

# Fire Effects Monitoring Breakout

- How can FLN support monitoring efforts?
- Evolution of the Heart of the Appalachians Monitoring Program
- Adaptive management loop
- Different monitoring protocols and examples.

# Heart of the Appalachians FLN



4.2 million acres in  
Heart of the Apps  
landscape

1.8 million acres in the  
George Washington &  
Jefferson National  
Forest

# Controlled burning in the Heart of the Apps

43,000 acres of prescribed fire since 2014  
Average 15 burns per year  
74% of all burns take place in March and April



# Forest Structure and Composition Monitoring Milestones

➤ FSC Monitoring Protocol Piloted



2007

2009

➤ TNC/GWJNF adopted FSC monitoring protocol

Monitoring Working Group Established



2012

2013

FFI database launch  
1<sup>st</sup> Plant ID and Protocol Refresher

2014

All data entered into FFI  
689 sample events

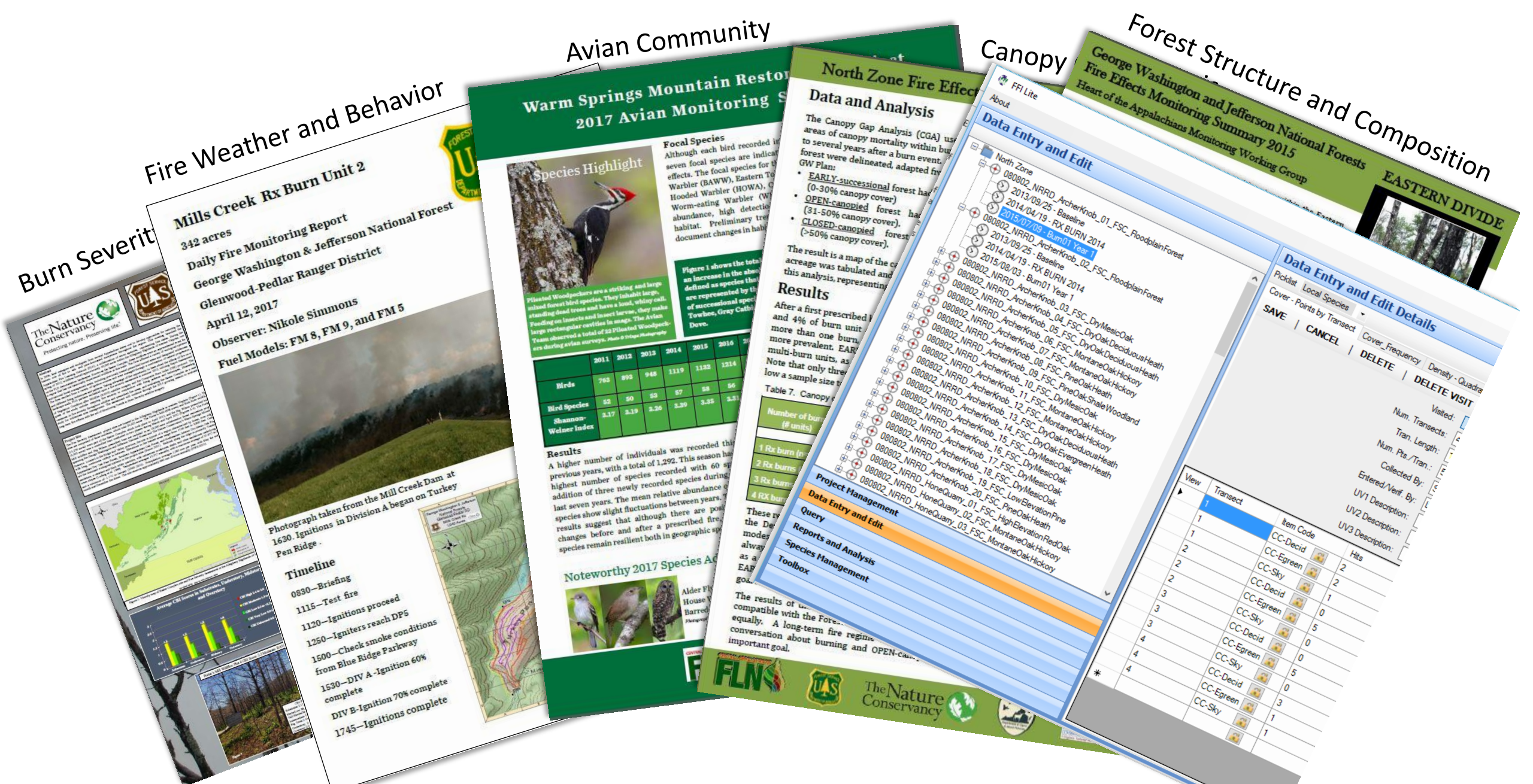
2015

State agencies join group and begin FSC monitoring

Complete Summaries Of FSC Results



2016



# Fire Weather and Behavior

# Burn Severity



The Nature Conservancy  
Protecting nature. Preserving life.



**Mills Creek Rx Burn Unit 2**  
342 acres  
Daily Fire Monitoring Report  
George Washington & Jefferson National Forest  
Glenwood-Pedlar Ranger District  
April 12, 2017  
Observer: Nikole Simmons  
Fuel Models: FM 8, FM 9, and FM 5



Photograph taken from the Mill Creek Dam at 1630. Ignitions in Division A began on Turkey Pen Ridge.

- Timeline**
- 0830—Briefing
  - 1115—Test fire
  - 1120—Igniters proceed
  - 1250—Igniters reach DF5
  - 1500—Check smoke conditions from Blue Ridge Parkway
  - 1530—DIV A -Ignition 60% complete
  - DIV B-Ignition 70% complete
  - 1745—Ignitions complete

# Avian Community

## Warm Springs Mountain Restoration 2017 Avian Monitoring Summary



**Species Highlight**  
Pileated Woodpeckers are a striking and large- billed forest bird species. They inhabit large, standing dead trees and have a loud, whistled call. Feeding on insects and insect larvae, they make large rectangular notches in snags. The Avian Team observed a total of 22 Pileated Woodpeckers during avian surveys. Photo © Tracey Thompson

**Focal Species**  
Although each bird recorded in seven focal species are indicated effects. The focal species for the Warbler (BAWW), Eastern Towhee (ETOW), Hooded Warbler (HOWA), Worm-eating Warbler (WOWE), and Gray Catbird (GCAT). Preliminary trend document changes in habitat.

Figure 1 shows the total increase in the abundance of species that are represented by the successional species: Towhee, Gray Catbird, and Dove.

	2011	2012	2013	2014	2015	2016
Birds	765	895	948	1319	1323	1214
Bird Species	52	50	52	57	58	56
Shannon-Weiner Index	3.17	3.19	3.26	3.39	3.35	3.31

**Results**  
A higher number of individuals was recorded this previous years, with a total of 1,292. This season has the highest number of species recorded with 60 species, in addition of three newly recorded species during the season. The mean relative abundance of species show slight fluctuations between years. These changes that although there are positive changes before and after a prescribed fire, species remain resilient both in geographic space and abundance.



Noteworthy 2017 Species Ac  
Alder Flycatcher, House Wren, Barred Owl

## North Zone Fire Effects Data and Analysis

The Canopy Gap Analysis (CGA) uses the areas of canopy mortality within burn units to several years after a burn event. The CGA Plan were delineated, adapted from the GW Plan:

- EARLY-successional forest had (0-30% canopy cover)
- OPEN-canopied forest had (31-50% canopy cover).
- CLOSED-canopied forest (>50% canopy cover).

The result is a map of the area and acreage was tabulated and this analysis, representing

**Results**  
After a first prescribed fire, 4% of burn unit more than one burn more prevalent. EARLY-successional forest multi-burn units, as low a sample size

Table 7. Canopy

Number of burn (# units)
1 Rx burn (n)
2 Rx burn
3 Rx burn
4 Rx burn

# Canopy

FFI Lite

### Data Entry and Edit

North Zone

- 080802\_NRRD\_ArcherKnob\_01\_FSC\_FloodplainForest
- 2013/09/25 - Baseline
- 2014/04/19 - RX BURIN 2014
- 2015/07/09 - Burn01 Year
- 2013/09/25 - Baseline
- 2014/04/19 - RX BURIN 2014
- 2015/08/03 - Burn01 Year 1
- 080802\_NRRD\_ArcherKnob\_02\_FSC\_FloodplainForest
- 080802\_NRRD\_ArcherKnob\_03\_FSC\_DryMeaicOak
- 080802\_NRRD\_ArcherKnob\_04\_FSC\_DryOakDeciduousHeath
- 080802\_NRRD\_ArcherKnob\_05\_FSC\_DryOakDeciduousHeath
- 080802\_NRRD\_ArcherKnob\_06\_FSC\_DryOakDeciduousHeath
- 080802\_NRRD\_ArcherKnob\_07\_FSC\_MontaneOakHickory
- 080802\_NRRD\_ArcherKnob\_08\_FSC\_MontaneOakHickory
- 080802\_NRRD\_ArcherKnob\_09\_FSC\_PineOakHeath
- 080802\_NRRD\_ArcherKnob\_10\_FSC\_PineOakHeath
- 080802\_NRRD\_ArcherKnob\_11\_FSC\_DryOakShaleWoodland
- 080802\_NRRD\_ArcherKnob\_12\_FSC\_MontaneOakHickory
- 080802\_NRRD\_ArcherKnob\_13\_FSC\_MontaneOakHickory
- 080802\_NRRD\_ArcherKnob\_14\_FSC\_MontaneOakHickory
- 080802\_NRRD\_ArcherKnob\_15\_FSC\_DryOakEvergreenHeath
- 080802\_NRRD\_ArcherKnob\_16\_FSC\_DryMeaicOak
- 080802\_NRRD\_ArcherKnob\_17\_FSC\_DryMeaicOak
- 080802\_NRRD\_ArcherKnob\_18\_FSC\_DryMeaicOak
- 080802\_NRRD\_ArcherKnob\_19\_FSC\_DryMeaicOak
- 080802\_NRRD\_HoneQuary\_01\_FSC\_PineOakHeath
- 080802\_NRRD\_HoneQuary\_02\_FSC\_HighElevationRedOak
- 080802\_NRRD\_HoneQuary\_03\_FSC\_MontaneOakHickory

