

Fire Effects Report

for

King's Mountain
National Military Park

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Program Overview

Over the past five years the Southern Appalachian Fire-Effects Team (based out of Great Smoky Mountains National Park in Gatlinburg, TN) has installed 23 FMH (Fire Monitoring Handbook) plots in Kings Mountain National Military Park (Table 1). These plots were established in prescribed burn units and were stratified by monitoring type. A monitoring type is a major fuel-vegetation complex or vegetation association subject to a particular burn prescription (Fire Monitoring Handbook 2001). Four plots are in the blackjack oak (*Quercus marilandica*) monitoring type and 19 are in the chestnut oak (*Q. montana*) monitoring type. A draft description of these monitoring types can be found in Appendix 4A and 4B.

In previous years, the Kings Mountain data summary has been a small section of a comprehensive annual report. Data analysis has included fuel reduction and pole-sized tree mortality with minimal discussion. While this report will provide more discussion of the results and our progress towards achieving resource management objectives, it is important to remember that we have monitored only a short time, and the restoration of a fire regime is a long-term process. Current resource management objectives are a best guess at the correct path to take in restoring this ecosystem to its historic structure and composition. Trends we notice one-year post-burn, may or may not reflect what we will see ten years from now. However, discussion of these data is essential because it is the first step towards adaptive management.

Table 1: List of burn units at Kings Mountain National Military Park along with the number of FMH plots, the year plots were established, and the year they burned.

<i>Burn units</i>	<i>Number of plots</i>	<i>Year plots established</i>	<i>Year of 1st burn</i>	<i>Year of 2nd burn</i>
Battlefield	3	1999	2000	2002
Saddleback (AKA Brown's Mountain)*	3	2000	2001	2004
Saddleback (AKA Y-S)*	3	2002	2002	2004
Howser House	2	2002	2002	
Coneflower	4	2002	2002	
Turkeybeard	1	2000	2001	
Brushy Mountain South	5	2002	2003	
Dellingham North	2	2002	2003	
Dellingham South	0	N/A	2004	
Long Branch	0	N/A	2004	
Partner	0	N/A	2004	

*The first Saddleback Rx-fire only burned a portion of the unit (Brown's Mt.). The following year the second portion (Y-S) burned. In 2004 the entire burn unit was able to burn.

Chestnut Oak Monitoring Type

INTRODUCTION

The chestnut oak monitoring type represents a xeric oak community which best matches Schafale and Weakley's Piedmont Monadnock Forest in *Classification of Natural Communities of North America* (1990; Appendix 4A, FMH 4). The canopy is dominated by chestnut oak (*Quercus montana*) and scarlet oak (*Q. coccinea*) (Figure 1). Red maple (*Acer rubrum*), sourwood (*Oxydendron arboretum*), blackgum (*Nyssa sylvatica*), and chestnut oak are the most prevalent species in the mid-story (Figure 2). Herbaceous cover is very sparse with the ground cover dominated by substrate (leaf litter, duff, rock etc; Figure 3). A comprehensive list of species found along the herbaceous transect, both pre-burn and one-year post-burn, can be found in Appendix 3A.

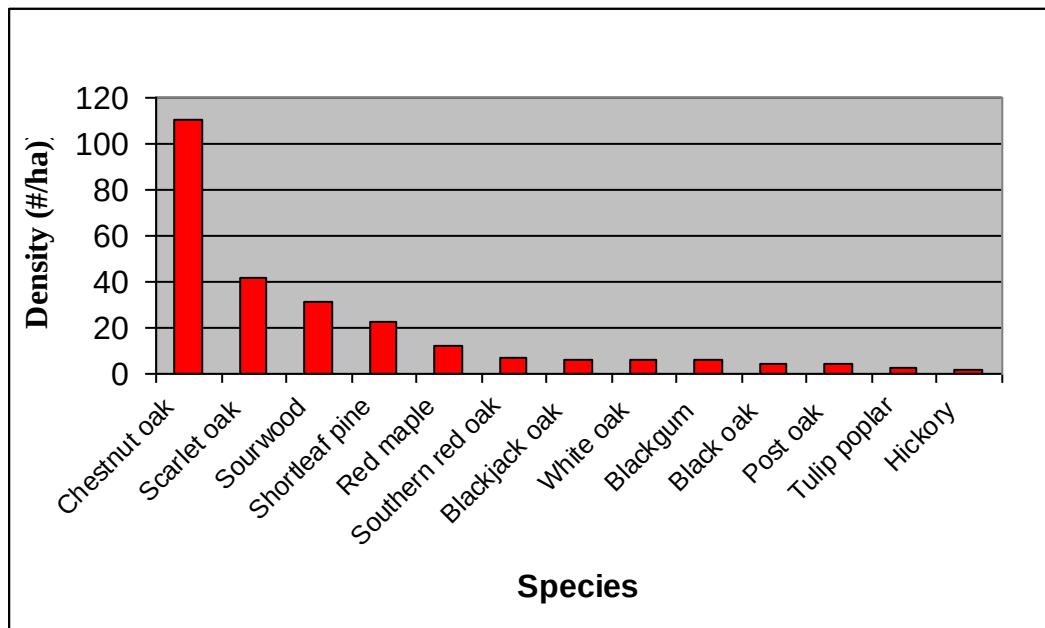


Figure 1: Pre-burn density of overstory tree species in the chestnut oak monitoring type (N = 19). Note: Not all species included. See Appendix 1A for a complete list.

