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The Effects of Prescribed Fire on the Herbaceous Layer in the Southern Appalachian Mountains.

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The Effects of Prescribed Fire on the Herbaceous Layer in the Southern Appalachian Mountains

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by
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ABSTRACT

The Effects of Prescribed Fire on the Herbaceous Layer in the Southern Appalachian Mountains

by

Michael Lee Zimmerman

Prescribed fire in the southern Appalachians is a frequently used and controversial forest management practice. Research is limited on the effects of prescribed fire in the mesic southern Appalachians, where many of Tennessee's rare and regionally endemic plant species occur. This study examined the effects of prescribed fire on the herbaceous layer. Field work was conducted on six previously burned sites within the Cherokee National Forest in northeast Tennessee. Complimentary non-burned sites were selected based on similarity of physical characteristics and forest structure. The numbers of herbaceous species and individuals and the total numbers of species and individuals were determined and used to compare burned and unburned forest. Following prescribed fires there were significant reductions in the number of herbaceous species and individuals. Species with myrmecochorous (ant-dispersed) seeds were markedly reduced on burned sites. Despite considerable variation among sites, the negative impact of fire on forest herbs was clearly evident.

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CHAPTER 1

INTRODUCTION

Prescribed fires are intentionally set fires [conducted by the United States Forest Service (USFS)] designed to manage and stabilize a forest ecosystem. The widespread use of prescribed fires in western states during recent decades has influenced forest management practices in southern Appalachia despite profound differences in the natural environment and vegetation of these forests. Over the past 5 to 10 years the use of prescribed fires in the southern Appalachians has dramatically increased. The purposes given for these deliberate fires include reduction of flammable ground material, preparation of areas for tree planting, and promotion of wildlife habitat or food plants (Elliot et al. 1999; Powers 2004).

Within the State of Tennessee, the Cherokee National Forest (CNF) encompasses approximately 640,000 acres. About 20,000 acres (> 3% of total acres) in the CNF are burned annually by prescribed fires. This far exceeds the average of 3,000 acres (< 1%) burned annually by wildfires, which are almost all started by humans. There is evidence that humans have been burning dryer areas in the southeastern forests for thousands of years prior to settlement by Europeans (Delcourt and Delcourt 1997). In the southern Appalachians the occurrence of lightning-set fires is very infrequent (Harmon 1982) because of the area’s high humidity and annual precipitation. Lightning-set fires appear to have had little effect on maintaining the region's areas of native pine forest (Barden and Woods 1976).

There is a large research literature on forest fire effects; however most of this research addresses regions and ecosystems quite distinct from the southern Appalachians. The use of fire as a management tool has been much-studied for the western United States (see, for example, Williams and Dallasala 2004, and the 12 articles included in this issue). These regions are generally dryer, with a deeper litter layer and slower decomposition compared to the southern Appalachian forests. There has also been considerable study of fire regimes in other dry ecosystems, such as grasslands or savannahs (e.g., Sparks et al. 1998; Valone et al. 2002), and chapparals or scrublands (e.g. Guo 2001; Wrobieski and Kauffman 2003).

Studies of prescribed burns in eastern forests have focused principally upon coastal pine forests (e.g. Gilliam and Christensen 1986; Glitzenstein and Streng 2003; and reviewed in Carter and Foster 2004). Investigations of fire effects in the southern Appalachians have often been directed towards the most xeric elements of this ecosystem, the ridgetop pine forest (e.g. Welch et al. 2000; Welch and Waldrop 2001). Other studies have investigated the relatively dry oak-pine forests, which are also relatively fire-prone and fire-adapted (e.g. Blankenship and Arthur 1999; Vose et al. 1999; Gilbert et al. 2003). Moreover, these studies typically did not address the entire plant community as impacted by fire but instead dealt with narrow objectives, such as timber production (Vose and Swank 1993; Blankenship and Arthur 1999; Elliot et al. 2002) or restoration of selected tree species (Vose et al. 1999).

The mesophytic broadleaf forest would seem even less fire prone than pine forests, because it is generally more moist and lacks the highly flammable pine needle litter of the pine forest. Most vegetation in the mesic forests of the southern Appalachians is not obviously fire-adapted. This is particularly true for the herbaceous perennials of hardwood forests. Many of Tennessee’s rarer and more regionally endemic plant species are found in the herbaceous layer of the forest (Bailey 2004). Although there has been much research on the effects of prescribed burns, very few studies have addressed the mesic hardwood forests of the southern Appalachians, which are now subject to extensive prescribed burns.

There is much controversy as to whether prescribed fires are beneficial to the southern Appalachian forest or if they play a detrimental role in the ecosystem. One side contends that prescribed fires are a tool in forest management that replaces the natural disturbance of fire. Opponents to the use of prescribed fires in the southern Appalachians believe that because of the area's moist conditions, the fires degrade the vegetative composition of the ecosystem and reduce the quality and diversity of both the flora and fauna.

Proponents of fire believe that prescribed fires play an important role in forest regeneration, restoration, and maintenance of biological diversity. The burns are claimed to improve forage production for wildlife and have been associated with timber stand improvement, pest control, and a reduction in wildlife hazards. Main and Richardson (2002) found that wildlife usage of an area increased in newly burned areas in southwest Florida pine flatwoods. The U.S. Forest Service often justifies prescribed burns with claims that they improve wildlife habitat (e.g. Florence 2001). These prescribed fires, controlled by forest managers of the USFS, aim at lower intensities (temperatures) than that of a wildfire in order to consume the leaf litter on the forest floor that would otherwise be used as fuel in a natural fire (Elliot et al. 1999). Because they remove ground cover and reduce the density of the forest understory, prescribed burns are considered an effective tool in silviculture. The additional open space in the forest makes it more difficult for flames to jump from tree to tree, reducing susceptibility to future wildfires. Prescribed burns also scorch lower branches, eventually killing them. This raises the live crown of a tree so its distance from the ground is increased making it farther away from future fires that may burn along the ground.

The effects of prescribed burns upon stream chemistry (Elliot and Vose 2005) and herpifauna (Ford et al. 1999) have been considered minor or unimportant. It is questionable, however, how these benefits of fire pertain to the moist southern Appalachian forests.

Opponents of prescribed fires contend that prescribed fires are harmful and diminish the overall health of the forest ecosystem. Prescribed fires are thought to negatively affect plant diversity, especially for mesophytic groups such as the herbs, which are not adapted to a regular fire regime. Disturbances, including fire, may favor weedy and invasive species that are more fire-tolerant and may move in quickly after fire, out-competing endemic species (Matlack 1994; McLachlan and Bazely 2000). Prescribed fires may decrease animal diversity. A study conducted by Gagan (2002) demonstrated that prescribed burning caused a reduction in the millipede populations in southern Appalachian forests. Additional invertebrates, as well as microbial and fungal diversity may also be negatively affected by forest fires. Prescribed fires reduce microarthropod abundance in annually burned watershed (Boerner and Dress 2004) and lower species richness of ants in a pine savanna in Florida (Izhaki and Levey 2003). A large reduction of beetles (Coleoptera) and mesofaunal ants was also seen on the Cumberland Plateau of Kentucky (Kalisz and Powell, 2000). Another study showed a reduction in immature Lepidoptera populations after a fire (Severns 2003). Amphibians may also be adversely affected by fire. One study showed amphibians and reptiles reduced by forest fires (Mitchell 2000). Another indicated that stream amphibians decreased following a fire but reptiles were not affected. Despite mixed results from various studies, negative ecological impacts of fire are becoming increasingly evident.

Other studies have shown that prescribed fires alter the soil structure and soil composition (Boerner et al. 2000), (Hutchinson and Iverson 2002), (Elliot and Vose 2005), and affect soil enzyme activity (Boerner et al. 2000). They are believed to increase the amount of runoff, therefore resulting in the loss of many nutrients essential for growing plants. Prescribed fires were shown to increase soil nitrate pools in forest but not in glades (Trammell et al. 2004). Vose et al. (1999) showed a reduction of nitrogen on ridgetops but not a mid and lower-slopes. A loss of nitrogen could have a negative effect on white pine growth (Elliot et al. 2002). Mycorrhyzial diversity may also be reduced following a prescribed fire (Tuininga and Dighton 2004), which may reduce diversity of plants. Increased erosion may also result from prescribed burns and impedes the growth of new herbs. It appears that the forest floor, and its micro-flora and micro-fauna are highly vulnerable to fire (Tiedemann et al. 2000).

The scientific literature regarding prescribed fires in the southern Appalachians is extremely limited, and advocates of prescribed fires dominate this literature. No scientific papers addressing the effects of prescribed fires on the herbaceous layer in the southern Appalachians have been found. Elliot et al. (1999) performed a detailed study of trees and shrubs following a prescribed fire; however, their survey of herb-layer species was limited and incomplete. They sampled herb-layer species only on the ridge and did not have consistent measurements for herb species over the 3 years of their study. Another study looked at recovery patterns of understory herbs in the northeastern United States and found that ant or gravity-dispersed seeds were absent from restored sites and were defined as highly vulnerable (McLachlan and Bazely 2000). These highly-vulnerable ant-dispersed herbs had not recovered at all because of their limited dispersal ranges. This is important because the dispersal distances for wind-dispersed seeds are the greatest, intermediate for vertebrate-dispersed, and are the shortest for ant-, explosion-, and gravity-dispersed seeds (Williams 1993).

The purpose of the present research is to examine how prescribed fires change the composition of the herbaceous layer in a mesophytic deciduous forest. Changes in species composition and abundance will be examined in burned versus unburned plots. Physical properties of the soil and litter layer will also be compared between similar burned and unburned sites. Changes to the herbaceous layer may reflect the impact that prescribed fires have on less visible groups that are also fire-intolerant, such as mosses, algae, fungi, and invertebrates. The effects of fire on these elements of the native vegetation may contribute to our understanding of the impact of prescribed burning as a forest management practice.

Hypotheses and Predictions

Comparisons between burned and non-burned forest plots may yield various outcomes, each with predictable results. The following hypotheses and predictions were established at the outset of this investigation:

Hypothesis 1: Vegetation will not differ between burned and non-burned plots.

Prediction 1: If there is no difference between burned and non-burned plots, then the burned and non-burned plots will have similar species composition.

Hypothesis 2: Vegetation in burned plots will have reduced diversity and number of individuals, because of elimination of native woodland perennials that are fire intolerant.

Prediction 2: Fire will create an opportunity for invasive plants to out-compete indigenous plants found in non-burned plots. The absence of fire in non-burned plots will allow the establishment of many native plant species, resulting in greater diversity and number of individuals versus burned plots.

Hypothesis 3: Vegetation in burned plots will have higher diversity and number of individuals because of greater fertility, light, and open ground available to invasive weeds.

Prediction 3: Because of fire-caused nutrient release and the seasonality of the (winter) burns, nutrients will be fully accessible to the spring growing herbs, resulting in higher diversity. Also, burns will remove the litter layer, exposing more surface to light.

Hypothesis 4: Vegetation in non-burned plots will have a higher diversity of native perennial herbaceous species, particularly for mesic taxa.

Prediction 4: In the absence of fire, the existing diversity of woodland species will be maintained, whereas the numbers of moisture and shade-requiring species will be reduced by fire in burned plots.

CHAPTER 2

MATERIALS AND METHODS

Study Area

This study on the effects of prescribed fire on vegetative reproduction in the southern Appalachians was conducted in the Cherokee National Forest in northeastern Tennessee. Sites used in this study where previous burns have occurred are located in Washington, Sullivan, and Johnson counties (Figure 1).