**Data Entry and Edit Details**

Picklist: Local Species

Cover: Points by Transect

SAVE | CANCEL | DELETE | DELETE VISIT

Cover\_Frequency | Density - Quadra

View: View | Transect

View	Transect	Item Code	Hits
1	1	CC-Decid	2
2	1	CC-Egreen	2
2	2	CC-Sky	0
3	2	CC-Decid	5
4	3	CC-Egreen	0
4	4	CC-Sky	5
4	4	CC-Decid	0
4	4	CC-Egreen	3
4	4	CC-Sky	1
4	4	CC-Sky	1

# Forest Structure and Composition

George Washington and Jefferson National Forests  
Fire Effects Monitoring Summary 2015  
Heart of the Appalachians Monitoring Working Group  
EASTERN DIVIDE

Fire Effects Monitoring in the Heart of the Apps

Mid-may to mid-June  
107 plots  
100 m fixed radius



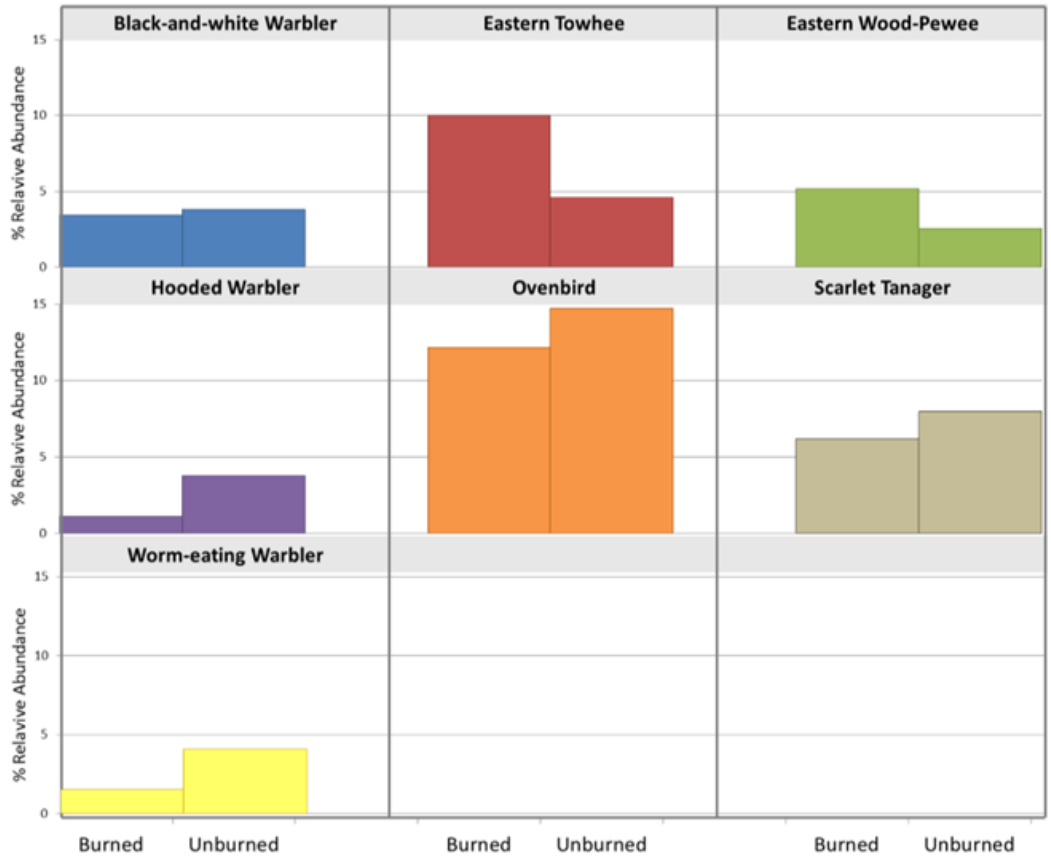


Figure 1: Mean differences in relative abundance of the study focal species in burned and un-burned plots.  
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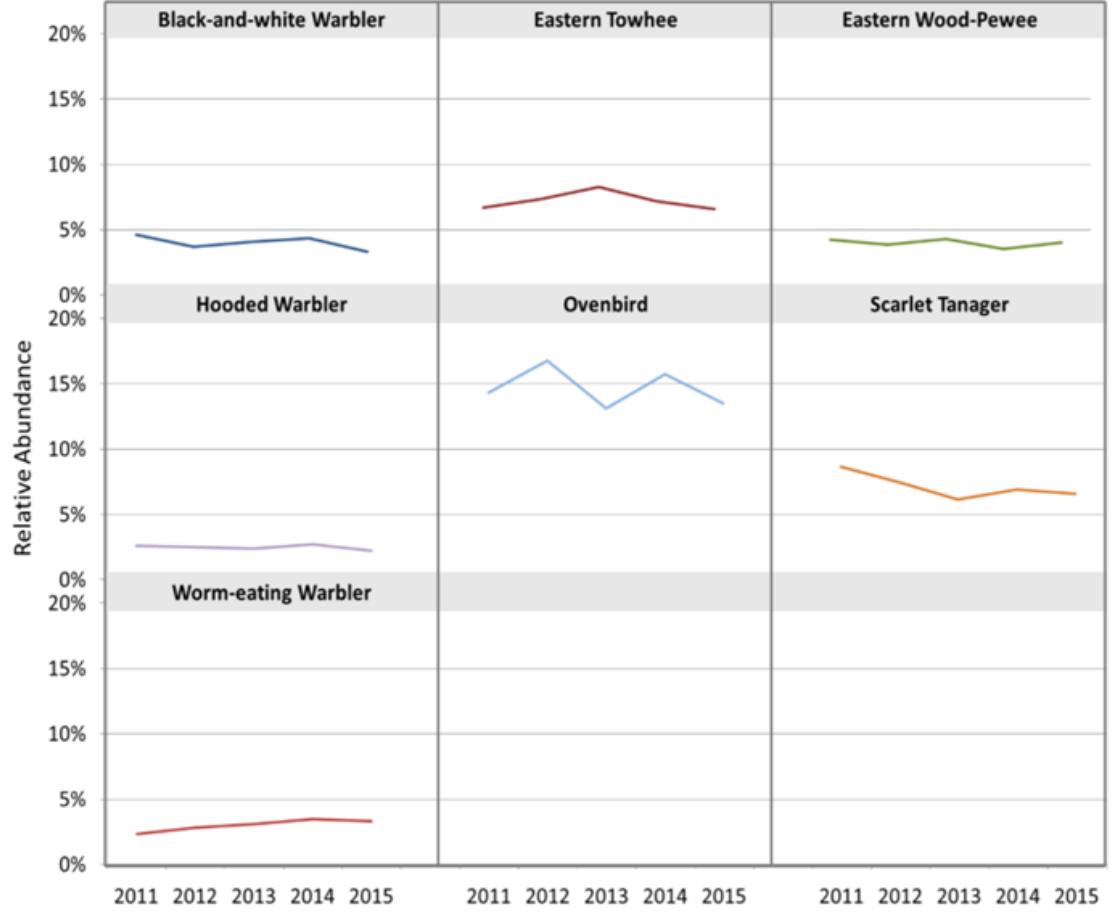


Figure 2: Mean annual differences in relative abundance of the study focal species (error bars indicate 1 standard error).