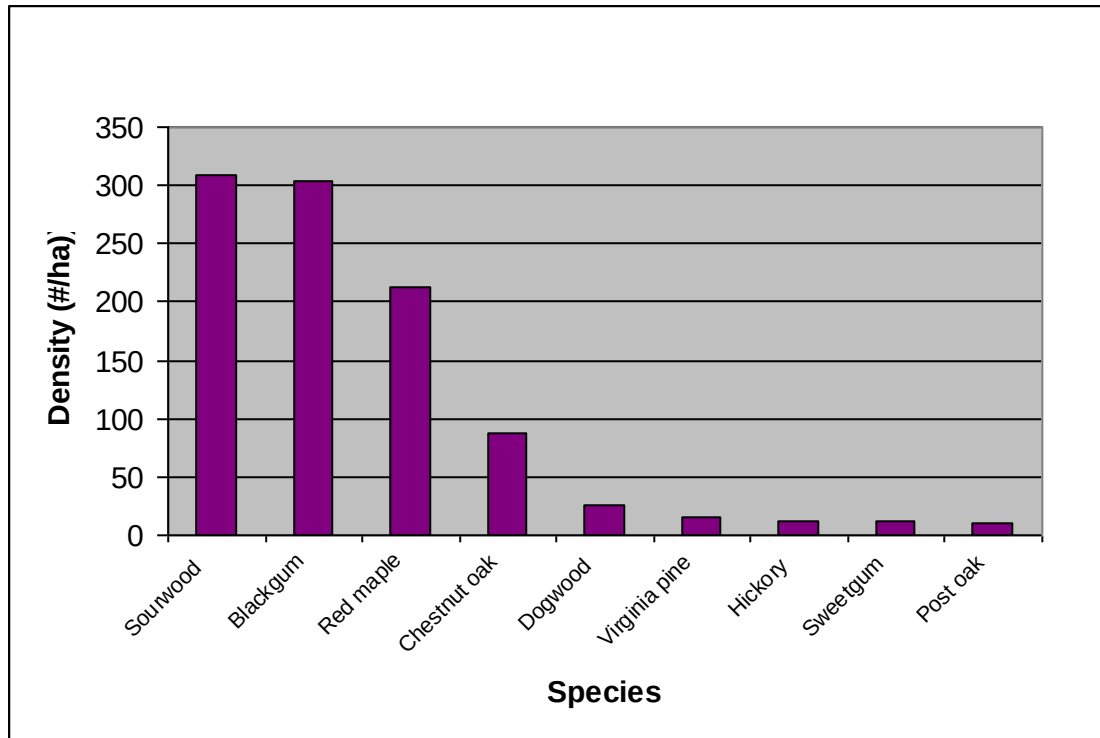


Figure 2: Pre-burn density of pole-sized tree species in chestnut oak monitoring type (N = 19). *Note:* Only species with > 10 stems per hectare included. See appendix 2A for complete list.

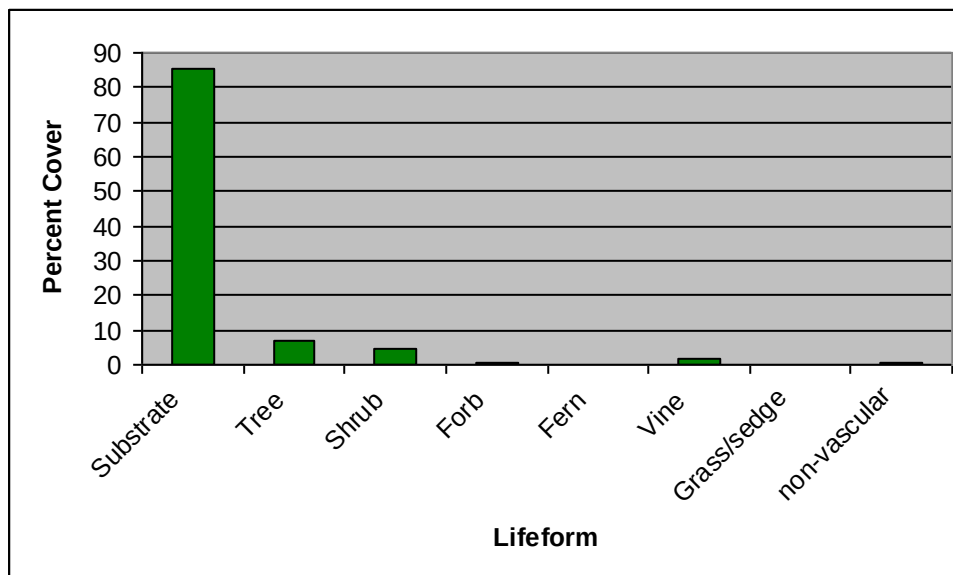


Figure 3: Pre-burn cover along the herbaceous transect in the chestnut oak monitoring type (N = 13).

What do pre-burn data tell us about this monitoring type?

The composition difference between the overstory and the pole-sized trees suggests that this oak system is in a state of transition. Oak represents 70% of the overstory composition but only 11% of the mid-story. Sourwood, blackgum and red maple together make up 80% of the pole-sized layer. The shift towards mesic species is undeniable, and the absence of fire is a probable enabling factor. Herbaceous cover is over 85% substrate (mostly litter) while forbs and grasses make up less than 1% of the final 15%. The herbaceous layer is perhaps naturally sparse, but without fire to reduce tree density (and hence reduce shading), or reduce litter and duff depths, herbaceous species do not thrive.

The main resource management goal at Kings Mountain National Military Park is to restore the ecosystem to its 1780 structure and composition, which is thought to have been an open oak (oak-pine) woodland on upper slopes and ridges. We have developed three Resource Management Objectives that we hope will lead us in that direction. It should be emphasized that these are relatively short-term objectives that are designed to achieve the long-term objectives of increasing oak and pine regeneration and maintaining open, healthy stands of those species.

The Short-term Resource Management Objectives are:

- 1) Reduce total fuel loading by 25-50% after 3 burns
- 2) Decrease pole-sized stem density by 50-80% after 3 burns.
- 3) Increase native grass and forb cover to 10-25% cover after 3 burns.

RESULTS

Canopy density was not significantly altered one-year post-burn across the burn units. One exception to this was QUMO 12, in the Y-S burn unit, where there was significant overstory mortality (57%).

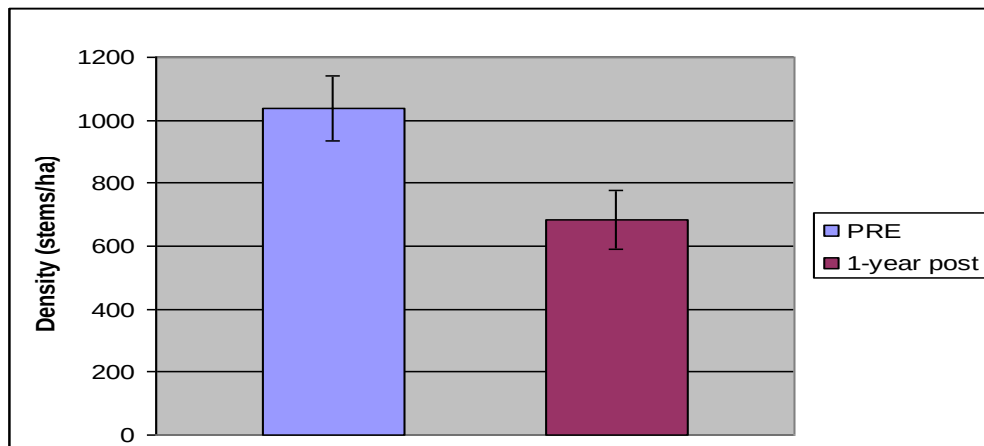


Figure 4: Density of pole-sized tree pre- and post burn in the chestnut oak monitoring type (N = 19, bars represent ± 1 SE).

Pole-sized tree density, on the other hand, decreased 34% from 1037.3 [± 101.3] stems/ha to 683.4 [± 91.5] stems/ha (Figure 4). Red maple, black gum, and sourwood were decreased by 43.5%, 36.1% and 32.0% respectively.