Burned sites were selected from 2 time periods: sites burned in 1998, and sites burned in 2001-2002. This allowed for comparisons of the effects of burns on vegetation over recovery-time periods of approximately 6 years and of only 2 to 3 years. The sites burned in 1998 included Buffalo Mountain and Horse Cove Gap, in Washington County, and Holston Mountain, in Sullivan County. The sites burned in 2001 included 2 located in an area called Flatwoods, in Sullivan County. The 2002 burn is found on Harp Mountain in Johnson County.

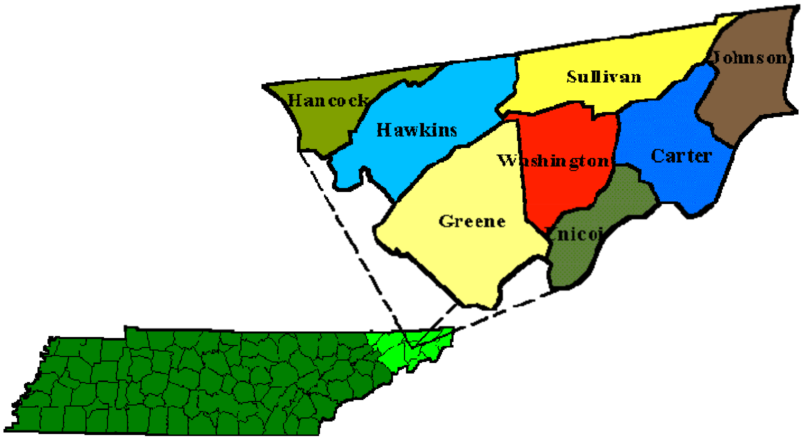

Figure 1 Location of study sites in northeast Tennessee

Study sites were located in areas of the Cherokee National Forest that have been subjected to prescribed burns during 1998 – 2002. For each site, a non-burned site near a burned site was located and used as a control for comparison with the corresponding burned site. The control site was selected to provide similar environmental and cultural conditions as the burned site. The following factors were evaluated in the selection of the matched control site for each burn site: elevation, slope, aspect (direction slope is facing), proximity to water, and exposure to disturbances was considered when selecting a control site. Control sites were located at least 300 meters away from the burned site to avoid edge effects that may alter conditions within the control site. Vegetation types of each burn and control plots were considered when selecting plots. This was done by identifying tree composition, size, and density using the point-quarter method. The selection of burned and control sites was facilitated by a earlier study of the effects of controlled burns on salamander and millipede species conducted by ETSU MS graduate A. Gagan (2002). The present study, however, used different sites than Gagan's study.

Sampling Method

In each burn, 3 study plots were established. These plots were selected based on accessibility and convenience to retrieve data within each burn. Within each plot, 3 line-point transects were spaced 10 meters apart. Along each transect, a total of 10 samples were taken at 3-meter intervals, thus, each transect was 27 meters long. A 2 foot high marker (steel reinforcing rod with painted end) was placed at the endpoint of each line transect.

A circular area of 0.5 m^2 was used for the size of each sample studied. At each sample, a 0.5 m^2 ring was placed on the forest floor and the plants located within the circle were surveyed.

All vascular plants were inventoried. To maximize data on herbaceous species, sample plots were moved to avoid large trees and rocks. If tree trunks covered a large portion of the sample ring, the plot was relocated. Specifically, when tree diameter at breast height (dbh) of all trees within a sample exceeded 50 cm, the sample was moved 1 meter. The sample ring was moved to avoid large rocks greater than 100 cm length plus width. All seedlings that were less than 5 centimeters in height or width were identified when possible. Plants were identified by use of diagnostic keys. Taxonomic nomenclature for species follows Gleason and Cronquist (1991). Species not in Gleason and Cronquist follow Radford et al. (1968) and the U. S. Department of Agriculture's Plant Database (http://plants.usda.gov/), *(Aesculus octandra* and *Cary alba*, respectively).

In an attempt to accurately sample all vegetation types throughout the growing season, sampling was carried out during 2 seasons: 1) May 22 through June 30, 2) July1 through July 23.

Environmental data were collected at each sample site at each sampling period. These included: elevation (meters above sea level), leaf litter depth (centimeters), soil pH, soil moisture (percent), percentage of canopy cover, and slope (degrees from horizontal).

Data Analysis

The comparisons of the number of species, number of herbaceous species, number of individuals and number of herbaceous individuals were initially performed using a two-way mixed model analysis of variance (ANOVA), with burn treatment as the fixed factor and site as the random factor, utilizing the statistical software MINITAB^{TM} (Minitab, Inc. 2000). However, because these parameters were not normally distributed, the assumptions for using the two-way

ANOVA were not met. Therefore, t-tests to compare means and nonparametric tests, the Mann-Whitney and Friedman tests to compare medians, were included to satisfy statistical assumptions regarding the data. The numbers for leaf litter were normal; therefore, allowing for the use of the two-way ANOVA. The two-way ANOVA was performed to estimate variance components for the response variable, leaf litter.

Additional analyses were preformed to evaluate the impact of treatment (fire) on the prevalence of each herbaceous species. A separate ANOVA was performed for each herbaceous species across all 6 sites to investigate whether there was a significant difference following treatment with a prescribed burn. Analyses were also conducted to evaluate the statistical differences among sites.

t-tests were used to evaluate the differences in physical characteristics (soil moisture, soil pH, and canopy cover) between burned and non-burned forest.

CHAPTER 3

RESULTS

The results are presented beginning with the physical survey of the sites, followed by a record of the species encountered. Next are the comparisons of the burned (treatment) and unburned (control) sites with respect to the numbers of species and individuals present. Treatment and control sites were also compared with respect to numbers of herbaceous species and individuals encountered. Statistical significance tests are reported for each of these comparisons.

Effects of Fire on Physical Characteristics of Study Sites

Physical characteristics of both the control and the burned sites were measured in order to establish the similarity in elevation, slope, aspect, and canopy cover of the control sites with their corresponding burn (treatment) site. Measurements of soil pH and moisture were also taken to evaluate the effects of fire on these critical components of the substrate. These data are provided for the 6 sites in Tables 1-6. Photos (Figures 2-13) and site descriptions are also included.

Site Descriptions

Site 1: Horse Cove Gap. This site, burned in 1998, is a moist mixed-hardwood forest located on a gentle slope that is dominated by young (less than 20 years old) trees of the genera of *Acer, Liriodendron,* and *Quercus*. There are also large shrubs of *Rhododendron maximum* in several areas of the site. Both the burn and control were located around 200 yards from a small creek. The understory included several fern species.

Table 1 Physical characteristics of Horse Cove Gap

HORSE COVE GAP		
	BURN	CONTROL
Coordinates	N 36°14.781’ W 82°22.766’	N 36°13.383’ W 82°23.166’
Elevation	2440 ft	2395 ft
Aspect Direction	SE	S-SE
Canopy Cover	82%	84%
Soil pH	6.4	6.6
Soil Moisture	25%	31%
Mean Leaf Litter Depth	7.2 cm	6.7 cm
Slope 1, 2, 3	-24°, -23°, -24°	-20°, -19°, -25°

Figure 2 Horse Cove Gap Control

Figure 3 Horse Cove Gap Burn

Site 2: Holston Mountain. The relatively moist, mixed-hardwood forest of this site, burned in 1998, is located on a gradual slope with a high density of woody plants. Trees were young (around 20 years) and the forest was relatively dense. *Oxydendron, Sassafras and Smilax* were well established in most areas of the site. The soil was somewhat rocky.

Table 2 Physical characteristics of Holston Mountain

HOLSTON MOUNTAIN		
	BURN	CONTROL
Coordinates	N 36°28.420’ W 82°05.620’	N 36°28.158’ W 82°06.852’
Elevation	2670 ft	2645 ft
Aspect Direction	N	N
Canopy Cover	79%	83%
Soil pH	5.6	6.1
Soil Moisture	23%	25%
Mean Leaf Litter Depth	5.8 cm	6.5 cm
Slope 1, 2, 3	-15°, -21°, -18°	-12°, 18°, -17°

Figure 4 Holston Mountain Control

Figure 5 Holston Mountain Burn

Site 3: Buffalo Mountain. This site, burned in 1998, was located at a higher elevation than other sites on a gentle slope. *Acer*, *Betula* and *Quercus* were found in this relatively moist, mixed-hardwood forest in both the burn and control, however the herb-layer was more developed in the control than in the burn. Tree age is estimated at 20-30 years.

Table 3 Physical characteristics of Buffalo Mountain

BUFFALO MOUNTAIN		
	BURN	CONTROL
Coordinates	N 36°12.956’ W 82°20.435’	N 36°13.702 W 82°21.055’
Elevation	2974 ft	2893 ft
Aspect Direction	SE	SE
Canopy Cover	75%	73%
Soil pH	6.2	6.6
Soil Moisture	24%	28%
Mean Leaf Litter Depth	5.9 cm	7.2 cm
Slope 1, 2, 3	-19°, -21°, -18°	-24°, -23°, -23°

Figure 6 Buffalo Mountain Control

Figure 7 Buffalo Mountain Burn

Site 4: Flatwoods Southern Section. This site, burned in 2001, was of moderate age (probably 20 to 40 years old) relatively moist, oak-pine forest. Located on a very gentle slope, the soil was somewhat rocky and had a few pines scattered through the site although *Quercus* and *Acer* were also found. This site seemed to be heavily used by wildlife as deer, black bear, and several species of birds were observed during data collection.

Table 4 Physical characteristics of Flatwoods SS

FLATWOODS SS		
	BURN	CONTROL
Coordinates	N 36°29.246’ W 82°04.444’	N 36°28.410’ W 82°06.928
Elevation	2013 ft	2015 ft
Aspect Direction	NE	NE
Canopy Cover	76%	79%
Soil pH	6.2	6.5
Soil Moisture	25%	28%
Mean Leaf Litter Depth	5.4 cm	6.0 cm
Slope 1	-8°, -5°, -17°	-8°, -6°, -10°

Figure 8 Flatwoods Southern Section Control

Figure 9 Flatwoods Southern Section Burn

Site 5: Harp Mountain. This site, burned in 2002, was a drier but still mesic, mixed-hardwood forest of trees estimated at 20 to 40 years old, located on a strong slope. Major trees included species of *Acer*, *Quercus*, *Fagus*, and *Liriodendron*. The herb layer was more reduced than at all other sites.

Table 5 Physical characteristics of Harp Mountain

HARP MOUNTAIN		
	BURN	CONTROL
Coordinates	N 36°31.161’ W 81°53.67’	N 36°36.210’ W 81°63.69’
Elevation	2670 ft	2645 ft
Aspect Direction	N	N
Canopy Cover	70%	83%
Soil pH	6.4	6.7
Soil Moisture	30%	29%
Mean Leaf Litter Depth	3.4 cm	5.8 cm
Slope 1	-40°, -45°, -48°	-42°, -35°, -32°

Figure 10 Harp Mountain Control

Figure 11 Harp Mountain Burn

Site 6: Flatwoods Northern Section. This site, burned in 2001, is that of a relatively moist, mixed-pine hardwood forest with a noticeable rocky soil. The site was dominated by a well developed shrub layer in the control; the burn layer not as much. With the exception of a few pines, members of the genus *Quercus* were found with *Acer* and *Fagus*.