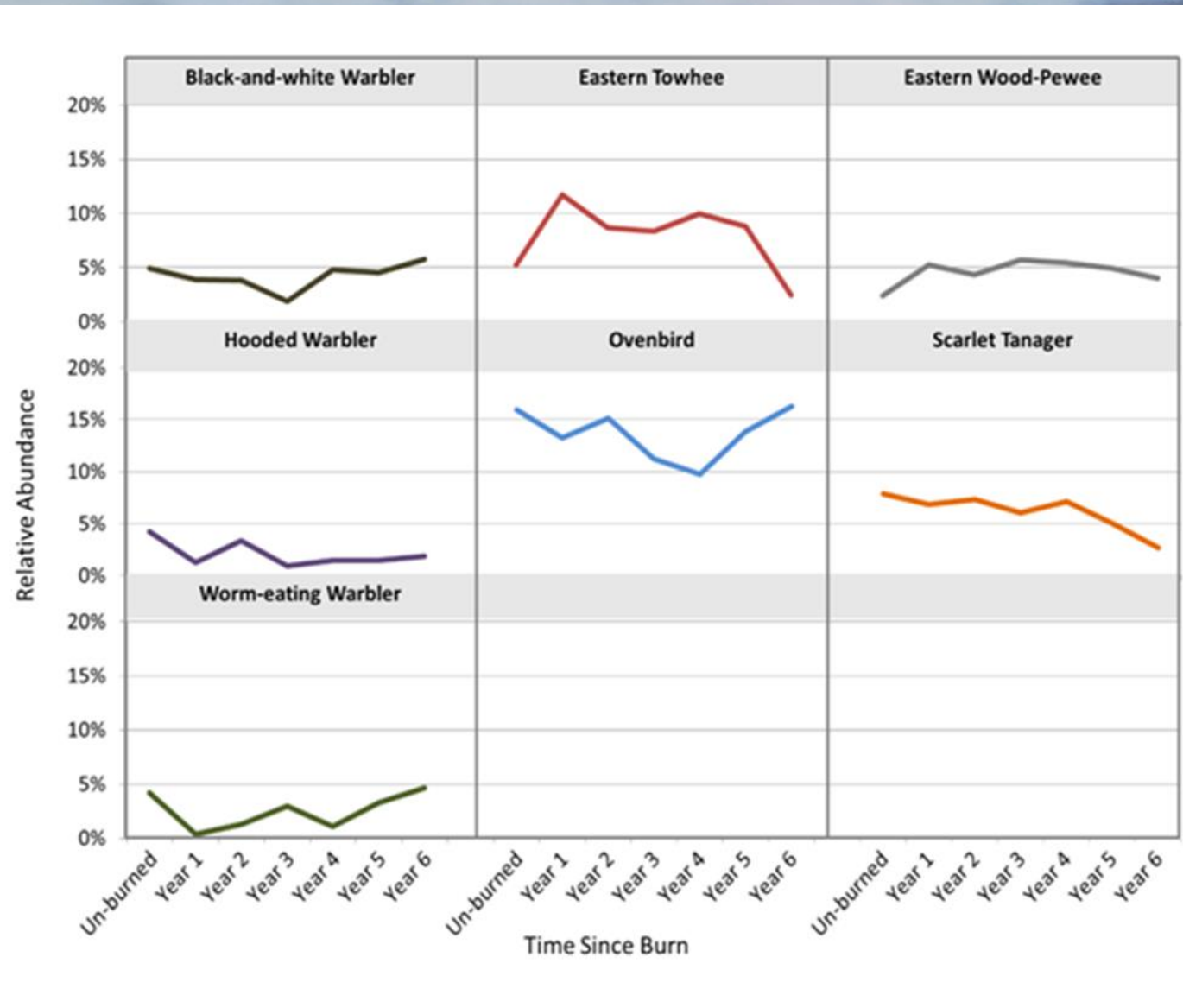


Figure 3: Mean differences in relative abundance of the study focal species since the last fire entry





# George Washington and Jefferson National Forest Fire Effects Monitoring Summary 2015

Heart of the Appalachians Monitoring Working Group

This report summarizes the effects of prescribed burning and one wildfire within the Central Zone of the George Washington National Forest (GWNF). Both on-the-ground vegetative sampling (Forest Structure and Composition-FSC) and GIS-based Image analysis (Canopy Gap Analysis-CGA) were used to characterize fire effects.

## Goals and Objectives for Prescribed fire

The GWNF's 2014 Land and Resource Management Plan recognizes fire as a crucial tool for achieving multiple goals: "Fire is used in a controlled, well-planned manner to manage vegetation, restore fire-dependent ecosystems and species, create desired wildlife habitat conditions, and modify uncharacteristic fuel conditions..." (pg. 2-24). In detailing the goals for ecosystem diversity, the Plan goes on to describe a range of desired conditions, specific to each major community (Table 1). Fire is one tool expected to help create these conditions.

Almost all of the examined burn units were burned prior to the 2014 Plan, but the goals of those operations were still consistent with the Plan. Below are typical objectives found in past Central Zone burn plans:

- Overstory/Midstory:** Reduce/maintain canopy cover of 40%-70%.
- Understory:** Top kill 30-80% of all small trees and shrubs less than 1" DBH. Top kill at least 80% of all blueberry and huckleberry plants to encourage sprouting and berry production.
- Overall species composition:** encourage a vegetation mosaic that favors fire-tolerant species.

Where appropriate, the results of these analyses are compared to both Plan objectives and burn unit objectives.

## Data and Analysis—Forest Structure and Composition (FSC)

As of 2015, one hundred and twenty-two (122) permanent plots have been established and sampled in the Central Zone, using the FSC protocol developed by Central Appalachians FLN partners (Fig.1). Of those plots, 35 have been sampled both before and after a unit's first prescribed burn. Those results are summarized in this report.

Data from all major community types (dry, dry-mesic, mesic) have been combined, due to the small sample size of the dry and mesic categories.

It should be noted that most plots remained relatively CLOSED-canopy after a first burn, and therefore these results best represent the post-fire development of CLOSED-canopy forest. However, as seen in the Canopy Gap Analysis (next section), some burn unit acreage has become OPEN-canopy or even EARLY-successional. The vegetation response in these more affected areas is likely to be significantly different than the results reported here. As burning continues, more plots are likely to become EARLY and OPEN, and results specific to each condition could be presented separately.

## CENTRAL ZONE



Pine and oak community common to the forests of Central Zone.

Table 1. Desired distribution of strike conditions for OAK Forest and Wood

Successional class	Percent landscape
Early	12%
Mid-CLOSED	7%
Mid-OPEN	10%
Late-OPEN	57%
Late-CLOSED	14%
<b>TOTAL</b>	<b>100%</b>

Figure 1. Location of burn units with FSC plots.



Figure 1. Location of burn units with FSC plots.



# Summaries of monitoring results

## North Zone Fire Effects Monitoring

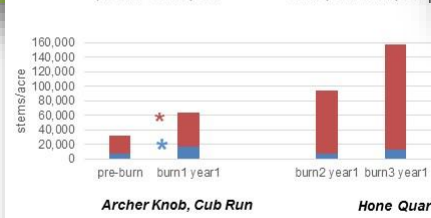
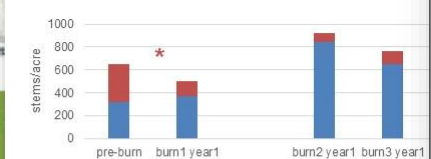
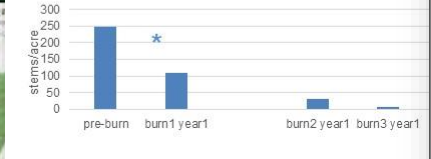
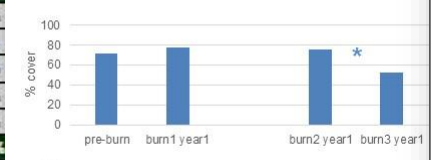
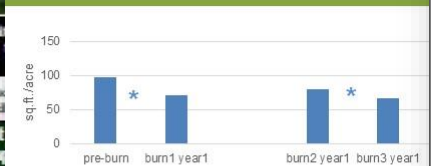


Figure 7. Small understory stems (<3.3ft)

Attributes of forest structure within burn units, by sampling period. Comparisons marked with an \* are significantly different.

## Eastern Divide Fire Effects Monitoring—FSC plots

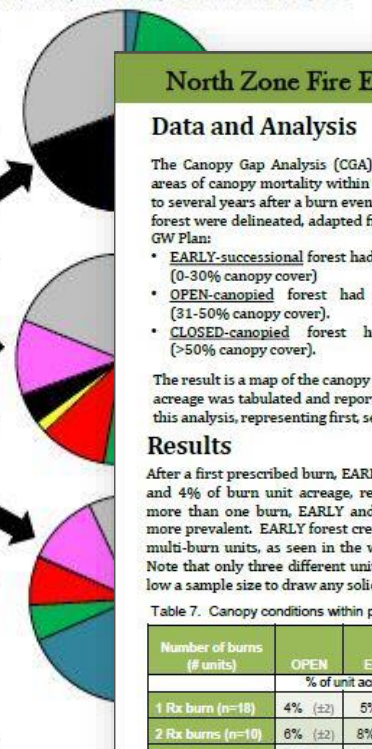
### SUMMARY 2nd prescribed burn

In these twice-burned plots, the overstory is still relatively closed; both basal area and canopy cover are over 90 ft<sup>2</sup>/acre and 90% cover, respectively. A moderately-dense midstory still persists; it is a relatively diverse mix of oaks, maples, blackgum and other hardwood species. A dense understory is present, with large and small stems dominated by shrub species. Oaks are a relatively small component of tree regeneration. Non-woody ground cover is relatively sparse.

The condition of these plots before the 2<sup>nd</sup> burn isn't known, therefore conclusions about the impacts of fire based on the data below should be limited.

Table 4. Forest structure and composition attributes of plots after a second prescribed burn (1 year post, n=24, all communities combined. Round Mtn., Mill Creek, No Business #327, 355 and 977).

<b>OVERSTORY</b>	Basal Area (ft <sup>2</sup> /ac): 91 ± 12 Canopy Cover: 92 ± 4
<b>MIDSTORY</b> (stems 1-4" DBH)	Total stem density/acre 244 ± 86 • shrub 6 ± 12 • tree 231 ± 83
<b>UNDERSTORY</b> (stems >3.3ft tall and <1" DBH)	Total stem density/acre 900 ± 524 • shrub 420 ± 407 • tree 479 ± 284 • oaks 54 ± 38
<b>UNDERSTORY</b> (stems <3.3ft tall)	Total stem density/acre 42,071 ± 18,892 • shrub 28,792 ± 18,758 • tree 13,152 ± 5,058 • Oaks 2,360 ± 884
<b>UNDERSTORY</b> (ground cover)	Non-woody cover: 11% ± 5% • Forbs 10 ± 4 • Grass 1 ± 1 • Vines 1 ± 1



## North Zone Fire Effects Monitoring—Canopy Gap Analysis

### Data and Analysis

The Canopy Gap Analysis (CGA) uses GIS to identify areas of canopy mortality within burn units (Fig.8), up to several years after a burn event. Three categories of forest were delineated, adapted from definitions in the GW Plan:

- EARLY-successional forest** had substantial mortality (0-30% canopy cover)
- OPEN-canopied forest** had moderate mortality (31-50% canopy cover).
- CLOSED-canopied forest** had little mortality (>50% canopy cover).



Figure 8. Canopy gaps delineated after a burn.

The result is a map of the canopy condition of entire burn units (Fig.9). The amount of EARLY, OPEN or CLOSED acreage was tabulated and reported as a percentage of the burn unit. Over 20 North Zone units were used for this analysis, representing first, second, third or fourth-entry burns from 1997-2014.

