 2	Brandewiede	3/?/2000 & 3/?/2003	from 1560 to 1120 = -28%	from 8.4 to 8.4 = 0%		3/27/2009 4/3/2013	from 8.4 to 10.8 = 29%
Moist woodland 3	Lower Thorny	3/?/2002 & 4/3/2013	From 1760 to 80 = -95%	from 5.7 to 13.3 = up 133%			from 5.7 to 13.3 = up 133%
Moist woodland 4	West Thorny	3/?/2001 & 3/?/2003	from 1680 to 840 = -50%	from 2.8 to 4.6 = up 64%		3/27/2009 4/3/2013	from 2.8 to 4.6 = up 64%
Moist woodland 5	West Thorny	3/?/2001 & 3/?/2003	from 2720 to 920 = -66%	from 4.4 to 11.9 = up 170%		3/27/2009 4/3/2013	from 4.4 to 13 = up 195%
Moist woodland 6	Booming Shoal II	?/?/2001 & 3/?/2004	from 1560 to 1120 = -28%	from 1.3 to 1.6 = up 23%		3/24/2007 3/5/2010 4/9/2014	from 1.3 to 2.4 = up 85%
Moist woodland 7	Chilton Creek	3/?/2003 & 4/4/2006	from 1000 to 680 = -32%	from 2.2 to 2.8 = up 27%		3/18/2010	from 2.2 to 3.5 = up 59%
Moist woodland 8	Chilton Creek	3/?/2003 & 4/4/2006	from 920 to 400 = -57%	from 3.8 to 4.1 = up 8%		3/18/2010	from 3.8 to 4.2 = up 11%
Moist woodland 9	Russell Mt.	?/?/2003 & 3/29/2006	from 1080 to 120 = -89%	from 1.5 to 1.6 = up 7%		3/23/2010 4/3/2013	from 1.5 to 3.3 = up 120%
Moist woodland 10	Russell Mt.	?/?/2003 & 3/29/2006	from 1400 to 480 = -66%	from 4.3 to 5.8 = up 35%		3/23/2010 4/3/2013	from 4.3 to 8.6 = up 100%
Moist woodland 11	South Chilton	4/4/2006 & 3/18/2010	from 1160 to 280 = -76%	from 1.9 to 3.1 = up 63%			from 1.9 to 3.1 = up 63%
Moist woodland 12	South Chilton	4/4/2006 & 3/18/2010	from 960 to 360 = -62%	from 5.0 to 6.5 = up 30%			from 5.0 to 6.5 = up 30%
Moist woodland 13	Angel Ridge	3/22/2007 & 3/12/2011	from 1320 to 40 = -97%	from 3.0 to 8.4 = up 180%			from 3.0 to 8.4 = up 180%
Moist woodland 14	Angel Ridge	3/22/2007 & 3/12/2011	from 560 to 280 = -50%	from 3.4 to 5.6 = up 65%			from 3.4 to 5.6 = up 65%
This row sums the moist woodland recovery goals and avg. results		GOAL - Reduce the density of pole trees (2.5-15 cm dbh) by at least 30% within two growing seasons after 2nd burn with a 80% confidence interval (C.I.)		RESULTS - Total pole tree reduction = 57% Decrease (N=14 plots with 2 fires)		GOAL -Increase the average number of native species (per quadrat) in herbaceous layer by at least 20% within 2nd growing season after 2nd burn	RESULTS - Total increase in average number of native species (per quadrat) in the herbaceous layer = 47.4% (N=14 plots with 2 fires, 80% C.I.)
						RESULTS - Total increase in average number of native species (per quadrat) in the herbaceous layer based on latest data = 76.2% (N=14 plots with 2 or more fires, 80% C.I.)	

A5. Based on 2014 ONSR native herbaceous plant species richness data:

1. **In the glades**, we are 90% certain there is a **35.2% increase in species richness by the second growing season after the second application of prescribed fire** based on data from 19 plots.
2. **In the glades**, we are 90% certain there is a **64.7% increase in species richness based on the latest data from 20 plots having 2 or more prescribed fires.**
3. **In the dry woodlands**, we are 90% certain there is a **57.7% increase in species richness by the second growing season after the second application of prescribed fire** based on data from 19 plots.
4. **In the dry woodlands**, we are 90% certain there is a **99% increase in species richness based on the latest data from 20 plots having 2 or more prescribed fires.**
5. **In the moist woodlands**, we are 80% certain there is a **47.4% increase in species richness by the second growing season after the second application of prescribed fire** based on data from 14 plots.
6. **In the moist woodlands**, we are 80% certain there is a **76.2% increase in species richness based on the latest data from 14 plots having 2 or more prescribed fires.**

A6. Based on the latest ONSR live pole-sized tree data as of 2014:

1. **In the glades** we are 80% certain there is a **44.6% decrease in the number of pole-sized trees per hectare based on the latest data from 20 plots having 2 or more prescribed fires.**
2. **In the dry woodlands** we are 80% certain there is a **62.6% decrease in the number of pole-sized trees per hectare based on the latest data from 19 plots having 2 or more prescribed fires.**
3. **In the moist woodlands** we are 80% certain there is a **72.8% decrease in the number of pole-sized trees per hectare based on the latest data from 14 plots having 2 or more prescribed fires.**

Table 3e. 2014 ONSR glade pre-burn vs. post-burn overstory tree basal area.

2014 ONSR glade pre-burn vs. post-burn overstory tree basal area (> 5.9 inch DBH), all species.			
Status = burn # & 1st or 2nd growing season's data	Live Basal Area sq. ft. per acre	Live overstory trees per acre	# of data plots
Preburn	33.1	81.7	20
01yr01	33.4	83.4	20
01yr02	35.7	87.8	20
02yr01	34.3	90.3	20
02yr02	37.1	92.6	19
03yr01	35.7	83.3	14

03yr02	42.5	94.2	11
04yr01	32.5	66.5	9
04Yr02	34.5	64.8	2
05yr01	65.9	80.9	1

Comparing the same 20 glade plots, the data show that live overstory trees increased slightly in basal area and increased by 11% in number by the first year after the second burn. This increase was predominantly due to growth in the size of eastern red cedars.

Table 3f. 2014 ONSR dry woodland pre-burn vs. post-burn overstory tree basal area.