Table 6 Physical characteristics of Flatwoods NS

FLATWOODS NS		
	BURN	CONTROL
Coordinates	N 36°31.714’ W 82°01.154’	N 36°28.248’ W 82°06.969’
Elevation	2050 ft	2064 ft
Aspect Direction	E	NE
Canopy Cover	70%	73%
Soil pH	5.9	6.1
Soil Moisture	30%	31%
Mean Leaf Litter Depth	5.3 cm	6.7 cm
Slope 1, 2, 3	-8°, -8°, -8°	-1°, -6°, -8°

Figure 12 Flatwoods Northern Section Control

Figure 13 Flatwoods Northern Section Burn

Comparisons Between Control and Burned Sites

The depth of the leaf litter was significantly less on the burned sites compared to unburned sites. Mean leaf litter depth for the unburned sites was 6.5 cm, while only 5.5 cm for the burned site (Table 8). There is a statistical significance difference in depths of leaf litter between treatments; however, litter depth also differs significantly between sites. Because the interaction between site and treatment is also significant, both mean squares (MS) of the main effects were divided by the MS of the interaction. This is the more conservative approach to correcting the F values. From these new F values, the adjusted P-values were calculated. These adjusted P-values (Table 7) indicate highly significant differences in leaf litter depth between treatments and between the sites.

Table 7 Results of Two-way ANOVA for leaf litter depth by treatment and site

Source	df	SS	MS	F	P
Site	5	41.1027	8.2205	4.88	0.053
Treatment	1	43.4468	43.4468	25.78	0.004 **
Site*Treatment	5	8.4249	1.6850	4.89	< 0.001 **
Error	96	33.0800	0.3446		
Total	107	126.0544			

* = P < 0.05, and ** = P-value < 0.01

Table 8 Mean litter depth (cm) for burned and control plots at each site

Site	BURN	CONTROL	DIFFERENCE
Horse Cove Gap	7.2	6.7	-0.5
Holston Mountain	5.8	6.5	0.7
Buffalo Mountain	5.9	7.2	1.3
Flatwoods SS	5.4	6.0	0.6
Harp Mountain	3.4	5.8	2.4
Flatwoods NS	5.3	6.7	1.4
Overall Mean	5.5	6.5	1.0

Soil pH may also be affected by prescribed fires. At all six sites, the pH was lower in the burn area than in matched control area (Table 9). A paired t-test showed that there was a highly significant difference in soil pH between burned and unburned forest.

Differences in soil moisture were apparent between the burned and unburned sites, and the difference was marginally significant (Table 10). Soil moisture measurements were lower by 1 to 6 percentage points in all but 1 (Harp Mountain) of the 6 sites. The 1 exception showed only a small difference, of 1% in soil moisture.

Canopy cover was not significantly different when comparing between the burned and control sites (Table 11). Canopy cover was not expected to change because prescribed fires burn at low intensities and are primarily restricted to the ground level.

Table 9 Mean soil pH for burned and control plots at each site

Site	BURN	CONTROL	DIFFERENCE
Horse Cove Gap	6.4	6.6	0.2
Holston Mountain	5.6	6.1	0.5
Buffalo Mountain	6.2	6.6	0.4
Flatwoods SS	6.2	6.5	0.3
Harp Mountain	6.4	6.7	0.3
Flatwoods NS	5.9	5.1	-0.8
Overall Mean	6.1	6.3	0.2

P-value = < 0.001 **, Confidence Intervals (-0.43935, -0.193983), df = 5, t-value = 6.64

Table 10 Mean soil moisture (%) burned and control plots at each site

Site	BURN	CONTROL	DIFFERENCE
Horse Cove Gap	25	31	6
Holston Mountain	23	25	2
Buffalo Mountain	24	28	4
Flatwoods SS	25	28	3
Harp Mountain	30	29	-1
Flatwoods NS	30	31	1
Overall Mean	26.2	28.7	2.5

P-value = 0.053, Confidence Intervals (-5.04907, 0.04907), df = 5, t-value = 2.52

Table 11 Mean canopy cover (%) for burned and control plots at each site

Site	BURN	CONTROL	DIFFERENCE
Horse Cove Gap	82	84	2
Holston Mountain	79	83	4
Buffalo Mountain	75	73	-2
Flatwoods SS	76	79	3
Harp Mountain	70	83	13
Flatwoods NS	70	73	3
Overall Mean	75.3	79.2	3.9

P-value = 0.135, Confidence Intervals (-8.63285, 1.56953), df = 5, t-value = 1.89

Species Composition of Study Sites

Species Surveyed

A total of 45 species representing 27 families were identified in this study. A list of these species, their family, habit, and dispersal mode is provided in Table 9. One fern, *Pteridium aquilinem,* a fire-tolerant species (Chandler et al. 1983) and 2 gymnosperm species were found. Eight species of monocots were surveyed.

Table 12 Vascular plant species identified during study, listed by plant family, growth habit, and dispersal syndrome
Abbreviations: T = tree, S = shrub, Vi = vine, H = herb, D.S. = dispersal syndrome, A = ant, V = vertebrate, W = wind, - = other/unknown, N = native, E = exotic

SPECIES	FAMILY	HABIT	D.S.
DICOTS			
Acer pensylvanicum L.	Aceraceae	T	W
Acer rubrum L.	Aceraceae	T	W
Acer saccharum L.	Aceraceae	T	W
Toxicodendron radicans (L.) Kuntze.	Anacardiaceae	Vi	V
Podophyllum peltatum L.	Berberidaceae	H	V
Betula allegheniensis Britton	Betulaceae	T	W
Calycanthus floridus L.	Calycanthaceae	S	-
Viburnum acerifolium L.	Caprifoliaceae	S	V
Cornus florida L.	Cornaceae	T	V
Galax aphylla L.	Diapensiaceae	H	-
Chimaphila maculata (L.) Pursh.	Ericaceae	H	-
Kalmia latifolia L.	Ericaceae	S	W
Oxydendrum arboreum (L.) DC	Ericaceae	T	W
Rhododendron maximum L.	Ericaceae	S	W
Vaccinium pallida Aiton.	Ericaceae	S	V
Desmodium nudiflorum (L.) DC	Fabaceae	H	V
Robinia pseudoacacia L.	Fabaceae	T	W
Quercus alba L.	Fagaceae	T	V
Quercus rubra L.	Fagaceae	T	V
Quercus velutina Lam.	Fagaceae	T	V
Aesculus octandra Marshall	Hippocastanaceae	T	V
Carya alba (L.) Nutt.	Juglandaceae	T	V
Lindera benzoin (L.) Blume.	Lauraceae	S	V
Sassafras albidium (Nutt.) Nees.	Lauraceae	S	V

Table 12 Continued

Liriodendron tulipifera L.	Magnoliaceae	T	W
Magnolia fraseri Walt.	Magnoliaceae	T	W
Conopholis americana (L.) Wallr.	Orobanchaceae	H	W
Sanguinaria canadensis L.	Papaveraceae	H	A
Duchesnea indica (Andrews) Focke.	Rosaceae	H	V
Prunus serotina Ehrh.	Rosaceae	T	V
Rubus occidentalis L.	Rosaceae	S	V
Viola canadensis L.	Violaceae	H	A
Viola hastata Michx.	Violaceae	H	A
Parthenocissus quinquefolia (L.) Planchon.	Vitaceae	H	V
MONOCOTS			
Dioscorea villosa L.	Dioscoreaceae	Vi	W
Medeola virginiana L.	Liliaceae	H	V
Smilacina racemosa (L.) Desf.	Liliaceae	H	V
Smilax bona-nox L.	Liliaceae	Vi	V
Smilax rotundifolia L.	Liliaceae	Vi	V
Cypripedium acaule Aiton.	Orchidaceae	H	-
Goodyera repens (L.) R. Br.	Orchidaceae	H	-
Panicum L. (unidentified species)	Poaceae	H	W
PTERIDOPHYTE			
Pteridium aquilinum (L.) Kuhn.	Dennstaedtiaeceae	H	-
GYMNOSPERMS			
Pinus strobus L.	Pinaceae	T	W
Tsuga canadensis (L.) Carriere.	Pinaceae	T	W

The family that was represented with the greatest number of species was Ericaceae. Regionally, this family is dominated by shrubs, including the abundant species *Rhododendron maximus*, as well as 1 tree and 1 herb species. The 4 most species-rich families identified during this study are listed in Table 13.

Table 13 Most species-rich families identified during study

RANK	FAMILY	NUMBER OF SPECIES
1	Ericaceae	5
2	Liliaceae	4
3	Aceraceae	3
4	Fagaceae	3

In terms of plant habit, tree and herbaceous species, with 17 (38%) and 16 species (36%) respectively, accounted for most of the species sampled. The remaining species were shrubs (8 species, 18%) and vines (4 species, 9%).

Effects of Fire on Species Richness

At 5 of the 6 sites, the mean number of species per site was greater in the unburned (control) than in the burned sites. A graph displaying all sample plots and number of species at each location is shown in Figure 14.

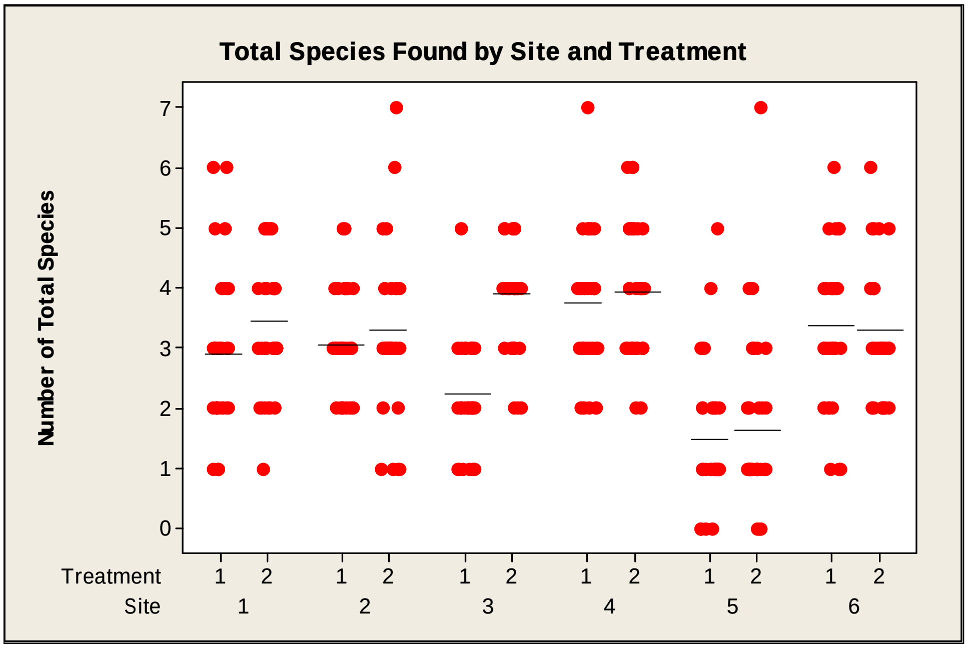

Figure 14 Number of species found at each plot by site and treatment.
Treatments: 1 = burned; 2 = unburned (control).
Sites: 1 = Horse Cove Gap; 2 = Holston Mountain; 3 = Buffalo Mountain;
4 = Flatwoods Southern; 5 = Harp Mountain; 6 = Flatwoods Northern
Means are indicated with black horizontal lines within the graph

The mean number of species for the burned and control plots at each site are shown graphically in Figure 15.