### Results

After a first prescribed burn, EARLY and OPEN forest represented 5% and 4% of burn unit acreage, respectively (Table 7). In units with more than one burn, EARLY and OPEN were slightly to somewhat more prevalent. EARLY forest creation was also more variable among multi-burn units, as seen in the wider confidence interval (Table 7). Note that only three different units with 4 burns were examined, too low a sample size to draw any solid conclusions from now.

Table 7. Canopy conditions within prescribed burn units, by burn history.

Number of burns (# units)	OPEN	EARLY	CLOSED	Total acres examined
1 Rx burn (n=18)	4% (±2)	5% (±5)	91% (±6)	26,988
2 Rx burns (n=10)	6% (±2)	8% (±10)	87% (±10)	10,466
3 Rx burns (n=7)	8% (±5)	20% (±21)	72% (±23)	8,517
4 RX burns (n=3)	7% (±16)	0% (±13)	84% (±23)	2,784

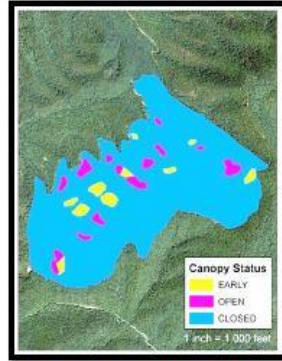


Figure 9. Post-burn canopy status for the New Road Run burn unit.

Heart of the Appalachians Monitoring Working Group  
Linsley Cuffin, USFS  
burn@hats.fed.us  
(540) 265-5220

These results show that burning has begun to shift the forest towards the Desired Conditions of the Forest Plan. A single burn created modest amounts of EARLY and OPEN, but repeated burning did not always result in ever-increasing amounts of these conditions. Taken as a whole, the results of burning were close to the Plan's goal for EARLY forest creation (~12%, Table 1), but have not yet achieved the goal for OPEN forest creation (~67%, Table 1).

The results of the CGA are consistent with the results of the FSC plot data: prescribed burning has been compatible with the Forest Plan, even though not all of the newly-described ecological targets have been met equally. A long-term fire regime will be necessary to fully achieve Desired Conditions. Additionally, a conversation about burning and OPEN-canopied forest might provide insight into better addressing this important goal.



# Avian monitoring

Located on 107 FSC plots across one landscape

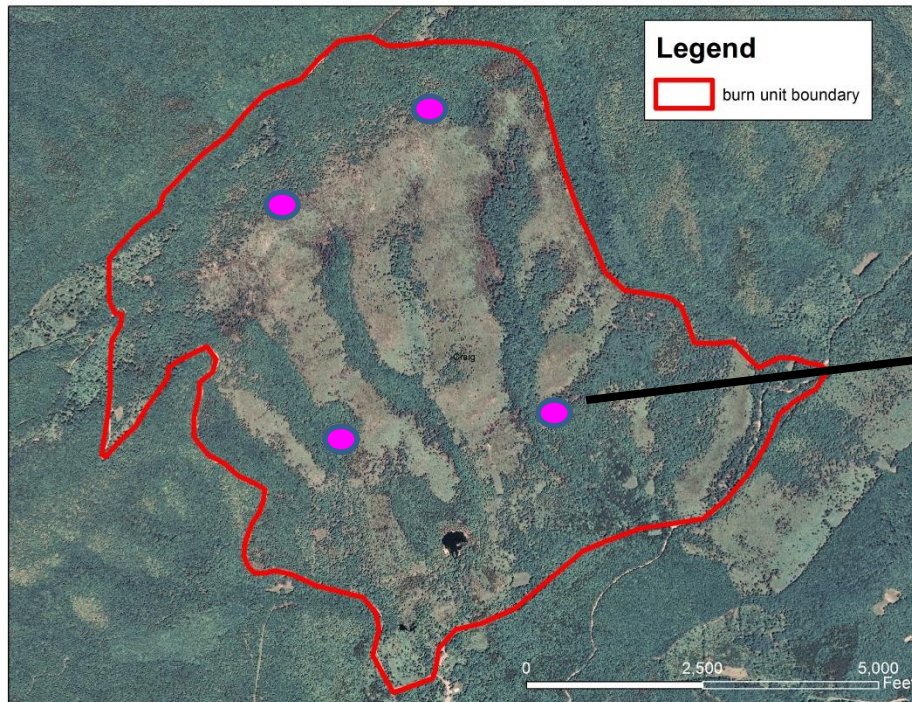
Training in Spring

Monitoring done in late Spring (May-June)

2 crews (2 people each)

5-7 weeks of work

7 years of monitoring complete (pre and post-burn)



# The importance of fire in the Heart of the Apps

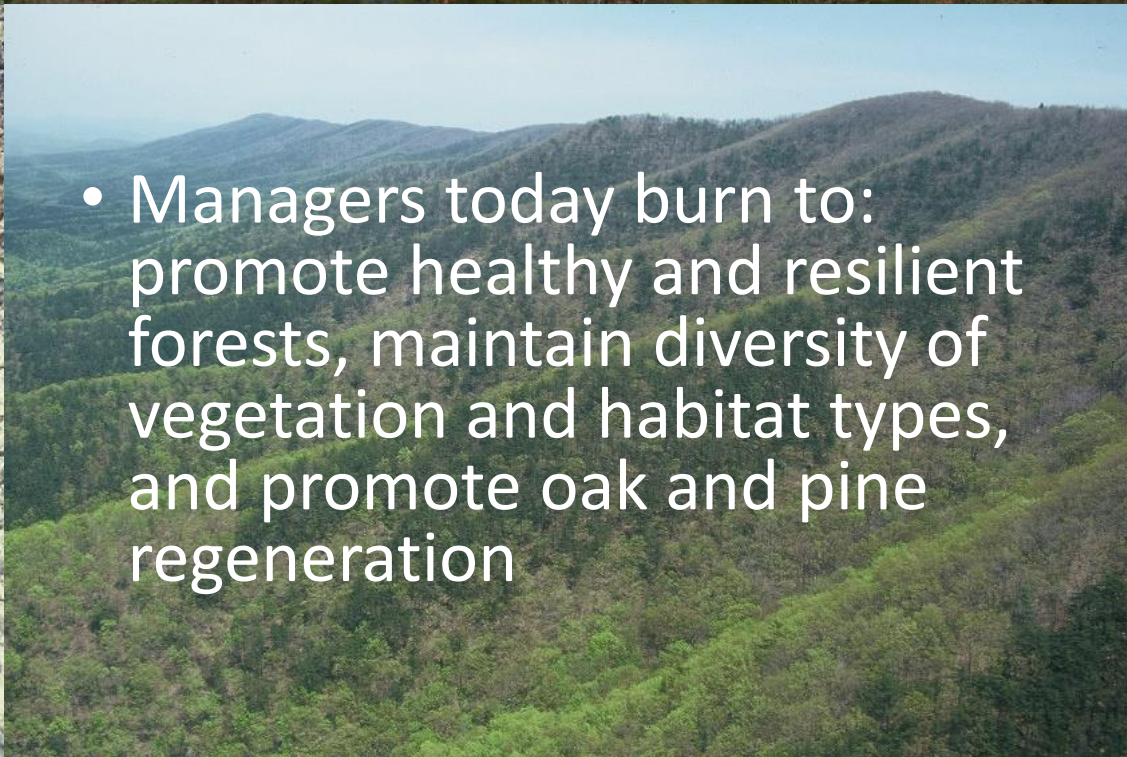
- Fire has shaped the vegetation and habitat types in the region over thousands of years, though its frequent presence across the landscape was all but extinguished in the early 20<sup>th</sup> century

- Managers today burn to: promote healthy and resilient forests, maintain diversity of vegetation and habitat types, and promote oak and pine regeneration



## The Demise of Fire and "Mesophication" of Forests in the Eastern United States

**ABSTRACT** • FIRE AND WOODLAND LOSS IN THE EASTERN UNITED STATES have altered the structure and composition of forests, leading to a decline in biodiversity and ecosystem resilience. This review synthesizes the historical role of fire in the region and the consequences of its suppression. The loss of fire has led to a shift in species composition, with an increase in shade-tolerant species and a decline in fire-adapted species. This has resulted in a more homogeneous forest structure and a loss of habitat diversity. The review also discusses the potential for fire management to restore the region's natural fire regime and the benefits of a more diverse and resilient forest.

