



**National Park Service
Northeast Region – Mountains to the Sea
Fire Ecology Annual Report
Calendar Year 2014**



Table of Contents

Summary	3
2014 Summary Tables.....	5
Program Information	13
Fire Ecologist Accomplishments and Areas of Focus	16
Fire Effects Crew Accomplishments and Areas of Focus	17
2015 Direction.....	17
2014 Park Unit Reports	20
Appomattox Court House National Historical Park (APCO)	20
Ferguson Field.....	20
Delaware Water Gap National Recreation Area (DEWA)	25
Darrones and Silver Spray Fields.....	25
New River Gorge National River (NERI)	29
Backus Mountain	29
Future Plans for NERI	35
Shenandoah National Park (SHEN)	36
Jarman Gap	38
Composite Burn Index (CBI) Fire Severity Analysis	45
Future Plans at SHEN	47
Valley Forge National Historical Park (VAFO)	48
Stirling's Barn Field.....	48

Summary

The 2014 season took the Mountains to the Sea (MTTS) fire effects monitoring crew to ten NPS park units, ranging from Gateway National Recreation Area in New York to Cumberland Island National Seashore in Georgia. The crew met all of their primary monitoring objectives, with monitoring taking place at Appomattox Court House National Historical Park, Delaware Water Gap National Recreation Area, Gateway National Recreation Area, Gettysburg National Military Park, New River Gorge National River, Shenandoah National Park, and Valley Forge National Historical Park. A total of 99 plots were inventoried, including 9 forest FMH plots, 24 brush FMH plots, 21 I&M brush transects, 15 grassland rapid assessments, and 30 CBI plots (Table 1a). Fire Ecology staff supported several prescribed burns in 2014, including dormant and growing season burns. Personnel served as FIRB, FEMO, and FFT2.



Figure 1. The 2014 MTTS fire monitoring crew at Jarman Gap (SHEN): Steve Paull (Lead), Ellen Frondorf, Katie Bell

Three parks were added to the MTTS monitoring roster this year as a result of growing interest within the region in the use of fire as a resource management tool: Gateway National Recreation Area, Gettysburg National Military Park, and Valley Forge National Historical Park. The parks plan to use prescribed burning as part of their efforts to control woody encroachment and invasive species in non-forested landscapes.

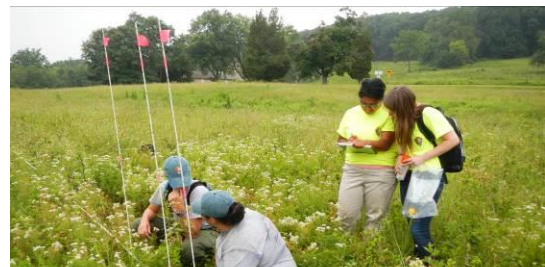


Figure 2. MTTS crew with biology interns at Valley Forge NHP.

The MTTS fire ecology program made collaboration a priority in 2014. Connections with various entities, both within and outside the NPS, were established or strengthened. Examples include the following:

- Participation in a prescribed fire training exchange (TREN) hosted by the Virginia office of The Nature Conservancy (TNC). Attendees included fire personnel from TNC, USFS, USFWS, NPS, and the Virginia Department of Natural Heritage.
- Participation in a plant identification workshop hosted by the USFS at George Washington and Jefferson National Forests. Participants included fire effects monitoring personnel from USFS, NPS, and TNC.

- Collaboration with USFS and TNC fire effects monitoring personnel on fire effects field work in order to create opportunities for knowledge sharing.
- Collaboration with the Eastern Rivers and Mountains I&M Network on field work at New River Gorge National River.
- Discussions with the Mid-Atlantic I&M Network regarding data sharing and the potential for future synergy on research projects.
- Participation in the annual NER/SER Fire Effects Summit at Cumberland Island National Seashore. The MTTs fire effects crew joined colleagues from Natchez Trace Parkway and the Everglades National Park to install several monitoring plots on the island.
- Discussions with other members of the Appalachian fire ecology community on the standardization of Composite Burn Index (CBI) scoring and interpretation.
- Participation as a NPS Virginia reviewer on the Southern Wildfire Risk Assessment (SWRA) working team.
- Site visit to Acadia National Park to consult with park managers on fire management planning and fuels projects.



Figure 3. Clockwise from upper left: prescribed fire in longleaf pine with TNC TREX; TNC joining MTTs fire effects crew at Jarman Gap (SHEN); NER/SER Fire Ecology Summit at Cumberland Island National Seashore (photo courtesy of Jesse Burton); working with I&M botany crew at Big Meadows (SHEN).

2014 Summary Tables

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

<i>Park</i>	<i>Monitoring Type</i>	<i>Type of Plot (FMH, photo point, other)</i>	<i>Pre-burn 2014</i>	<i>Imm. Post 2014</i>	<i>Post-burn 2014</i>	<i>Annual Total (2014)</i>	<i>Total Plots</i>
Appomattox	White Oak	FMH Forest Plot	0	0	0	0	3
Court House NHP	Mixed Grassland	FMH Brush Plot	0	0	8	8	8
Catoctin	Pine-Oak	FMH Forest Plot	0	0	0	0	2
Mountain Park	Mixed Grassland	Rapid assessment	0	0	0	0	8
Delaware Water Gap NRA	Mixed Grassland	FMH Brush Plot	0	0	10	10	10
Fredericksburg & Spotsylvania	White Oak	FMH Forest Plot	0	0	0	0	3
	Mixed Grassland	FMH Brush Plot	0	0	0	0	14
Gateway NRA	Mixed Grassland	Rapid assessment	5	0	0	5	5
Gettysburg NMP	Mixed Grassland	Rapid assessment	6	0	0	6	6
New River Gorge NR	Xeric Oak / Mesic Oak	FMH Forest Plot	0	0	2	2	4
	Mixed Grassland	Rapid assessment	4	0	0	4	4
Richmond NBP	Loblolly Pine	Photo points	0	0	0	0	4
	Loblolly Pine	FMH Forest Plot	0	0	0	0	2
	Mixed Grassland	FMH Brush Plot	0	0	0	0	13
Saratoga NHP	Mixed Grassland	FMH Brush plots	0	0	0	0	15
Shenandoah NP	Pine-Oak	FMH Forest Plot	0	0	3	3	13
	Xeric Oak	FMH Forest Plot	0	0	4	4	9
	Mesic Oak	FMH Forest Plot	0	0	0	0	3
	Neighbor Mtn	CBI	-	-	12	12	31
	Jarman Gap	CBI	-	-	18	18	18
	Big Meadows	I&M brush transects	-	-	21	21	87
Valley Forge NHP	Mixed Grassland	FMH Brush Plot	6	0	0	6	6
SHEN MTTS Totals			21	0	78	99	268

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

<i>Park</i>	<i>Monitoring Type</i>	<i>Type of Plot (FMH, photo point, other)</i>	<i>Pre-burn 2014</i>	<i>Imm. Post 2014</i>	<i>Post-burn 2014</i>	<i>Annual Total (2014)</i>	<i>Total Plots</i>	<i>Comments</i>
Cape Cod NS	<i>Lombard Paradise Hollow Research Area</i>	<i>Research Plot (20m x 20m) (Umass / NPS Collaborative with Patterson / Crary)</i>	0	0	9	9	9	<i>On going treatments of 27 year repeated burn experiment in S. Truro, MA. First order effects only recorded in 2013.</i>
	<i>Fort Hill</i>	<i>Plant germination</i>	0	0	0	0	0	<i>Seeded burn pile footprints reviewed for schizachyrium seedlings.</i>
	<i>Marconi Heathland</i>	<i>Photo Points, Point Intercept, Wx data (day of treatment)</i>	1	1	1	3	1	<i>First order fire effects collected on a nine acre clearcut followed by a five acre burn</i>
	<i>Broom Crowberry</i>	<i>Point Intercept, Ocular percent cover estimate, photo</i>	0	0	0	0	0	<i>Ongoing experiment, no plots observed in 2014, next anticipated monitoring data on the 9 each 30 x 30 m plots is 2017</i>
	<i>Broom Crowberry</i>	<i>Sub-plots reviewed for Corema germination</i>	0	0	35	35	35	<i>Dr. Von Holle (Univ of Central Fla) research, plots were initiated and burned in 2011-12 and had follow-up monitoring in 2014</i>
	<i>Marconi Heathland</i>	<i>Photo Points, Point Intercept, Wx data (day of treatment)</i>	3	3	0	6	3	<i>No monitoring conducted on 3 each Slash, cure, burn units</i>
	<i>NEW - Marconi Nitrogen Deposition Plots</i>	<i>12 each 1-acre plots were established</i>	12	0	0	12	12	<i>4 each control, 4 each 1/2 basal area removal and 4 each clearcut plots were sampled and treated with varying N levels. Plots to be burned in June/July 2015</i>
	<i>Pilgrim Springs</i>	<i>CACO Monitoring Plot (BAF, Releve, Browns transect)</i>	0	0	0	0	0	<i>Initiated by Henderson - no followup in 2014</i>
	<i>Rx Burn Photos</i>	<i>Photo</i>	10	10	10	30	10	<i>Photo points (25 different area single photo) plots established/taken for CACO 2014 Rx Burn Reports</i>
CACO Plots (managed by CACO)			26	14	55	95	70	

Table 2. Fire Ecology Staffing 2014

Position	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
<i>Missy Forder</i> Fire Ecologist	1/1/2014	12/31/2014	26	Yes	S-490 Advanced Fire Behavior Calculations, M-581 Fire Program Management, H-337, I-300, I-400 Command and General Staff Functions for Local Incident Management Teams, EMR Refresher, RT-130 Fire Refresher, USPP Helicopter Training, READ at FOMC, SEMO Plans, FIRB several Rx projects.
<i>Steve Paull</i> Lead Monitor	3/23/2014	12/31/2014	20	Yes	READ, UTVO, and BOTA qualifications, FALA taskbook opened, READ course at YOSE, Virginia TNC TREX, Carhart Wilderness training, S-212 (Wildland Fire Chainsaws), S-131 (Advanced Fire Fighter), FEMO on several Rx projects.
<i>Ellen Frondorf</i> Crew Member	6/1/2014	9/30/2014	8.75	No	S-130/S-190 (Wildland Fire Fighter), I-100 (Intro to ICS), I-700 (NIMS), fire effects training, field botany training, FFT2 on several Rx projects.
<i>Katie Bell</i> Crew Member	6/1/2014	9/30/2014	8.75	No	RT-130 (Wildland Fire Safety Refresher), fire effects training, field botany training, FFT2 on several Rx projects.

Table 3. 2014 Management Objectives and Monitoring Results

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

Appomattox Court House National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Ferguson Field Mixed Grassland	Maintain percent cover of woody species < 25%, as measured after 3 treatments.	Woody species= 29% (±7)	No*	2014 (2008-2014)
	Percent cover of non-native graminoids and forbs < 25%, as measured after 3 treatments.	Non-native graminoids = 27% (±8) Non-native forbs = 58% (±12)	No* No*	2014 (2008-2014)
	Percent cover of native graminoids and forbs > 75%, as measured after 3 treatments.	Native graminoids = 79% (±7) Native forbs = 37% (±9)	Yes* No*	2014 (2008-2014)
NC Woodlot	Short Term: Reduce Fuels: <1/4 inch diameter size class (litter) by 65 - 75%, ¼ to 1 inch diameter size class by 25% to 50%, 1in to 3 in diameter size class by 10%-25%.	Pre-burn data only (Rx has not yet occurred)	N/A	N/A
	Short Term: Reduce Density of pole-sized trees by at least 25% as measured within 1 year post burn.	Pre-burn data only (Rx has not yet occurred)	N/A	N/A
	Short Term: Limit overstory mortality to <25% as measured 1 year post burn.	Pre-burn data only (Rx has not yet occurred)	N/A	N/A
* Only 2 of 3 treatments completed at this time.				

Cape Cod National Seashore				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Fire Cache <i>Corema conradii</i>	Fire Cache <i>Corema conradii</i> transplanting	Measure long term cover and health of 40 <i>Corema</i> plants prior to transplanting	ocular estimate only, 50% mortality	2010
Lombard Paradise Hollow	Lombard Paradise Hollow	Research, vegetation	in prep year 24 (Patterson / Motskin et. al.)	2012
Heathland Monitoring / Marconi Site Heathland restoration	Remove overstory and maintain heath dominated landscape	Research, burning	on-going	2012
Broom Crowberry burn	Heathland Monitoring / Marconi Site Heathland restoration	Establish pre-treatment baseline data for 35 area heathland restoration in the Marconi area, seed-scarify-burn plots, document results	on-going, Univ FLA (Von Holle, principle invest.)	2012
Heathland /Hunting summers plots	Broom Crowberry burn	Determine if spring, summer or fall burning favors <i>Corema conradii</i> , three each 03 acres plots were burned (2.7 acres)	in prep year 3 (Patterson et. al.)	2012
Marconi Nitrogen Deposition Plots	Determine impacts to heathland communities given increased N deposition from air pollutants	Plot establishment, vegetation baseline data collection, fertilize and cut plots (Oct 2014). Burn Plots June/July 2014.	on-going Univ FLA (Von Holle, principle invest.)	2014
Pilgrim Springs	Reduce fine fuels by 50%	Following treatments will be needed in 3-7 years (Rx fire)	yes	2012

Delaware Water Gap National Recreation Area				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Darrones and Silver Spray Units	Percent cover of woody species < 25%.	Native woody species = 20% (±5) Non-native woody species = 13% (±4) Total woody = 33%	No*	2014 (2009 - 2014)
	Percent cover of non-native graminoids and forbs < 25%.	Non-native graminoids = 74% (±10) Non-native forbs = 30% (±5)	No* No*	2014 (2009 - 2014)
	Percent cover of native graminoids and herbs > 75%.	Native graminoids = 20% (±4) Native forbs = 112% (±12)	No* Yes*	2014 (2009 - 2014)
* Only 2 of 3 treatments completed at this time.				