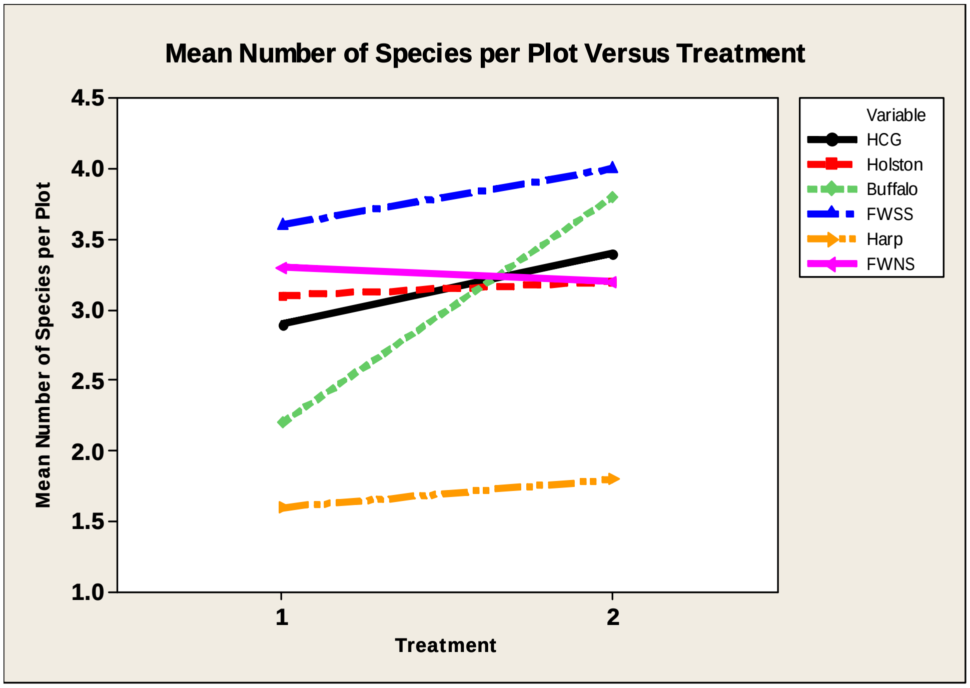

Figure 15 Mean number of species for burned and control plots at each site
Site Abbreviations: HCG = Horse Cove Gap, Holston = Holston Mountain,
Buffalo = Buffalo Mountain, FWSS = Flatwoods Southern Section,
Harp = Harp Mountain, FWNS = Flatwoods Northern Section
Treatments: 1 = burned, 2 = unburned (control)

Differences in the mean number of species at burn versus control plots when compared across all sites were tested for statistical significance. Because of the large number of zero values for the medians, the mean values from each site were used to perform the Friedman test. The results of each of each of these tests are given in Table 14. The differences in mean number of species were not statistically significant when either of these tests were applied.

Table 14 Results of Friedman and paired t-test for comparisons across all sites of mean number of species at burned versus control plots

Test	df	Test Statistic	P-value
Friedman	1	S = 2.67	0.102
t-test	5	t = 1.83	0.13

Because the data were not normally distributed, the assumptions for a two-way ANOVA were violated and its use is questionable. Nevertheless, results of ANOVA were consistent with the results of the tests reported above. That is, the treatment effect, when compared across all sites, was not significant (Table 15). Furthermore, the ANOVA substantiates the great differences among the 6 sites, with respect to number of species. The 6 sites show significant differences in number of species regardless of treatments. The highly significant site by treatment interaction effect (P = 0.001) mirrors this high intersite variation.

Table 15 Two-way ANOVA testing for effects of site and burn treatment on total number of species

Source	df	SS	MS	F	P
Site	5	150.267	30.053	5.41	0.044 *
Treatment	1	18.678	18.678	3.36	0.127
Site*Treatment	5	27.789	5.558	4.02	0.001 **
Error	348	481.267	1.383		
Total	359	678.000			

To test the overall effects of prescribed fire on species richness, the mean numbers of species from each burn and control at each site were compared across all sites. Comparing across all sites, the mean number of species on burned sites was fewer than on the non-burned (control) sites. In all but 1 site (Flatwoods NS), controls contained more species on average per plot. These results are shown in Table 16.

Table 16 Mean and median number of species in burn and control plots by site

Site	Mean species per plot (Standard Error of the Mean)		Median species per plot	
	BURN	CONTROL	BURN	CONTROL
Horse Cove Gap	2.9 (0.24)	3.4 (0.21)	3	3
Holston Mountain	3.1 (0.17)	3.2 (0.25)	3	3
Buffalo Mountain	2.2 (0.16)	3.8 (0.17)	2	4

Table 16 Continued

Flatwoods SS	3.6 (0.22)	4.0 (0.21)	4	4
Harp Mountain	1.6 (0.21)	1.8 (0.27)	1	1
Flatwoods NS	3.3 (0.24)	3.2 (0.21)	3	3

The data were not normally distributed and did not meet the assumptions to perform a two-way ANOVA. Consequently, the means and medians for total number of species were calculated for each site and then compared using a paired t-test and a Mann-Whitney test, respectively. The results of the paired t-test and Mann-Whitney test (Table 17) show a wide range of P-values. However, just 1 site, Buffalo Mountain, displays a statistically significant difference between burn and control plots in both the t-test and Mann-Whitney.

Table 17 Paired t-test and Mann-Whitney results comparing total number of species by treatment at each site

Site	t-Test			Mann-Whitney		
	P-value	t	df	P-value	W	df
Horse Cove Gap	0.109	1.65	29	0.093	804	29
Holston Mountain	0.544	0.61	29	0.602	881	29
Buffalo Mountain	< 0.001 **	6.75	29	< 0.001 **	566	29
Flatwoods SS	0.21	1.28	29	0.222	834.5	29
Harp Mountain	0.615	0.51	29	0.737	893	29
Flatwoods NS	0.742	0.33	29	0.599	950	29

Effects of Fire on Plant Abundance

A graph displaying all sample plots and number of individuals at each location is given in Figure 16. The means are indicated with black horizontal lines within the graph. The mean number of individuals per site is greater in the unburned (control) than in the burn for 5 of the 6 sites.

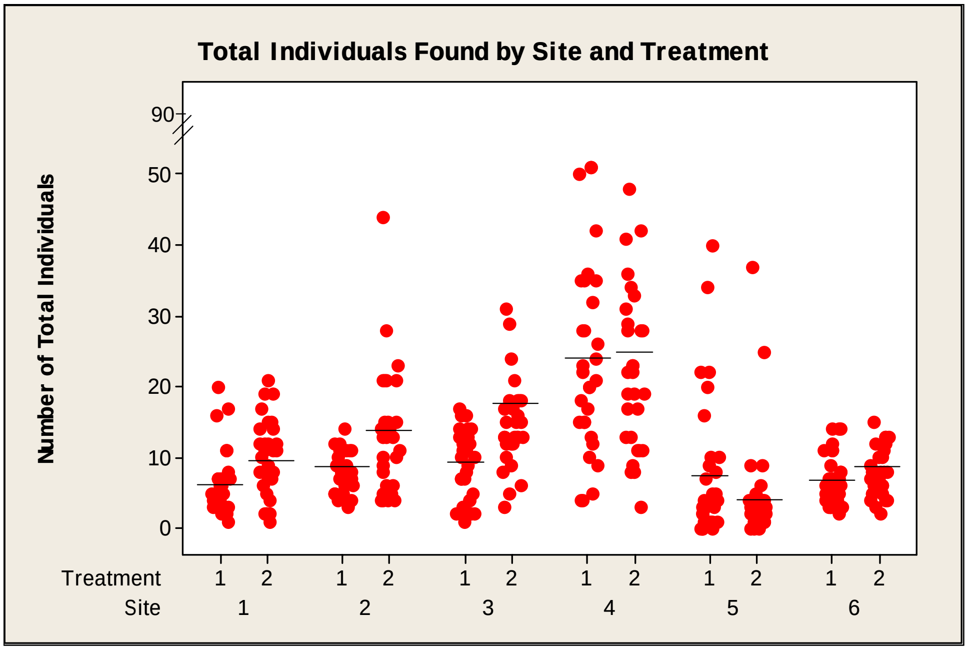

Figure 16 Number of individuals found at each plot by site and treatment
Treatments: 1 = burned; 2 = unburned (control).
Sites: 1 = Horse Cove Gap; 2 = Holston Mountain; 3 = Buffalo Mountain; 4 = Flatwoods Southern; 5 = Harp Mountain; 6 = Flatwoods Northern
Means are indicated with black horizontal lines within the graph

The mean number of individuals per plot for all 6 sites is shown in Figure 17.

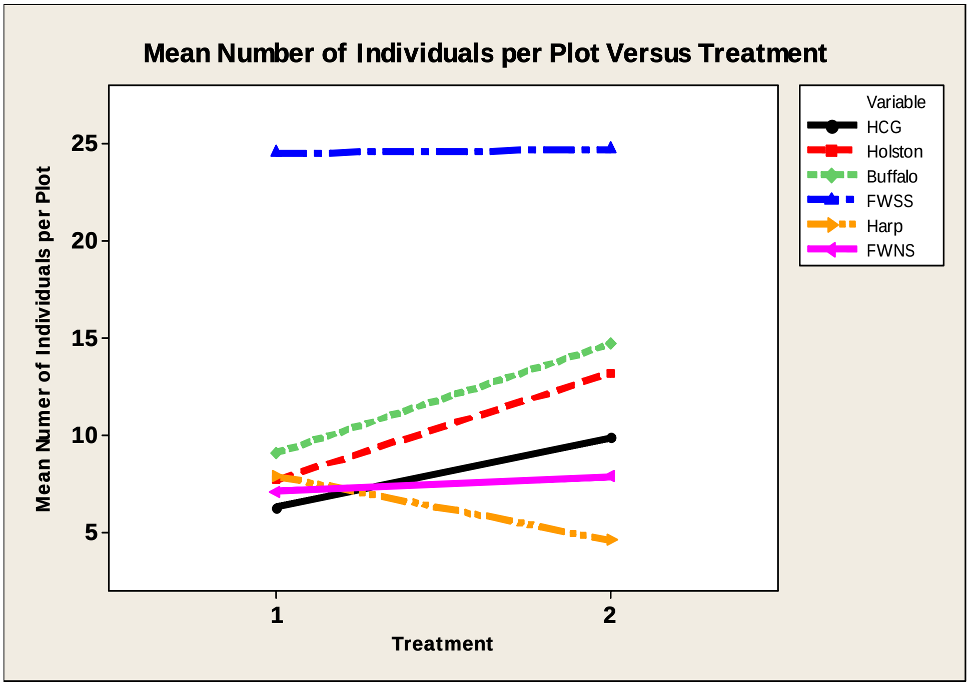

Figure 17 Mean number of individuals for burned and control plots at each site
Site Abbreviations: HCG = Horse Cove Gap, Holston = Holston Mountain,
Buffalo = Buffalo Mountain, FWSS = Flatwoods Southern Section,
Harp = Harp Mountain, FWNS = Flatwoods Northern Section,
Treatments: 1 = burned, 2 = unburned (control)

Differences in the number of total individuals at burns versus controls when compared across all sites were tested for statistical significance. Paired t-tests were used to compare the mean values, and the Friedman test was used to compare the median values. The results of each of each of these tests can be seen in Table 18. Neither test shows a significant difference for within site comparisons of total individuals in burns versus controls.