2014 ONSR dry woodland pre-burn vs. post-burn overstory tree density (> 5.9 inch DBH), all species.			
Status = burn # & 1st or 2nd growing season's data	Live Basal Area sq. ft. per acre	Live overstory trees per acre	# of data plots
Preburn	92.3	124.4	19
01yr01	89.4	118.2	19
01yr02	88.9	113.3	19
02yr01	89.4	111.8	19
02yr02	91.1	110.8	19
03yr01	88.5	111.0	12
03yr02	87.9	109.6	12
04yr01	88.3	99.2	8
04Yr02	96.0	104.5	6
05yr01	94.1	102.5	3

Comparing the same 19 dry woodland plots, the data show that live overstory trees decreased slightly in basal area and decreased by 11% in number by the second year after the second burn.

Table 3g. 2014 ONSR dry-mesic woodland pre-burn vs. post-burn overstory tree basal area.

2014 ONSR dry-mesic woodland pre-burn vs. post-burn overstory tree density (> 5.9 inch DBH), all species.			
Status = burn # & 1st or 2nd growing season's data	Live Basal Area sq. ft. per acre	Live overstory trees per acre	# of data plots
Preburn	82.6	96.8	14
01yr01	82.2	94.2	14
01yr02	83.2	93.7	14
02yr01	84.9	92.2	14

02yr02	85.9	92.8	14
03yr01	85.5	94.0	9
03yr02	81.7	91.7	9
04yr01	84.9	96.5	7
04Yr02	99.5	103.9	4
05yr01	109.9	105.2	2

Comparing the same 14 dry-mesic woodland plots, the data show that live overstory trees increased in basal area and decreased slightly in number by the second year after the second burn.

A7. Summary of 2014 ONSR Riddell's goldenrod data:

The 2014 data we obtained from the 2 Riddell's goldenrod plots (10m x 25m) at ONSR showed a **population increase of 1,026% over pre-management numbers** (from 115 in 2011 to 1,125 in 2013, and 1,295 in 2014). In the Ozarks, Riddell's goldenrod (*Solidago riddellii*) is a rare but characteristic fen plant that is dependent on significant sunlight and wet/damp organic soil in order to produce viable seed and seedlings. In the absence of the historic fire regime, the Riddell's goldenrod population at the Mill Mt. fen was being shaded out by invasive eastern red cedars.

Starting in January of 2012, ONSR staff cut 9 acres of cedars on and near the fens. The cedar slash on the fens was dragged away and burned in piles in the surrounding pine woodland. The fen also received a broadcast burn on 4/13/2013. The response of the native grasses and wildflowers was tremendous (see following photos). I submitted a fire success story titled Prescribed Burn Partnership Increases Locally Rare Plant at ONSR based on the data conveyed above.



Riddell's goldenrod plot 2 before & after cedar removal & 1 burn.





Riddell's goldenrod plot 1 before & after cedar removal & 1 burn.



A7. Summary of 2014 ONSR tall larkspur monitoring data.

This year's highlights include:

1. Overall, the 8 tall larkspur monitoring plots receiving fire management have increased by 100% from the initial populations, (from 1,052 to 2,106 = +100%). By contrast, the one plot in an unmanaged tall larkspur population decreased by 43% since 2011 (from 138 to 79 = -43%).
2. Although the overall tall larkspur population increased in 2014 (due to big increases in the Devils Well and Welch Lodge prescribed burn units), the Pistol Barrel prescribed burn unit had a decline.
3. The Pistol Barrel Rx unit received a moderate intensity burn on 3/24/14, as prescribed. The primary goals were to reduce leaf litter accumulation, reduce small diameter woody competition, and leave most of the duff layer intact. Post burn observations indicated that all of these objectives were achieved. Consequently, it was perplexing to see the 19% decline from the initial population inventory (from 759 to 612 = -19%).
4. The 19% decline since the initial population inventories is especially baffling, considering that this population increased significantly after the low-intensity Rx burn of 2011. Furthermore, the populations in both the Devils Well and Welch Lodge prescribed burn units have increased enormously following Rx fire.

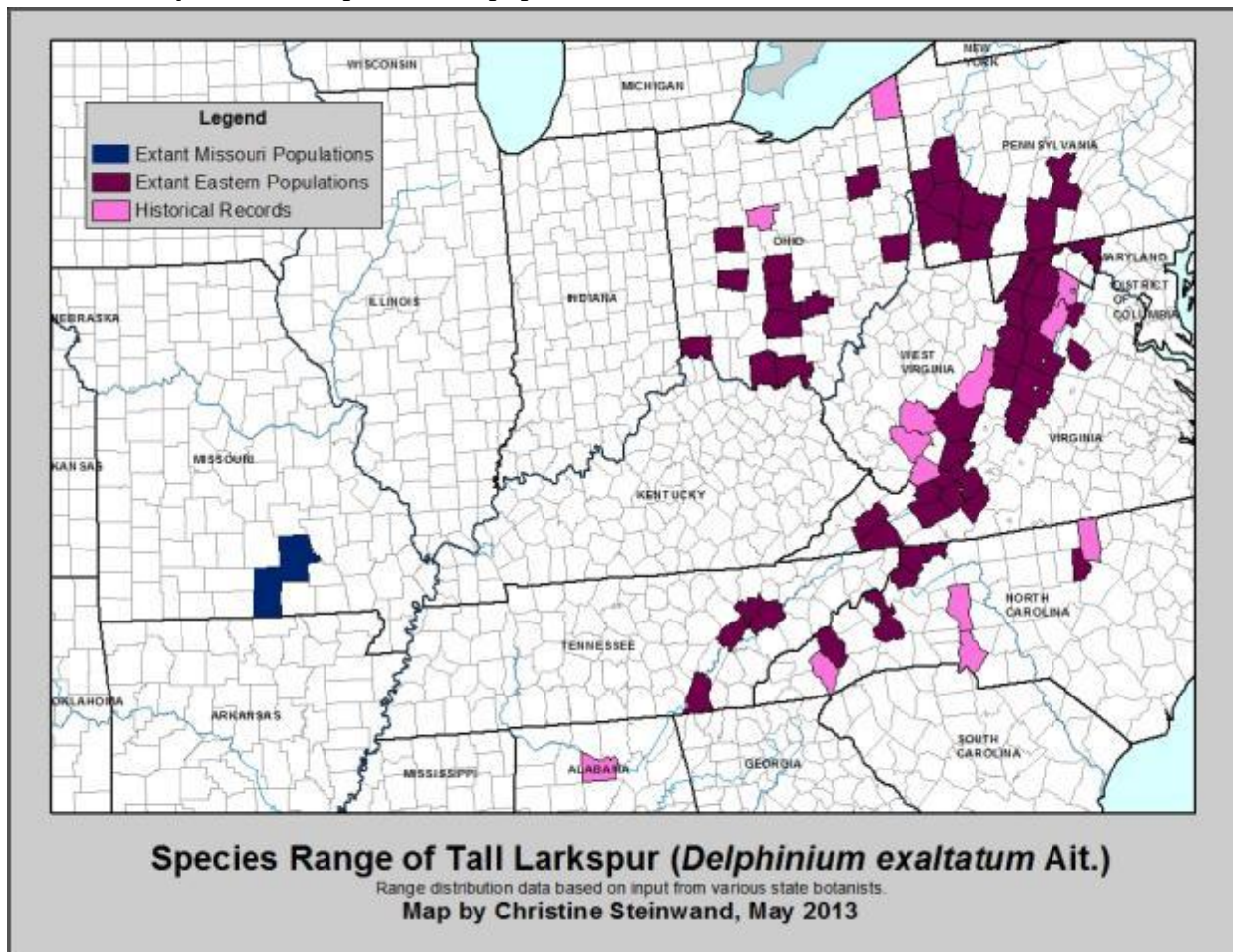
Additional analysis of the Pistol Barrel data showed that the number of tall larkspur plants that were significantly damaged by deer herbivory (>10% of leaf area) increased by 2,033% (from 3 in 2011 to 64 in 2014). In 2011, deer damaged plants were 0.3% of the population (3 of 858), while in 2014, deer damaged plants were 10.5% of the population (64 of 612). Deer herbivory research on American ginseng by Farrington and Drees published in 2009 showed that plants which were heavily browsed by deer in April were often dormant by mid-July. Potentially, a single inventory of tall larkspur populations in late July may miss plants that went dormant early due to deer herbivory weeks earlier. Although the data is insufficient to exclusively implicate increased deer herbivory for a lower population of tall larkspur at Pistol Barrel, it is a variable that is worth future analysis. Fortunately, all of the tall larkspur populations at ONSR are in areas open to deer hunting. If deer are negatively impacting local tall larkspur populations this should be a transient impact.