Fredericksburg and Spotsylvania National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Spotsylvania Mixed Grassland	Percent cover of woody species < 25%.	Low Shrub Cover Fields Shrubs = 34% (±3) Trees = 27% (±1) High Shrub Cover Fields Shrubs = 50% (±6) Trees = 9% (±1)	No	2011 (2008 - 2011)
	Percent Cover on non-native grasses and forbs <25%.	Low Shrub Cover Fields Non-native grass = 0.8% (±0.2) Non-native forbs = 0.6% (±0.2) High Shrub Cover Fields Non-native grass = 25% (±4) Non-native forbs = 0.8 (±0.2)	Yes	2011 (2008 - 2011)
	Percent cover of native grasses and forbs >75%.	Low Shrub Cover Fields Native grass = 122% (±4) Native forbs = 57% (±4) High Shrub Cover Fields Native grass = 108% (±6) Native forbs = 69% (±5)	Yes	2011 (2008 - 2011)

New River Gorge National River				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Xeric Oak	>50% reduction in fuel loading after 3 burns.	30% reduction in total fuel loading	No, but only one treatment	2014 (2012 - 2014)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	18% (±14%) after one burn	No, but only one treatment	2014 (2012 - 2014)
	>30% reduction in overstory tree density after 3 burns.	3% (±3%) after one burn	No, but only one treatment	2014 (2012 - 2014)
	Post-burn shrub cover <20% after 3 burns.	Will analyze after 2015 sampling	N/A	N/A
	>150 tall (>1m) oak seedlings per acre after 3 burns.	Will analyze after 2015 sampling	N/A	N/A

Richmond National Battlefield Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Malvern Hill	Maintain percent cover of woody species <25%	Cool Season Grass Fields Shrub = 4% (± .2) Tree = 16% (± 11) Warm Season Grass Fields Shrub = 0 Tree = 2 (± .1)	Yes Yes	2010 (2005 - 2010)
	Percent cover of non-natives grasses and forbs < 25%.	Cool Season Grass Fields Non-Native Grass Cover = 47 (± 12) Non-Native Forb Cover = 12(± 5) Warm Season Grass Fields Non-Native Grass Cover = .3 (± .3) Non-Native Forb Cover = 10 (± 10)	No Yes	2010 (2005 - 2010)
	Percent cover of "meadow specialists" native grasses and forbs >75%.	Cool Season Grass Fields Native Grass Cover = 71(± 12) Native Forb Cover = 43(± 10) Warm Season Grass Fields Native Grass Cover = 150(± 4) Native Forb Cover =13(± 3)	Yes Yes	2010 (2005 - 2010)
	>50% reduction in pole size (2.5-15cm) tree density after four burns	Pre: 46 pole trees 03YR02: 22 pole trees	Yes	2010 (2003 - 2010)
	Cultural landscape: maintain an open forested stand	Photopoints ongoing	Yes	2010 (2003 - 2010)
	Increase native grasses by >75% after four burns.	Pre: 1.2% 03YR02: 7%	Yes	2010 (2003 - 2010)
Cold Harbor				

Saratoga National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Mixed Grassland Hillside Plots n=5 (Plots 2,3,15,17,20) Plots have burned 4-5 times. The area has burned 8-13 times.	Percent cover of native grasses and herbs >75%.	2006 Native Grass = 84% (±11) 2010 Native Grass = 100% (±11) 2011 Native Grass = 110% (±4) 2013 Native Grass = 135% (±6)	YES	2013 (2006 - 2013)
		2006 Native Herb = 132% (±19) 2010 Native Herb = 139% (±15) 2011 Native Herb = 169% (±7) 2013 Native Herb = 136% (±7)	YES	
	Percent cover of woody species < 35%.	2006 Native Shrub = 31% (±8) 2010 Native Shrub = 28% (±4) 2011 Native Shrub = 30% (±3) 2013 Native Shrub = 35% (±4)	No	2013 (2006 - 2013)
		2006 Non Native Shrub = 10% (±5) 2010 Non Native Shrub = 7% (±4) 2011 Non Native Shrub = 10% (±4) 2013 Non Native Shrub = 9 (±4)	No	
	Percent cover of non-native grasses and forbs < 50%.	2006 Non-native Herbs = 41% (±8) 2010 Non-native Herbs = 46% (±15) 2011 Non-native Herbs = 40% (±6) 2013 Non-native Herbs = 28% (±5)	YES	2013 (2006 - 2013)
		2006 Non-native Grass = .4% (±.2) 2010 Non-native Grass = 9% (±4) 2011 Non-native Grass = 22% (±3) 2013 Non-native Grass = 26% (±5)	YES	

Saratoga National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Mixed Grassland Neilson House Plots 2008 n=3 (Plots 5,6,7) 2010 / 2011 / 2013 n=6 (Plots 5,6,7,14,18,24) Plots have burned 1-4 times. The area has burned 1-8 times.	Percent cover of native grasses and herbs >75%.	2008 Native Grass = 95% (±16) 2010 Native Grass = 117% (±12) 2011 Native Grass = 132% (±5) 2013 Native Grass = 168% (±3)	YES	2013 (2008 - 2013)
		2008 Native Herb = 24% (±14) 2010 Native Herb = 23% (±6) 2011 Native Herb = 23% (±3) 2013 Native Herb = 19 (±2)	NO	
	Percent cover of woody species < 35%.	2008 Native Shrub = 18% (±5) 2010 Native Shrub = 21% (±4) 2011 Native Shrub = 27% (±3) 2013 Native Shrub = 31% (±2)	YES	2013 (2008 - 2013)
		2008 Non Native Shrub = 2% (±.3) 2010 Non Native Shrub = .5% (±.2) 2011 Non Native Shrub = .3% (±.08) 2013 Non Native Shrub = .8 (±.1)	YES	
	Percent cover of non-native grasses and forbs < 50%.	2008 Non-native Herbs = 150% (±21) 2010 Non-native Herbs = 127% (±22) 2011 Non-native Herbs = 119% (±10) 2013 Non native Herbs = 88 (±9)	NO	2013 (2008 - 2013)
		2008 Non-native Grass = 5% (±3) 2010 Non-native Grass = 16% (±5) 2011 Non-native Grass = 15% (±2) 2013 Non-native Grass = 42 (±4)	YES	

Saratoga National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Mixed Grassland Chatfield Farm 2003 n=2 (Plots 11,12, 23) Plots have been burned 1-3 times. Area burned 1-4 times.	Percent cover of native grasses and herbs >75%.	2003 Native Grass = 116% (±26) 2010 Native Grass = 101% (±13) 2011 Native Grass = 91% (±2) 2013 Native Grass = 129% (±12)	NO	2013 (2003 - 2013)
		2003 Native Herb = 28% (±2) 2010 Native Herb = 19% (±7) 2011 Native Herb = 18% (±3) 2013 Native Herb 33% (±3)	NO	
	Percent cover of woody species < 35%.	2003 Native Shrub = 42% (±15) 2010 Native Shrub = 33% (±2) 2011 Native Shrub = 37% (±3) 2013 Native Shrub = 27(±3)	YES	2013 (2003 - 2013)
		2003 Non Native Shrub = 2% (±.3) 2010 Non Native Shrub = .3% (±.3) 2011 Non Native Shrub = 0% (±0) 2013 Non Native Shrub = .3% (±.2)	YES	
	Percent cover of non-native grasses and forbs < 50%.	2003 Non-native Herbs = 74% (±27) 2010 Non-native Herbs = 74% (±13) 2011 Non-native Herbs = 92% (±16) 2013 Non-native Herbs = 101 (±11)	No	2013 (2003 - 2013)
		2003 Non-native Grass = 7% (±5) 2010 Non-native Grass = 2% (±.3) 2011 Non-native Grass = 1% (±.1) 2013 Non-native Grass = 9% (±.3)	Yes	

Shenandoah National Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Jarman Gap Pine-Oak	>50% reduction in fuel loading after 3 burns.	35% reduction in total fuel loading (pine-oak & xeric oak data combined) after one treatment	Litter and duff, but not large fuels	2013 (2010 - 2013)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	63% (±4%) reduction after one burn	No, but only one treatment	2013 (2010 - 2013)
	>30% reduction in overstory tree density after 3 burns.	11% (±6%) reduction after one burn	No, but only one treatment	2014 (2010 - 2014)
	Post-burn shrub cover <10% after 3 burns.	48% (±8%) shrub cover after one burn	No, but only one treatment	2014 (2010 - 2014)
	Duff depth less than 1.5 inches after 3 burns.	1.78 in post burn	No, but only one treatment	2013 (2010 - 2013)
	>50 stems of yellow pine per FMH seedling plot (0.0125 acre) 5 years post-burn.	19 (±10)	No, but only one treatment	2014 (2010 - 2014)
Jarman Gap Xeric Oak	>50% reduction in fuel loading after 3 burns.	35% reduction in total fuel loading (pine-oak & xeric oak data combined) after one treatment	Litter and duff, but not large fuels	2013 (2010 - 2013)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	57% (±4%) after one burn	No, but only one treatment	2013 (2010 - 2013)
	>30% reduction in overstory tree density after 3 burns.	35% (±19%) after one burn	Yes	2014 (2010 - 2014)
	Post-burn shrub cover <20% after 3 burns.	30% (±5%) shrub cover after one burn	No, but only one treatment	2014 (2010 - 2014)
	>150 tall (>1m) oak seedlings per acre after 3 burns.	Data not currently available	N/A	N/A

Shenandoah National Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Big Meadows (collaborative monitoring effort with SHEN botany crew)	Maintain the cultural open landscape.	Analysis in progress. Completed by SHEN Botany.	Yes	NCR 2008 (1998 - 2008)
	Examine changes in vegetation over time in response to management.	Analysis in progress. Completed by SHEN Botany.	Yes	NCR 2008 (1998 - 2008)
	Monitor Northern Blue Ridge Mafic Fen plant community that contains a significant number of the park's rare plant species.	Analysis in progress. Completed by SHEN Botany.	Yes	NCR 2008 (1998 - 2008)

Valley Forge National Historical Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Stirling's Barn Field	Use prescribed fire and herbicide application to reduce the percent cover of each of the following species by 25%, as measured after 3 prescribed fire treatments: <i>Celastrus obriculatus</i> , <i>Lonicera japonica</i> , and <i>Miscanthus sinensis</i> .	Pre-burn data only	N/A	N/A
	Percent cover of both native graminoids and native herbs >75%, as measured after 3 prescribed fire treatments.	Pre-burn data only	N/A	N/A
	Percent cover of trees and shrubs <25%, as measured after 3 prescribed burns.	Pre-burn data only	N/A	N/A

Program Information

The following tables provide a summary of the MTTs program information.

Table 4. Planning - 2014

Park	Does Park have written DFCs? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project or Community-level Monitoring Plans (not just 2014)	Assisted with how many BAER in 2014?
Appomattox Court House NHP	Yes	2008	1	0
Cape Cod NS	No	Included in FMP	1	0
Catoctin Mountain Park	Yes	none	1	0
Delaware Water Gap NRA	Yes	none	1	0
Fredericksburg & Spotsylvania NMP	Yes	2011	1	0
Gateway NRA	No	none	1	0
Gettysburg NMP	Yes	none	1	0
New River Gorge NR	Yes	none	1	0
Richmond NMP	Yes	2011	1	0
Saratoga NHP	Yes	in progress	1	0
Shenandoah NP	Yes	2014	2	0
Valley Forge NHP	Yes	none	1	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 *
Appomattox Court House NHP	100%	100%	1	0	0	0
Cape Cod NS (completed by CACO staff)	100%	100%	31	14	2	0
Catoctin Mountain Park	N/A	N/A	0	0	0	0
Delaware Water Gap NRA	100%	100%	2	0	0	0
Fredericksburg & Spotsylvania NMP	N/A	N/A	0	0	0	0
Gateway NRA	100%	100%	1	0	0	0
Gettysburg NMP	100%	100%	1	0	0	0
New River Gorge NR	100%	100%	2	0	0	0
Richmond NBP	N/A	N/A	0	0	0	0
Saratoga NHP	N/A	N/A	0	0	0	0
Shenandoah NP	100%	100%	2	1	1	1 (Neighbor Mtn)
Valley Forge NHP	100%	100%	1	0	0	0
*Number of treatment units with treatment efforts monitoring conducted. Include pre-burn and post-burn monitoring but not burn-day monitoring.						
**Data entry and quality checking performed by the park and data is maintained by park staff.						

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?
Acadia NP	0	1	0	No
Appomattox Court House NHP	1	0	0	No
Cape Cod NS (completed by CACO staff)	1	1	1 (Yale University)	No
Catoctin National Park	0	0	0	No
Delaware Water Gap NRA	1	0	0	No
Fredericksburg & Spotsylvania NMP	0	1	0	No
Gateway NRA (preburn planning)	0	2	1	No
Gettysburg NMP	0	1	0	No
New River Gorge NR	1	5	1	No
Richmond NBP	0	0	0	No
Saratoga NHP	0	0	0	No
Shenandoah NP	1	5	1	No
Valley Forge NHP	1	2	0	No

Table 7. Research - 2014

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2014	# of Proposals Funded in 2014	# of Research Projects Supported in 2014*	Additional comments
Acadia NP	yes	1	0	Will be supported if funded	Submitted to JFSP. In review.
Appomattox Court House NHP	yes	0	0	0	
Cape Cod NS (completed by CACO staff)	yes	0	0	0	Research done in house as needed
Catoctin Mountain Park	yes	0	0	0	
Delaware Water Gap NRA	yes	0	0	0	
Fredericksburg & Spotsylvania NMP	yes	0	0	0	
Gateway NRA	yes	0	0	0	
Gettysburg NMP	FMP in revision	0	0	0	
New River Gorge NR	yes	1	1	0	Research Reserve Fund Request
Richmond NBP	yes	0	0	0	
Saratoga NHP	yes	0	0	0	
Shenandoah NP	yes	1	0	0	
Valley Forge NHP	yes	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 at NERI

New River Gorge National River has received \$29,960 in FY15 to study the effects of prescribed fire and deer exclosures on tree regeneration and understory diversity in oak-dominated forests. Site selection and contracting for fence installation is currently underway. Plot installation will begin this spring with 120 planned installs. An outline of the project timeline follows below.

- Winter 2014 – Spring 2015: site selection, compliance, planning
- June – July 2015: plot installation, collect pre-treatment data
- July – August 2015: install deer fence
- March – April 2016: spring prescribed burns
- June 2016: interim data collection (partial)

Deliverables

- Presentations to NERI staff, Fire Management staff, and Inventory and Monitoring staff
- A final report detailing the study findings

- Professional scientific and management meetings (Central Appalachians Fire Learning Network annual meeting, George Wright Society Conference, Association of Fire Ecologists)
- Rx Effects Newsletter
- 1-2 peer-reviewed scientific articles in notable journals in the fields of ecology, fire management or forestry

Fire Ecologist Accomplishments and Areas of Focus

Table 8. Fire Ecologist 2014 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	40%	FMP - NERI, ACAD, SHEN
		Organize planning and compliance needs for NER/NCR
		WFPAC (Boise, KIMO)
		MTA, Compliance (PEPC, Section 7, 106)
		STARFire data layers
Presentations	10%	Presentation at MTTs FMO and Resource Managers meeting.
		NERI, ACAD fire ecology presentation
		NER FMO meeting presentation
		Fire Success stories.
		Rx Effects
NPS Meetings / Task Groups	5%	Deemer Scholars field trip lead.
		Natural Resource Condition Assessment meetings.
		SE/NE Annual Symposium
Interagency Work	5%	Attend SHEN Natural Resources monthly meetings.
		Appalachian Fire Learning Network meetings, Forest Service
Wildfire Assignments	5%	Southern Wildfire Risk Assessment (SWRA)
Prescribed Fire Projects	5%	WFDSS, FOBS(t), UTVO
Non-Fire Fuels Projects	5%	FIRB on multiple prescribed fires / FOBS(t), WFDSS Wildfires
Research	0%	
Data Collection	2%	Research Reserve Requests
Data Entry	1%	SHEN data collection.
Data Analysis	0%	
Supervision & Administration	2%	Completed data summaries and analysis for supported parks.
		Hire seasonal crew.
		Developed performance standards for permanent and seasonal employees.
Training	5%	Lead and seasonal performance evaluations.
		S-490 Advanced Wildland Fire Calculations
		M-581 Fire Program Management
		H-337, I-300, I-400 Command and General Staff Functions for Local Incident IMT
Travel Out of Park (plot or project work)	10%	Fire Ecology and Fire Planning Site Visits to ACAD, NERI, VAFO
Miscellaneous	5%	FOMC, SEMO

Fire Effects Crew Accomplishments and Areas of Focus

Table 9. Fire Effects Crew 2014 Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
FMH Plots	46%	Forest and grass plots
WUI Plots	0%	
CBI Plots	13%	CBI plots (Neighbor Mountain and Jarman Gap)
Other Monitoring	5%	Fuel moisture sampling program (SHEN), collaboration with I&M to read Big Meadows fire transects
Wildfire Assignments	0%	
Prescribed Fire Projects	3%	FEMO and operational support
Non-fire Fuels Projects	0%	
Data Entry	10%	100% of plot data has been entered into FFI and quality control complete
Data Analysis & GIS	1%	Map creation and maintenance in GIS (Lead Monitor)
Supervision & Administration	5%	Lead assisted with hiring, prepared for season, supervised the crew of three, and maintained time, travel and administrative paperwork
Training	11%	READ course at YOSE (Lead), S-212 (Lead), S-131 (Lead), RT-130 (x2), S-130/190 (x1), TNC TREX (Lead), UTV refresher, CPR / First Aid, Wilderness training (Lead), FMH protocol training (crew), FFI training (crew), botany review (crew)
Miscellaneous	6%	SAR, 1-3 hours of physical training a week, assistance with fire-related educational hike

2015 Direction

Emphasis will continue to be placed on xeric forest ecosystems where interesting questions remain regarding the effects of fire. Grassland data will be collected on a three- to five-year cycle in areas where prescribe fire continues to play a role in resource management. Monitoring priorities will depend, in part, on crew funding and operational factors such as the timing of prescribe burn projects.

For new projects, the level of monitoring will be evaluated on a case-by-case basis, keeping in mind the budget outlook and the ability of the crew to meet existing monitoring obligations. Below is a complete list of 2015 projects, including items that are tentative or low priority.