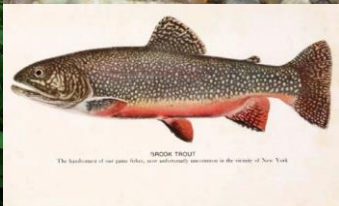




Desired Conditions



Oak, Hickory & Pine Regeneration  
Open Forests and Woodlands  
Diverse stand classes





# Desired Conditions

New Road Run Burn GWJNF North Zone

Creating conditions for a healthy and resilient forest



Heart of the Apps FLN Monitoring Working Group



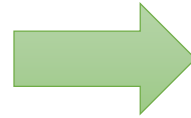
# Fire Effects Monitoring in the Heart of the Apps





Forest Structure & Composition  
Species List

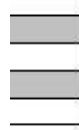
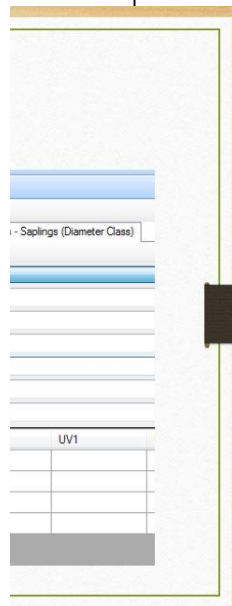
Common Name	Symbol	Scientific Name
alder	ALNUS	<i>Alnus</i>
Allegheny serviceberry	AMLA	<i>Amelanchier laevis</i>
alternatleaf dogwood	COAL2	<i>Cornus alternifolia</i>
American basswood	TIAM	<i>Tilia americana</i>
American beech	FAGR	<i>Fagus grandifolia</i>
American chestnut	CADE12	<i>Castanea dentata</i>
American elm	ULAM	<i>Ulmus americana</i>
American hazelnut	COAM3	<i>Corylus americana</i>
American holly	ILOP	<i>Ilex opaca</i>
American hornbeam/ironwood	CACA18	<i>Carpinus caroliniana</i>
American mountain ash	SOAM3	<i>Sorbus americana</i>
American witchhazel	HAVI4	<i>Hamamelis virginiana</i>
ash	FRAXI	<i>Fraxinus</i>
autumn olive	ELUMP	<i>Elaeagnus umbellata</i> var. <i>parvifolia</i>
beaked hazelnut	COCO6	<i>Corylus cornuta</i>
bear oak	QUIL	<i>Quercus ilicifolia</i>
bigtooth aspen	POGR4	<i>Populus grandidentata</i>
birch	BETUL	<i>Betula</i>
black cherry	PRSE2	<i>Prunus serotina</i>
black huckleberry	GABA	<i>Gaylussacia baccata</i>
black locust	ROPS	<i>Robinia pseudoacacia</i>
black oak	QUVE	<i>Quercus velutina</i>
black walnut	JUNI	<i>Juglans nigra</i>
blackberry	RUBUS	<i>Rubus</i>
blackgum	NYSY	<i>Nyssa sylvatica</i>
blackhaw	VIPR	<i>Viburnum prunifolium</i>
blackjack oak	QUMA3	<i>Quercus marilandica</i>
Blue Ridge blueberry	VAPA4	<i>Vaccinium pallidum</i>
blueberry	VACCI	<i>Vaccinium</i>
boxelder	ACNE2	<i>Acer negundo</i>
bristly locust	ROHI	<i>Robinia hispida</i>
buffalo nut	PYPU	<i>Pyralaria pubera</i>
Burning Bush	EUAL8	<i>Euonymus alata</i>
butternut	JUCI	<i>Juglans cinerea</i>
Carolina hemlock	TSCA2	<i>Tsuga caroliniana</i>
cat greenbrier	SMGL	<i>Smilax glauca</i>
Catawba rosebay	RHCA8	<i>Rhododendron catawbiense</i>
chestnut oak	QUMO4	<i>Quercus montana</i>
chinkapin	CAPU9	<i>Castanea pumila</i>
cogongrass	IMCY	<i>Imperata cylindrica</i>



# Common Trees and Shrubs of Southwest Virginia



Central Apps FLN



# Forest Structure and Composition Monitoring Milestones

➤ FSC Monitoring Protocol Piloted



2007

➤ TNC/GWJNF adopted FSC monitoring protocol

2009

Monitoring Working Group Established



2012

2013

FFI database launch  
1<sup>st</sup> Plant ID and Protocol Refresher

2014

All data entered into FFI  
689 sample events

2015

State agencies join group and begin FSC monitoring

Complete Summaries Of FSC Results



2016

# Lessons Learned

Make it easy for people to do

Dedicate someone to help drive the monitoring forward

People will ask a lot of questions, don't be afraid to answer them

Keep folks informed of progress, even if you don't have a lot of results to share

Make it fun



# Forest Structure and Composition Monitoring Stats

439 Plots Total

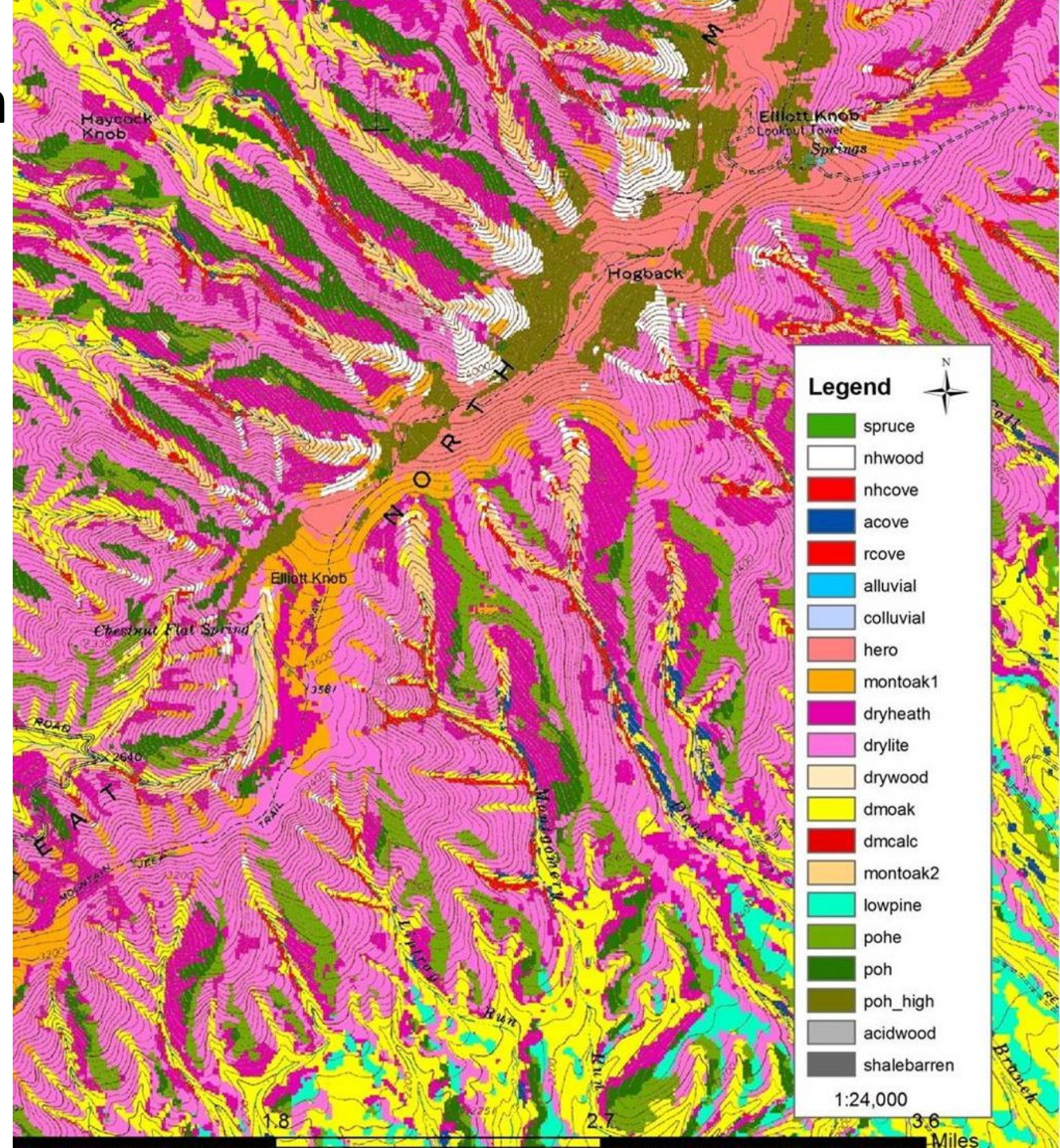
2,245 Plot Visits

Plots Stratified by Vegetation Type

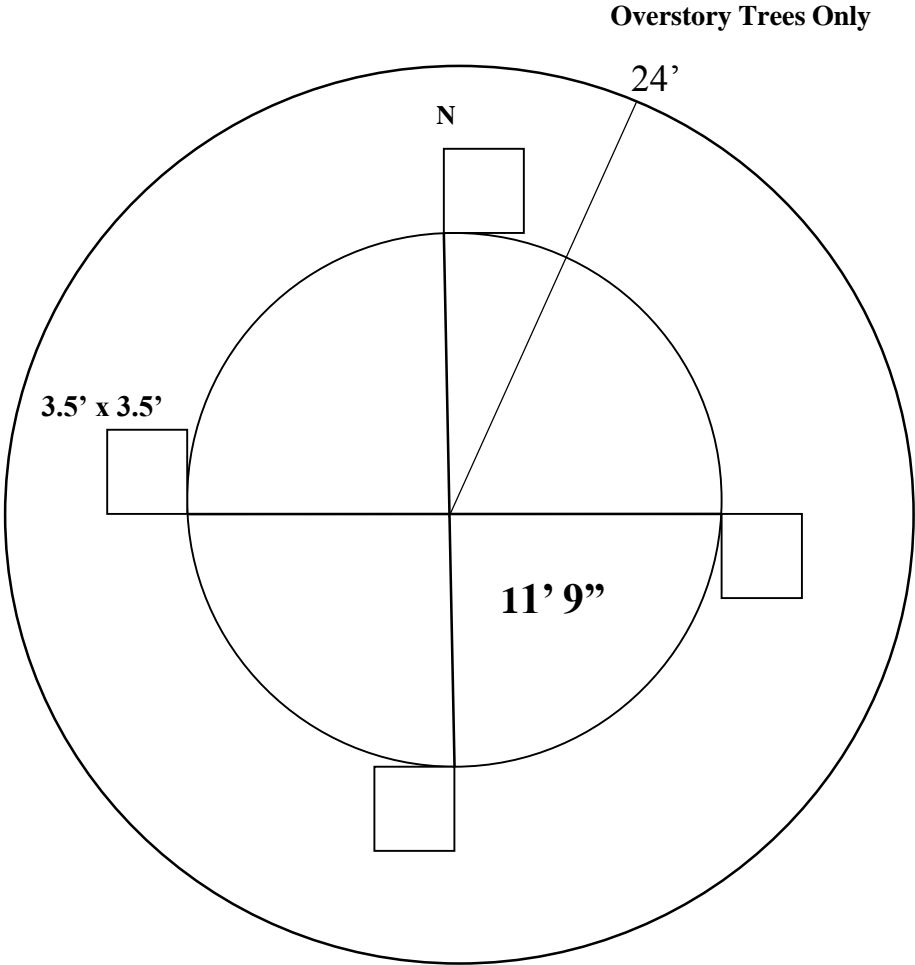
46 burn units, 63,000 acres

Plots visited 1 year post burn and again at 5 years

All Data is entered into Feat and Fire Mon Integrated (FFI)