Tall larkspur's national subpopulation at ONSR

Tall larkspur is a nationally rare wildflower primarily distributed through the central Appalachian Highlands. The entire national sub-population of tall larkspur occurs in 2 counties of the Missouri Ozarks. The disjunct Ozark population is 400 miles west of the closest populations in Ohio or Tennessee. Significantly, about 80% of the Ozark population grows within the designated boundary of ONSR.

This nationally rare wildflower is listed as endangered in four states (Maryland, North Carolina, Pennsylvania, and Tennessee) (USDA Plants Database 2013). Tall larkspur is occasionally grown by native wildflower enthusiasts as a garden perennial due to its beauty and attractiveness

to hummingbirds, butterflies, and bumblebees. Nevertheless, relatively little is known regarding the life history of tall larkspur in wild populations.



Map 1. Updated species range map of tall larkspur across the United States, excluding garden escape records.

Overall, from the initial populations, the 8 tall larkspur monitoring plots receiving fire management have increased by 100% (from 1,052 to 2,106 = +100%). By contrast, the one plot in an unmanaged tall larkspur population decreased by 43% since 2011 (from 138 to 79 = -43%). Unfortunately, no clear predictable pattern of tall larkspur population response to fire management has emerged yet. Although the overall tall larkspur population increased in 2014 (due to big increases in the Devils Well and Welch Lodge prescribed burn units), the Pistol Barrel prescribed burn unit had a decline.

The Pistol Barrel Rx unit received a moderate intensity burn on 3/24/14, as prescribed. The primary goals were to reduce leaf litter accumulation, reduce small diameter woody competition, and leave most of the duff layer intact. Post burn observations indicated that all of these objectives were achieved.

2014 data results.

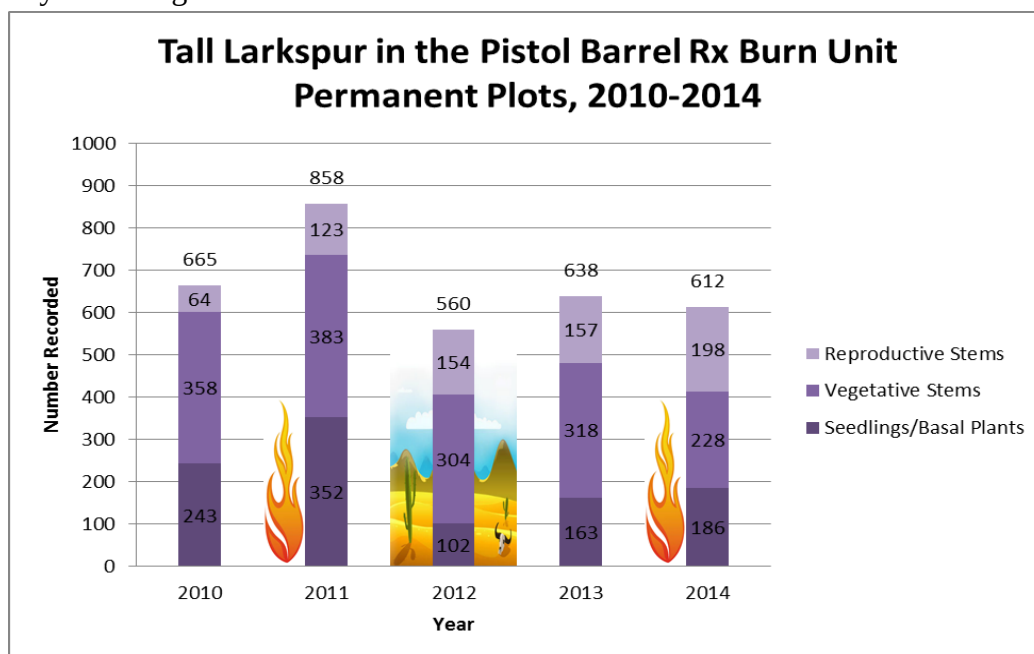
Table 3h. Stem counts for tall larkspur by plot, 2010-2014. See Figures A1 – A10 on pages 21 -26 for annual life stage counts by plot.

Year	DeEx 1	DeEx 2	DeEx 3	DeEx 4	DeEx 5	DeEx 6	DeEx 7	DeEx 8	DeEx 9	DeEx 10
2010	167	203	118	177	13	N/A	N/A	N/A	N/A	N/A
2011	135	314	128	187	12	94	129	109	184	138
2012	89	189	67	136	N/A	79	197	74	200	50
2013	78	185	100	173	N/A	93	243	147	363	104
2014	78	184	104	164	N/A	82	526	237	1257	79

Table 3i. Names of DEEX plots and population locations.