2015 PROJECTS

Collaboration

- Plant ID workshop with USFS and TNC
- Field work with USFS/TNC at SHEN and GWNF
- NER/SER Fire Ecology Summit (GRSM probably hosting in 2015)

APCO

- Read woodlot FMH plots (refresh of pre-burn tree/fuel data)

CATO

- Braestrup post-burn monitoring if Rx occurs

GATE

- Floyd Bennett post-burn monitoring if Rx occurs

GETT

- Neinstedt 1 post-burn reads if Rx occurs.

NERI

- Backus Mountain 01YR02 data collection in forest plots
- Deer exclosure study – installation and sampling of 120 plots

RICH

- Post-burn monitoring at Malvern Hill
- Cold Harbor post-burn monitoring if Rx occurs

SHEN

- Jarman Gap – collect tall seedling data; yellow pine photo points
- Rip Rap – pre-burn tree and fuels data
- Big Meadows transects with I&M botany crew
- Rocks Mountain CBI (extended assessment)

VAFO

- Post-burn reads (01YR01) at Stirling's Barn Field

Table 10. Parks Monitored by the MTTs Fire Effects Crew

Park	Date of last Rx fire or mechanical treatment	Year Monitored Last	Planned Monitor 2015?	Current level of monitoring?
Acadia NP	2014	2014	May assist I&M 2015	Advisory for photo point / Retired FMH forest plots
Antietam NBP (NCR)	2014	2011 (by park)	No	Retired FMH grassland plots, park conducting monitoring
Appomattox Courthouse NBP	2013	2014	Yes	Grassland and forest plots
Assateague Island NS	2010	2011 (with park)	No	Retired park plots, park not burning
Cape Cod NS	2014	2014 (by CACO personnel)	No	Monitoring conducted by CACO personnel
Catoctin Mountain Park	Never	2013	TBD	Preburn FMH forest plots installed 2012; grass plots installed 2013
Delaware Water Gap NRA	2013	2011	No	FMH grassland plots
Fredericksburg & Spotsylvania NMP	2013	2013	TBD	FMH grassland plots and FMH forest plots
Gateway NRA	None to date	2014	TBD	FMH grassland plots
Gettysburg NMP	2014	2014	TBD	FMH grassland plots
George Washington Birthplace NBP	None to date	Not yet monitoring	No	Advisory FMP, park in planning stages
New River Gorge NR	2014	2014	Yes	Preburn FHM forest plots installed 2012; grassland plots installed 2014
Petersburg NBP	2011 (mechanical)	Not yet monitoring	No	Advisory FMP, park in planning stages
Richmond NBP	2014	2013	Yes	FMH forest and grassland plots
Saratoga NHP	2014	2013	No	FMH grassland plots
Shenandoah NP	2014	2014	Yes	FMH forest plots; I&M grassland plots
Valley Forge NHP	2014	2014	Yes	FMH grassland plots

2014 Park Unit Reports

Appomattox Court House National Historical Park (APCO) 2014 Fire Effects Monitoring Annual Report

Appomattox Court House National Historical Park (APCO) consists of approximately 1,743 acres in the Piedmont of south-central Virginia, and is located approximately three miles northeast of the town of Appomattox. The primary goal of the fuels program at APCO is to maintain the historic scene of April 9, 1865, the day that the park commemorates, while also creating a diverse grassland habitat. This is being accomplished via mechanical removal of trees, herbicide treatment of exotic vegetation, scheduled mowing, and through the use of prescribed fire. A majority of the grassland areas in the park have been managed in one form or another for years. Currently, approximately 400 acres of grasslands are managed for cool-season grasses (primarily fescues), for hay production (~200 acres), and for pasture for cattle grazing (~200 acres) through the Historic Property Leasing Program. Fifty-four acres (Sweeney Prizery Field and Village Back Field) are managed as native, warm-season grasses for hay production through the same program. Forty-two acres (Ferguson Field and Upper Nash Field) are managed as a mature grassland community.

Ferguson Field

The MTTs fire effects monitoring crew maintains eight(8) FMH grassland monitoring plots at Ferguson Field. Ferguson field was a pasture utilized for cattle grazing until 2001. The field was treated with a selective herbicide in 2002 to reduce non-native perennial grasses and replanted with a mixture of native warm season grasses (NWSG) including *Sorghastrum nutans*, *Panicum virgatum* and *Andropogon gerardii*. The field was first burned in the spring of 2009. A few weeks following the initial prescribed fire, the Mid Atlantic Exotic Plant Management Team re-treated the newly re sprouting cool season meadow fescue (*Schedonorus pratensis*). This combination of burning and follow up spraying was notably successful at reducing the coverage of this non-native grass. A second prescribed burn occurred in 2013.

The vegetation of the Ferguson Field is currently characterized by a mosaic of native and non-native grasses, native forbs, native woody shrubs and pioneer trees, and non-native forbs and shrubs. Vegetation cover is dominated by graminoids, including the native perennials *Andropogon virginicus*, *Tridens flavus*, *Sorghastrum nutans*, *Panicum virgatum* and *Andropogon gerardii*. Non-native perennial grasses are primarily of the genus *Festuca*. Forbs, shrubs, and trees include *Solidago* species, *Symphoricarpos orbiculatus*, *Rubus* species, *Rhus* species, and *Juniperus virginiana*. Non-native species include *Rosa multiflora* and *Centaurea maculosa*.

Goals and Objectives

The field is managed to provide habitat for the field sparrow and northern bob-white, as well as to maintain the cultural landscape. Resource management would like to maintain a relatively high cover of native woody species and forbs in order to create the desired bird habitat. Specific objectives for Ferguson Field are as follows:

- Decrease percent cover of woody species to less than 25%, as measured after three treatments.
- Decrease percent cover of non-native graminoids and forbs to less than 25%, as measured after three treatments.
- Maintain percent cover of native graminoids and forbs at 75% or greater, as measured after three treatments.

2013 Prescribed Fire

Ferguson Field was burned for the second time in September of 2013. An initial qualitative assessment of the results was recorded in the fire monitoring report (9/27/2013, Stephen Paull, FEMO-t):

Fire carried through a majority of the area contained within the operational units, but some moist low-lying areas did not carry fire well. Fire carried more readily and with more complete consumption through areas with higher cover of native warm season grasses. Fire severity appeared to be lower in regions that were dominated by forbs. Overall, variations in topography, vegetation type, and fire type (e.g., backing versus head) combined to create a mosaic of fire effects and severity. The impact of low intensity backing fire on small woody plants such as red cedar saplings appears to have been minimal; however, it is difficult to assess the effects on woody vegetation immediately following fire because mortality is often delayed. Future monitoring will gauge project success by evaluating whether or not project-specific objectives were achieved.



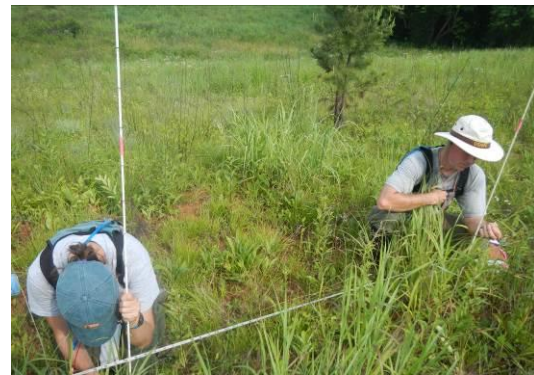
Two flaming fronts coming together in the southern portion of Ferguson Field.



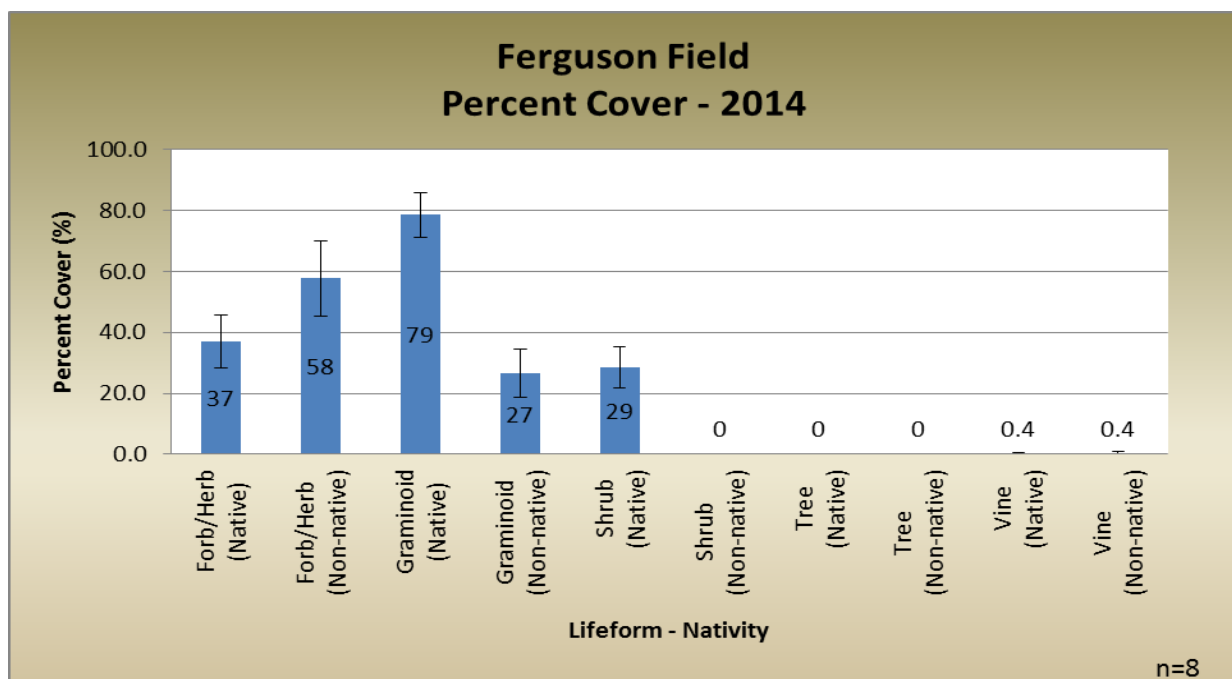
Ferguson Field, southern portion, immediately post-burn.

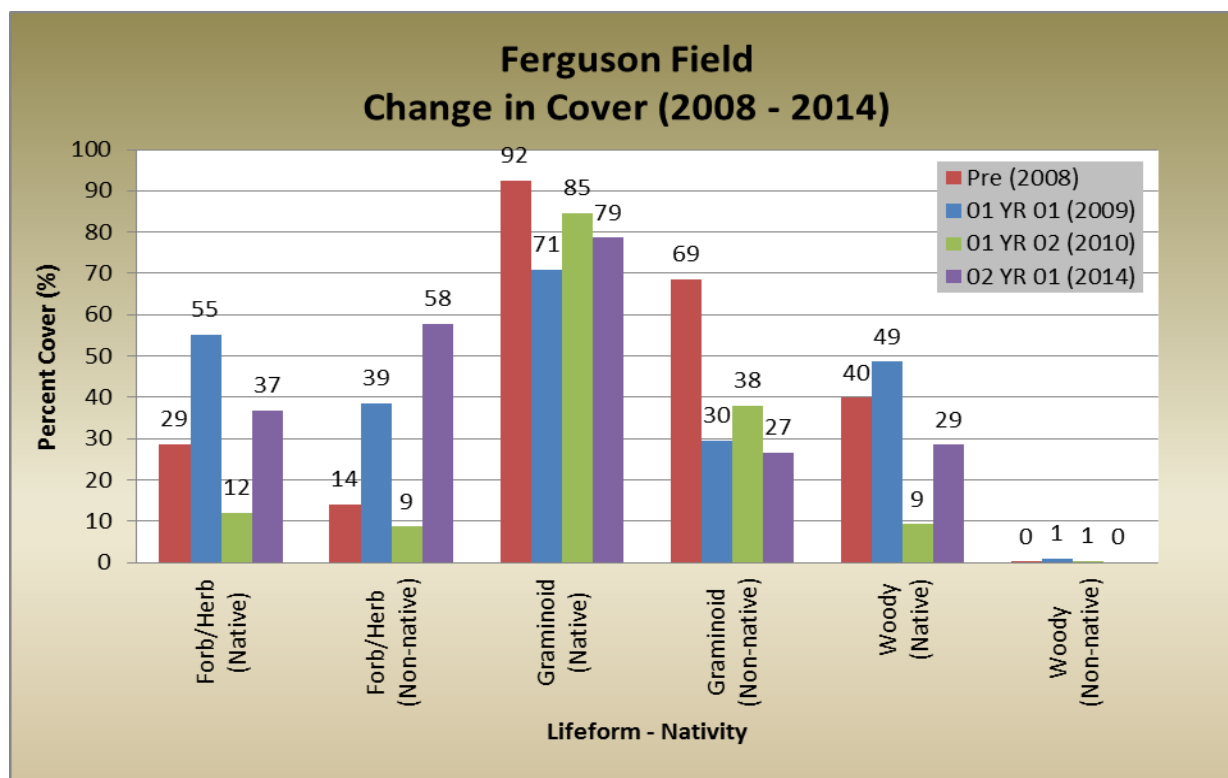
2014 Analysis and Discussion

The MTTs fire effects monitoring crew returned to APCO in June to collect 02YR01 data. Data was compared to pre-burn, 01YR01, and 01YR02 data to determine if objectives are being met. Results are summarized in the following charts.



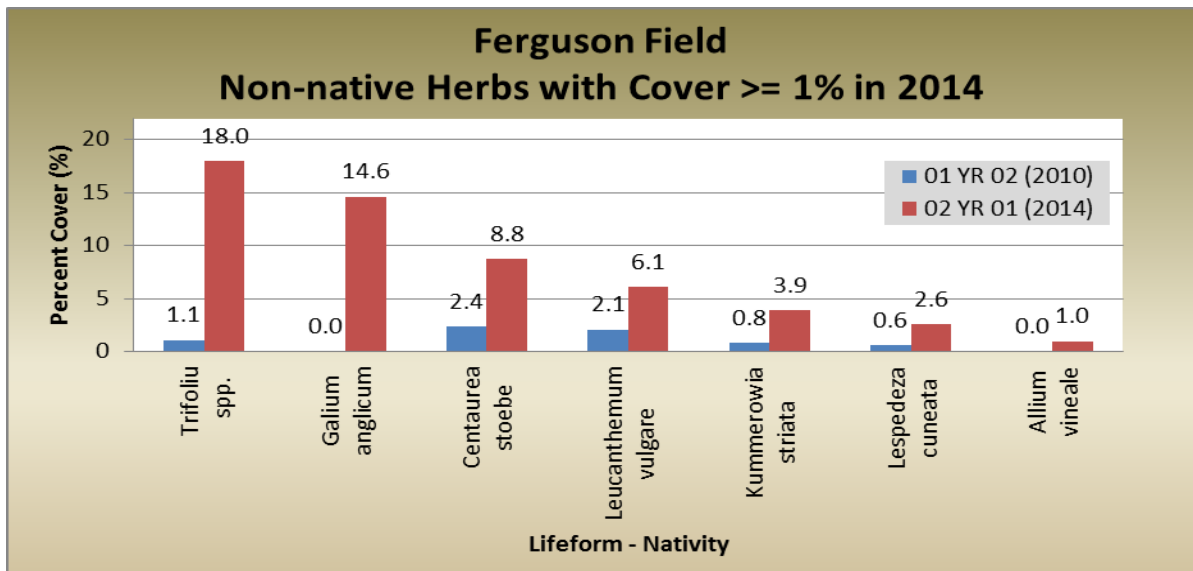
Collecting data at Ferguson Field in 2014.





Native graminoid cover has remained stable through the study period, and continues to exceed our target of 75%. Non-native graminoids are also stable and very close to our target of 25% cover. Woody cover, which was at its lowest in 2010 after two seasons of herbicide application (2009-2010), has increased to 29%. This is slightly above our desired maximum of 25%. Cover is comprised of *Rubus* spp. (25%) and *Symphoricarpos orbiculatus* (4%). Total woody cover may continue to increase in the absence of additional summer burns and/or herbicide application.