Table 18 Results of Friedman and paired t-test for comparisons across all sites of mean number of individuals at burned versus control plots

.

Test	df	Test Statistic	P-value
Friedman	1	S = 2.67	0.102
t-test	5	t = 1.83	0.591

The two-way ANOVA was again consistent with the results from the Friedman and paired t-test. The effect of treatment on number of individuals was not significant in the ANOVA (Table 19) as was true for the paired t-test (Table 18). The differences between sites were highly significant, as was the interaction between site and treatment.

Table 19 Two-way ANOVA testing for effects of site and burn treatment on total number of individuals

Source	df	SS	MS	F	P
Site	5	13691.5	2738.3	14.96	0.005 **
Treatment	1	370.1	370.1	2.02	0.215
Site*Treatment	5	915.7	183.1	2.54	0.029 *
Error	348	25142.0	72.2		
Total	359	40119.4			

The mean and median number of individuals from each burn and control at each site were calculated. Comparing across all sites, the mean number of individuals on burned sites was fewer than on the non-burned (control) sites in all but one site (Harp Mountain). These results can be seen in Table 20 and Figure 17.

Table 20 Mean and median number of individuals in burn and control plots by site

Site	Mean individuals per plot (Standard Error of the Mean)		Median individuals per plot	
	BURN	CONTROL	BURN	CONTROL
Horse Cove Gap	6.3 (0.84)	9.9 (1.00)	5.5	10.5
Holston Mountain	7.7 (0.52)	13.2 (1.60)	7	13
Buffalo Mountain	9.1 (0.89)	14.7 (1.12)	10	13
Flatwoods SS	24.5 (2.47)	24.7 (3.15)	21.5	22
Harp Mountain	7.9 (1.86)	4.6 (1.41)	4	2
Flatwoods NS	7.1 (0.64)	7.9 (0.61)	6.5	8

The means and medians for total number of individuals (abundance) were also calculated for each site and then compared using a paired t-test and a Mann-Whitney test, respectively. Both tests show a highly significant decrease in the number of individuals at the burn versus the control at three sites: Horse Cove Gap, Holston Mountain, and Buffalo Mountain. The calculated P-value for each site can be seen in Table 21.

Table 21 Paired t-test and Mann-Whitney results comparing total number of individuals by treatment at each site

Site	t-Test			Mann-Whitney		
	P-value	t	df	P-value	W	df
Horse Cove Gap	0.016 *	2.56	29	0.008 **	735.5	29
Holston Mountain	0.003 **	3.23	29	0.008 **	735.5	29
Buffalo Mountain	0.001 **	3.55	29	0.001 **	682	29
Flatwoods SS	0.862	0.17	29	0.882	925.5	29
Harp Mountain	0.205	1.30	29	0.168	1008	29
Flatwoods NS	0.357	0.94	29	0.288	843	29

Effects of Fire on Richness of Herbaceous Species

A graph displaying all sample plots and number of herbaceous species at each location is shown in Figure 18. All 6 sites had a higher mean number of herbaceous species in controls than in burns.

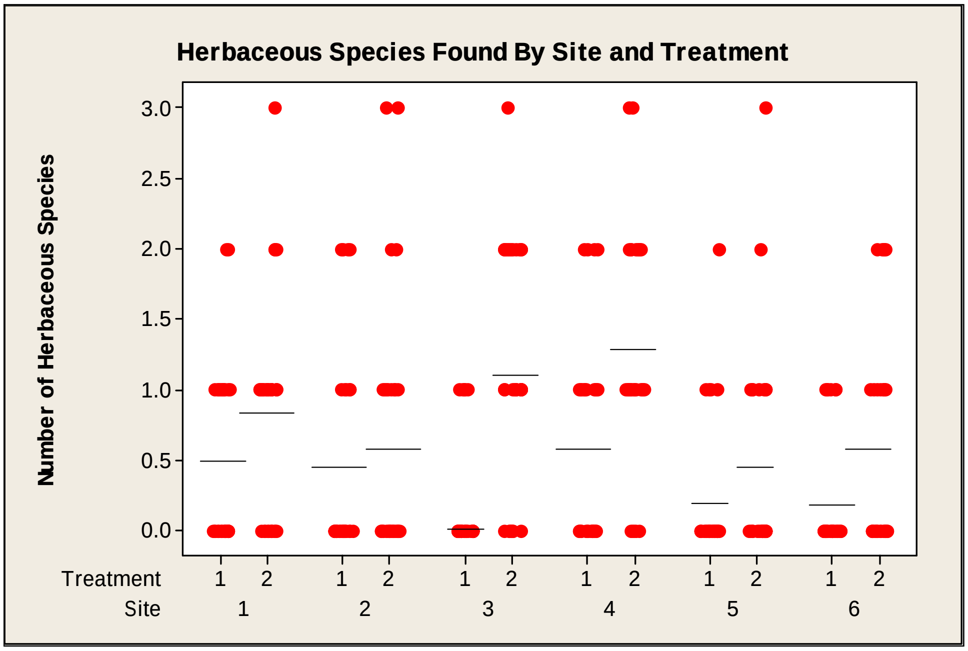

Figure 18 Herbaceous species found at each plot by site and treatment
Treatments: 1 = burned; 2 = unburned (control).
Sites: 1 = Horse Cove Gap; 2 = Holston Mountain; 3 = Buffalo Mountain;
4 = Flatwoods Southern; 5 = Harp Mountain; 6 = Flatwoods Northern
Means are indicated with black horizontal lines within the graph

The mean number of herbaceous species for the burned and control plots at each site are shown graphically Figure 19.

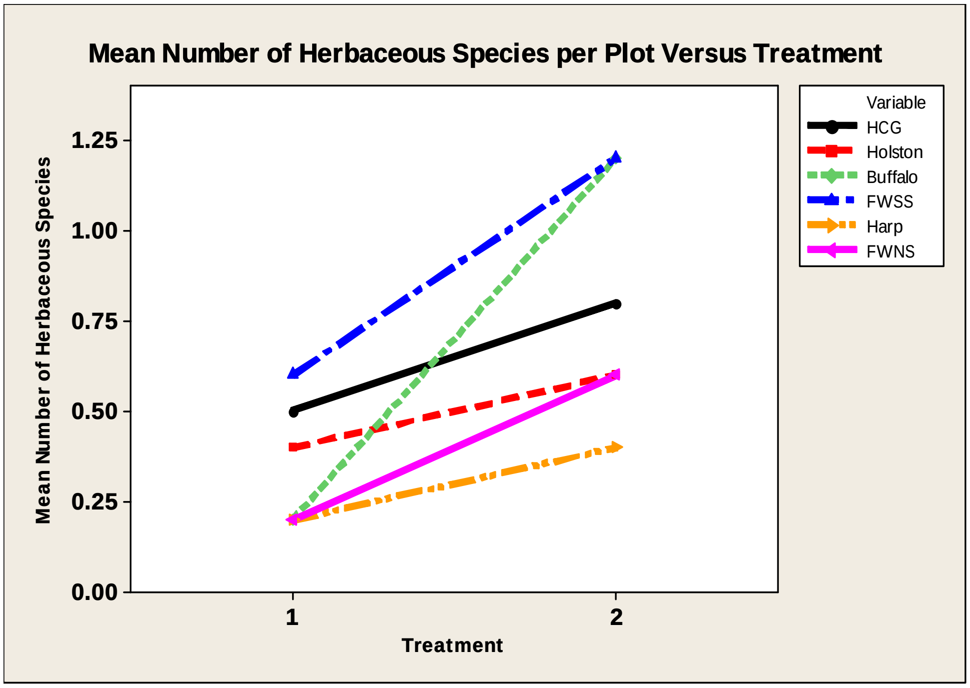

Figure 19 Mean number of herbaceous species for burned and control plots at each site
Site Abbreviations: HCG = Horse Cove Gap, Holston = Holston Mountain,
Buffalo = Buffalo Mountain, FWSS = Flatwoods Southern Section,
Harp = Harp Mountain, FWNS = Flatwoods Northern Section
Treatments: 1 = burned, 2 = unburned (control)

Differences in the number of herbaceous species at burns versus controls when compared across all sites were tested for statistical significance. Because the parameters were not normally distributed, only a nonparametric test could be implemented. Paired t-tests were not used to analyze data on herbaceous species. The Friedman test was used to compare the median values. The results of this test (df = 1, S = 6.00, P = 0.014 **) showed a highly significant decrease in the number of herbaceous species in burn versus control.

The median number of herbaceous species at each site is shown in Table 22 along with its corresponding P-value and test statistic. Three sites, Buffalo Mountain, Flatwoods Southern, and Flatwoods Northern, showed a significant difference in number of herbaceous species in burn versus control.

Table 22 Median number of herbaceous species per plot and Mann-Whitney results

Site	Median herbaceous species		Mann-Whitney		
	BURN	CONTROL	P-value	W	df
Horse Cove Gap	0	1	0.111	817	29
Holston Mountain	0	0	0.457	872	29
Buffalo Mountain	0	1	< 0.001 **	630	29
Flatwoods SS	0	1	0.003 **	726	29
Harp Mountain	0	0	0.225	854	29
Flatwoods NS	0	0	0.031 *	795	29

In order to get a non-zero measure for each site at each condition (many of the medians were zero), the mean values from each site were used to perform the Friedman test. The means for each site are shown in Table 23.

Table 23 Mean number of herbaceous species per plot

Site	Mean herbaceous species per plot (Standard Error of the Mean)	
	BURN	CONTROL
Horse Cove Gap	0.5 (0.16)	0.8 (0.14)
Holston Mountain	0.4 (0.13)	0.6 (0.16)
Buffalo Mountain	0.2 (0.07)	1.2 (0.16)
Flatwoods SS	0.6 (0.12)	1.2 (0.15)
Harp Mountain	0.2 (0.09)	0.4 (0.13)
Flatwoods NS	0.2 (0.07)	0.6 (0.14)

Effects of Fire on Herbaceous Abundance

A graph displaying all sample plots and number of herbaceous individuals for the burned and control plots at each site is shown in Figure 20.