Fuel loading one-year post-burn decreased overall by 23.4% from 28.4 [± 1.6] tons/acre to 21.8 [± 1.4] tons/acre. Woody fuel increased slightly though the change was not significant. Combined litter and duff were significantly reduced by 29.9% from 23.9

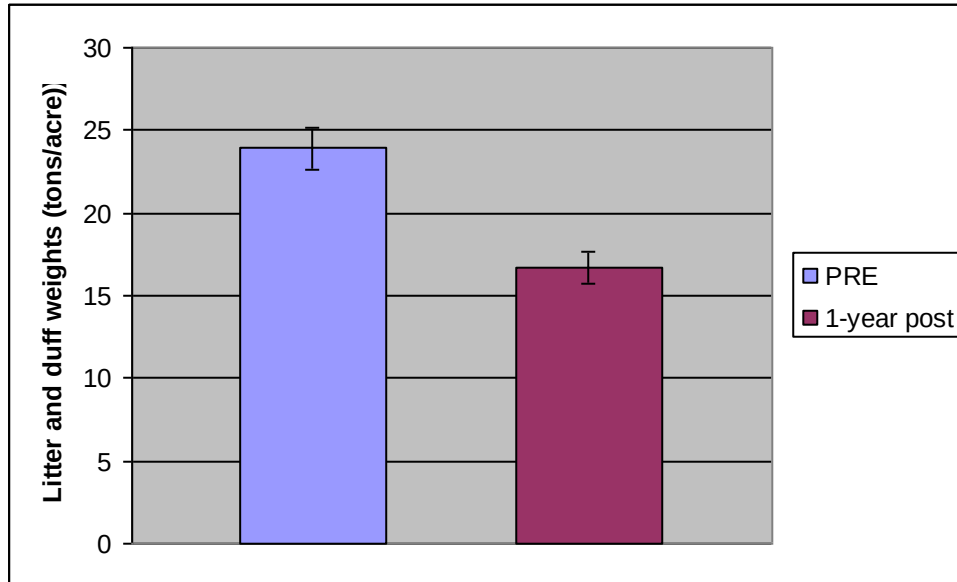


Figure 5: Change in combined litter and duff weight between pre-burn and one-year post-burn in the chestnut oak monitoring type (N = 19, bars represent ± 1 SE).

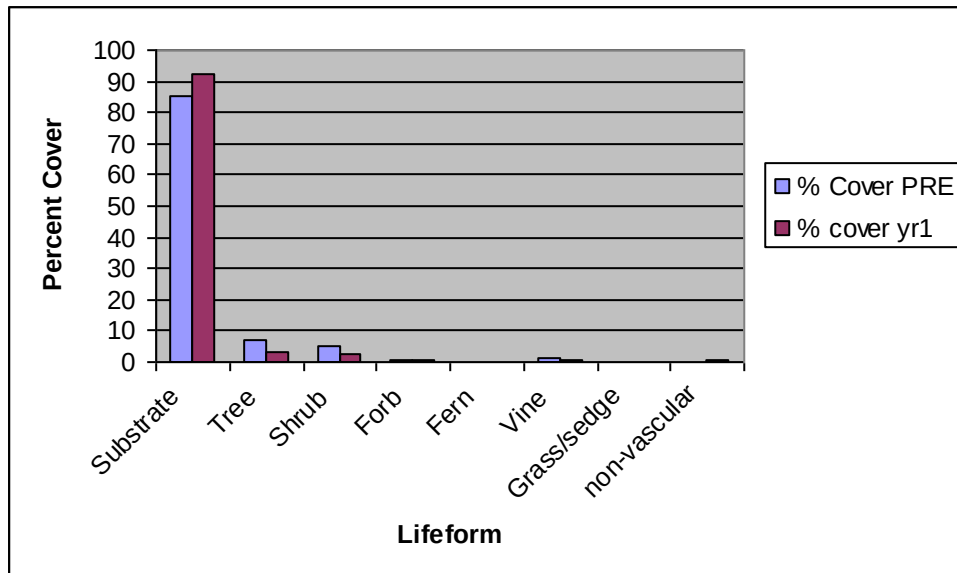


Figure 6: Change in percent cover of plants along the herbaceous transect from pre-burn to one-year post-burn in the chestnut oak monitoring type (N = 13).

[± 1.30] tons/acre to 16.7 [± 1.0] tons/acre (Figure 5). Taken individually, 66.5% of the litter (3.3 [± 0.2] tons/acre to 1.1 [± 0.2] tons/acre) and 24.0% of the duff (20.6 [± 1.2] tons/acre to 15.6 [± 1.0] tons/acre) were consumed.

The only significant one-year post-burn change in the herbaceous layer was an increase in substrate cover (Figure 6). Seedling and shrub cover decreased while forb, fern, grass and sedge cover remained practically non-existent.

Blackjack Oak Monitoring Type

INTRODUCTION

Blackjack oak is an especially drought tolerant species that can survive in the harshest of places with the thinnest of soils and serves as an indicator for the blackjack oak monitoring type. While we feel it is deserving of a distinct monitoring type (the monitoring plan will address this in depth), it, like the chestnut oak monitoring type, best matches Schafale and Weakley's Piedmont Monadnock Forest in *Classification of Natural Communities of North America* (Appendix 4B, FMH 4). Overstory trees are typically stunted and at lower densities allowing for greater herbaceous cover than the chestnut oak monitoring type. In this monitoring type chestnut and blackjack oaks dominate the canopy (Figure 7). Blackjack oak, sourwood and shortleaf pine are scattered in the mid-story (Figure 8). Herbaceous cover is about 73% substrate, almost 20% shrubs and trees, and less than 5% forbs and grasses (Figure 9).