Perhaps the most noteworthy observation is the increase in herb cover (as compared to 2010), especially non-native species (see chart below). *Trifolium* cover jumped from approximately 1% in 2010 to 18% in 2014. *Galium anglicum*, a weedy non-native annual with a diffuse procumbent growth habit, was not observed in 2010 but had a cover of 14% in 2014. *Centaurea stoebe* (spotted knapweed), a noxious invasive perennial, increased from approximately 2% to almost 9%. This species deserves special attention because of its negative potential as an invasive exotic. Fire alone is unlikely to control spotted knapweed; therefore, the application of a selective broadleaf herbicide is recommended if cover exceeds an acceptable level. *Lespedeza cuneata* (sericea lespedeza), which increased from 0.6% to almost 3%, should also be treated with herbicide if cover increases to an unacceptable level.



A summary of APCO objectives and current status follows in the chart below.

<i>Appomattox Court House National Historical Park</i>				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Ferguson Field Mixed Grassland	Maintain percent cover of woody species < 25%, as measured after 3 treatments.	Woody species = 29% (±7)	No*	2014 (2008-2014)
	Percent cover of non-native graminoids and forbs < 25%, as measured after 3 treatments.	Non-native graminoids = 27% (±8) Non-native forbs = 58% (±12)	No* No*	2014 (2008-2014)
	Percent cover of native graminoids and forbs > 75%, as measured after 3 treatments.	Native graminoids = 79% (±7) Native forbs = 37% (±9)	Yes* No*	2014 (2008-2014)
* Only 2 of 3 treatments completed at this time.				

Future Plans

Ferguson Field monitoring will occur approximately every three (3) years. This cycle will continue to provide the necessary data to evaluate whether management goals and objectives are being met and whether undesired effects are occurring. Currently, grassland plots at APCO are located only at Ferguson Field, and there are no plans to install additional plots elsewhere. The forested fuels unit, NC Woodlot, may be burned in 2015, in which case post-burn sampling will occur next season or in 2016.

Delaware Water Gap National Recreation Area (DEWA)

2014 Fire Effects Monitoring Annual Report

Delaware Water Gap National Recreation Area is the largest natural area in the National Park Service between Virginia and Maine, and one of the largest protected natural areas in the metropolitan corridor extending from Washington, D.C., to Boston, Massachusetts. The recreation area encompasses 67,000 acres of mountain ridges, forests, and floodplains on both sides of the Delaware River in the states of New Jersey and Pennsylvania. Forty miles of the Middle Delaware River are within the park unit. The mission of the park is to provide outdoor recreation opportunities while conserving the natural, cultural and scenic resources of the recreation area. The park contains a significant number of threatened species, including 49 plants, 9 fish, 13 mammals, 7 reptiles and 10 amphibians.

Open meadows dominated by native warm season grasses and scattered native shrub cover provide critical habitat for songbirds and wildlife species, but most of this habitat within and around DEWA has been lost to agriculture, suburban development, and reforestation. In those fields that do remain, native grasses have been largely replaced by non-native species such as smooth broom (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*), while non-native invasive shrubs such as Morrow's honeysuckle (*Lonicera morrowii*) and autumn olive (*Elaeagnus umbellata*) crowd out native vegetation. Resource management staff has identified the use of prescribed fire as a viable management technique to aid in the restoration of native grasslands and to help them achieve the open space goals and objectives listed in the park's General Management and Resource Management Plans. An open space prescribed fire plan was completed in 2007 that describes many units that can be treated with prescribed fire.

Darrones and Silver Spray Fields

Ten (10) grassland FMH plots were installed in the Darrones and Silver Spray prescribed burn units in 2009, with two subsequent burns taking place in 2010 and 2013.

Goals and Objectives

The overall objectives for Darrones and Silver Spray are to perpetuate the native species, maintain the open character of the landscape, maintain wildlife habitat, control invasive exotic species, maintain fire dependent ecosystems, and reduce hazardous fuel concerns by disrupting fuel continuity. Specific objectives are as follows:

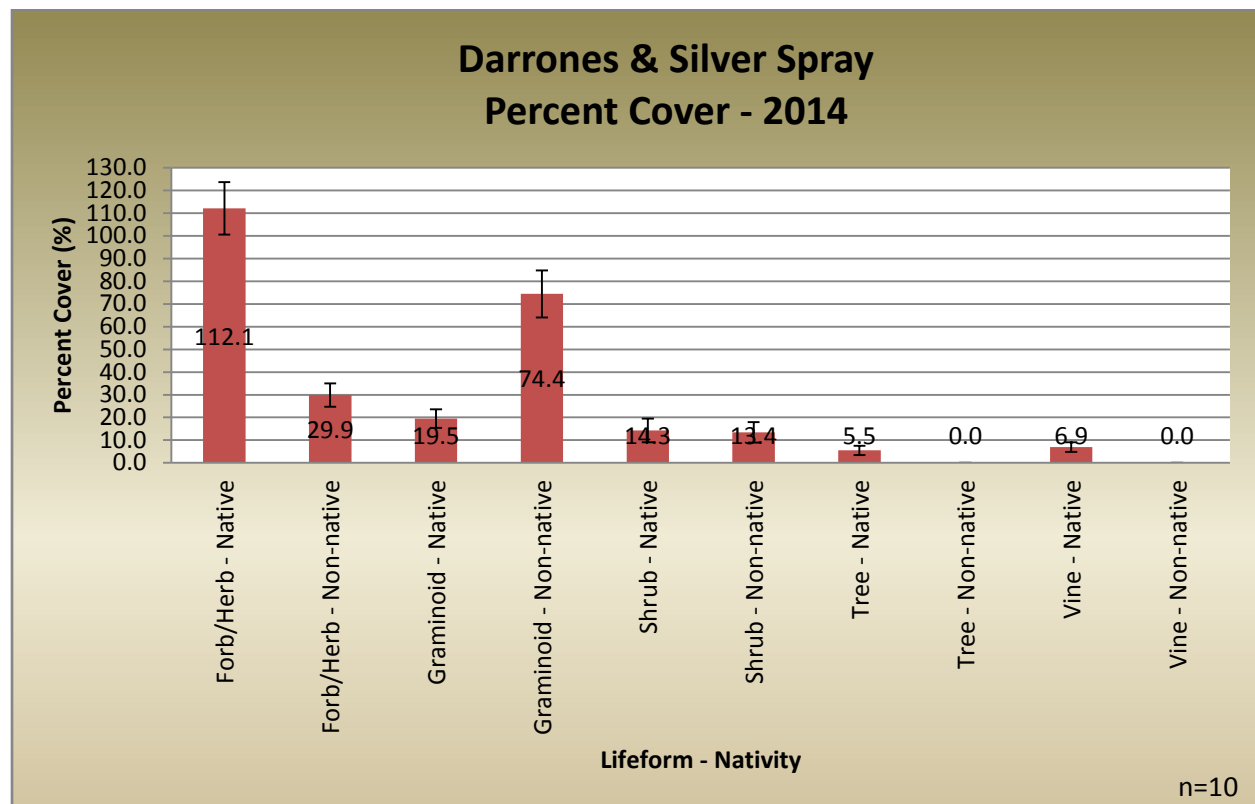
- Percent cover of woody species < 25% as measured after four treatments.
- Percent cover of non-natives grasses and forbs < 25% as measured after four treatments.
- Percent cover of native graminoids and herbs > 75% as measured after four treatments.
- Reduce 1-hour, dead and down fuels by ≥ 75% as determined immediately post burn.

2014 Analysis and Discussion

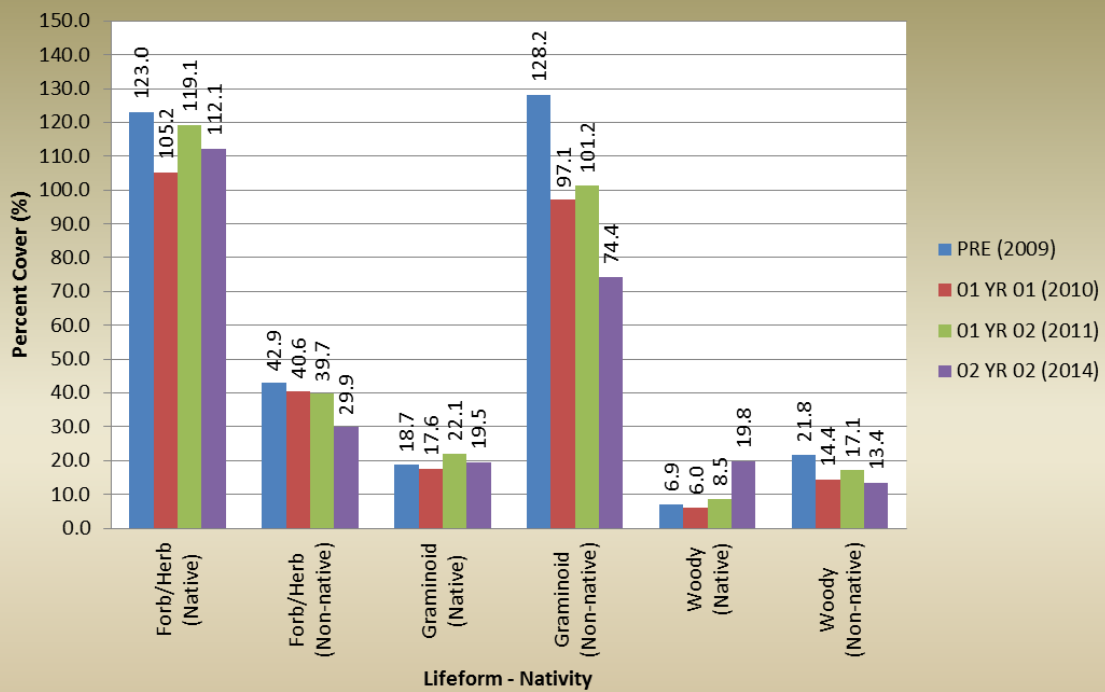
The MTTs fire effects monitoring crew returned to DEWA in June to collect 02YR02 data. Mike Guarino and Mike Gawronski, both employed as fire technicians at DEWA, assisted the crew with GPS work and data collection. Data was compared to pre-burn, 01YR01, and 01YR02 data to determine if objectives are being met. Results are summarized in the following charts.



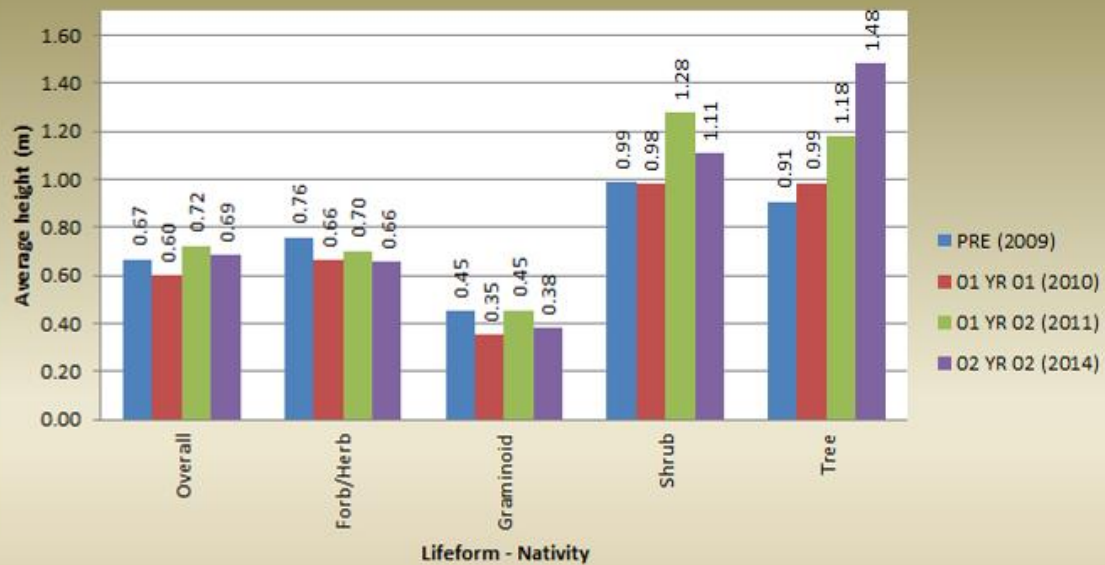
MTTS FEM crew with DEWA staff at the Silver Spray prescribed burn.



Darrones & Silver Spray Change in Cover (2009 - 2014)



Darrones & Silver Spray Change in Height* (2009 - 2014)



* Height data is collected only for the tallest plant at each sampling point, so values are effectively the average of the tallest individuals in each group.

Native cover of herbs continues to exceed the >75% threshold with herb cover at 112% (± 12) while native grass cover noticeably lags behind with only 20% (± 5). Non-native grass cover still remains significantly above the <25% threshold at 74% (± 10), but has decreased from the pre burn cover of 127% (± 12) and post burn 97% (± 12), 101% (± 4) and 74% (± 10) respectively. The woody cover (trees and shrubs) have increased from 26% to 33% with our target of <25%. Woody cover is higher at Silver Spray than at Darrones with the majority of woody cover in 2014 comprised of two species: *Lonicera morrowii* (10.8%) and *Rubus* spp. (9.7%). Tree height has increased from 0.91 m before the first prescribed burn to 1.48 m in 2014. The actual exotic shrub cover at Silver Spray may be higher than our data suggests because our plots miss some of the thicker areas of *Lonicera morrowii*. It is highly recommend that the *L. morrowii* and non-native grasses be treated with herbicide. Additionally, with the increase of woody plants, it is recommended that the park use growing season fire to reduce the percent cover of woody vegetation.

- Percent cover of woody species < 25% as measured after four treatments.
- Percent cover of non-natives grasses and forbs < 25% as measured after four treatments.
- Percent cover of native graminoids and herbs > 75% as measured after four treatments.

Delaware Water Gap National Recreation Area				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Darrones and Silver Spray Units	Percent cover of woody species < 25%.	Native woody species = 20% (± 5) Non-native woody species = 13% (± 4) Total woody = 33%	No*	2014 (2009 - 2014)
	Percent cover of non-native graminoids and forbs < 25%.	Non-native graminoids = 74% (± 10) Non-native forbs = 30% (± 5)	No* No*	2014 (2009 - 2014)
	Percent cover of native graminoids and herbs > 75%.	Native graminoids = 20% (± 4) Native forbs = 112% (± 12)	No* Yes*	2014 (2009 - 2014)
* Only 2 of 3 treatments completed at this time.				

Future Plans

With the onset of smaller travel budgets and increasing workloads, the monitoring interval will be modified to every three to five years. This will continue to provide the necessary data to evaluate whether management goals and objectives are being met and whether undesired effects are occurring.

New River Gorge National River (NERI) 2014 Fire Effects Monitoring Annual Report

Established in 1978, New River Gorge National River (NERI) encompasses over 70,000 acres of land along 53 miles of the New River from Bluestone Dam to Hawk's Nest Lake. New River Gorge and its tributaries are part of the mixed mesophytic forest region (Braun 1950) of central Appalachia. Stand composition varies from site to site, depending on factors such as slope, soil characteristics, exposure, and land use history, but it is generally dominated by deciduous trees and shrubs. Larger canopy trees include species of the red and white oak groups, basswood, tulip poplar, sugar maple, buckeye, beech, hickory, and hemlock. Cliff and flatrock communities are home to yellow pine species such as Virginia pine, pitch pine and Table Mountain pine.

Due to aggressive control policies, fire has not played a major role in shaping the character of the park's flora over the last 50 years. In the absence of fire, the canopy has become more closed and forest succession has progressed toward a mixed-mesophytic forest type. Fire suppression has also contributed to higher fuel loads that could result in stand-replacing fires under drought conditions. Park management supports the use of prescribed fire as a tool to reduce fuel loading while also creating an environment more conducive to oak regeneration.

Backus Mountain

Park Natural Resources staff, with input from Fire Management, determined that the Backus Mountain area is an appropriate location for the application of prescribed fire. The site is a mosaic of xeric, dry-mesic, and mesic habitats, with oak-hickory being the dominant vegetation type. Ericaceous shrub cover varies from low to moderate, with greater cover occurring on drier south- and west-facing slopes.

The 17-acre Backus Mountain burn unit contains two FMH forest monitoring plots (NERI #3 and #4), both of which were installed and sampled in 2012. The plots are located in moderately sloped xeric and dry-mesic areas with significant oak representation. Canopy dominants include several oak species (chestnut, black, white, and scarlet), sassafras, hickory, and sourwood. The subcanopy contains sourwood, maple, hickory, sassafras, chestnut, and dogwood. The understory and herb layers are sparse to moderate. Burn scars on the uphill side of some canopy trees indicate that fire has occurred in relatively recent history (date unknown).