# Forest Structure and Composition Monitoring Methods



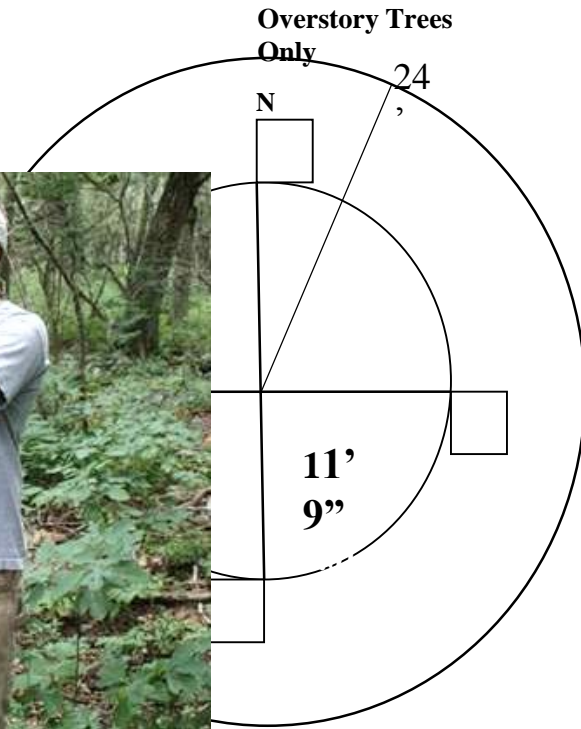
# Forest Structure and Composition Monitoring Methods

**Percent Canopy Cover** determined at five points along each of four transects located in the cardinal directions from plot center.

**Percent Cover Class** within four 3.5' x 3.5' quadrats, all woody stems 6" to 3.5' in height are counted.

**Stem Regeneration** a percent aerial cover of graminoids, forbs, woody trees/shrubs, woody vines, and non-native invasive species are estimated.

**Top:** Dan Buckler measures canopy cover with a GRS densitometer. **Bottom:** Laurel Schablein measures stems with a density quadrat frame.



# Forest Structure and Composition Monitoring Methods

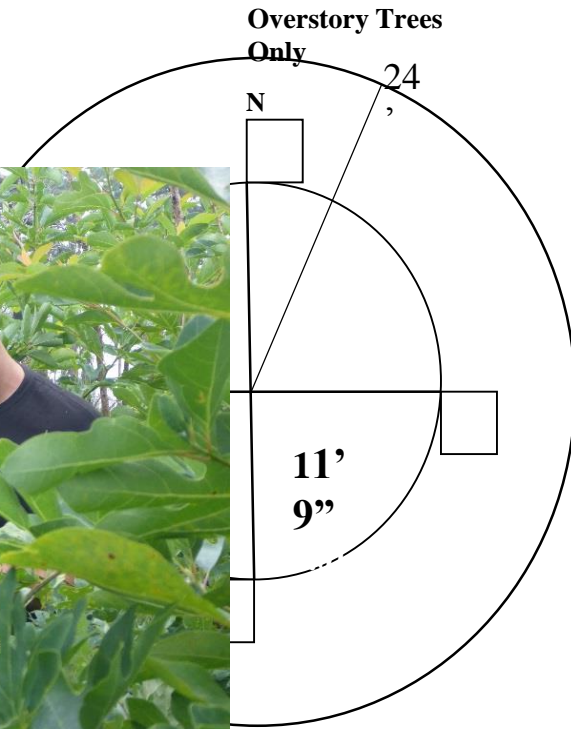
**Saplings** within 11.9' radius, all woody tree and shrub stems < 1" at DBH and >3.5 feet tall are tallied.

**Trees** within 11.9' radius, all woody tree and shrub stems <4" and >1" at DBH and >3.5 feet tall are measured and tallied.

**Fixed Radius Trees** within 24' radius, all trees >4" at DBH are measured, tagged and tallied.

**Top:** Adam Christie counted 170 live and 89 dead Sassafras stems in the 2016 Burn 3 Year 1 visit.

**Bottom:** Patrick Lacienski measures an American Chestnut in the Middle Mountain burn unit.





WSMRP Porters Mill Plot 05-01

08/02/2017

Burn 1 Year 5

North



# OVERSTORY changes

1 year after a 1<sup>st</sup> burn

On average, basal area (>4" DBH) **decreased by 17%**

High variability: some plots had complete canopy mortality, some had none

**Burn Plan  
Objectives**

Reduce overstory canopy in Oak and Pine woodlands by 5-15% each treatment



# MIDSTORY changes

1 year after a 1<sup>st</sup> burn

Tree and Shrub stem density (1"-4" DBH) **decreased by 66%**

Low variability: almost all plots experienced a substantial decrease

## Burn Plan Objectives

Decrease the number of <4" DBH of fire intolerant trees in the mid-story by 50% within one year post-burn.

Top kill 50-75% of woody vegetation <4" DBH across the unit.