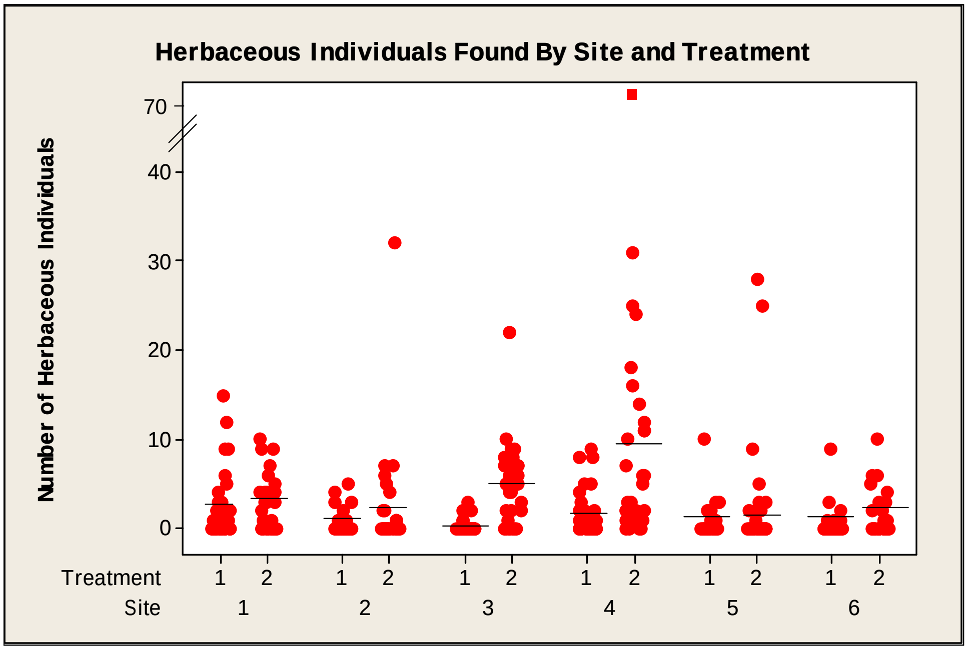

Figure 20 Herbaceous individuals found at each plot by site and treatment
Treatments: 1 = burned; 2 = unburned (control).
Sites: 1 = Horse Cove Gap; 2 = Holston Mountain; 3 = Buffalo Mountain; 4 = Flatwoods Southern; 5 = Harp Mountain; 6 = Flatwoods Northern
Means are indicated with black horizontal lines within the graph

The mean number of herbaceous individuals per plot for all 6 sites is shown in Figure 21.

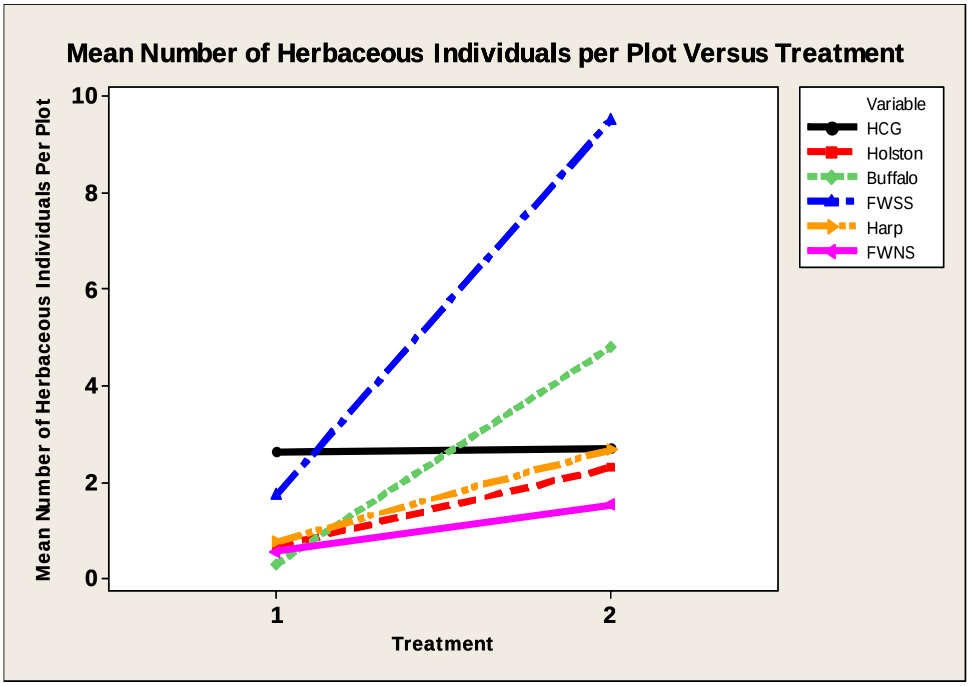

Figure 21 Mean number of herbaceous individuals for burned and control plots at each site
Site Abbreviations: Buffalo = Buffalo Mountain, HCG = Horse Cove Gap,
Holston = Holston Mountain, FWSS = Flatwoods Southern Section,
FWNS = Flatwoods Northern Section, Harp = Harp Mountain
Treatments: 1 = burned, 2 = unburned (control)

Differences in the number of herbaceous individuals at burns versus controls when compared across all sites were tested for statistical significance. Because the parameters were not normally distributed, only a nonparametric test could be implemented. Paired t-tests were not used to analyze data on herbaceous species. The Friedman test was used to compare the median values. The results of this test (df = 1, S = 5.00, P = 0.025 *) showed a significant difference in herbaceous individuals in the burn versus the control.

The medians for total number of herbaceous individuals were calculated for each site and then compared using a Mann-Whitney test. The calculated P-value for total number of individuals at each site using the Mann-Whitney test is shown in Table 24. Three of the 6 sites show a significant reduction in herbaceous individuals in the burn versus the control. At 2 of these sites (Buffalo Mountain and Flatwoods Southern Section) the reductions are highly significant.

Table 24 Median number of herbaceous individuals per plot and Mann-Whitney results

Site	Median herb. individuals		Mann-Whitney		
	BURN	CONTROL	P-value	W	df
Horse Cove Gap	1	1.5	0.604	880.5	29
Holston Mountain	0	0	0.214	844	29
Buffalo Mountain	0	5	< 0.001 **	598	29
Flatwoods SS	0	4	< 0.001 **	673	29
Harp Mountain	0	0	0.411	869.5	29
Flatwoods NS	0	0	0.038 *	799	29

In order to get a non-zero measure for each site at each condition (many of the medians were zero), the mean values from each site were used to perform the Friedman test. The means for each site is shown in Table 25.

Table 25 Mean number of herbaceous individuals per plot

Site	Mean herbaceous individuals per plot (Standard Error of the Mean)	
	BURN	CONTROL
Horse Cove Gap	2.63 (0.71)	2.70 (0.56)
Holston Mountain	0.67 (0.25)	2.30 (1.10)
Buffalo Mountain	0.30 (0.14)	4.80 (0.83)
Flatwoods SS	1.73 (0.49)	9.50 (2.58)
Harp Mountain	0.77 (0.36)	2.67 (1.23)
Flatwoods NS	0.57 (0.32)	1.53 (0.45)

Species Vulnerable to Fire

Data were tabulated to show the particular herbaceous species that were found at the 2 plots, Buffalo Mountain and Flatwoods Northern Section, where the burn effects appeared more frequent. Frequency of the most common herbs in the Buffalo Mountain site is shown in Figure 22.

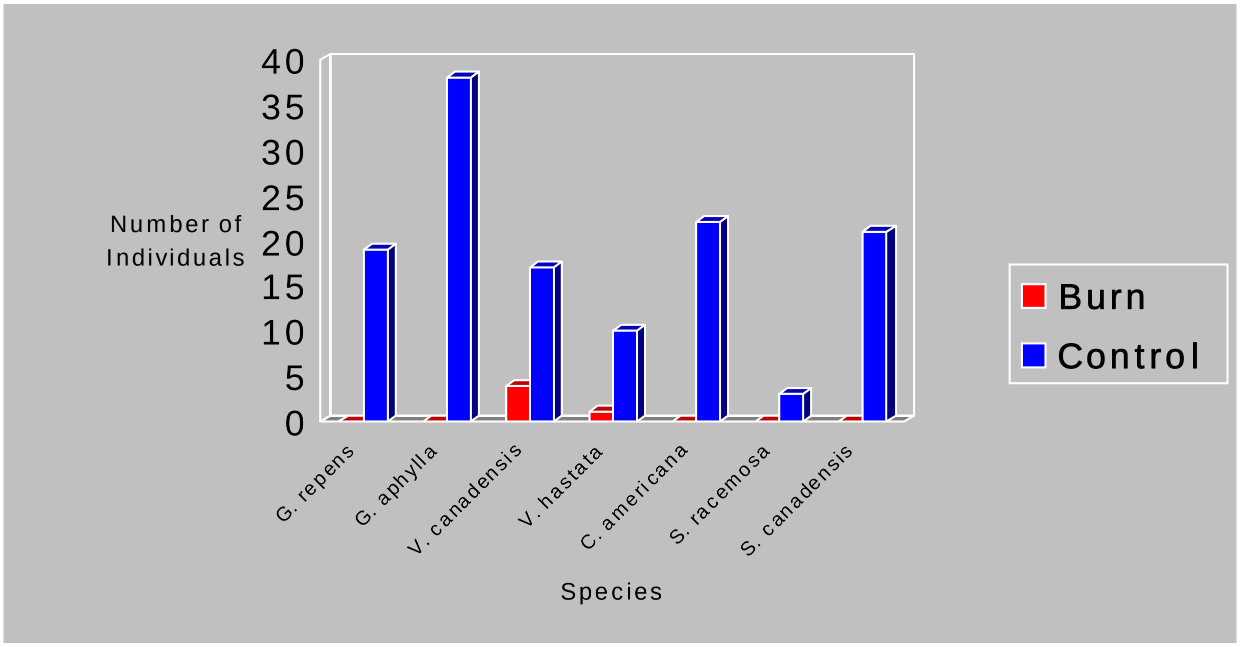

Figure 22 Number of individuals of the most common herbaceous species at Buffalo Mountain

A second site, Flatwoods NS, also shows several herbaceous species that are impacted by fire. A representative graph is shown in Figure 23.

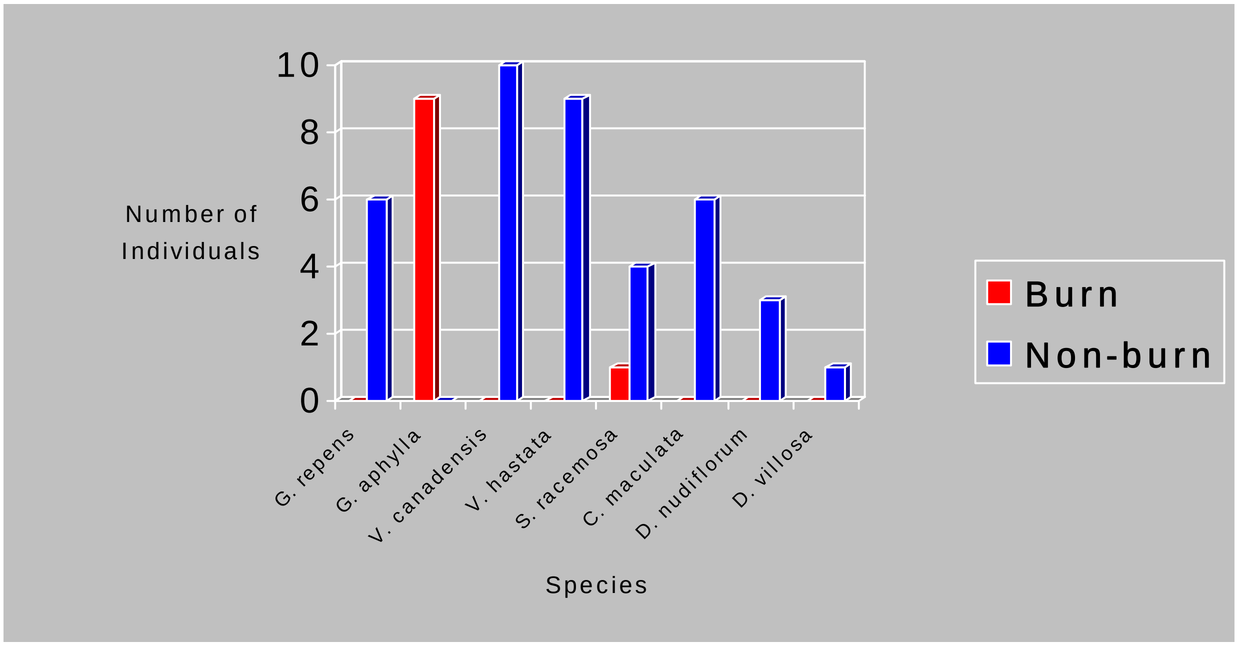

Figure 23 Number of individuals of the most common herbaceous species at Flatwoods NS

The most common herbaceous species include several violets, an orchid, and several other species. The total number of occurrences in burned and control plots across all 6 sites are shown in Table 26.