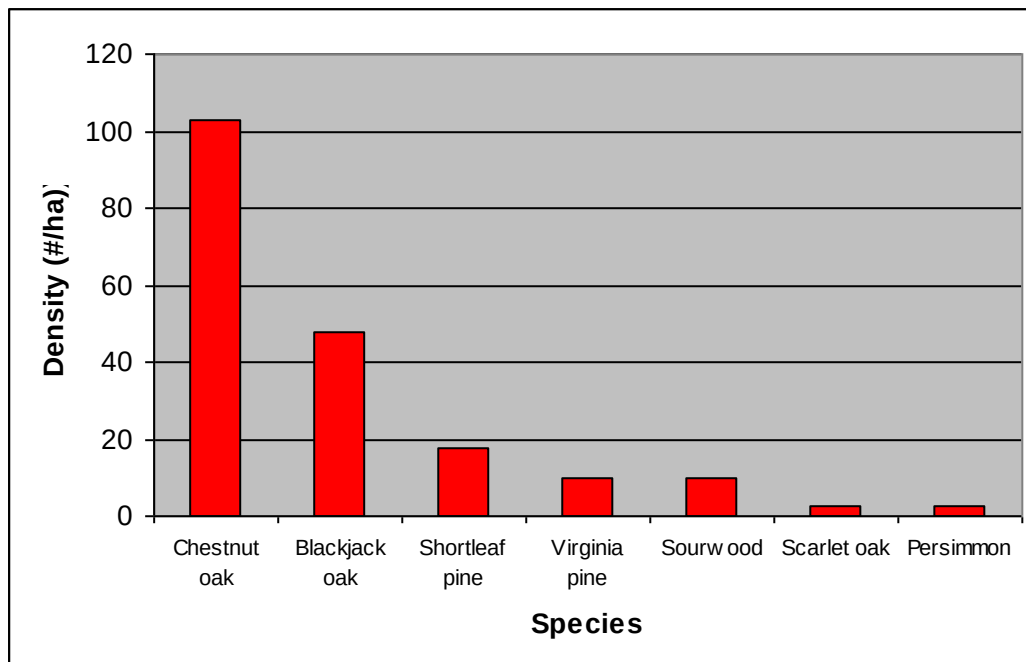


Figure 7: Pre-burn density of overstory tree species in the blackjack oak monitoring type (N = 4). *Note:* All species included, but more information can be found in Appendix 1B.

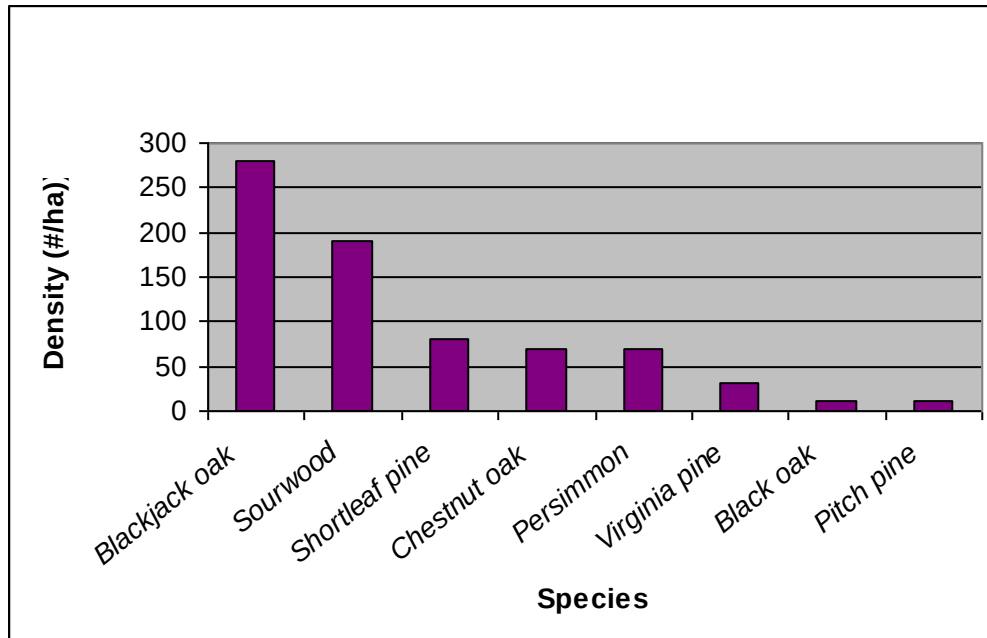


Figure 8: Pre-burn density of pole-sized tree species in the blackjack oak monitoring type (N = 4). *Note:* All species included but more information can be found in Appendix 2B.

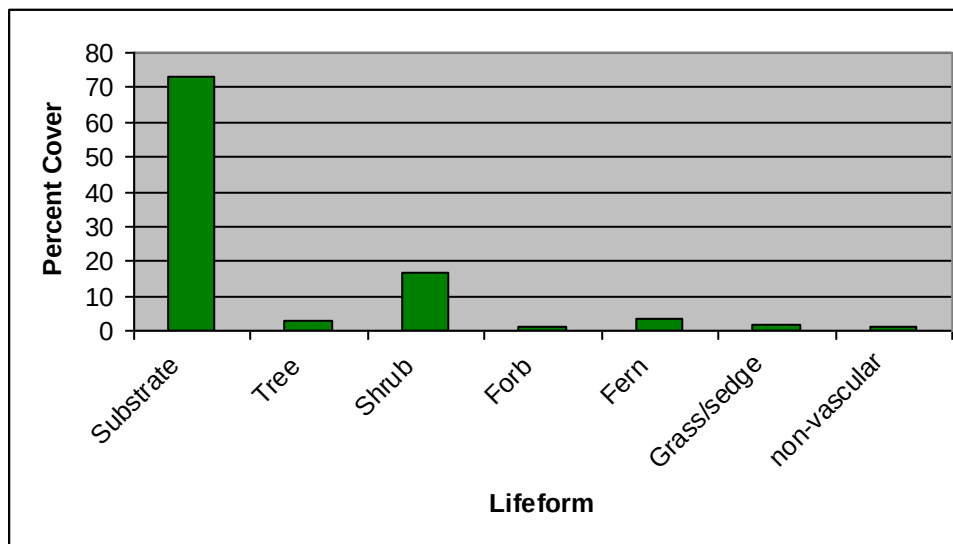


Figure 9: Pre-burn cover along the herbaceous transect in the blackjack oak monitoring type (N = 3).

What do pre-burn data tell us about this monitoring type?

Given the much smaller sample size within this monitoring type, caution should be exercised when using the data to make statements about the larger community. With that said, the blackjack oak monitoring type, unlike the chestnut oak, seems to be maintaining its xeric species composition. The overstory is 79% oak, 14% pine and 7% sourwood/persimmon. Among pole-sized trees, 49% are oak, 16% pine and 35% sourwood/persimmon. Interestingly, there are no blackgum or red maple in the mid-story. It is possible that the dry, exposed conditions in this habitat make it harder for such mesic species to invade.

There may, however, be a transition occurring between the two dominant oak species. Chestnut oak represents 53% of the overstory, but only 9% of the midstory. Blackjack represents 24% of the overstory and 38% of the midstory. Are blackjack oaks replacing chestnut oak? If one looks at the habit of blackjack oak, it is a short, stout species. The conventional way to distinguish between overstory and midstory is by DBH (diameter at breast height). Perhaps in this community that is not valid. Given the average DBH of the pole-sized blackjack oaks (3.8" or 9.6 cm), it is likely that some of the individuals in the pole-sized class are really growing in the canopy. Perhaps chestnut oak just appears to dominate the overstory is because it naturally grows to a larger diameter. If we compare ratios of chestnut oak and blackjack oak we see there are 100 stems/ha vs. 50 stems/ha in the overstory, but 70 stems/ha vs. 280 stems/ha in the midstory. Perhaps fire suppression has allowed chestnut oak to increase in more xeric sites that were historically dominated by blackjack oak. Or perhaps this ratio is indicative of the life history patterns of these two oaks.

The blackjack oak understory is slightly less dominated by substrate and has a higher herbaceous cover. Perhaps because the trees are less densely spaced, more light reaches the ground allowing more production in the understory.