Tall larkspur permanent plots	Population Location
DEEX 1-4	Pistol Barrel
DEEX 5	Alley Spring, abandoned because better control plot was found near Round Spring
DEEX 6	Pistol Barrel
DEEX 7	Devils Well
DEEX 8, 9	Akers Ferry (Welch Lodge Burn Unit)
DEEX 10	Round Spring

2014 population counts from the 5 plots in the **Pistol Barrel Rx unit** indicate that none of the tall larkspur plots have maintained their initial population levels (see Table 3 below). However, the populations in both the Devils Well and Welch Lodge prescribed burn units have increased enormously following fire.





Reduction in small-diameter woody cover in plot 1 where tall larkspur declined by 53% from 2010 to 2014.

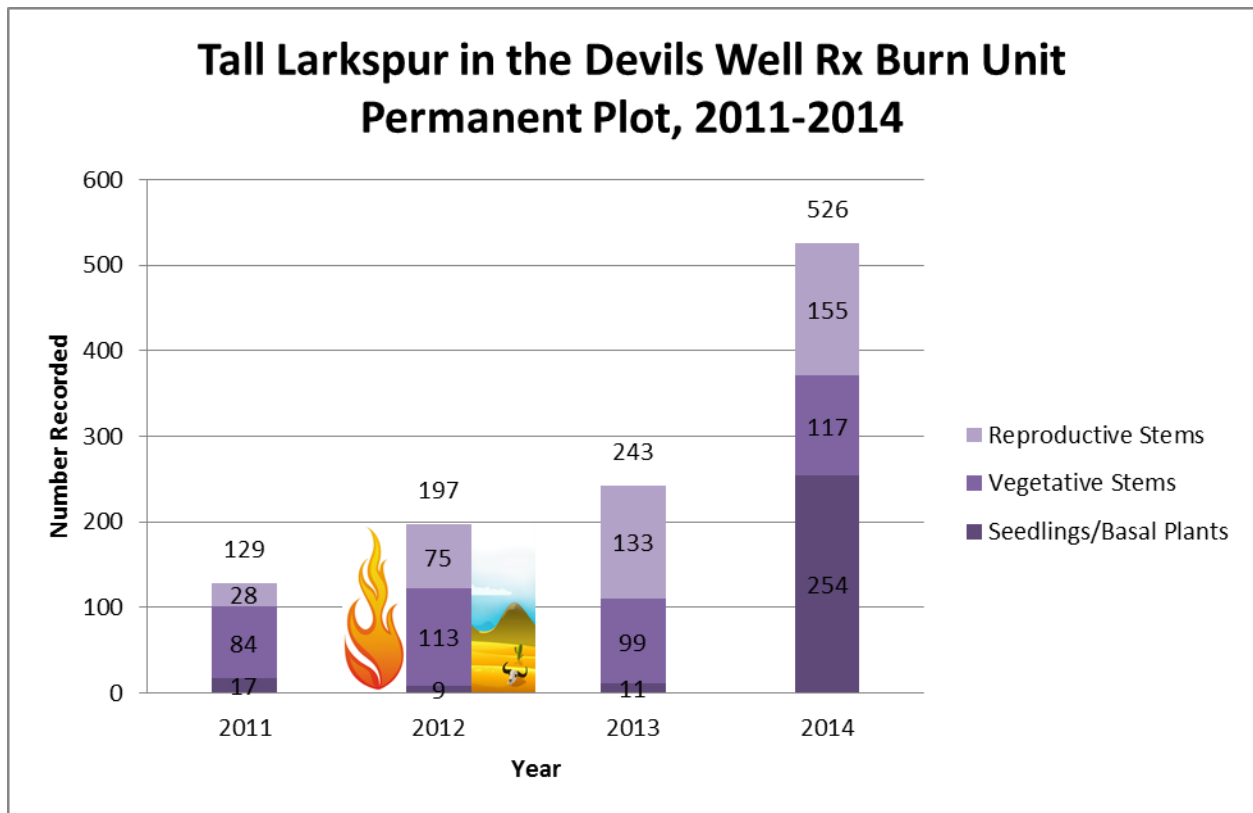




Reduction in small-diameter woody cover in plot 2 where tall larkspur declined by 9% from 2010 to 2014.



From the initial population observation, the **Devils Well population** has increased 308% (from 129 to 526 = +308%). Interestingly, this increase occurred despite the horribly dry/hot summer of 2012 . It has now expanded to include all 3 of the plant size classes (seedling/basal, vegetative stem, & reproductive stem).

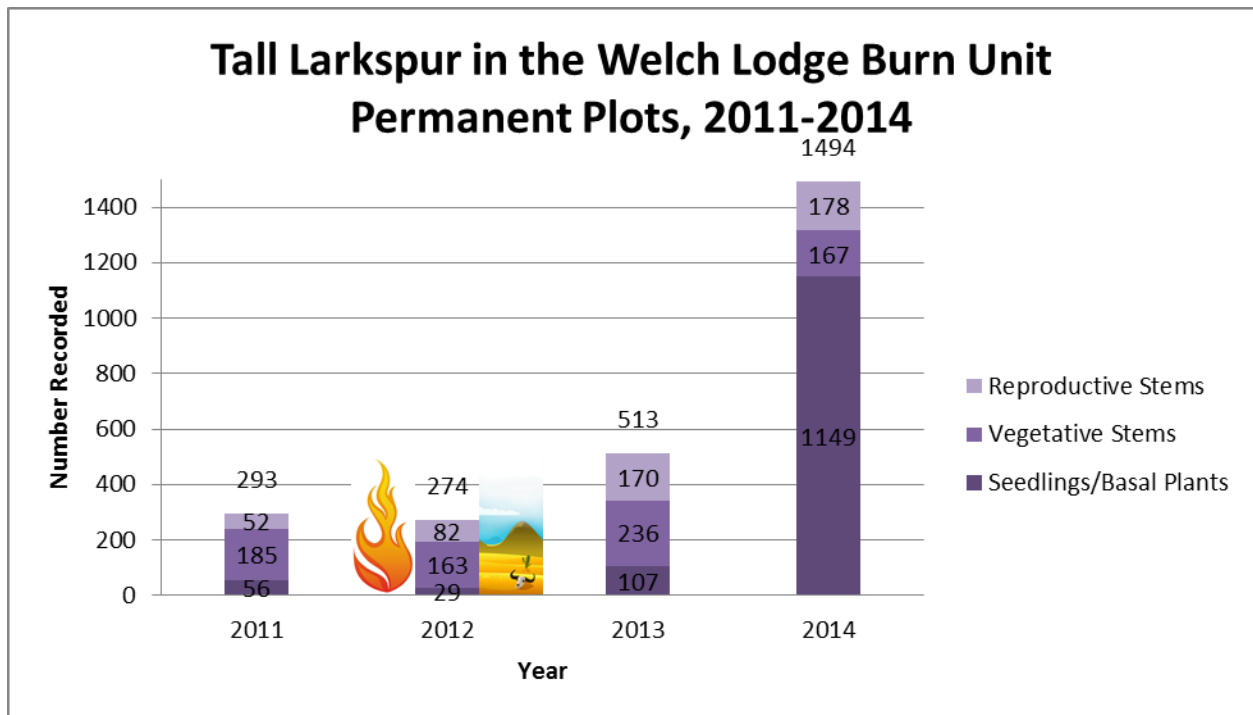




Reduction in small-diameter woody cover in plot 7 where tall larkspur increased by 308% from 2011 to 2014.