Table 26 Number of occurrences for herbaceous species at burned and control plots across all six sites

Species	Burn	Control
Chimaphila maculate	0	6
Conopholis americana	0	51
Desmodium nudiflorum	0	10
Dioscorea villosa	0	3
Galax aphylla	52	63
Goodyera repens	20	46
Sanguinaria canadensis	7	299
Smilacena racemosa	5	39
Viola canadensis	17	47
Viola hastata	10	36

Some of the very high numbers for species such as bloodroot (*Sanguinaria canadensis*) may be because of proliferations of rhizomatous colonies.

Many of the herbaceous perennial species that appear to have been eliminated by fire are myrmecochorous – their seeds are dispersed by ants. Comparisons of the number of individuals for these myrmecochorous species are given in the Table 27.

Table 27 Number of individuals of *Viola canadensis*, *Viola hastata*, and *Sanguinaria canadensis* by site and treatment

	Viola canadensis		*Viola hastata*		*Sanguinaria canadensis*	
Site	Burn	Control	Burn	Control	Burn	Control
Horse Cove Gap	7	0	3	2	6	19
Holston Mountain	3	11	1	9	0	0
Buffalo Mountain	4	17	1	10	0	21
Flatwoods SS	0	2	5	3	0	232
Harp Mountain	3	7	0	3	1	27
Flatwoods NS	0	10	0	9	0	0
Total	17	47	10	36	7	299

CHAPTER 4

DISCUSSION

This study demonstrated that prescribed burns can have adverse effects on the mesic mixed hardwood forests of the southern Appalachians. Significant differences in physical, chemical, and biotic aspects of the forest floor were documented for burned areas versus their matched controls across 6 highly variable sites. Reductions in soil pH, moisture and, most significantly, leaf litter are very likely clear direct effects of prescribed forest fires. More importantly, this study clearly demonstrates the negative impact of fire upon the native herbaceous layer of the southern Appalachian mesic hardwood forests. Burned sites had markedly fewer herb species and lower average numbers of individuals than their corresponding unburned sites. Prescribed fires significantly reduced herbaceous species in 3 of the 6 sites and reduced the number of herbaceous individuals in 2 out of the 6 sites. Overall plant abundance (including woody plants) was also significantly reduced in 3 of the 6 sites. Moreover, the species most affected by fire are the wildflower species most characteristic of the moist southern Appalachian forest - rattlesnake plantain orchid (*Goodyera repens*), bloodroot (*Sanguinaria canadensis*), wintergreen, false Solomon's seal (*Smilacena racemosa*), and other popular spring-blooming flowers. Many species present in control sites were absent altogether from burned sites. These 3 sites were the oldest burns (burned in 1998).

Leaf litter, canopy cover, soil moisture and soil pH all were slightly affected by the changes brought about by fire. These findings confirm published studies which show similar negative impacts of fire on soil pH (Boerner et al. 2000), soil moisture (Hutchinson and Iverson 2002), and litter depth (Trammell et al. 2001). Leaf litter may be a key factor in the survival of many herbaceous species of the forest floor because it provides shade to their roots and rhizomes, moderates soil temperatures, and conserves soil moisture. Moreover, leaf litter provides critical habitat for soil-dwelling invertebrates, including ants, and vertebrates, such as salamanders. (Dress and Boerner 2004). There was only 1 site, the Horse Cove Gap site, in which the leaf litter depth is greater in the burn (7.24 cm) than in the control (6.66 cm).

Soil moisture was lower by 1 to 6 percentage points in all but 1 of the 6 sites. The 1 exception showed only a small increase, of 1% in soil moisture value. Reductions in soil moisture have been shown to reduce the survival of the vulnerable native spring flowering perennials of the mesic hardwood forest (McLachlan and Bazely 2000).

Canopy cover was not expected to change considering prescribed fires burn at low intensities along the ground. Differences in canopy cover may represent different forest types.

When evaluating the effects of fire on the total number of all species, only the Buffalo Mountain site was significantly different.

Unlike the results for total number of species, 3 of the 6 sites were significantly different for the total number of individuals. As seen in Table 21, Buffalo Mountain, Holston Mountain, and Horse Cove Gap all had significantly fewer species in burned sites. These 3 sites were all in the group of older burns. Time may have allowed plants to become established and out-compete other plants; therefore, keeping numbers of individuals low. The more recently burned sites, Flatwoods Southern Section, Flatwoods Northern Section, and Harp Mountain, did not show any significance or trends. There were, however significant differences between sites for total species and total individuals as seen in Tables 15 and 19. It is well recognized that the effects of burns can be very site-specific, because of the many variables that influence fire outcomes (Franklin et al. 1997; Elliot et al. 1999).

Although the perennial spring wildflowers are a most conspicuous and charismatic aspect of the eastern montaine forests, previous studies of post-burn vegetational changes in the southern Appalachians have not addressed this essential component of our forests' native vegetation (Elliot et al. 1999; Kuddes-Fischer and Arthur 2002). The median numbers of herbaceous species were significantly fewer in burned sites for 3 out of the 6 sites (Table 22). Only 1 of these sites, Buffalo Mountain, is in the group of older burns. The other 2 sites, Flatwoods NS and Flatwoods SS were more recently burned sites. These sites also had a more rocky soil than most of the other sites.

The number of herbaceous individuals was also significantly reduced by prescribed burns. The Mann-Whitney comparison of medians (Table 24) showed a significant difference in the same 3 sites (Buffalo Mountain, Flatwoods NS, and Flatwoods SS).

It appears that herbaceous plant diversity and abundance do not fully recover following a prescribed burn, even after periods of up to 6 years (Buffalo Mountain was a 6 year old burn with almost no recovery of herbaceous elements). Some herbaceous species were not found at all after a burn, whereas they were found in their non-burned counterparts. Some absent species included *Goodyera repens* (rattlesnake plantain), *Smilacina racemosa* (false Solomon's seal), and *Sanguinaria canadensis* (bloodroot), all of which are indicators of moist woods and are not adapted to a regular fire regime. *Goodyera repens,* an orchid, is listed in Tennessee as a species of “Special Concern.” It may be that these species are not adapted to fire, which would not be unexpected, given the mesic conditions of the southern Appalachians. Most of these fragile herbs have soft rhizomes (shallow ground-stems) near the surface which are unprotected from fire in the litter layer.

Only 1 site, Buffalo Mountain, showed a significant reduction in total number of species. Frequency of the occurrence of the most common herbs in the Buffalo Mountain site is shown in Figure 22. This chart shows the striking affects of prescribed fire on the herbaceous layer. Herbaceous species in 6 genera were decimated by the managed fires. Five of these - *Goodyera*, *Galax*, *Sanguinaria*, *Smilacina*, and *Conopholis* appear to have been eliminated entirely from the burned sites. Of these 6 herbaceous genera only species of *Viola* (violets) were found in the burned sites. The very high number of individuals for *Galax aphylla* may be because of the rhizomatous habit of this species, which develops colonies from underground stems.

A second site which demonstrated the profound impact of fire on herbaceous perennial species is the Flatwoods NS site. Five of the 7 genera present in the unburned control were entirely absent from the burned site. Unlike the Buffalo Mountain site, representatives from Violaceae, *Viola hastate,* and *Viola canadensis* were found in the control but not found in the burn. This pattern was also found for *Goodyera repens*, *Chimaphila maculata* (spotted wintergreen), *Desmodium nudiflorum* (tickseed*)*, and *Dioscorea villosa* (wild yam). The 1 herbaceous species that had a greater number of individuals on the burned sites was *Galax aphylla*. This rhizomatous (underground) stems of *Galax* may survive some fires, and subsequently may grow more vigorously because of increased nutrients from the ash, reduced competition, and increased sunlight because of fire clearing of other herbs and shrubs.

Many of the herbaceous perennial species that appear to have been eliminated by fire are myrmecochorous - their seeds are dispersed by ants. *Viola hastata*, *Viola canadensis*, and *Sanguinaria canadensis* are all myrmecochorous and bear lipid bodies ("elaiosomes") on their seeds. Ants carry these seeds to their nests and consume the elaiosomes, thus providing the plant with dispersal to a favorable site (Handel et al. 1981). The extreme vulnerability of ant-dispersed spring flowering ephemeral herbs to disturbance has been reported (McLachlin and Bazely 2000). Furthermore, the very low dispersal rates of these species (less than 1 meter per year on average) suggests that these attractive woodland wildflower species may not return to disturbed or burned sites or do so only slowly. Matlack (1994) suggested that over time, these species may be extirpated from regrowth forests because of their extremely limited dispersal rates.

Whereas wind, birds, and mammals can disperse seeds at great distances, ants travel relatively short distances to disperse seeds. This may explain why these herbs did not reestablish in the previously burned forest. Other species that have their seeds dispersed by wind, such as *Acer spp*., *Liriodendron tulipifera* and *Robinia pseudoacacia*, appear to establish themselves well following a prescribed burn. Species with seeds dispersed by vertebrates, such as using birds and mammals for example, *Quercus*, *Toxicodendron radicans*, and *Vaccinium pallida*, help to quickly establish following a prescribed fire. The populations of these species were not dramatically affected by fire.

The impact of fire on woodland perennials reflects the general vulnerability of the leaf layer or surface layer biota to relatively low temperature burns. While this study did not investigate the soil fauna, it seems likely that fire, even at controlled "low" temperatures, also has a devastating impact on communities of ants and other insects (Gagan 2002). Such effects are well documented in other studies of eastern hardwood forests (Kalisz and Powell 2000; Boerner and Dress 2004). The ecological interactions between these insects and plants are complex and often include both pollination of flowers and dispersal of seeds. There are many other organisms involved in the soil community that are vulnerable to fire. The mycorhizzal component of the forest soils is known to be of critical importance for plant growth, and though seldom investigated, it is reported that fire damages the mycorrhizal community (Tuininga and Dighton 2004).

The indirect effects of forest burning can be diverse and unexpected. Fire damages the soil algae, which causes a reduction of soil moisture because of loss of algae (Myers and Davis 2003). Fire may have reduced populations of a rare Saturnid butterflies, perhaps because of destruction of the litter layer (Severns 2003). The loss of leaf litter may also be responsible for reduced numbers of millipedes (Gagan 2002) and of reptiles (Mitchell 2000) subsequent to forest burning. Indirect effects of fire may even facilitate invasive gypsy moth colonization with consequent devastation of hardwood forests by eliminating predatory ant species that otherwise hold the gypsy moth in check (Gibbs et al. 2003). The effects of fire on these diverse members of the soil and litter community - including bacteria, fungi, and invertebrates - should be investigated further before fire is deemed safe or used as a regular forest management practice.

Prescribed burns are conducted to promote selected timber, wildlife, or forage species, but the community most highly impacted may be on the forest floor. The destructive effects of fire on the leaf litter, soil structure, microbial community, and ground fauna are most often ignored but may be critical for the survival of the forest ecosystem (Tiedemann et al. 2000). The mesic mixed-hardwood mature forests of our southern Appalachian are not fire adapted, and the maintenance of the old-growth mesic mountain forests is not compatible with fire communities (Delcourt and Delcourt 1997).