Goals and Objectives

The ecological objectives for Backus Mountain are as follows:

- >50% reduction in fuel loading after 3 burns.
- >70% reduction in quantity of mesic pole-size trees after 3 burns.
- >30% reduction in overstory tree density after 3 burns.
- Post burn shrub cover <20% after 3 burns.
- >150 tall (>1m) oak seedlings per acre after 3 burns.

2014 Prescribed Burn

The Backus Mountain unit was burned on May 31, 2014. A summary of the fire effects, as observed in August, 2014, follows.

Plot 3: Low severity effects in plot. Scorched leaves still on many saplings. Litter consumption patchy, but high in places. Smallest poles top-killed, but larger poles still alive with scorching up to 6 meters. Minimal impact on canopy trees, charring negligible. Small patches of mineral soil, particularly in steeper areas, suggesting that duff consumption may have occurred. Tuliptree regeneration extremely high (600+ first year seedlings in seedling plot).

Plot 4: Severity low to low-moderate. Significant litter and duff consumption. Low shrubs and small poles top-killed, with smaller stems consumed. Some larger poles top-killed, with scorching up to 8 meters. Minimal impact on canopy trees. Charring on trunks of larger trees ranged from negligible to 0.5 meter. Severity appeared to be highest on Q1-Q2 line, lower on Q3-Q4 side. Many first year tuliptree seedlings, but not as many as observed in Plot 3.

Pre- and post-burn photos are shown on the following two pages.



Plot 3 pre- and post-burn photographs. Top photo taken in 2012 prior to treatment. Bottom photo taken in 2014 following treatment.



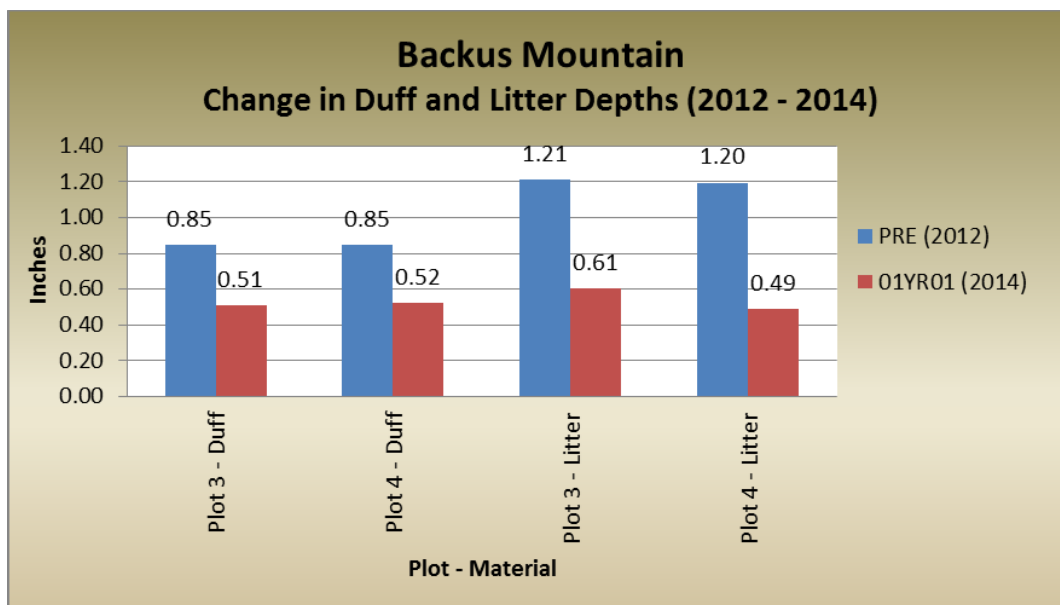
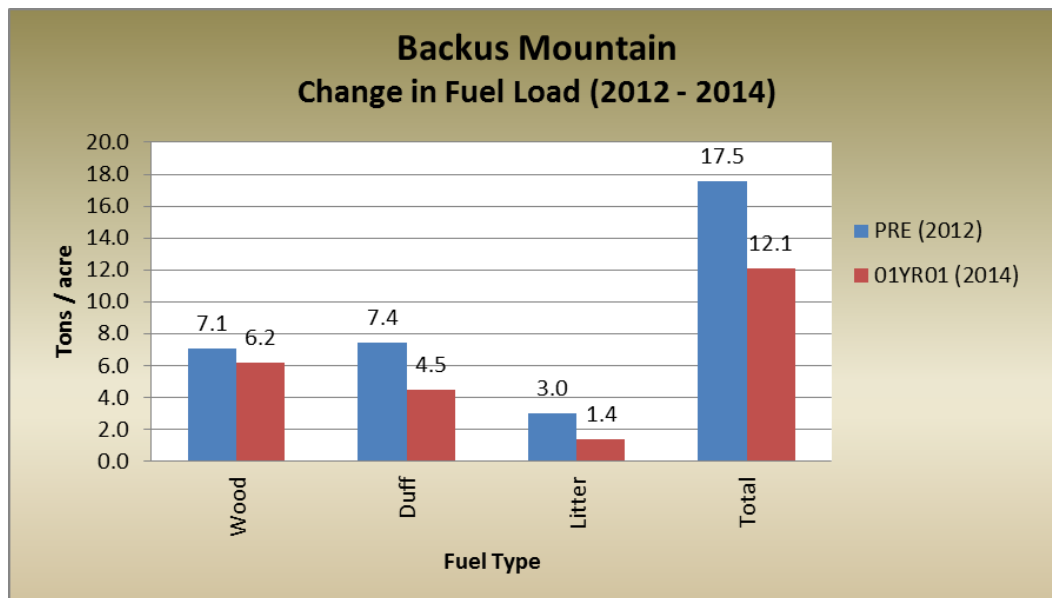
Plot 4 pre- and post-burn photographs. Top photo taken in 2012 prior to treatment. Bottom photo taken in 2014 following treatment.

2014 Analysis and Discussion

Analysis this year will focus on fuels reduction and tree mortality. Seedlings and shrub cover will be addressed next year following the 01YR02 sampling.

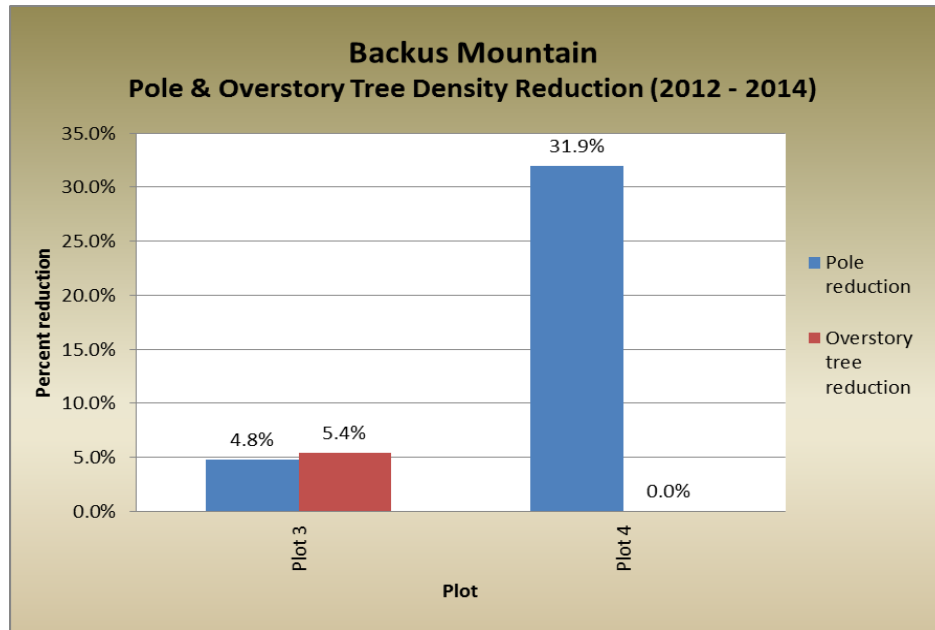
Fuels Reduction

Compared to pre-burn conditions there was an overall fuel reduction of 30% (± 8). A majority of this reduction was the result of litter and duff consumption (55% decrease in litter depth; 39% decrease in duff depth). The woody fuels load dropped modestly, falling from 7.1 tons/acre to 6.2 tons/acre.

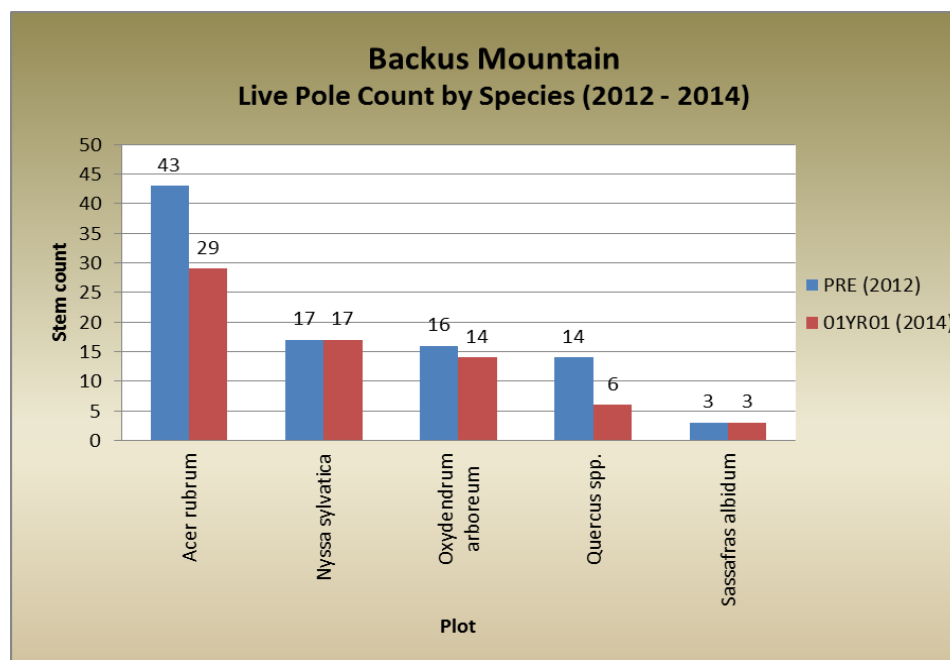


Tree Mortality

Consistent with what is expected for a low severity fire, overstory tree density experienced a minimal reduction of 3% (± 3). Pole-sized tree density saw a greater drop, falling 18% (± 14), with most of the mortality occurring in Plot 4 where burn severity was somewhat higher.



Looking at live pole-sized tree counts, we see that most of the reduction can be attributed to maple and oak mortality. A majority of fire-girdled trees had basal resprouts, so they may return to the pole stratum in the future in the absence of additional treatments.



A summary of Backus Mountain objectives and current status follows in the chart below.

<i>New River Gorge National River</i>				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Xeric Oak	>50% reduction in fuel loading after 3 burns.	30% reduction in total fuel loading	No, but only one treatment	2014 (2012 - 2014)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	18% (±14%) after one burn	No, but only one treatment	2014 (2012 - 2014)
	>30% reduction in overstory tree density after 3 burns.	3% (±3%) after one burn	No, but only one treatment	2014 (2012 - 2014)
	Post-burn shrub cover <20% after 3 burns.	Will analyze after 2015 sampling	N/A	N/A
	>150 tall (>1m) oak seedlings per acre after 3 burns.	Will analyze after 2015 sampling	N/A	N/A

Future Plans for NERI

Monitoring the effects of fire on forest ecosystems at NERI is a high priority for the MTTS fire effects crew. The 2015 field season will include the following:

- Collection of 01YR02 data at the Backus Mountain FMH plots.
- Reserve Fund Research – Installation and sampling of modified I&M plots as part of a new study looking at the interactions between fire and deer herbivory as they relate to oak regeneration.

The park is considering the use of fire in grasslands to maintain cultural landscapes. The fire effects crew will be tasked with monitoring the fields in the event that prescribed burning takes place.

Shenandoah National Park (SHEN)

2014 Fire Effects Monitoring Annual Report

Shenandoah National Park is located within the Blue Ridge Mountains of northwestern Virginia and lies closer to more people than does any other national park in the country. The park is comprised of approximately 200,000 acres, including almost 80,000 acres of federally designated Wilderness. Elevations in the park range from 595 feet at Front Royal to 4,049 feet at the summit of Hawksbill Mountain.

The vast majority (93%) of the park is blanketed by second-growth forest. Approximately 5% of the park is covered by meadows, wetlands, and barrens, with developed areas and roads making up the remaining 2%. The composition of the park's forest has been influenced by the topography, climate, geology, and natural disturbance regimes of the northern Blue Ridge Mountains, as well as by historic land use and other anthropogenic disturbances. The park falls within the Oak-Hickory Forest Region described by Braun (1950); accordingly, oaks make up about 40% of the forest cover with hickory typically coexisting as a secondary component.

In 2009, the MTTS fire effects crew began establishing monitoring plots in Shenandoah National Park in an effort to study the effects of fire on oak and pine communities. Most plots fall within one of the two monitoring types described below.

Pine-Oak Monitoring Type

Central Appalachian Pine - Oak /Heath Woodland & Central Appalachian Xeric Chestnut Oak - Virginia Pine Woodland (Young et al. 2009). Pine-oak stands typically occupy xeric, upper slopes and ridges on south to northwest aspects at elevations ranging from 1550-3200 feet. Physiognomy of these stands ranges from closed forest (long-term fire exclusion) to open shrubland (coincident depredation by southern pine beetle and stand-replacing wildfires). Though this community is widely distributed on the Blue Ridge and in the Park, it is most extensive on quartzite ridges in the south district and on the western slopes of the park. Contemporary Pine-Oak stands vary from closed forest to open woodland that are dominated by *Pinus rigida* or *Pinus pungens*, though most stands observed are dominated by *Pinus rigida*. *Quercus prinus* is consistently a co-dominant in these stands. Most frequent canopy associates include *Quercus coccinea*, *Quercus marilandica*, *Pinus virginiana*, and *Nyssa sylvatica*. Subcanopy tree strata are frequently dominated by numerous

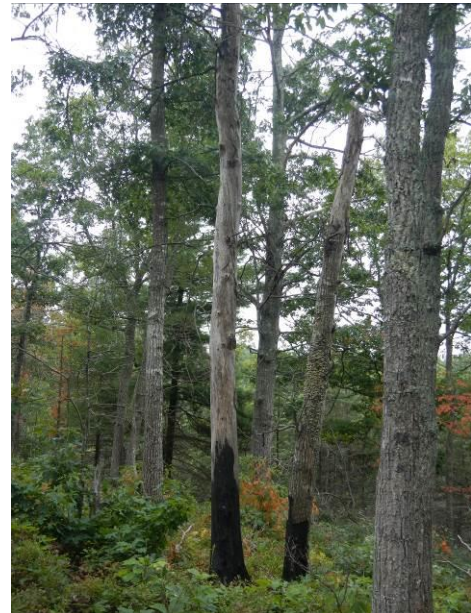


shade-tolerant species including *Nyssa sylvatica*, *Acer rubrum*, and *Sassafras albidum*. Typically, *Quercus ilicifolia* dominates a sporadic to very dense tall-shrub layer, while *Kalmia latifolia*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Gaylussacia baccata*, *Lyonia ligustrina*, *Rhododendron periclymenoides*, and other ericads form a continuous low shrub stratum.

Due to extensive and multi-layered hardwood encroachment, most herb assemblages are very diffuse, while subshrub assemblages occasionally achieve conspicuous abundance. Greatest ground layer abundance is observed in areas characterized by shallow, rocky substrates and/or very open to sparse tree and shrub canopies, as well as along insolated corridors (i.e, trails, roads, gaslines, powerlines, etc.) that maintain favorable growing conditions in the face of extensive shade-displacement.