The main resource management goal at Kings Mountain National Military Park is to restore the ecosystem to its 1780 structure and composition. Long term objectives to support this goal in the blackjack oak monitoring type include restoring/maintaining an open woodland structure and increasing the cover and production of the herbaceous layer.

We have developed three **Short-term Resource Management Objectives** to begin the process of achieving the long term goals:

- 1) Reduce total fuel loading by 25-50% after 3 burns
- 2) Decrease pole-sized stem density by 40-60% after 3 burns.
- 3) Increase native grass and forb cover to 15-30% cover after 3 burns.

RESULTS

The canopy was not significantly affected one-year post-burn. Pole-sized tree density decreased significantly 20.2% from 742.6 [± 107.7] stems/ha to 592.5 [± 37.2] stems/ha (Figure 10, N=4).

One-year post-burn data show fuel loading decreased 33.1% from 27.7 [± 2.2] tons/acre to 18.5 [± 2.4] tons/acre. Combined litter and duff decreased 38.2% from 24.9 [± 2.1] tons/acre to 15.4 [± 2.2] tons/acre (Figure 11). Litter alone decreased 64.7% from 2.6 [± 0.4] tons/acre to 0.9 [± 0.3] tons/acre and duff decreased 35.1% from 22.3 [± 1.8] tons/acre to 14.5 [± 2.0] tons/acre.

The only significant change to the understory was a reduction in shrubs (Figure 12). Substrate cover increased, but the change was not significant.

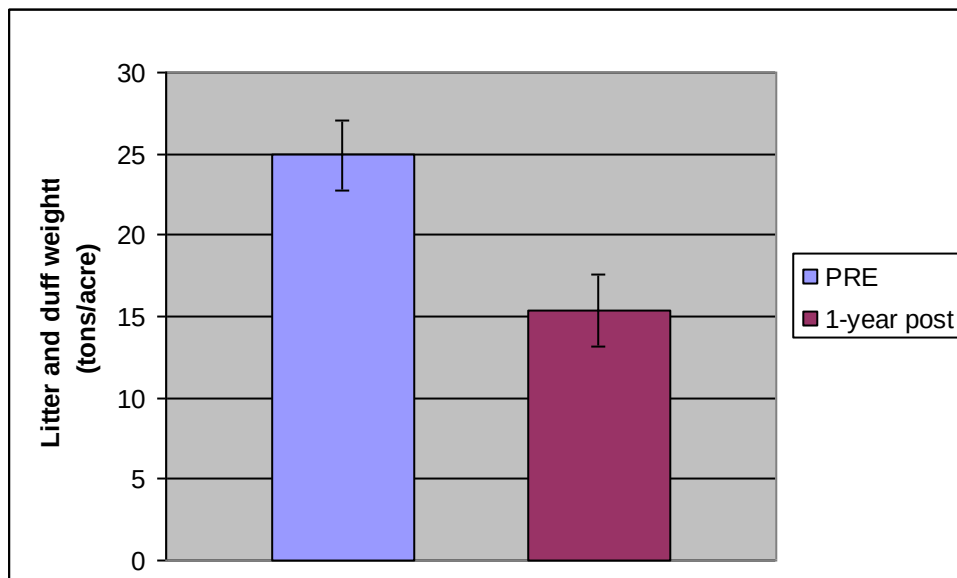


Figure 10: Pole-sized stem density between pre and one-year post-burn in the Blackjack oak monitoring type (N=4; bars represent +/- one standard error).

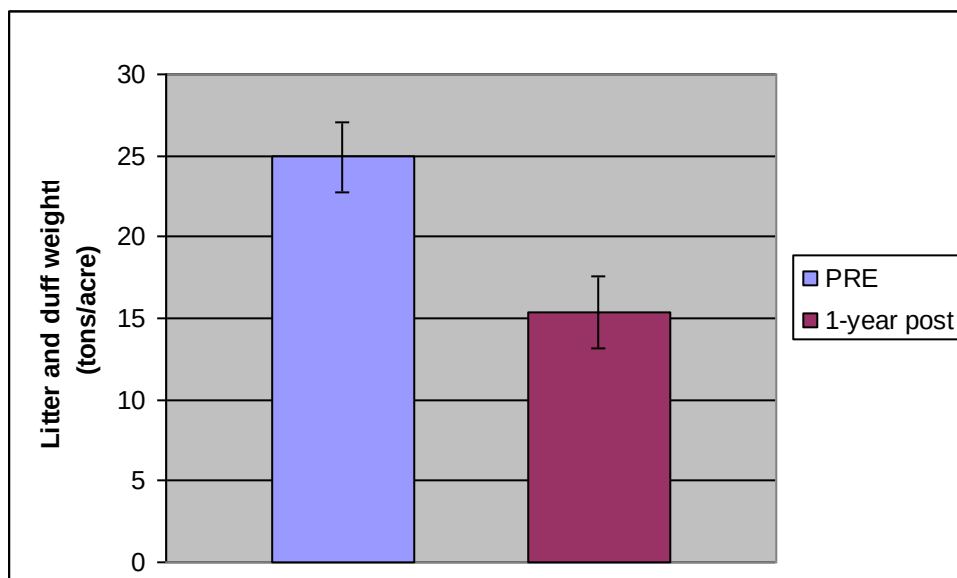


Figure 11: Change in combined litter and duff weight from pre-burn to one-year post-burn in the blackjack oak monitoring type (N=3; bars represent +/- one standard error).

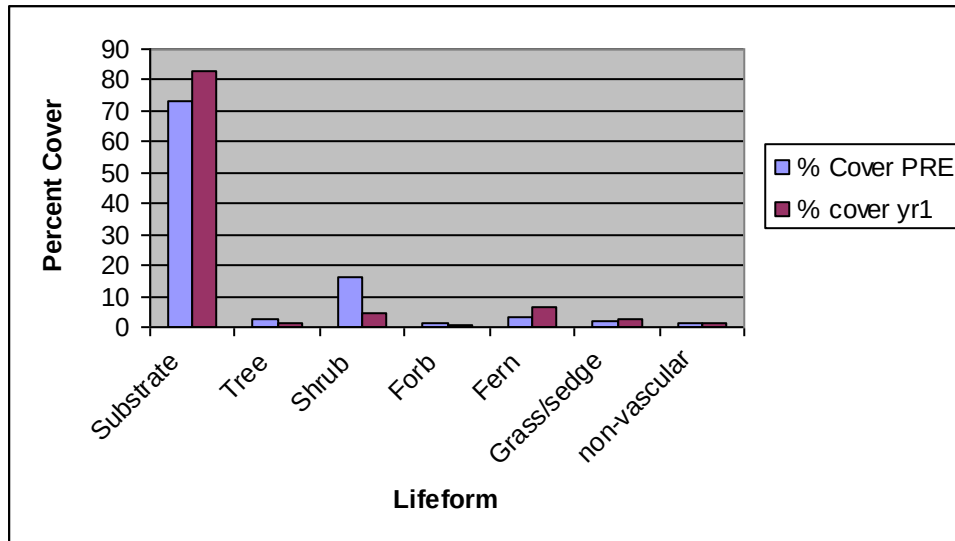


Figure 12: Change in percent cover along the herbaceous transect from pre-burn to one-year post-burn in the blackjack oak monitoring type (N = 3).