# UNDERSTORY changes

Oak stem density increased by 55%

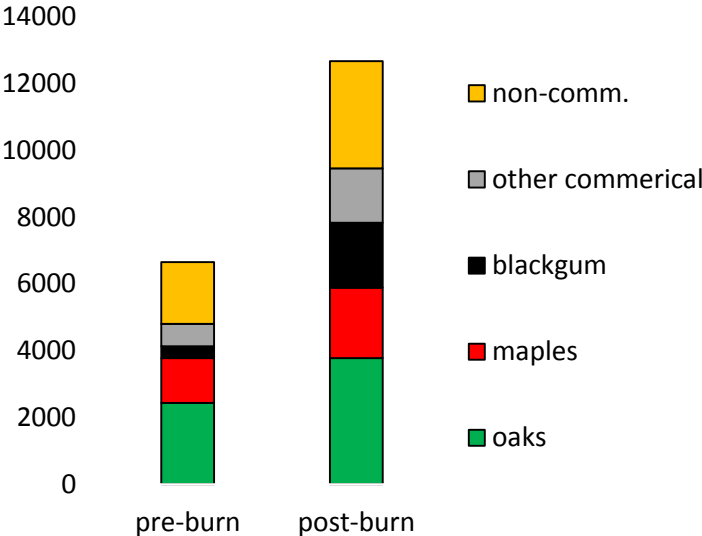
Vaccinium density increased by 50%

## Burn Plan Objectives

Increase oak regeneration

Top kill at least 80% of all blueberry and huckleberry plants

# 1 year after a 1<sup>st</sup> burn



# UNDERSTORY (non-woody) changes

Cover	Before 1 burn	After 1 Burn
Forbs	4%	8%
Grasses	0.5%	3%



5 years after a 1<sup>st</sup> burn



# Remote sensing of canopy conditions

## EARLY

0-30% Canopy Cover



## OPEN

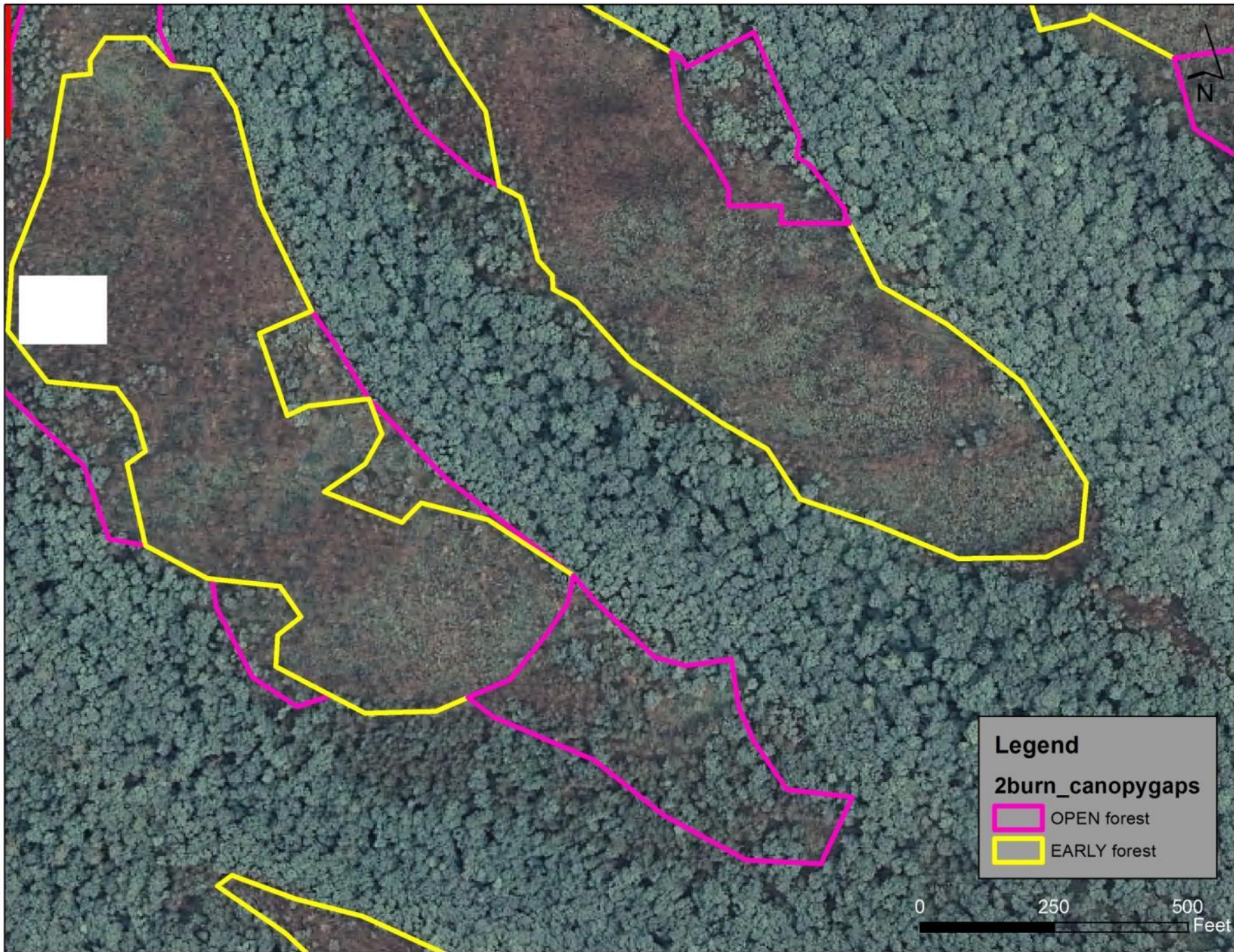
31-50% Canopy Cover

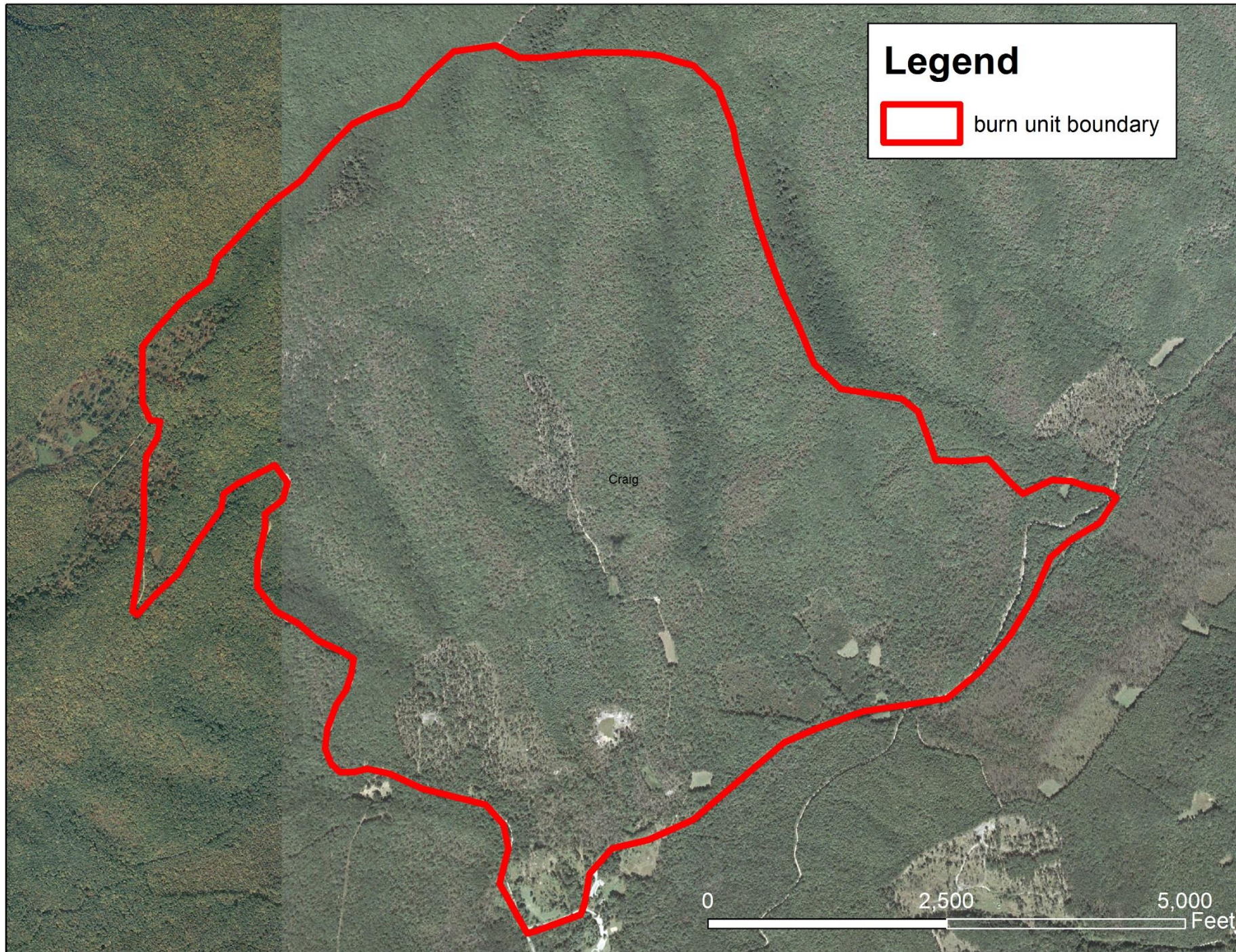


## CLOSED


51-100% Canopy Cover








**Legend**

 burn unit boundary

Craig

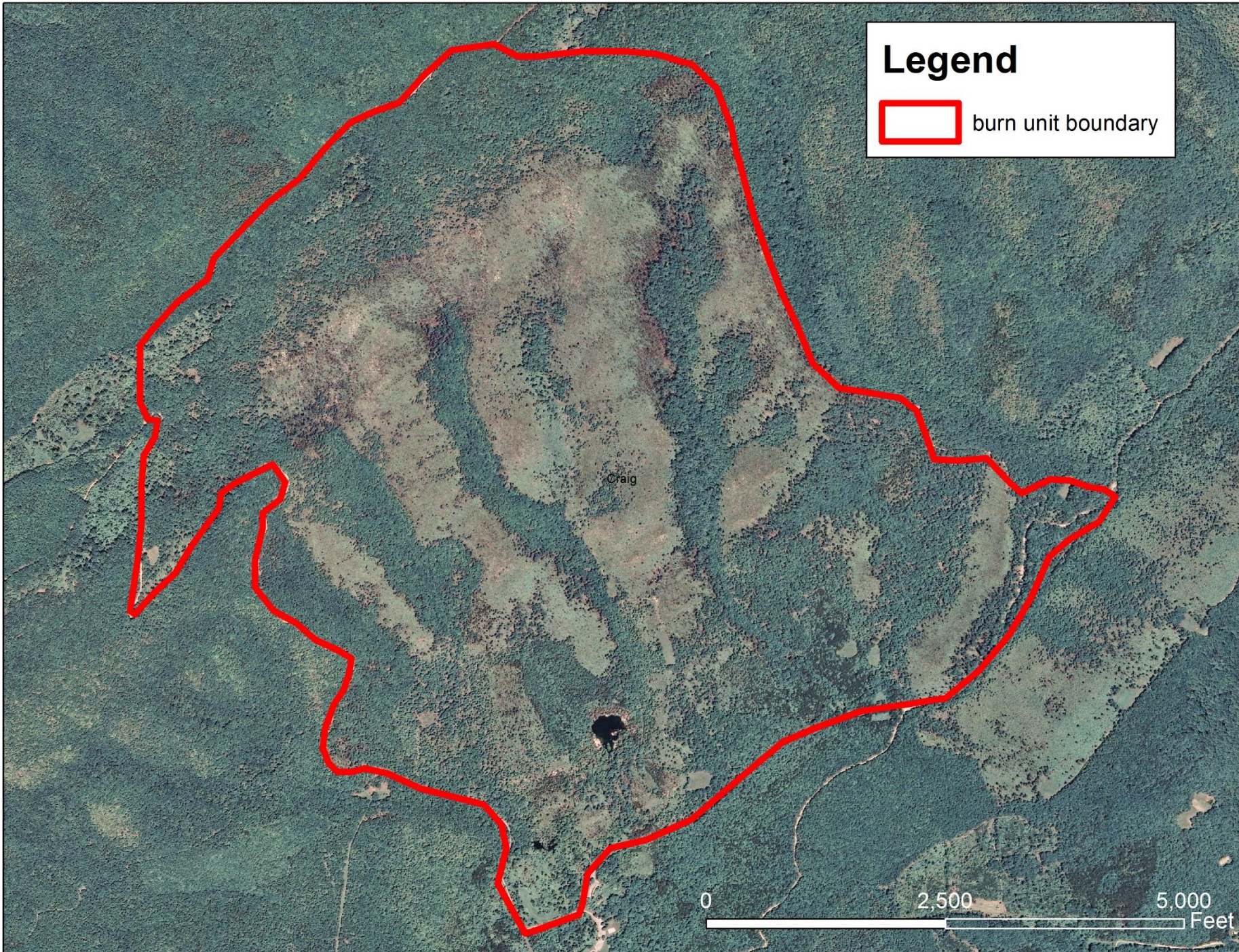
0 2,500 5,000 Feet

# Legend

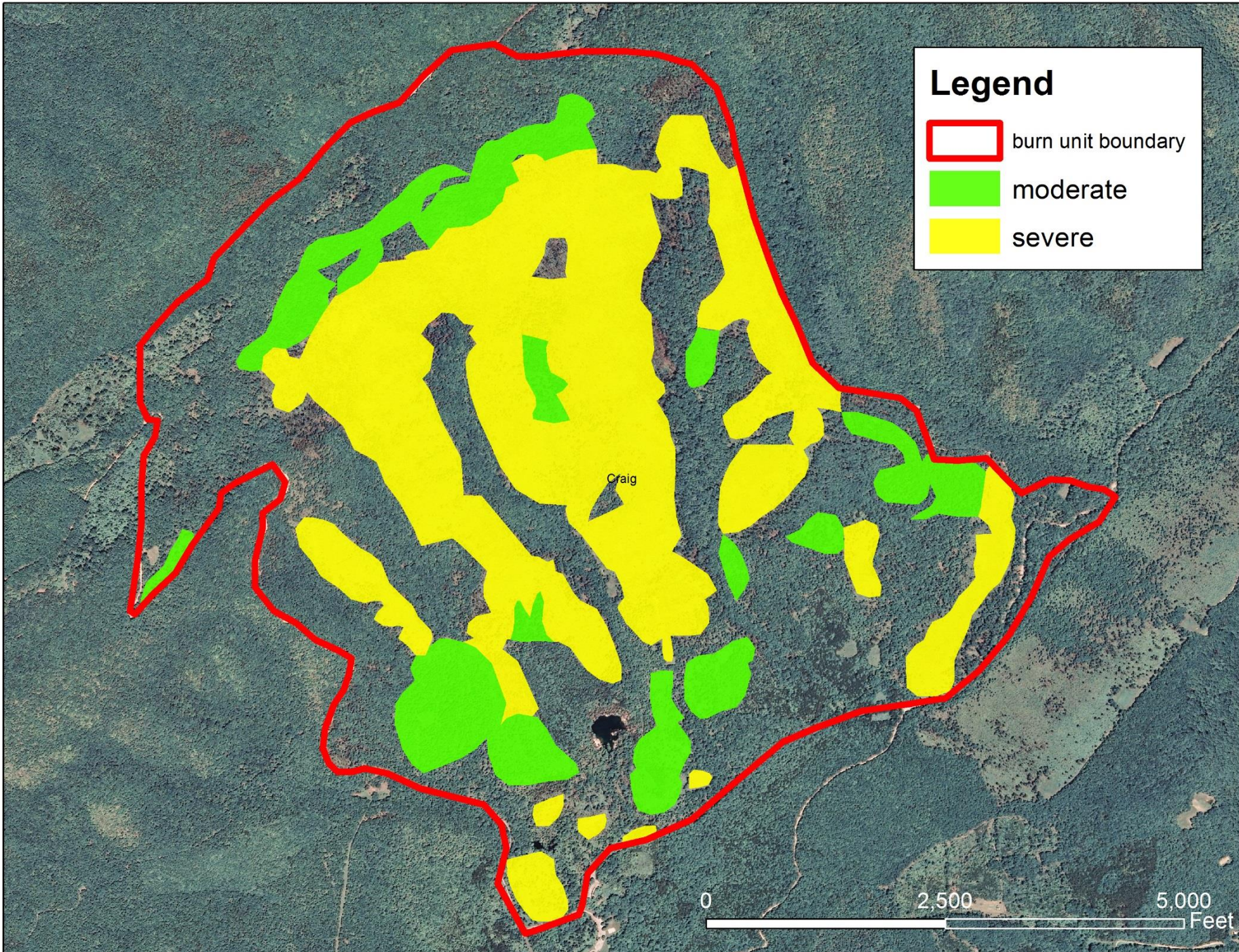
 burn unit boundary

Craig

0 2,500 5,000 Feet







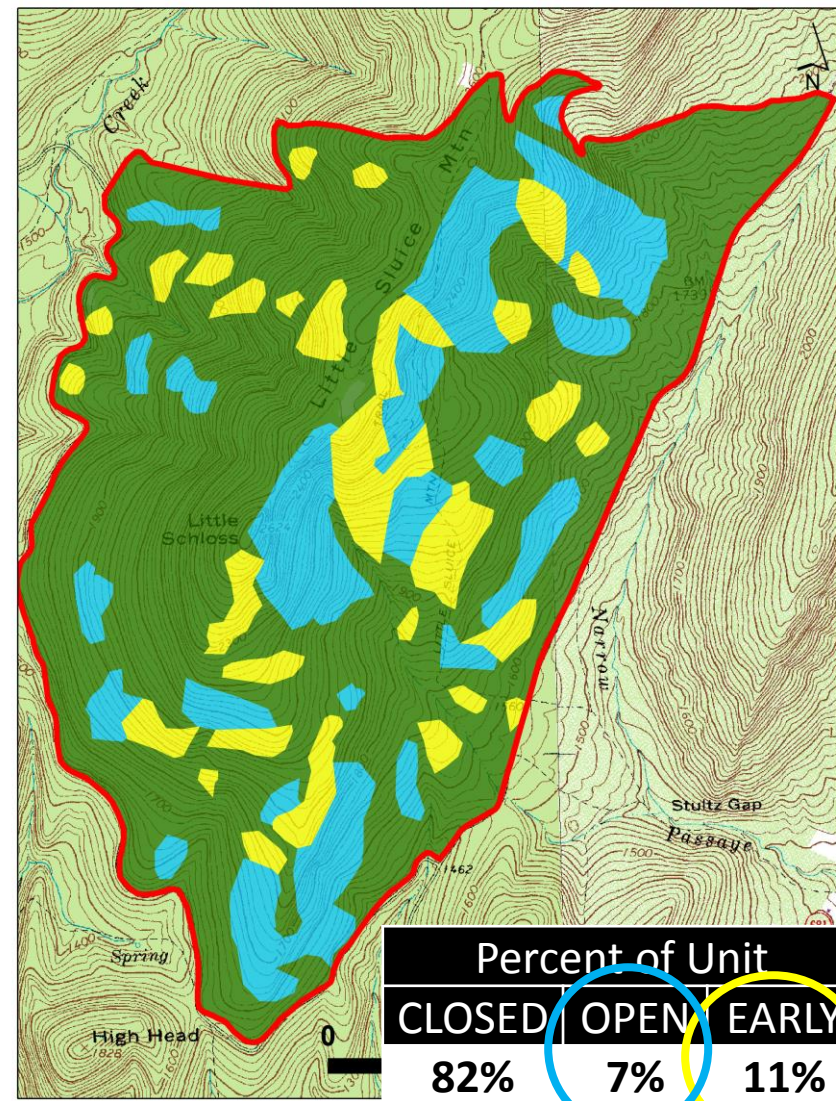
# Remote sensing of canopy conditions

## Burn Plan Objectives:

Reduce overstory canopy in Oak and Pine woodlands by 5-15% each treatment