In the **Welch Lodge Rx burn unit**, populations have increased 410% (from 293 to 1,494 = +410%). The number of seedling/basal-sized plants and reproductive plants in the Welch Lodge unit increased significantly. There was a slight decline in the number of vegetative stem plants (likely due to many of the vegetative stems becoming reproductive stems). A huge increase in seedling/basal-sized plants in plot 9 accounted for the majority of the increase.





Reduction in small-diameter woody cover in plot 9 where tall larkspur increased by 583% from 2011 to 2014.



A8. Table 3j. Buffalo National River (BUFF) fire effects objectives and monitoring results

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?	Year Last Analysis Completed (Range of data years included in analysis)
BUFF, Glade/Transition	Reduce pole density (2.5 – 15 cm dbh) by 60% after 10 years of burning; (80% C.I.)	Total pole tree reduction = 20% decrease (n=8 plots, 2 fires)	No	2013 2001-2013
	Increase the average number of native species in the herbaceous layer by at least 40% within two growing seasons after the second burn; (90% C.I.)	No change in the average number of species (per quadrat) in the herbaceous layer. (n=8 plots, 2 fires)	No	2013 2001-2013
	Reduce new growth of eastern red cedar by 95% after three consecutive burns (90% C.I.)	Reduced new growth eastern red cedar by 100% (n=6 plots, 2 fires)	Yes	2013 2001-2013
BUFF, Dry Woodland	Reduce pole-sized tree density (2.5-15 cm dbh) by 60% after 10 years of burning; (80% C.I.)	64% Reduction (n=8 plots, 8 – 9 years after 1 st fire)	Yes	2013 2001-2013
	Reduce overstory-sized tree density to open vista with a target density of 74 trees/hectare after 20 years (80% C.I.)	295 tph = no reduction (n=8 plots, 8 – 9 years after 1 st fire)	NA, first burns with plots were in 2004, but reaching goal is unlikely.	2013 No 20 yr data 2001 - 2013
	Reduce live tree stems/acre by 60 % over 10 years of burning (90% C.I.)	52% Reduction (n=8 plots, 8 – 9 years after 1 st fire)	No, because no additional burns are planned before 10 years.	2013 2001 - 2013

BUFF data analysis interpretation

No glade plots were burned at BUFF in 2014. The one woodland plot that burned in 2014 (Dry woodland plot #8, at Pruitt), had the native herbaceous species richness increase from 4.1 preburn to 10.0 after its third burn. This is an increase of 144%.

A plot established to monitor the nationally-rare and fire-benefitted Bush's poppy mallow (*Callirhoe bushii*) in the North River Road Rx unit partially burned in 2014. The remaining 1-hour fuel load indicated that portions of the plot burned incompletely, leaving about 30-40% of the 1-hour fuels unburned. The Bush's poppy mallow population would probably benefit from a hotter and more complete burn the next time this unit is burned, if that is feasible.

In comparison to data initially collected in 2012, the Bush's poppy mallow population appears to be struggling to produce mature-sized plants due to a combination of excessive shade and herbivory by deer or elk. I recommend cutting 50% - 100% of the eastern red cedar trees in these plots that are less than 9 inches DBH during the dormant season, and pile burning them in the adjoining roadbed before green-up, to hopefully reinvigorate this population. Please see additional information near the end of the following trip report.

Draft 4, BUFF trip report for 6/23-25/2014

From 6/23-25/2014, the 3-person Ozark Highlands Fire Effects Monitoring (FEMO) Crew and I worked on fire effects data collection at Buffalo National River (BUFF).

Pruitt Glades Rx Unit

We began our work in the Pruitt Glades Rx unit which was burned on 3/22/2014 using a combination of hand ignition and aerial ignition.

A crew from BUFF had visited the unit in May to collect immediate post-burn data. They identified that Pruitt glade plot #10 had not burned in 2014. Unfortunately, the BUFF staff mistakenly thought that Pruitt glade plot # 9 had burned in 2014. When the Fire Effects Monitoring (FEMO) crew and I got to glade plot #9 we discovered cryptic but substantial evidence that glade plot #9 had not burned since 2012.

It became apparent that errors were made during the post-burn fire effects monitoring efforts, which resulted in invalid data that couldn't be used. This will be corrected in future monitoring by providing training to BUFF staff. BUFF staff had mistaken charcoal from the March 2012 prescribed burn (and/or pile burning of cedar slash that also occurred in 2012), for 2014 fire effects. When we left glade plot #9 (hiking downhill), we discovered a partially burned ping pong ball nestled into a pocket of leaf litter (see photo below). Obviously, the glade portion of the Pruitt Glades Rx unit was too damp on 3/22/2014 to carry effective fire.



However, evidence from the one dry-woodland plot in the Pruitt Glades Rx unit showed that the woodland plot carried a strong and nearly complete fire. **Unfortunately, the irony of getting a**

much stronger burn in the woodland habitat, than the glade habitat, is nothing unusual for the Ozarks in March. In March, the bedrock that outcrops in Ozark glades is typically seeping water, even after several days of good drying conditions that have made the leaf litter in the adjoining woodlands ideal for burning. This occurs because winter precipitation typically saturates the entire soil profile and much of the bedrock above the water table.

The delayed release of this winter precipitation in March (by bedrock outcropping in the glades), routinely makes the glades resistant to burning at this time, unless there are strong winds. This resistance to burning is further magnified by the shade produced by invasive eastern red cedars. Although huge amounts of cedar were removed from the Pruitt Glades Rx unit, there is still a substantial amount of shade contributed by the remaining larger cedars.

This problem is a plague to glade restoration throughout the Midwest. I have encountered this problem throughout my 35 year career. My fire effects data analysis from both BUFF and OZAR clearly show that we have not obtained our written goal of getting a 40% increase in the average number of native herbaceous species per quadrat in our glades with fire alone. However, the adjoining dry-woodlands at BUFF averaged a 94% increase in the average number of species per quadrat in the herbaceous layer (based on 2013 data). The dry-woodlands at OZAR averaged a 54% increase in the average number of species per quadrat in the herbaceous layer (based on 2013 data).