Discussion (Monitoring Types combined)

Pole trees

Pole-sized tree densities were significantly reduced in both the chestnut oak and blackjack oak monitoring types by 34% and 20% respectively. Both densities were reduced to near 600 stems/ha. Resource management objectives are well on the way to being met. Future objectives should begin to address reductions in the overstory and the composition of the pole-size class.

Fuel loading

Pre-burn fuel loading was very similar in chestnut oak and blackjack oak monitoring types. The burns reduced fuels by 23% and 33%, respectively, in each monitoring type. Habitats and burning conditions were similar enough to elicit a similar response. The resource management objective for fuels was achieved after only one burn in the blackjack oak type, and very nearly achieved in the chestnut oak type. The slight increase in downed woody debris is expected as burning often exposes, without burning completely, twigs that were hidden under the litter in the pre-burn read. Also, twigs often fall from trees after the fire has burned the area.

Herbaceous layer

Changes to the herbaceous layer in the chestnut oak monitoring type were minimal. Seedling and shrub cover was cut in half exposing more substrate. This is to be expected one growing season after a fire. The forbs/grasses have a time-lag in their response which may not be noticed for several years after the fire or after several more fires. The canopy in the chestnut oak monitoring type remains closed. More fire is needed to lower tree density and allow for enough sunlight to support a healthy herbaceous community.

In the blackjack oak monitoring type the shrub density decreased significantly. Mountain laurel (*Kalmia latifolia*), and two blueberry species (*Vaccinium pallidum* and *V. arborea*) were all significantly reduced though these rhizomatous species are capable of prolific re-sprouting. Grasses and forbs showed some increase, though it was not significant. Blackjack oak plots had a higher pre-burn herbaceous cover and perhaps have more viable seeds in the soil that are able to take advantage of the increased light and decreased litter. It will likely take more than one burn for them to fully take advantage of this.

Burn intensity

Most plots were burned with light to moderate severity and intensity. Accordingly, vegetation responses were fairly mild. One plot (QUMO 12), however, has had a noticeably exciting vegetation response. It is located in an area locally known as Taylor's Folly in the Y-S burn unit. In 2002 an intense head fire was sent up a draw near this plot. Burn severity data were comparable to other plots, but char heights were exceptionally high (16 meters). Over 50% of the overstory and 100% of the pole-sized trees were killed. After a second burn, forb cover increased from 0% to 6%. Many of these individuals were observed during the '04 field season to be flowering, which is a rare occurrence in other chestnut oak plots. Additionally, the pine reproduction (shortleaf?) in this plot was far greater than in other chestnut oak plots.

None of our plots are located in the sections of Saddleback that burned hot in 2004. However, we anecdotally noticed high densities of fireweed, little bluestem, coreopsis and other species one finds after an intense fire. Many of these individuals were flowering. The fire clearly killed a high percentage of the overstory, but given the size of the burn unit and the overall light burn severity the rest of our data show, we feel that these occurrences are an important part of the burn severity mosaic.

We do not believe it necessary or advisable to burn all burn units with such intensity. We do believe, however, that a diversity of intensities--a burn mosaic--is essential to maintaining species diversity of all taxa and is a critical component of the restoration that the park has undertaken.

Conclusions

1. Fire has significantly reduced the density of pole-sized trees in both monitoring types.
2. Fire has significantly reduced fuel loading by nearly 30% in both monitoring types.
3. Fire has had no significant effect on overstory densities in either monitoring type.
4. The reduction of fuels and pole-sized tree density may enhance the growth and survival of herbaceous species, but we are unable to detect that at this time.
5. The chestnut oak monitoring type appears to be in transition to a more mesic (non-oak) community type, likely as a result of fire suppression. The blackjack oak monitoring type appears to be maintaining a stable population of xeric species which would benefit from fire, though the woody stem densities are probably still higher than they would have been historically.

Bibliography

Schafale M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program; Division of Parks and Recreation; N. C. Department of Environment, Health, and Natural Resources. Raleigh, NC.

USDI National Park Service. 2001. Fire Monitoring Handbook. Boise (ID): National Interagency Fire Center. 247p.

APPENDICES

APPENDIX 1A

Complete list of overstory species found in chestnut oak monitoring type along with number per hectare, basal area, and average DBH (19 Plots).

Species	#/ha	Basal area (m ² /ha)	DBH (cm)
<i>Quercus montana</i>	110.6	7.3	27.2
<i>Quercus coccinea</i>	41.7	3.3	30.2
<i>Oxydendron arboreum</i>	31.3	1.1	20.4
<i>Pinus echinata</i>	22.3	1.1	24.8
<i>Acer rubrum</i>	12.2	0.4	19.8
<i>Quercus falcata</i>	7.2	0.5	27.6
<i>Quercus marilandica</i>	6.3	0.2	19.3
<i>Quercus alba</i>	6.3	0.6	30.9
<i>Nyssa sylvatica</i>	5.9	0.3	21.2
<i>Quercus velutina</i>	4.6	0.4	30.2
<i>Quercus stellata</i>	4.6	0.2	24.2
<i>Liriodendron tulipifera</i>	2.5	0.2	31.0
<i>Carya species</i>	2.1	0.1	25.4
<i>Pinus virginiana</i>	2.1	0.1	20.0
<i>Liquidambar styraciflua</i>	1.3	0.1	22.7
<i>Prunus serotina</i>	0.4	0	28.1

APPENDIX 1B

Complete list of overstory species in the blackjack oak monitoring type along with number per hectare, basal area, and average DBH (4 Plots).

Species	Number per hectare	Basal area (m ² /ha)	DBH (cm)
<i>Quercus montana</i>	103.0	4.1	21.9
<i>Quercus marilandica</i>	47.7	1.1	17.1
<i>Pinus echinata</i>	17.5	0.9	25.2
<i>Pinus virginiana</i>	10.1	0.4	22.0
<i>Oxydendron arboreum</i>	10.1	0.3	18.9
<i>Quercus coccinea</i>	2.5	0.2	27.7
<i>Diospyros virginiana</i>	2.5	0.1	18.2

APPENDIX 2A

Complete list of pole-sized species found in chestnut oak monitoring type along with number per hectare, basal area, and average DBH (19 Plots).