Xeric Oak Monitoring Type (Chestnut Oak Variant)

Central Appalachian Dry Chestnut Oak - Northern Red Oak / Heath Forest & Central Appalachian / Northern Piedmont Chestnut Oak Forest. Xeric oak woodlands exhibit notable structural and compositional variety in the canopy, subcanopy, and herbaceous layers along a north-south gradient. MTTs Fire Ecology recognizes distinct xeric oak communities that are suitable prescribed fire target areas including the following put forth in “Vegetation of Shenandoah National Park in relation to environmental gradients” (Young et al. 2009): Central Appalachian/Northern Piedmont Chestnut Oak Forest, Central Appalachian Dry Chestnut Oak-Northern Red Oak/Heath Forest, Low-Elevation Mixed Oak/Heath Forest, Central Appalachian Acidic Oak-Hickory Forest. For the



purposes of MTTs Fire Ecology, two xeric oak monitoring type descriptions are created to improve programmatic sampling design, statistical & analytical groupings, and the placement of MTTs Fire Ecology plots within ecological variants that are recognizably distinct within the xeric oak complex. In Shenandoah National Park, Xeric Oak forests and woodlands occupy all geologic substrates, topographic positions and aspects, but is most associated with upper to midslope positions on south to west aspects. It occurs at elevations ranging from 800 feet to over 3000 feet on dry, infertile slopes and ridges.

Contemporary Xeric Oak forests and woodlands range from open to closed stands dominated by *Quercus prinus*. In certain stands, *Quercus alba*, *Quercus coccinea*, *Quercus rubra* and/or *Quercus velutina* achieve co-dominance. Overstory associates may include *Pinus pungens*, *Pinus rigida*, *Pinus virginiana*, *Carya glabra*, and *Fraxinus americana*. Midstory tree strata are frequently dominated by the following shade-tolerant species: *Nyssa sylvatica*, *Acer rubrum*, and

Sassafras albidum. Typically, *Kalmia latifolia* dominates an abundant tall-shrub layer, while *Vaccinium pallidum*, *Vaccinium stamineum*, *Gaylussacia baccata*, *Lyonia ligustrina*, *Rhododendron catawbiense*, and *Rhododendron periclymenoides* form a continuous low shrub stratum.

Ground layer herbaceous and subshrub cover is typically sparse, though rich assemblages are occasionally observed in areas characterized by rocky substrates and/or very open to sparse tree and shrub canopies, as well as along insolated corridors (i.e, trails, roads, gaslines, powerlines, etc.) that maintain favorable growing conditions in the face of extensive shade-displacement.

Jarman Gap

On April 10th, 2013, personnel from the Northeast Region completed the 500-acre Jarman Gap prescribed fire at Shenandoah National Park. The unit is located in the southern district of Shenandoah National Park to the west of Skyline Drive. The dominant vegetation types within the unit are oak-heath forest (75%) and pine-oak heath forest (5%). This was the first prescribed burn for the unit. Seven (7) FMH plots are located within the burn unit: 4 pine-oak type and 3 xeric oak type.

Goals and Objectives

In addition to the fuels reduction goal, objectives included the use of prescribed fire of low to moderate intensity to restore dry oak and pine communities through the reduction of duff depth and the elimination of fire-intolerant/shade-tolerant tree species. Specific objectives for the two monitoring types present within the unit are described below.

Pine Oak Monitoring Type

- >50% reduction in fuel loading after 3 burns.
- >70% reduction in quantity of mesic pole-size trees after 3 burns.
- >30% reduction in overstory tree density after 3 burns.
- Post burn shrub cover <10% after 3 burns.
- Duff depth less than 1.5 inches after 3 burns.
- >50 stems of yellow pine per FMH seedling plot (0.0125 acre) 5 years post-burn.

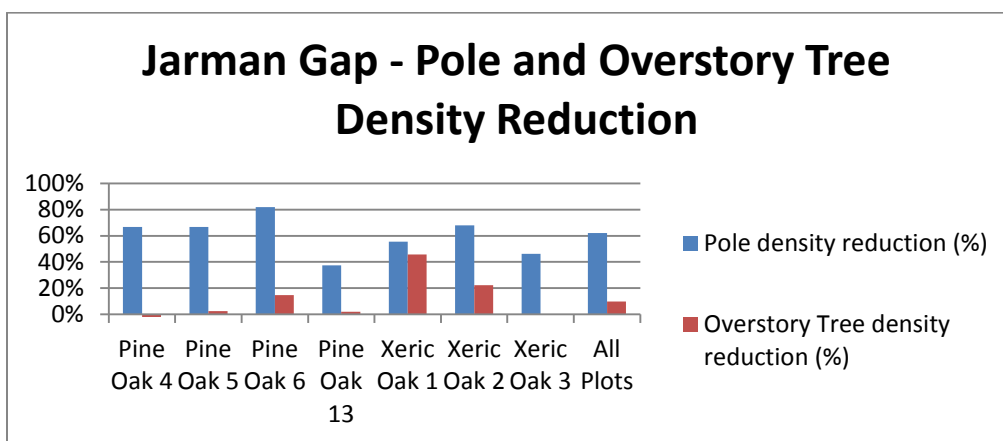
Xeric Oak Monitoring Type

- >50% reduction in fuel loading after 3 burns.
- >70% reduction in quantity of mesic pole-size trees after 3 burns.
- >30% reduction in overstory tree density after 3 burns.
- Post burn shrub cover <20% after 3 burns.
- >150 tall (>1m) oak seedlings per acre after 3 burns.

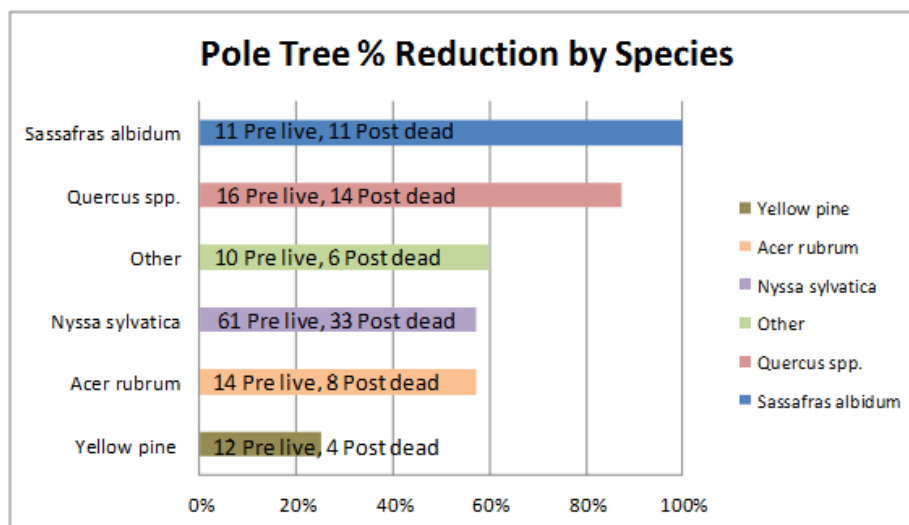
Summary of 2013 Post-Burn Results

Immediate post-burn severity of the vegetation was light/moderate (2.45) while substrate severity was light (3.01 for pine-oak plots; 2.93 for xeric oak plots). Pine-oak plots saw an 87% reduction in litter depth and an 18% reduction in duff thickness. Xeric oak plots experienced a 94% reduction in litter depth and a 29% reduction in duff thickness. Overall, total fuels reduction was 35%, with most of this change being a result of fine/small fuels consumption.

The density of pole-sized trees decreased by 62% overall; however, most top-killed poles had basal re-sprouts. We found that only 20% of “dead” fire-girdled trees were lacking re-sprouts. Overstory tree density was reduced by 10%.



The mortality of pole-sized trees was analyzed on a species-by-species basis, with results shown in the table below. As most top-killed poles were re-sprouting, many of them can be expected to return to the pole stratum in the future in the absence of additional treatments. It will take multiple fire treatments over several years to slowly stress these trees and re-sprouts and bring about tree mortality, thus removing them from all strata.



2014 Analysis and Discussion

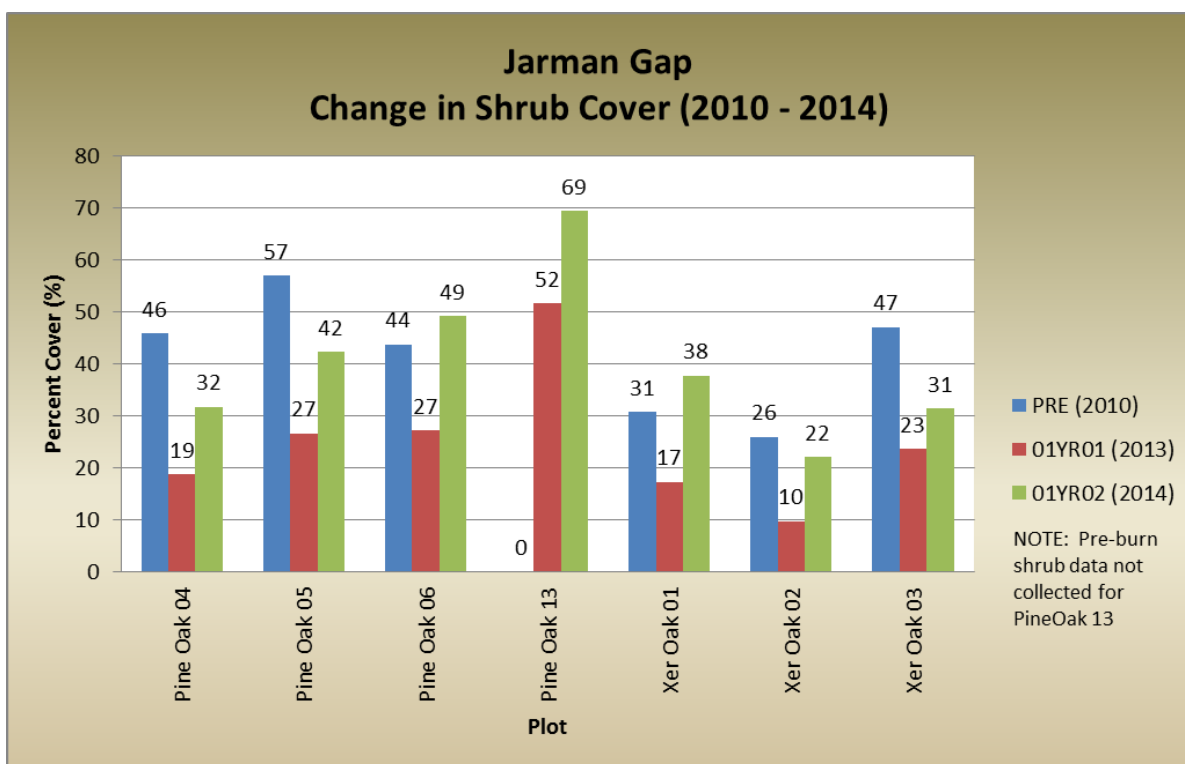
The MTTs fire effects monitoring crew returned to Jarman Gap to collect 01YR02 data. This year's analysis will focus on those objectives that were not addressed last year: shrub cover and seedling densities. Additionally, overstory trees will get a second look to determine the impact of delayed mortality.



Overlooking the northern side of the Jarman Gap burn unit. Canopy mortality low in area visible from this vantage point.

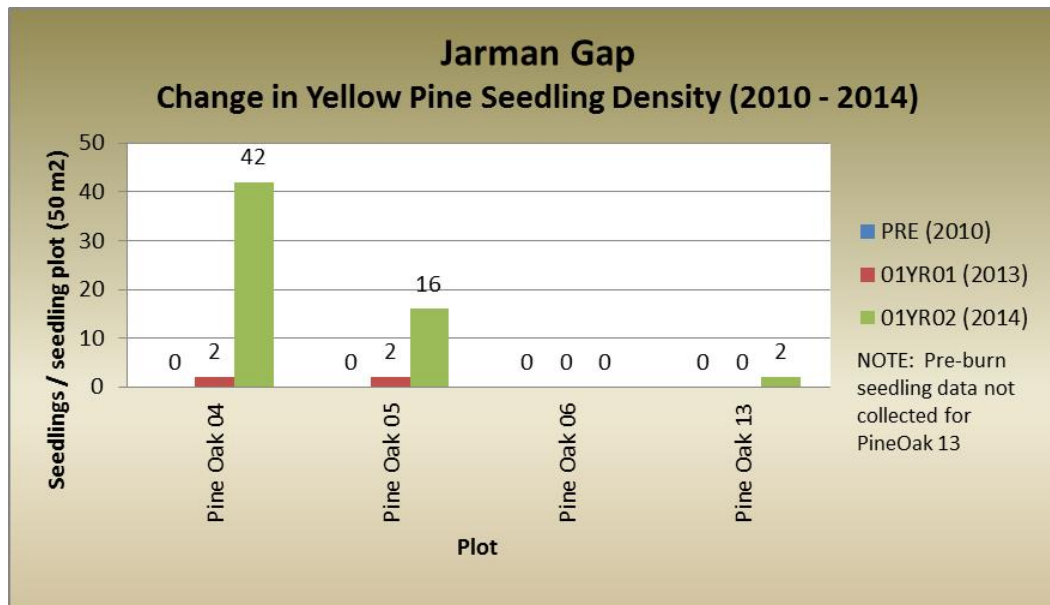
Shrub Cover

Average shrub cover in pine-oak plots decreased insignificantly from 49% at pre-burn to 48% (± 8) in 2014. The change in shrub cover in xeric oak plots was also minimal, decreasing from 35% to 30% (± 5) during the same period. Future treatments should further reduce the shrub cover toward our target values (10% for pine-oak, 20% for xeric oak). Shrub cover per plot is shown in the chart below.

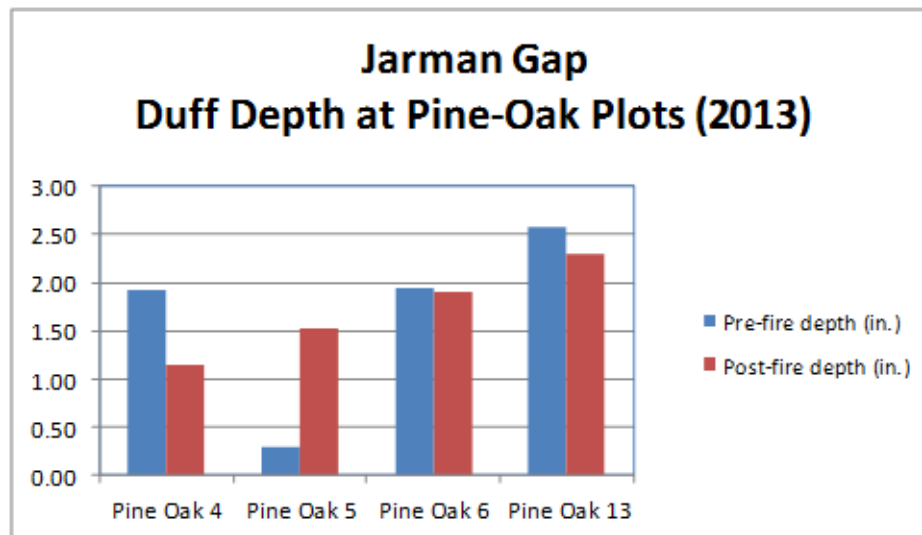


Seedling Density

Within pine-oak plots, the objective is to increase seedling density to >50 yellow pine stems per seedling plot (50 square meters). Prior to the prescribed burn, yellow pine seedlings were completely absent from the pine-oak monitoring plots. Pine recruitment began to occur following treatment, with a dramatic increase in density occurring in 2014 (mean density of 19 (± 10)). This increase is likely the result of decreased duff thickness and an increase in forest floor insolation.