It is very important to be as successful at restoring the glades, as managers have been at restoring the woodlands. Glade restoration is probably even more important. In the Ozarks, there are significantly more acres of woodland habitat, and woodlands have proven easier to restore with fire alone. Although there are many woodland-dependent species, I believe I could easily eclipse the list of woodland-dependent species with glade-dependent species. Glades typically have more habitat specialists, while woodlands typically have more habitat generalists.

I believe that the two best solutions for obtaining the desired glade restoration goals are to do additional cedar killing, and/or implement autumn prescribed burning. Historically, Ozark glades certainly would have burned in March, but probably during “red flag” conditions which Rx fire managers can rarely apply safely. Typical Ozark glade conditions from mid-August to mid-November do not include water seeping out of bedrock outcrops. Consequently, Rx fire managers will typically have more complete fire coverage, greater fire intensity, and greater fire severity in the glade habitat by burning in autumn.

As a footnote, analysis of the 2014 data from the dry-woodland plot in the Pruitt Glades Rx unit shows a 144% increase in the average number of species per quadrat in the herbaceous layer. Apparently, the elk love the increase in herbaceous cover, the increase in forage palatability, and the increase in forage digestibility associated with the burning of this woodland plot.

Indeed, I was shocked to see so much fresh elk feces inside such a steep and rocky place as plot #8. Throughout this 1,000 square meter plot, there was rarely a place where elk feces was more than 2 meters away.

Bush's poppy mallow (*Callirhoe bushii*)

On 6/12/12, a 10m x 25m plot was established to monitor a population of the nationally-rare fire-dependent Bush's poppy mallow in the North River Road Rx unit, along the road going to the East Charcoal Field. Prior to June 2012, the North River Road Rx unit had been burned more than once. On 6/12/12, we counted 34 Bush's poppy mallow in the Poppy Mallow Plot #1.

Alarming, 78% (18 of 23) of the stem producing plants were browsed off (probably by deer or elk).

On 6/25/2014 we completed the second monitoring of Poppy Mallow Plot #1 and found 43 Bush's poppy mallow, but they were all seedlings or basal-leaved plants (immature plants too small to form a stem). Surprisingly, 47% (20 of 43) of these juvenile plants had 10% or more of their leaf area browsed off. No browsing was observed on juvenile plants in 2012.

Even more alarming was the fact that we found no Bush's poppy mallow plants that produced stems. In 2012, we found 23 stem-producing plants. The long-term viability of this population does not look good without extra management attention. I recommend cutting 50% - 100% of the cedar trees in this plot that are less than 9 inches DBH during the dormant season, and pile burning them in the adjoining roadbed before green-up, in order to reinvigorate this population.

On 6/25/2014 we also established a second Poppy Mallow Plot (#2), across the narrow 1-lane road (west side) that goes to the East Charcoal Field. This plot contained 44 Bush's poppy mallow plants, but 77% (34 of 44) were browsed. Alarming, all 11 of the stem-producing plants had 10% or more of their leaf area browsed off.

Both of these Bush's poppy mallow populations showed evidence of burning in 2014. However, the residual 1-hour fuel load indicated that these portions of the burn unit burned incompletely, leaving about 30-40% of the 1-hour fuels unburned. These Bush's poppy mallow populations would probably benefit from a hotter and more complete burn the next time this unit is burned, if that is feasible.

A9. Table 3k. Pea Ridge National Battlefield (PERI) fire effects objectives and monitoring results

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?	Year Last Analysis Completed (Range of data years included in analysis)
PERI, Oak Hickory Forest/Woodland	Reduce mean density of pole-sized trees (2.5-15cm dbh) by 50-70% after four burns; (80% C.I.)	Reduced mean density of pole-sized trees (2.5-15cm dbh) by 23% after 1 to 2 burns. (n=5 plots, 1 burn = 3 plots, 2 burns = 2 plots)	NA, some units with 2 burns & some with 1	2013 No 4 burn data yet.

	Increase mean density of oak seedlings and/or resprouts by 300-500% after four burns. (80% C.I.)	Increased mean density of oak seedlings and/or resprouts by 2,360% after 1 to 2 burns. (n=5 plots, 1 burn = 3 plots, 2 burns = 2 plots)	Yes, assuming that these initial results are maintained after the 4 th burn.	2013 No 4 burn data yet.
PERI, Post oak-blackjack oak savannah/woodland	Reduce mean density of pole-sized trees (2.5-15cm dbh) by 50-70% after four burns; (80% C.I.)	Reduced mean density of pole-sized trees (2.5-15cm dbh) by 22% after 1 burn to 2 burns. (n=6 plots, 1 burn = 4 plots, 2 burns = 2 plots)	NA, some units with 2 burns & some with 1	2013 No 4 burn data yet.
	Increase mean percent cover of native herbaceous species by 60-100% after four burns (80% C.I.)	No change after 1 or 2 burns. (n=6 plots, 1 burn = 4 plots, 2 burns = 2 plots)	NA, some units with 2 burns & some with 1	2012 No 4 burn data yet.

PERI data analysis interpretation – No fire effects monitoring plots were burned at PERI in 2014. No fire effects monitoring trips were made to PERI in 2014.

A10. Table 3L. Hot Springs National Park (HOSP) fire effects objectives and monitoring results

Monitoring Unit	Management Objective (Restoration)	Monitoring Results (XX% confidence interval)	Objective Achieved?	Year Last Analysis Completed (Range of data years included in analysis)
HOSP, Dry Woodland (Oak/Hickory/Pine)	Reduce the density of pole trees (2.5-15 cm dbh) by at least 30% within two growing seasons after 2 nd burn; (80% C.I.)	Total pole tree reduction = 47% (n=11 plots, 1 fire)	Yes	2011

No fire effects monitoring trips were made to HOSP in 2014. No prescribed burns with monitoring plots have been conducted at HOSP since 2011.