## Forest Plan Objectives:

	EARLY	MID CLOSED	MID OPEN	LATE OPEN	LATE CLOSED
Target % of acreage	12	7	10	57	14

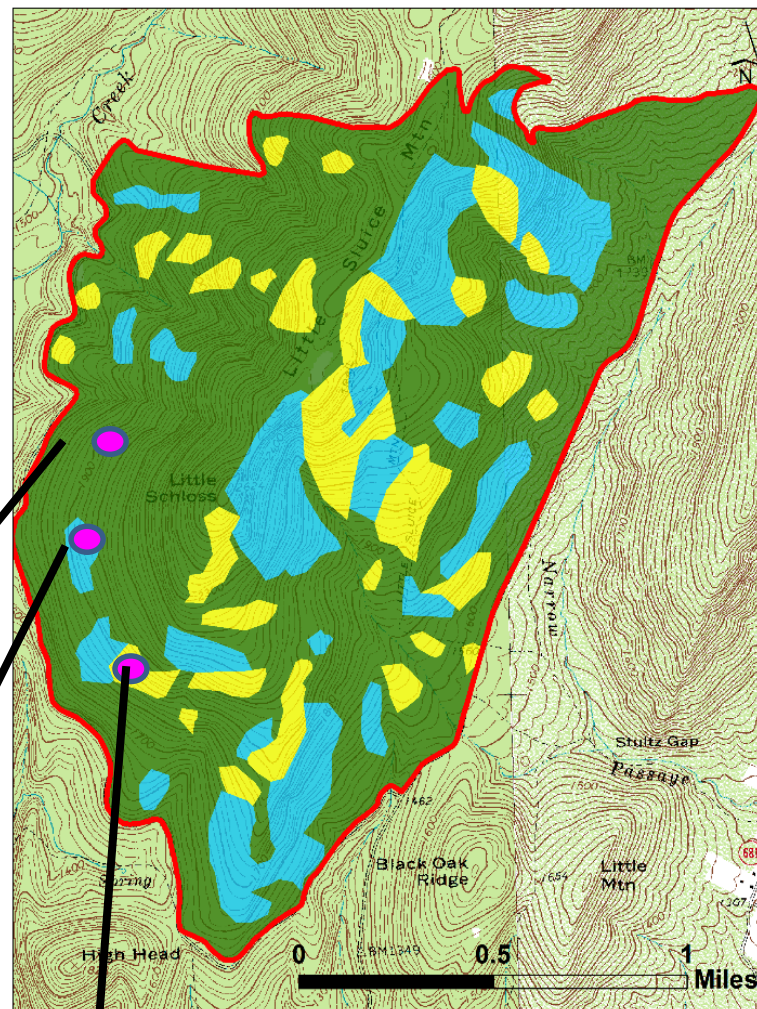


# Combine monitoring data

- On-the-ground veg data

STRATIFIED BY

- Remote sensing canopy data



Sampling strata		Canopy condition		
		<b>CLOSED</b>	<b>OPEN</b>	<b>EARLY</b>
OVER-STORY	Basal area/acre	83 c	56 b	18 a
MID-STORY	Woody stems/acre	214 b	0 a	11 ab
UNDERSTORY	Woody stems/acre	47,000 b	150,000 a	171,000 a

# Putting the results to work

- Adaptive Management
- National Environmental Policy Act (NEPA)
- Shared Learning
- Informing Research
- Sharing data with Southern Blue Ridge FLN
- Strategic planning for Heart of the Apps FLN





Thank you to all, who  
make this work  
possible!

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Mill Creek Burn Central Zone GWJNF

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