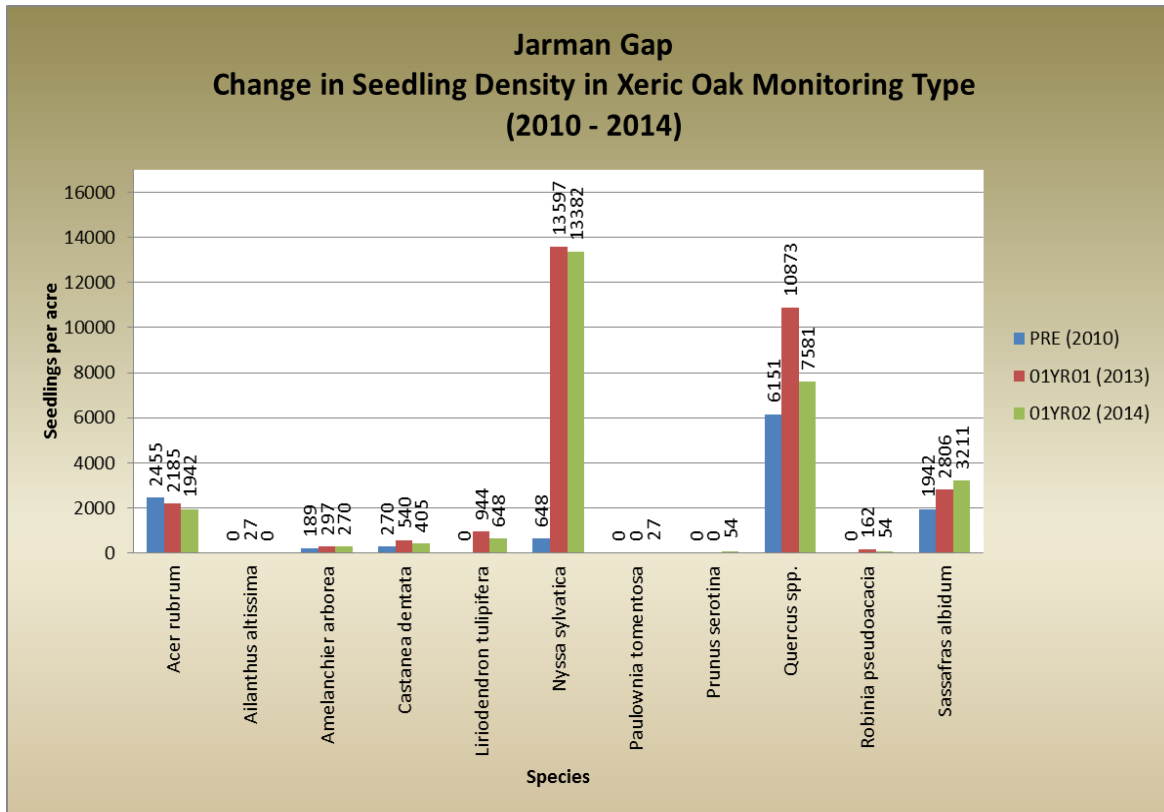
Pine regeneration was greatest in the plot with the shallowest post-burn duff layer (Pine Oak 4). This is consistent with the finding that a duff depth of less than 4 cm (1.57 in) is necessary for successful yellow pine regeneration (Jenkins et al., 2011). Duff thickness results from 2013 are shown below (NOTE: Pine Oak 5 pre-burn thickness appears to be erroneous, presumably due to sampling error).



Future treatments will kill many of these new pine seedlings, but the current trend shows that fire does create an environment that is favorable to pine regeneration through the consumption of duff. Seedlings that are lost during future prescribed fires should be replaced by new regeneration as long as mature seed trees persist in the canopy.

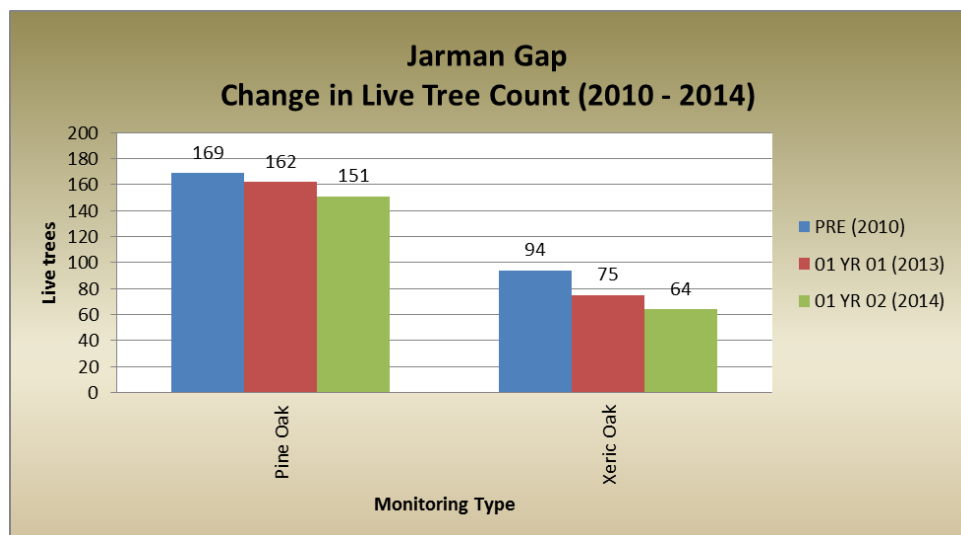
The 2014 MTTS seedling sampling protocol did not provide the data needed to determine if oak seedling recruitment is meeting established monitoring objectives in xeric oak plots. The following has been done to correct this: 1) the seedling objectives, which included density targets in three separate size classes, have been reduced to one objective (i.e., >150 tall seedlings per acre), and 2) the MTTS seedling sampling protocol has been modified so that data is collected in the proper size class (i.e. greater than 1 m tall).

Despite the inconsistencies between monitoring objectives and monitoring data at this time, there is value in looking at current trends in seedling densities at the species level (see chart below). It should be noted that root sprouts are counted as seedlings in the MTTS seedling sampling protocol, so stem density values include the prolific resprouts that often occur at the base of top-killed trees following fire. Black gum (*Nyssa sylvatica*) experienced the most dramatic increase in seedling density following treatment, probably as a result of fire-induced basal reprints and herbivore-induced secondary resprouting (i.e., resprouts of resprouts) because of their preferred status as a food source for white-tailed deer. It will be interesting to see how many of these black gum stems advance to the larger size class in the future. Red maple (*Acer rubrum*), oak (*Quercus* spp.) and sassafras (*Sassafras albidum*) demonstrated a more moderate response to treatment. Early seral species such as tuliptree (*Liriodendron tulipifera*), black cherry (*Prunus serotina*) and black locust (*Robinia pseudoacacia*) appeared following fire, but at low densities. Likewise, the exotic invasive species tree-of-heaven (*Ailanthus altissima*) and princess tree (*Paulownia tomentosa*) also arrived following treatment, but at very low densities (a density of 27 means that one seedling was observed at one of the four xeric oak monitoring plots).



Overstory Trees – Delayed Mortality

As expected, delayed mortality resulted in fewer living canopy trees. Mortality increased from an average of 4% to 11% (± 6) in the pine-oak monitoring type, and increased from an average of 23% to 35% (± 19) in the xeric oak monitoring type. Total live tree counts for the two monitoring types are shown in the chart below.



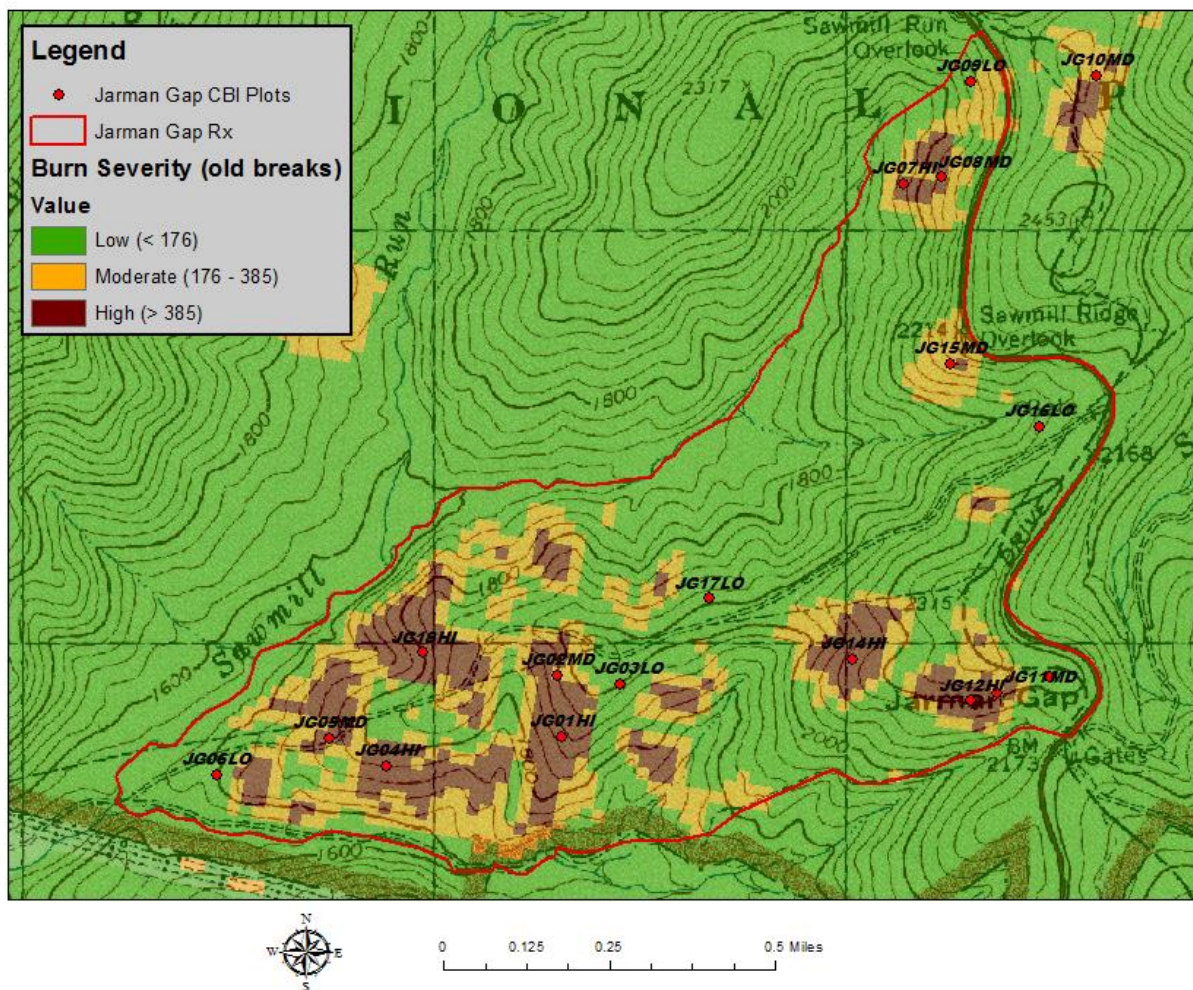
A summary of Jarman Gap objectives and current status follows in the chart below.

Shenandoah National Park				
Monitoring Unit	Management Objective (80% C.I.) α .2	Monitoring Results	Objectives Achieved?	YR Last Analysis?
Jarman Gap Pine-Oak	>50% reduction in fuel loading after 3 burns.	35% reduction in total fuel loading (pine-oak & xeric oak data combined) after one treatment	Litter and duff, but not large fuels	2013 (2010 - 2013)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	63% ($\pm 4\%$) reduction after one burn	No, but only one treatment	2013 (2010 - 2013)
	>30% reduction in overstory tree density after 3 burns.	11% ($\pm 6\%$) reduction after one burn	No, but only one treatment	2014 (2010 - 2014)
	Post-burn shrub cover <10% after 3 burns.	48% ($\pm 8\%$) shrub cover after one burn	No, but only one treatment	2014 (2010 - 2014)
	Duff depth less than 1.5 inches after 3 burns.	1.78 in post burn	No, but only one treatment	2013 (2010 - 2013)
	>50 stems of yellow pine per FMH seedling plot (0.0125 acre) 5 years post-burn.	19 (± 10)	No, but only one treatment	2014 (2010 - 2014)
Jarman Gap Xeric Oak	>50% reduction in fuel loading after 3 burns.	35% reduction in total fuel loading (pine-oak & xeric oak data combined) after one treatment	Litter and duff, but not large fuels	2013 (2010 - 2013)
	>70% reduction in quantity of mesic pole-size trees after 3 burns.	57% ($\pm 4\%$) after one burn	No, but only one treatment	2013 (2010 - 2013)
	>30% reduction in overstory tree density after 3 burns.	35% ($\pm 19\%$) after one burn	Yes	2014 (2010 - 2014)
	Post-burn shrub cover <20% after 3 burns.	30% ($\pm 5\%$) shrub cover after one burn	No, but only one treatment	2014 (2010 - 2014)
	>150 tall (>1m) oak seedlings per acre after 3 burns.	Data not currently available	N/A	N/A

Composite Burn Index (CBI) Fire Severity Analysis

The MTTs fire effects crew has collected CBI data for eight (8) fires within Shenandoah National Park. The data were collected between the years 2000 and 2014 on both wildfires and prescribed fires. This data set presents an opportunity to analyze the relationship between on-the-ground fire severity observations (i.e., CBI plot scores) and fire severity maps that are generated via remote sensing algorithms such as the Differenced Normalized Burn Ratio (dNBR). This relationship is of interest to the MTTs fire ecology program because current severity thresholds often appear to over-estimate the severity of the fire; for example, an area that is “high” severity according to dNBR data is found to be “moderate” when ground truthing occurs as part of CBI data collection. The map below of the Jarman Gap burn unit indicates the presence of large high severity patches in the western area of the unit, but actual high severity areas were found to be smaller in the field.

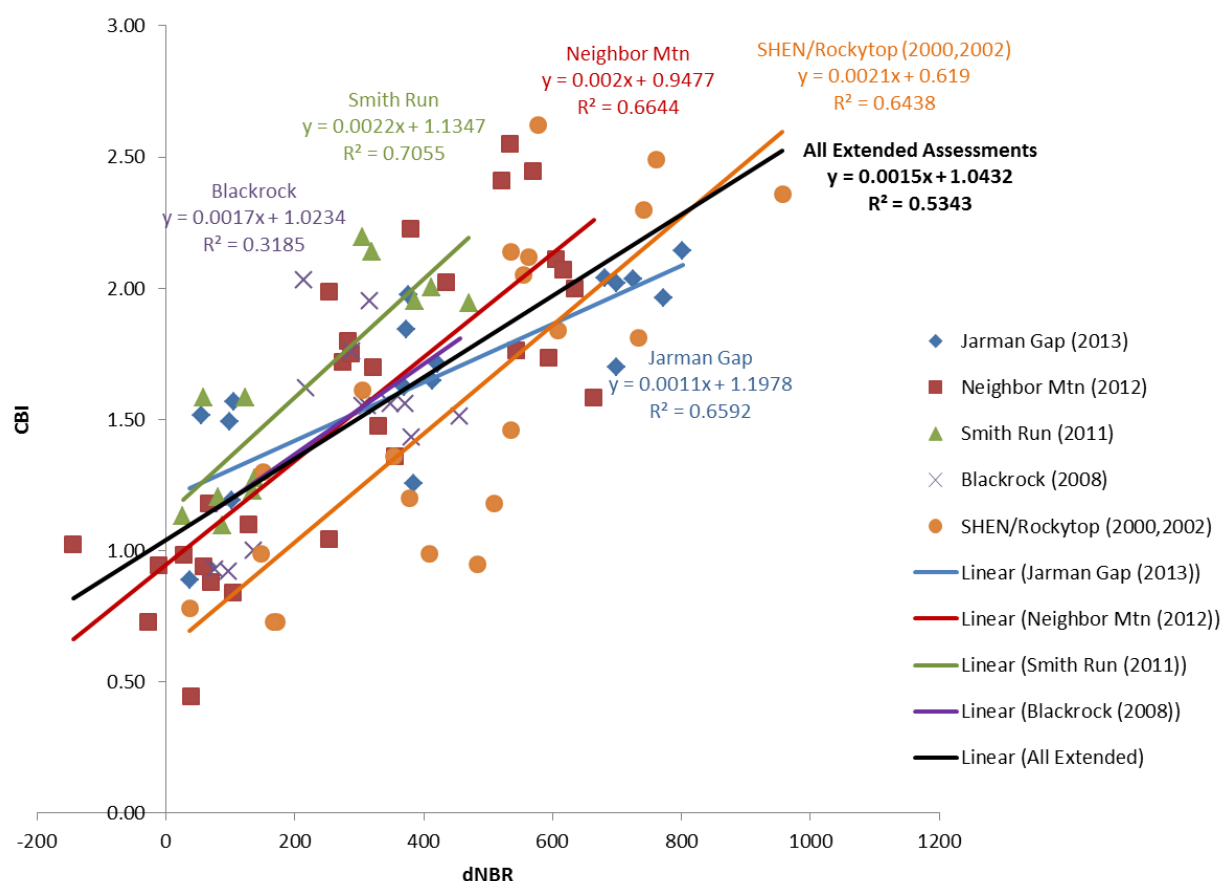
SHEN Jarman Gap Burn Severity Map



Data Analysis

All CBI data points were assigned a corresponding dNBR score taken from a USGS-provided dNBR raster file derived from a post-burn satellite image. The dNBR scores were calculated using the 5-point averaging method described in the CBI Landscape Assessment document (Key & Benson, 2006). A scatter plot was generated containing all “extended assessment” data (shown below). Data that were collected in the growing season immediately following the fire, known as the “initial assessment,” were excluded because they do not take into account delayed mortality or vegetation recovery potential.