B. Program Information

Table 4. Planning - 2014

Park	Does Park have written Desired Future Conditions?	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?
Buffalo National River	no	Draft 2002	0	0
Hot Springs National Park	no	None	0	0
Ozark National Scenic	no	Completed 2000	0	0

Riverways		Partially revised 2007		
Pea Ridge National Military Park	no	Draft 2003	0	0

Table 5. Monitoring - 2014

Park	% 2014 Data Entered	% 2014 Data Quality Checked	# Prescribed Fires Monitored*	# Non-fire Fuels Treatments Monitored*	# Wildfires Monitored*	# BAER Treatments Monitored*
Buffalo National River	100%	100%	2	0	0	0
Hot Springs National Park	NA	NA	NA	0	0	0
Ozark National Scenic Riverways	100%	100%	7	0	0	0
Pea Ridge National Military Park	37%	37%	0	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 6. Communicating Results - 2014

Park	# of Project Monitoring Reports completed in 2014	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Buffalo National River	2	1	0	
Hot Springs National Park	0	0	0	
Ozark National Scenic Riverways	4	1	0	Yes, BUFF & OZAR analyzed from 1 install on Drees laptop
Pea Ridge Military Park	0	0	0	

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

Table 7. Research – 2014

Park	Are research needs identified in FMP or Monitoring Plan?	# of Proposals Submitted in 2014	# of Proposals Funded in 2014	# of Research Projects Supported in 2014*	Additional Comments
Buffalo National River	no	0	0	0	
Hot Springs National Park	no	0	0	0	
Ozark National Scenic Riverways	yes	1	0	0	park-requested tall larkspur project ;
Pea Ridge 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.

Reserve Fund Research: No fire-related reserve fund research in park group.

C. Fire ecologist accomplishments and areas of focus

This section deals with roles and functions of the ecologist. Identify accomplishments and/or focus areas along with a rough estimate of the amount of time spent in these areas.

Table 8. Fire Ecologist 2014 Accomplishments/Focus Areas

Category	% Time	Accomplishments and/or areas of activities
1. Planning	11%	- Made updated fire operations maps for all 4 of the 2014 prescribed burns at OZAR. Made maps (NEPA, Operations, & Vicinity) for 1 proposed burn unit expansion and 2 new proposed burn units. Calculated numerous acreage figures, coordinates, and other GIS-related elements to be incorporated into Rx burn plans and operations. 8 days scouting new fire-management acres in the Jerktail Mt., Macy/Reed & Pulltite Rx units. Led Fire Effects Monitoring (FEMO) Crew in the systemic scouting of the proposed Pulltite Rx unit. Found numerous small glades infused with thousands of prairie dock and hundreds of Texas green-eyes wildflowers. The Pulltite Rx unit has the largest populations of these two fire-dependent wildflowers than anyplace in ONSR currently under fire management. - Took the initiative to write a successful \$2,500 National Wild Turkey Federation grant request to help fund the Jerktail Mt. Rx cultural clearance field work. - Worked with Terrestrial Ecologist on RMEF grant request that provided \$7,500 to help fund the cultural clearance field work for the Jerktail Mt. Rx unit. Contributed info for grant request, including grant title, primary scope of work, detailed budget calculations, and 3 maps. - Wrote a successful \$7,800 grant request for FY15 funds from the MDC Wildlife Diversity Fund to support fireline construction/Rx burning of the Stegall Mt. Rx Complex in 2015. Did data analysis of fen plots (Riddell's goldenrod) and glade plots from the Mill Mt/Buzzard Mt Rx unit. Wrote and distributed the 3-page Mill Mt Fens Fire Success Story. Coordinated and led the logistical-efforts to conduct Jerktail Rx unit cultural clearance. - Coordinated and led the logistical-efforts to conduct Jerktail Rx unit cultural clearance. - Wrote 3 cultural resource scouting reports for new or expanded Rx units (complete with photos, GPS coordinates, and maps) and provided these to cultural staff for use in their Section 106 compliance work. - Developed a spreadsheet of all 29 OZAR Rx units, Rx unit partners, acreages by ownership, date of last burn, year of next burn, and acres needing cedar slashing. Updated this spreadsheet prior to the FY15 fire planning meeting between ONSR Fire, RM Chief and TE. - Frequently provided Engine Module Leader with information that he needed to write the Jerktail Mt. Rx plan. - Met with Fire Management Officer to look at my ArcMap project of ONSR Glade's in order to develop a list of potential future Rx units and their sizes. Helped FMO use this info to develop Rx unit acreages in need of cultural clearance. - Developed (and submitted to FMO) a spreadsheet showing the estimated cultural clearance cost breakdown for several potentially new or expanded Rx units. - Calculated ONSR glade acreages, project budget, and worked with TE to write PMIS glade restoration project request. - Put together a detailed response to MDC Shannon County Private Lands Coordinator's proposal/inquiry to have a large prescribed burn unit(s) due west of Blair Creek.

2. Presentations	5%	2 presentations of the Fire Ecology of the Current River Watershed for; the OZAR fuels crew & OZAR fire effects crew. - Wrote Mill Mt. Fire Success Story for OZAR. - Developed a 20-page handout summarizing 15 years of the ONSR fire effects data collection/analysis & presented the highlights at a fire mgmt. coordination meeting between NPS, USFS, MDC, TNC, DSP, and LAD. - Developed custom handouts & led 1 day of OZAR burn units tours for U. of MO forestry field camp (Stegall Mt., Denning Hollow, & Mill/Buzzard). - As requested by TNC and MDC, prepared handouts for & presented a tour of restored glades & woodlands for private landowners.
3. NPS Meetings/ task groups	4%	- Meetings and coordination with OZAR resource management on several issues. - Frequent meetings and coordination with OZAR fire staff on numerous issues. - Served on ONSR General Mgmt. Plan presentation group interacting with the public at 3 public meetings. - Attended several supervisor's meetings at OZAR.
4. Interagency work	3%	- Wrote a 4-page report on the discovery of 1,000+ fronds of a club moss called Running Ground Cedar (<i>Lycopodium digitatum</i>) in the Jerktail Mt. Rx unit and submitted it to the MDC Heritage Botanist, along with the recommendation to remove this species from the rare plant list. The State Botanist accepted the recommendation & delisted. - Attended several meetings with Pioneer Forest staff to advance the 1,836-acre Jerktail Mt. Rx burn for 2015. Attended partners gathering at Pioneer Forest HQ and briefed Pioneer staff on status of Jerktail Mt. Rx project in advance of their grant meeting with the Wildlife Conservation Society. - Represented ONSR at a day-long Climate Change Adaptation webinar/meeting between Pioneer Forest, USFS, and other partners in the Jerktail Mt. Rx project. Contributed significantly to the goals, measurable objectives, and monitoring protocols established to meet the criteria of the \$97,000 Wildlife Conservation Society grant. - Attended 2 meetings of the Current River Conservation Opportunity Area. - Served as liaison between TNC and ONSR regarding the Kelley inholding acquisition.
5. Wildfire assignments	<1%	FFT2 on 1 local wildfires (1 operational period)
6. Prescribed fire projects	7%	4 Rx fires at OZAR, 3 as FEMO & 1 as FFT1. 1 Rx burn with MDC as FFT2. - Wrote and distributed the 12-page Vance/Barnett Rx Burn Report, the 16-page Booming Shoal Rx Burn Report, and the 8-page Pistol Barrel Rx Burn Report, all of which included MDC acreage.
7. Non-fire fuels projects	<1%	Developed a map of Devils Well Rx Unit glades in need of cedar slashing
8. Research	2%	- Continued collecting, analyzing, and reporting on tall larkspur population monitoring at OZAR. - Completed requirements of tall larkspur genetic research permit for OZAR.
9. Data collection	19%	24 days in the field with plot reads and rare plant searches in Rx burn units. - Produced a list of probable ONSR igneous glade plants to assist in our expanding igneous glade monitoring (until recently, the vast majority of our glade monitoring plots were on dolomite glades with notably different flora).
10. Data entry & checking	2%	All data entry was accomplished by the FEMO crew. After filtering several data sets, I tracked down data entry errors spanning the last 15 years & made corrections using the well-archived original data sheets.
11. Data analysis	21%	- Worked on 2014 data analysis for OZAR and BUFF. - Wrote an 11-page Lower Buffalo Wilderness Fire Effects Analysis Report, customized for potential sharing with constituents opposed to Rx fire in wilderness areas.