Species	#/ha	Basal area (m ² /ha)	DBH (cm)
<i>Oxydendron arboreum</i>	147	1.7	7.7
<i>Nyssa sylvatica</i>	144	1.0	5.9
<i>Acer rubrum</i>	101	0.8	5.9
<i>Quercus montana</i>	41	0.5	8.2
<i>Pinus virginiana</i>	7	0.1	8.9
<i>Cornus florida</i>	12	0.1	6.3
<i>Quercus stellata</i>	5	0.1	10.4
<i>Liquidambar styraciflua</i>	6	0.1	9.0
<i>Carya species</i>	4	0.1	9.6
<i>Carya tomentosa</i>	2	0	11.8
<i>Quercus marilandica</i>	2	0	10.5
<i>Quercus coccinea</i>	3	0	6.8
<i>Pinus echinata</i>	2	0	8.9
<i>Quercus falcata</i>	1	0	13.5
<i>Prunus serotina</i>	2	0	7.9
<i>Pinus rigida</i>	1	0	12.3
<i>Quercus alba</i>	1	0	10.1
<i>Ilex opaca</i>	3	0	4.5
<i>Fagus grandifolia</i>	2	0	4.7
SNAG	1	0	6.0
<i>Quercus nigra</i>	1	0	5.3
<i>Sassafras albidum</i>	1	0	4.4
<i>Quercus velutina</i>	1	0	3.5
<i>Liriodendron tulipifera</i>	1	0	2.9
<i>Juniperus virginia</i>	1	0	2.6

APPENDIX 2B

Complete list of pole-sized species in the blackjack oak monitoring type along with number per hectare, basal area, and average DBH (4 Plots).

Species	Number per hectare	Basal area (m ² /ha)	DBH (cm)
<i>Quercus marilandica</i>	280.8	2.3	9.8
<i>Oxydendron arboreum</i>	190.8	1.1	7.7
<i>Pinus echinata</i>	80.2	0.6	8.9
<i>Quercus montana</i>	70.3	0.6	9.8
<i>Diospyros virginiana</i>	70.0	0.2	5.5
<i>Pinus virginiana</i>	30.3	0.2	9.2
<i>Quercus velutina</i>	10.1	0.0	7.9
<i>Pinus rigida</i>	10.1	0.0	6.8

APPENDIX 3A

Change in herbaceous cover in chestnut oak monitoring type between pre-burn and one-year post-burn (N = 13; ± 1 standard error; species highlighted in red represent significant changes).

Species	% Cover PRE	% Cover 01yr01
Substrate	85.4 ± 1.7	92.2 ± 1.5
<i>Acer rubrum</i>	2.1 ± 0.5	1.1 ± 0.4
<i>Kalmia latifolia</i>	1.8 ± 1.1	1.3 ± 0.9
<i>Vaccinium pallidum</i>	1.5 ± 0.7	0.6 ± 0.3
<i>Nyssa sylvatica</i>	1.3 ± 0.5	0.5 ± 0.1
<i>Vitis rotundifolia</i>	1.5 ± 0.7	0.7 ± 0.5
<i>Quercus montana</i>	1.4 ± 0.5	0.5 ± 0.2
<i>Vaccinium arboreum</i>	0.9 ± 0.7	0.3 ± 0.3
<i>Vaccinium staminum</i>	0.7 ± 0.2	0.2 ± 0.2
<i>Oxydendron arboreum</i>	0.5 ± 0.2	0.5 ± 0.4
<i>Quercus coccinea</i>	0.5 ± 0.2	0.2 ± 0.1
<i>Smilax rotundifolia</i>	0.4 ± 0.2	0.2 ± 0.1
<i>Quercus velutina</i>	0.4 ± 0.2	0.1 ± 0
MOSS	0.3 ± 0.1	0.4 ± 0.1
<i>Prunus serotina</i>	0.2 ± 0.1	0.1 ± 0.1
Liquidambar styraciflua	0.1 ± 0.1	0.2 ± 0.2
Cornus florida	0.1 ± 0.1	0.1 ± 0.1
<i>Smilax glauca</i>	0.2 ± 0.1	0.1 ± 0
<i>Diospyros virginiana</i>	0.2 ± 0.1	0 ± 0
<i>Carya species</i>	0.1 ± 0.1	0 ± 0
<i>Quercus alba</i>	0.1 ± 0	0 ± 0
CAXX	0.1 ± 0.1	0 ± 0
CHMA	0.1 ± 0	0 ± 0
<i>Pteridium aquilinum</i>	0.1 ± 0	0.2 ± 0.1
<i>Sassafras albidum</i>	0 ± 0	0.1 ± 0.1
<i>Schizachrium scoparium</i>	0 ± 0	0.1 ± 0.1
<i>Galax urseolata</i>	0 ± 0	0.1 ± 0.1

APPENDIX 3B

Change in herbaceous cover in blackjack oak monitoring type between pre-burn and one-year post-burn (N = 3; ± 1 standard error; species highlighted in red represent significant changes).

Species	% Cover PRE	% Cover 01yr01
Substrate	72.9 ± 8.6	82.8 ± 2.6
<i>Kalmia latifolia</i>	8.1 ± 3.1	1.6 ± 1.5
<i>Vaccinium pallidum</i>	4.8 ± 2.1	1.9 ± 0.7
<i>Pteridium aquilinum</i>	4.3 ± 2.7	6.7 ± 4.3
<i>Vaccinium arboreum</i>	3.9 ± 1.4	1.4 ± 0.8
<i>Smilax rotundifolia</i>	1.5 ± 1.5	0.5 ± 0.5
<i>Oxydendron arboreum</i>	1.3 ± 1.3	0.1 ± 0.1
<i>Danthonia sericea</i>	1.3 ± 0.4	1.6 ± 0.4
Moss	0.8 ± 0.2	1.1 ± 0.3
<i>Quercus marilandica</i>	1.0 ± 0.7	0.6 ± 0.2
<i>Gaylussacia baccata</i>	0.6 ± 0.6	0 ± 0
<i>Schizachrium scoparium</i>	0.6 ± 0.5	1.2 ± 0.6
Lichen	0.6 ± 0.6	0.2 ± 0.2
<i>Smilax glauca</i>	0.3 ± 0	0.1 ± 0.1
<i>Pinus echinata</i>	0.1 ± 0.1	0.5 ± 0.4
<i>Sassafras albidum</i>	0.1 ± 0.1	0 ± 0
<i>Diospyros virginiana</i>	0.1 ± 0.1	0.1 ± 0.1
<i>Quercus montana</i>	0.2 ± 0.1	0.1 ± 0.1
Unk. Poacea <i>andropogon/schizachrium</i>	0.2 ± 0.2	0 ± 0
<i>Robinia species</i>	0.1 ± 0.1	0 ± 0
<i>Nyssa sylvatica</i>	0 ± 0	0.2 ± 0.2

APPENDIX 4A

The monitoring type descriptions are still in revision. The final will be located in the monitoring plan which is now 40% complete.