CBI vs. dNBR (2000 - 2014) Extended Assessments



The scatter plot reveals a few interesting points:

- There is significant scatter, but CBI-dNBR correlation is very strong ($p < 0.0001$).
- Trend lines vary considerably between fires.
- Initial assessments may over-estimate fire severity, as indicated by steep regression slopes (not shown in graph above).

Ultimately, MTTS fire ecology would like to develop custom dNBR severity breakpoints that work fairly well at SHEN across multiple fires. Current default breakpoints result in fire severity maps that tend to over-estimate severity. In theory, custom dNBR ranges could be determined by assigning a CBI score range to each severity level (e.g., low, moderate, and high), and then plugging the CBI scores into the scatter plot regression equation to get the corresponding dNBR ranges. Several issues/questions must be addressed before adopting custom breakpoints, including:

- CBI scoring may vary from fire to fire because of changes in personnel and differing interpretations of the definitions described in the CBI Landscape Assessment document.
- There is not clear consensus on what low, moderate, and high severity effects look like in the Central Appalachians, so it is difficult to select CBI score ranges for each severity category.
- Differences in dNBR threshold levels between fires, probably due to seasonality of images.

Discussions are currently underway with other members of the Appalachian fire ecology community, including personnel from NPS, USFS, and TNC, in an attempt to address these issues and develop consistent definitions and strategies that will be adopted by all agencies.

Future Plans at SHEN

Monitoring of the effects of fire on forest ecosystems at SHEN will continue to be a high priority for the MTTS fire effects crew. The 2015 field season will likely include FMH data collection within the Rip Rap prescribed fire project, CBI data collection at the Rocks Mountain wildfire, and Big Meadows transect data collection (data maintained by SHEN Natural Resources staff). The fire effects crew will return to Jarman Gap in 2017 to collect 5-year post-burn data.

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- Key, C.H. and N.C. Benson. 2006. Landscape Assessment: Ground measure of severity, the Composite Burn Index; and Remote sensing of severity, the Normalized Burn Ratio. In D.C. Lutes; R.E. Keane; J.F. Caratti; C.H. Key; N.C. Benson; S. Sutherland; and L.J. Gangi. 2006. FIREMON: Fire Effects Monitoring and Inventory System. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. Gen. Tech. Rep. RMRS-GTR-164-CD: LA 1-51.

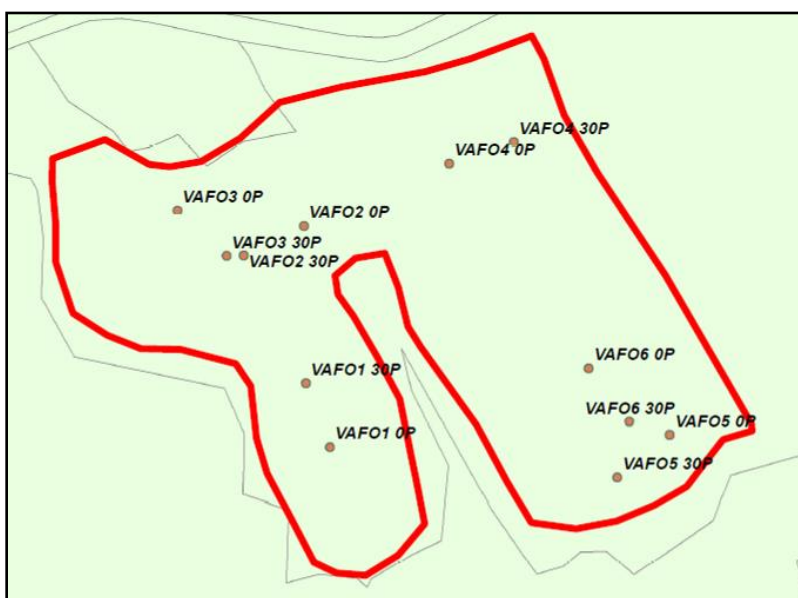
Valley Forge National Historical Park (VAFO) 2014 Fire Effects Monitoring Annual Report

The 3,500-acre Valley Forge National Historical Park encompasses an area of historical significance, as well as an area of substantial biodiversity. The park contains over 1,500 acres of meadows that provide important habitat for birds and mammals; however, exotic invasive plants have increased in abundance in recent years, resulting in habitat degradation. Control efforts focused on mowing and herbicide application have proven to be inadequate. The park Resource Management staff is interested in exploring the use of prescribed fire as an additional tool for invasive plant control.

Stirling's Barn Field

Located to the south of Yellow Springs Road in the western portion of the park, this 10-acre field was chosen by park Natural Resources staff as a pilot study location for testing the effectiveness of prescribed fire in reducing invasive plant encroachment in park meadows. This area was selected because it is not immediately adjacent to developed areas, and it contains a diverse array of native and non-native species. Both fields were mowed during the last dormant season (2013-2014), and the eastern half of the field was treated with herbicide in the fall of 2013. The park is planning to use a combination of fire and herbicide application to control invasive exotics in the field.

The MTTs fire effects monitoring crew established six (6) FMH grassland plots in the summer of 2014 and collected pre-burn baseline data. Plot locations are shown below (burn unit perimeter in red).





Top: Pre-burn photograph of Plot 1 shows high cover of exotics such as Oriental bittersweet (matted prostrate vines in foreground), typical of many areas in the western portion of the field.
 Bottom: Pre-burn photograph of Plot 4 shows high graminoid and herb cover (both native and exotic), typical of many areas in the eastern portion of the field.

Goals and Objectives

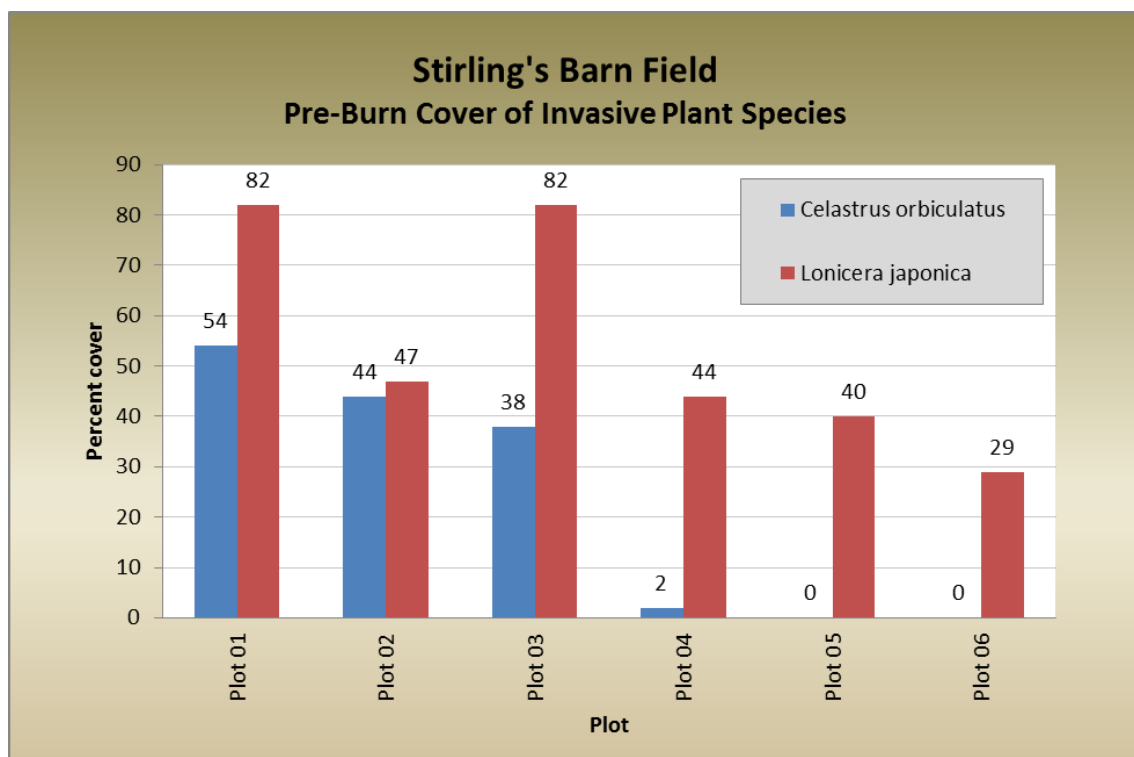
The ecological objectives for Stirling's Barn Field are as follows:

- Use prescribed fire and herbicide application to reduce the percent cover of each of the following species by 25%, as measured after 3 prescribed fire treatments: *Celastrus oboiculatus*, *Lonicera japonica*, and *Miscanthus sinensis*.
- Percent cover of both native graminoids and native herbs >75%, as measured after 3 prescribed fire treatments.
- Percent cover of trees and shrubs <25%, as measured after 3 prescribed burns.

Pre-Burn Data Summary

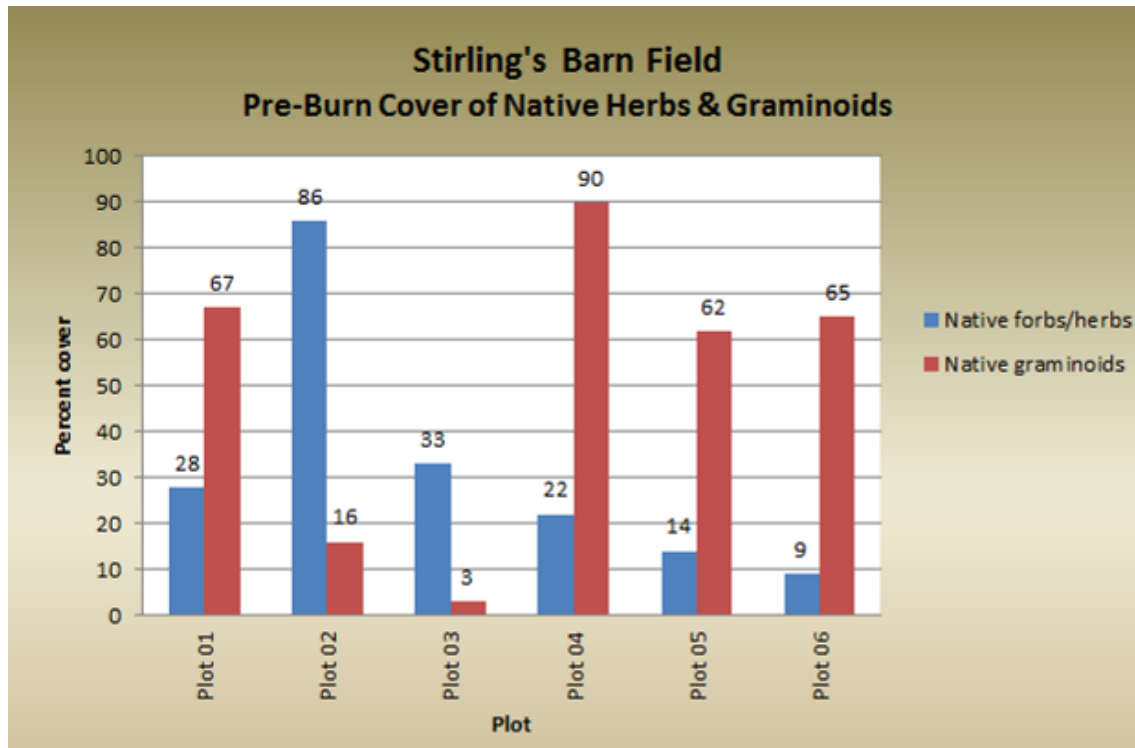
Invasive Species

Resource Management is particularly interested in the cover of three exotic plant species: Oriental bittersweet (*Celastrus oboiculatus*), Japanese honeysuckle (*Lonicera japonica*), and Chinese silvergrass (*Miscanthus sinensis*). Average pre-burn cover of these three species was 23%, 54% and 0%, respectively. Small patches of Chinese silvergrass were observed within the burn unit, but it was not growing in any of the monitoring plots. Cover of Oriental bittersweet and Japanese honeysuckle is shown on a per-plot basis in the chart below.



Native graminoids and herbs

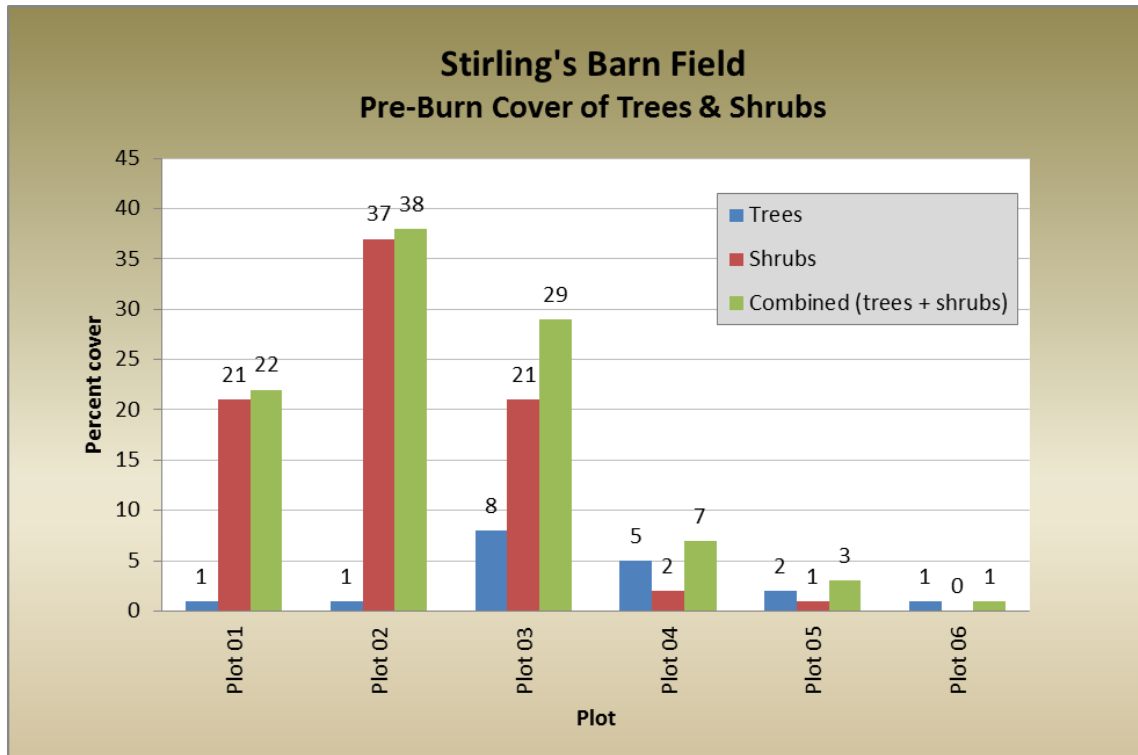
Average cover of native graminoids and herbs were 51% and 32%, respectively. Cover on a per-plot basis is shown in the chart below.



Trees and shrubs

The average combined tree and shrub cover was 17%, with nearly half of this cover (8%) being *Rubus*. *Rosa multiflora* (2.8%) and *Acer ginnala* (2.7%) have the second and third highest cover in the tree/shrub stratum.

Seventeen percent is below the acceptable maximum of 25%; therefore, a reduction of tree and shrub cover from current values is not necessary to meet the objective. Woody vegetation was more prevalent in the eastern monitoring plots (#1 – 3) than in the western plots (#4 – 6). Cover on a per-plot basis is shown in the chart below.



Future Plans

The Stirling's Barn Field was burned on October 9, 2014. The MTTs fire effects crew will return to VAFO during the summer of 2015 to perform 01YR01 sampling.