		- Completed the 2014 tall larkspur data analysis, wrote the 2014 Tall Larkspur Annual Report, and widely distributed the report locally, regionally, and nationally. - Did statistical analysis of 2013 data from the 15 plots in the Thorny Creek Rx unit and identified the one plot that did not show a significant gain in herbaceous species richness. Personally, collected the species richness data from moist-woodland plot 2. Discovered that the previous year's crew reading this plot (comprised of 3 good seasonal staff) lacked the botanical skills to differentiate between some of the plants that looked very similar. Discovered that the herbaceous species richness had increased significantly from pre-fire levels in plot 2, up 28.6%. Last year's data collection showed a 7.1% decline from pre-burn levels.
12. Supervision/Admin	15%	- Worked through a daunting process to get a seasonal FEMO covered by Worker's Comp for a potential tick-borne illness. Conducted extensive research into the nebulous world of how Worker's Comp handles tick bites. Discovered many gray areas. Provided NPS MWR Worker's Comp Coordinator with a detailed written list of questions in order to clear up many uncertainties in how OWCP would pay for seasonal employee's medical care. - Developed and distributed 2 drafts and a final of the OZAR Fire Effects Tick & Insect Bite Form & Instructions. Took the initiative to work with the MWR Worker's Comp specialist (and others), to enhance the form and instructions after finding the previous form/instructions vague and incomplete. - Was directed to submit several renditions of the Vacant Fire Position Exemption Request for the vacant Lead Monitor position which ultimately went nowhere. - Supervision, performance appraisal plans, & EPAP's for each of my 5 staff. - Botany training, travel, payroll, etc. - Recruiting and hiring of 2 seasonal FEMO employees remained a ridiculous process because of incompetence in the Central SHRO (months to fly a JA, providing forms to complete & then rejecting the forms they provided because they were obsolete, etc.).
13. Training	4%	READ, Ozark Botany, Red-carded, Fireline Safety refresher, CPR, AED, USERRA, FISSA, Discrimination & Whistleblowing in the Workplace, VET-FHM, Approving Official and Cardholder mandatory charge card trainings, mandatory 10 hours of annual training for Supervisors, 8 hours of EEO.
14. Travel out-of-park for plot or project work	1 %	1 trip to BUFF. Include <u>travel time only</u> for distant, multi-day plot/project work requiring a travel authorization (Note: include data collection or project time associated with these trips in the plot or project categories above)
15. Miscellaneous	6%	- Submitted detailed weekly reports to FMO. - Functioned as the GIS map maker for the OZAR Fire Shop, making 37 maps of Rx units for planning, compliance, operations, reports, and meetings. Also mapped 2 wildfires. - Processed shapefiles from 21 Rx fire units into zip files and sent them to MWR Fire GIS specialist as requested. - Contributed article to NPS Rx Effects Newsletter about the Jerktail Mt. Rx multi-partnership.

D. Fire effects crew accomplishments and areas of focus

Table 9. Fire Effects Crew 2014 Accomplishments/Focus Areas

Category	% Time	Notes
FMH plots	50	Estimated amount of time spent collecting plot data; includes any preparation time.
WUI plots	0	NA
CBI plots	0	

Other plot work	4	Fire-dependent rare plant plots.
Wildfire assignments	1	LM was FFT2 on 2 OZAR wildfires (4 operational periods).
Prescribed fire projects	6	LM was Engine Boss trainee on 3 OZAR burns and 1 TNC burn.
Non-fire fuels projects	0	
Travel out-of-park for plot or project work	1	1 trip to BUFF. Include <u>travel time only</u> for distant, multi-day plot/project work requiring a travel authorization (Note: include data collection or project time associated with these trips in the plot or project categories above)
Data entry	20	Estimated amount of time spent entering data from paper to PC
Data analysis	4	Develop graphs with tall larkspur data.
Supervision/Ad min	6	LM typically supervised crew during plot reads. LM handled all of the travel and most of the crew training.
Training	5	LM had 2-day Rare Mo. plant ID workshop, Ozark Botany, Red-carded, Fire Safety refresher, USERRA, FISSA. Seasonal staff had a mix of S-130/190, I-100, I-700. All had Ozark Botany, fireline refresher. UTV/ATV training for seasonals.
Miscellaneous	3	Update OZAR FEMO Botany Manual

E. 2015 Direction

The Ozark Highlands Fire Effects Monitoring (FEMO) Crew plans for the near future are to continue collecting high quality data from recently burned units. Importantly, this includes species level recognition of immature grasses and forbs, since recovery of herbaceous species richness and abundance are our best measures of success.

Maintaining existing levels of data collection, management, and analysis continues to be more daunting as OZAR FEMO budgets and staffing continue to decline. For the first time in 16 years the OZAR fire effects program will not have a Lead Monitor for the upcoming field season.

Additionally, OZAR is plagued by a serious shortage of seasonal housing and what is available is in very poor condition. Consequently, for the first time in 5 field seasons the FEMO crew will not be supplemented with botany interns.

Due to the FY2013 requirement that FEMO travel be funded out of Rx Fire Project Budgets, we no longer monitor plots the second growing season after a burn or between burns. This makes some of the existing written objectives at BUFF and HOSP unattainable. Consequently, these parks now only have fire effects monitoring data the first year after a burn, and even then only **if** the AR FMO reserves enough money in the project budget to pay for the travel expenses.

F. Optional Information - None submitted.