FMH4 MONITORING TYPE DESCRIPTION SHEET (draft) PARK: KIMO

Monitoring Type Code* F Q U M 0 1 G 0 9 **Date Described** 7/1999 **Revised** 1/2004

Monitoring Type Name Chestnut Oak (*Quercus montana*) Forest

Preparer Bob Dellinger / Chris Revels

Revisers Rob Klein / Virginia McDaniel

Burn Prescription Burning of units will occur between March and October.

Flame lengths 0.5-6 feet, Optimum - 2 feet

Air Temperature 32-95 degrees, Optimum - 65-85 degrees

Relative Humidity 20-75%, Optimum - 25-30%

1 hour fuel moisture 3-12%, Optimum - 4%

10 hour fuel moisture 4-14%, Optimum - 5%

100 hour fuel moisture N/A

Rate of spread 0.5-15 ch/hr

Resource Management Objective(s)

- 1) Reduce total fuel loading by 25-50% after 3 burns
- 2) Decrease pole-sized stem density by 50-80% after 3 burns.
- 3) Increase native grass and forb cover to 10-25% cover after 3 burns.
- 4) Increase oak and pine seedlings.

Fire Monitoring Objective(s)

- 1) We want to be 80% certain of detecting a 25% reduction in total fuel loading after 3 burns.
- 2) We want to be 80% certain of detecting a 50% decrease in pole-sized stem density after 3 burn.
- 3) We want to be 80% certain of detecting that native grass and forb cover is 10% of the total cover after 3 burns.
- 4) We are unsure at the moment of how many seedlings are needed in the understory to maintain an oak/pine overstory. We are still researching, but would gladly take any advice you have to offer.

Fire Monitoring Variable(s) Pole density; grass/forb cover; oak/pine seedlings

Physical Description The chestnut oak monitoring type is located on monadnocks, ridges, exposed or protected slopes at elevations from 750-1200 feet. Any aspect is acceptable.

Biological Description

The Chestnut oak monitoring type best matches Schafale and Weakley's Piedmont Monadnock Forest in Classification of Natural Communities of North America. The canopy is fairly closed (75 – 95% cover) with sparse herbaceous cover of low diversity. Soils are acidic, nutrient poor and xeric. The canopy is strongly dominated by Chestnut oak. Other canopy species include scarlet oak (*Q. coccinea*), Shortleaf pine (*Pinus echinata*), southern red oak (*Q. falcata*), black

jack oak (*Q. marilandica*), white oak (*Q. alba*), black oak (*Q. velutina*), post oak (*Q. stellata*), pignut hickory (*Carya glabra*), mockernut hickory (*C. tomentosa*), and Virginia pine (*P. virginiana*). The understory is dominated by sourwood (*Oxydendron arboreum*), blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*), chestnut oak with some dogwood (*Cornus florida*) and other species. The shrub layer is spotty, but consisting of blueberry (*Vaccinium pallidum* and *V. staminium*), huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*) and catbriar (*Smilax rotundifolia* and *S. glabra*). Herb layer is very sparse with stripped wintergreen (*Chimaphila maculata*), bracken fern (*Pteridium aquilinum*), *Danthonia* sp. and little blue stem (*Schizachrium scoparium*). Rare species associated with this monitoring type are *Fothergilla major*, *Monotropsis odorata*, *Smilax biltmoreana*, *Thermopsis mollis* var. *mollis*.

Rejection Criteria Areas less than 20 m from a trail or road or riparian area; areas of 50% or more mountain laurel (*Kalmia latifolia*) density; areas with > 50% dead standing trees; exclude anomalous vegetation patches.

APPENDIX 4B

The monitoring type descriptions are still in revision. The final will be located in the monitoring plan which is now 40% complete.

FMH4 MONITORING TYPE DESCRIPTION SHEET (draft) PARK: KIMO

Monitoring Type Code* F Q U M A 1 G 0 9

Date Described 1/2004

Monitoring Type Name Blackjack Oak (*Quercus marilandica*)

Preparer Rob Klein / Virginia McDaniel

Burn Prescription Burning of units will occur between March and October.

Flame lengths 0.5-6 feet, Optimum - 2 feet

Air Temperature 32-95 degrees, Optimum - 65-85 degrees

Relative Humidity 20-75%, Optimum - 25-30%

1 hour fuel moisture 3-12%, Optimum - 4%

10 hour fuel moisture 4-14%, Optimum - 5%

100 hour fuel moisture N/A

Rate of spread 0.5-15 ch/hr

Resource Management Objective(s)

- 1) Reduce total fuel loading by 25-50% after 3 burns
- 2) Decrease pole-sized stem density by 40-70% after 3 burns.
- 3) Increase native grass and forb cover to 15-30% cover after 3 burns.
- 4) Increase oak and pine seedlings

Fire Monitoring Objective(s)

- 1) We want to be 80% certain of detecting a 25% reduction in total fuel loading after 3 burns.
- 2) We want to be 80% certain of detecting a 40% decrease in pole-sized stem density after 3 burn.
- 3) We want to be 80% certain of detecting that native grass and forb cover is 15% of the total cover after 3 burns.
- 4) We are unsure at the moment of how many seedlings are needed in the understory to maintain an oak/pine overstory. We are still researching, but would gladly take any advice you have to offer.

Fire Monitoring Variable(s) Pole density; grass/forb cover; oak/pine seedlings

Physical Description The blackjack oak monitoring type is located on the most exposed, very xeric upper slopes, ridges and monadnocks at elevations from 750-1200 feet at any aspect. Soils are acid, nutrient poor, and rocky.

Biological Description

The blackjack oak monitoring type, like the chestnut oak type, best matches Schafale and Weakley's Piedmont Monadnock Forest in Classification of Natural Communities of North America. The species composition and structure of this community, however, differ enough to make it a separate monitoring type. The canopy is more open and shorter than the chestnut oak monitoring type (40 – 60% cover) and though chestnut oak is still the dominant tree, blackjack oak is the second most important canopy tree. Herbaceous cover is also sparse, though the

canopy openness makes it slightly higher than the chestnut oak type. Other canopy species include Shortleaf pine (*Pinus echinata*), Virginia pine (*P. virginiana*), and scarlet oak (*Q. coccinea*). The understory is dominated by blackjack oak, sourwood (*Oxydendron arboreum*), persimmon (*Diospyros virginiana*), and other species. The shrub layer consists of blueberry (*Vaccinium pallidum* and *V. arboreum*), huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*) and catbriar (*Smilax glabra*). Herb layer is very sparse with bracken fern (*Pteridium aquilinum*), *Danthonia* sp., little bluestem (*Schizachrium scoparium*) and goats rue (*Tephrosia virginiana*).

Rejection Criteria Areas less than 20 m from a trail or road or riparian area; areas of 50% or more mountain laurel (*Kalmia latifolia*) density; areas with > 50% dead standing trees; exclude anomalous vegetation patches.