Future research should address the adverse effects of prescribed burns on the mesic forests' soil communities. Forest Service monitoring of these burns should not ignore the herbaceous plants and soil invertebrates that are most directly affected by surface-layer fires. Studies should be continued over longer time periods and should incorporate information on the post-burn treatments such as herbicide and repeated burnings that are often applied to prescribed burn areas.

It is important to understand how the herbaceous community responds to fire. Forest managers should consider herbaceous species' negative response to fire when making forest management policies and decisions. Reduced practices of prescribed fires by the U.S. Forest Service may be beneficial to the survival of some of these non-fire adapted herbs. Careful planning and surveys of local vascular plant taxa should always be employed when using prescribed fire as a silvicultural technique.

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APPENDIX
Plant Species Found by Site and Treatment

Site 1: Flatwoods SS Burn Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	18
A		Kalmia latifolia	2
A		Smilax rotundifolia	1
A	2	Acer rubrum	33
A		Kalmia latifolia	9
A		Quercus alba	1
A		Dichanthelium sp. sp.	8
A	3	Acer rubrum	9
A		Kalmia latifolia	2
A	4	Acer rubrum	17
A		Kalmia latifolia	2
A	5	Acer rubrum	7
A		Kalmia latifolia	5
A		Quercus alba	1
A		Smilax rotundifolia	1
A		Dichanthelium sp.	1
A	6	Acer rubrum	16
A		Kalmia latifolia	7
A		Smilax rotundifolia	3
A		Dichanthelium sp.	8
A		Viola hastata	1
A	7	Acer rubrum	17
A		Kalmia latifolia	6
A		Dichanthelium sp.	1
A		Smilax rotundifolia	3
A	8	Acer rubrum	7
A		Kalmia latifolia	2
A	9	Acer rubrum	41
A		Kalmia latifolia	1
A		Quercus alba	1
A		Dichanthelium sp.	3
A		Aesculus octandra	1
A	10	Acer rubrum	20
A		Dichanthelium sp.	2
B	1	Acer rubrum	15
B		Kalmia latifolia	6
B		Smilax rotundifolia	1
B		Smilacena racemosa	2
B		Robinia pseudoacacia	2
B	2	Acer rubrum	14
B		Kalmia latifolia	5
B		Quercus alba	2
B	3	Acer rubrum	21

B		Smilax rotundifolia	2
B		Dichanthelium sp.	3
B		Viola hastata	2
B	4	Acer rubrum	10
B		Kalmia latifolia	1
B		Smilax rotundifolia	2
B	5	Acer rubrum	28
B		Kalmia latifolia	4
B		Quercus alba	2
B		Oxydendrum arboreum	1
B	6	Acer rubrum	2
B		Kalmia latifolia	1
B		Quercus alba	1
B	7	Acer rubrum	10
B		Kalmia latifolia	2
B		Galax aphylla	1
B		Sassafras albidum	1
B	8	Acer rubrum	24
B		Kalmia latifolia	7
B		Sassafras albidum	1
B		Smilax rotundifolia	1
B		Toxicodendron radicans	1
B	9	Acer rubrum	18
B		Kalmia latifolia	5
B		Smilax rotundifolia	1
B	10	Acer rubrum	21
B		Kalmia latifolia	4
B		Smilax rotundifolia	1
B		Viola hastata	2
B		Liriodendron tulipifera	2
C	1	Acer rubrum	44
C		Smilax rotundifolia	1
C		Dichanthelium sp.	4
C	2	Acer rubrum	39
C		Smilax rotundifolia	1
C		Smilacena racemosa	1
C		Dichanthelium sp.	1
C	3	Acer rubrum	5
C		Smilax rotundifolia	1
C		Galax aphylla	8
C		Liriodendron tulipifera	1
C	4	Acer rubrum	32
C		Smilax rotundifolia	2
C		Liriodendron tulipifera	1
C	5	Acer rubrum	20
C		Smilax rotundifolia	1
C	6	Kalmia latifolia	1
C		Smilax rotundifolia	1
C		Cornus florida	1

C	7	Acer rubrum	11
C		Smilax rotundifolia	1
C		Sassafras albidium	1
C		Galax aphylla	5
C	8	Acer rubrum	6
C		Kalmia latifolia	1
C		Quercus alba	1
C		Oxydendron arborium	2
C	9	Acer rubrum	14
C		Smilax rotundifolia	1
C		Sassafras albidium	2
C		Cornus florida	2
C	10	Acer rubrum	4
C		Liriodendron tulipifera	1

Flatwoods SS Burn Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	20
A		Kalmia latifolia	2
A		Smilax rotundifolia	1
A	2	Acer rubrum	31
A		Kalmia latifolia	9
A		Quercus alba	1
A		Dichanthelium sp.	8
A	3	Acer rubrum	9
A		Kalmia latifolia	3
A	4	Acer rubrum	18
A		Kalmia latifolia	2
A	5	Acer rubrum	7
A		Kalmia latifolia	5
A		Quercus alba	1
A		Smilax rotundifolia	1
A		Dichanthelium sp.	1
A	6	Acer rubrum	16
A		Kalmia latifolia	8
A		Smilax rotundifolia	3
A		Dichanthelium sp.	8
A		Viola hastata	1
A	7	Acer rubrum	18
A		Kalmia latifolia	6
A		Dichanthelium sp.	1
A		Smilax rotundifolia	3
A	8	Acer rubrum	7
A		Kalmia latifolia	2
A	9	Acer rubrum	45
A		Kalmia latifolia	1
A		Quercus alba	1
A		Dichanthelium sp.	3
A		Aesculus octandra	1
A	10	Acer rubrum	20

A		Dichanthelium sp.	2
B	1	Acer rubrum	15
B		Kalmia latifolia	6
B		Smilax rotundifolia	1
B		Smilacena racemosa	2
B		Robinia pseudoacacia	2
B	2	Acer rubrum	11
B		Kalmia latifolia	5
B		Quercus alba	2
B	3	Acer rubrum	20
B		Smilax rotundifolia	2
B		Dichanthelium sp.	3
B		Viola hastata	2
B	4	Acer rubrum	10
B		Kalmia latifolia	1
B		Smilax rotundifolia	2
B	5	Acer rubrum	28
B		Kalmia latifolia	4
B		Quercus alba	2
B		Oxydendrum arboreum	1
B	6	Acer rubrum	2
B		Kalmia latifolia	1
B		Quercus alba	1
B	7	Acer rubrum	11
B		Kalmia latifolia	2
B		Galax aphylla	1
B		Smilacena racemosa	1
B	8	Acer rubrum	25
B		Kalmia latifolia	7
B		Sassafras albidum	1
B		Smilax rotundifolia	1
B		Toxicodendron radicans	1
B	9	Acer rubrum	17
B		Kalmia latifolia	6
B		Smilax rotundifolia	1
B	10	Acer rubrum	24
B		Kalmia latifolia	4
B		Smilax rotundifolia	1
B		Viola hastata	2
B		Liriodendron tulipifera	2
B		Toxicodendron radicans	1
B		Sassafras albidum	1
C	1	Acer rubrum	45
C		Smilax rotundifolia	1
C		Dichanthelium sp.	4
C	2	Acer rubrum	39
C		Smilax rotundifolia	1
C		Smilacena racemosa	1
C		Dichanthelium sp.	1

C	3	Acer rubrum	7
C		Smilax rotundifolia	1
C		Galax aphylla	8
C		Liriodendron tulipifera	1
C	4	Acer rubrum	31
C		Smilax rotundifolia	2
C		Liriodendron tulipifera	1
C	5	Acer rubrum	31
C		Smilax rotundifolia	1
C	6	Kalmia latifolia	2
C		Smilax rotundifolia	1
C		Cornus florida	1
C	7	Acer rubrum	9
C		Smilax rotundifolia	1
C		Sassafras albidium	5
C		Galax aphylla	1
C	8	Acer rubrum	6
C		Kalmia latifolia	1
C		Quercus alba	1
C		Oxydendron arborium	2
C	9	Acer rubrum	14
C		Smilax rotundifolia	1
C		Cornus florida	3
C	10	Acer rubrum	4
C		Liriodendron tulipifera	1

Flatwoods SS Control Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	12
A		Smilax bona-nox	2
A		Sanguinaria canadensis	12
A		Smilacena racemosa	1
A		Oxydendrum arboreum	1
A	2	Acer rubrum	7
A		Acer pensylvanicum	2
A		Smilacena racemosa	1
A		Smilax bona-nox	1
A		Oxydendron arboreu;m	2
A	3	Acer rubrum	7
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A	4	Acer rubrum	6
A		Smilax rotundifolia	1
A	5	Acer rubrum	7
A		Acer saccharum	2
A		Pinus strobus	1
A		Oxydendrum arboreum	1
A	6	Acer rubrum	14
A		Smilax rotundifolia	1
A		Pinus strobus	1

A		Toxicodendron radicans	1
A	7	Acer rubrum	4
A		Sanguinaria canadensis	7
A		Smilax bona-nox	2
A	8	Acer rubrum	14
A		Smilax bona-nox	4
A		Smilax rotundifolia	2
A		Toxicodendron radicans	1
A		Smilacena racemosa	1
A	9	Acer rubrum	11
A		Smilax rotundifolia	4
A		Sassafras albidium	1
A		Sanguinaria canadensis	2
A	10	Acer rubrum	9
A		Sanguinaria canadensis	24
A		Lindera benzoin	1
B	1	Acer rubrum	17
B		Acer pensylvanicum	1
B		Sanguinaria canadensis	9
B		Desmodium nudiflorum	1
B	2	Acer rubrum	12
B		Sanguinaria canadensis	1
B		Desmodium nudiflorum	2
B		Quercus rubrum	1
B		Liriodendron tulipifera	1
B	3	Acer rubrum	17
B		Acer pensylvanicum	1
B		Dioscorea villosa	1
B	4	Acer rubrum	4
B		Acer rubrum	1
B		Rhododendron maximum	1
B	5	Acer rubrum	12
B		Acer pensylvanicum	1
B		Oxydendrum arboreum	1
B		Sanguinaria canadensis	10
B	6	Acer rubrum	6
B		Sanguinaria canadensis	20
B		Tsuga canadensis	1
B	7	Acer rubrum	13
B		Smilax rotundifolia	2
B		Acer rubrum	1
B		Sanguinaria canadensis	15
B	8	Acer rubrum	6
B		Sanguinaria canadensis	2
B		Toxicodendron radicans	1
B	9	Acer rubrum	9
B		Smilax rotundifolia	1
B		Sanguinaria canadensis	3
B		Oxydendrum arboreum	1

B	10	Acer rubrum	4
B		Smilax rotundifolia	1
C	1	Acer rubrum	14
C		Tsuga canadensis	1
C		Acer pensylvanicum	2
C		Desmodium nudiflorum	1
C	2	Acer rubrum	23
C		Sanguinaria canadensis	4
C		Desmodium nudiflorum	1
C	3	Acer rubrum	18
C		Smilax rotundifolia	2
C		Sanguinaria canadensis	8
C		Goodyera repens	3
C	4	Acer rubrum	22
C		Acer rubrum	1
C		Smilacena racemosa	2
C		Sanguinaria canadensis	14
C	5	Acer rubrum	14
C		Smilax rotundifolia	1
C		Sanguinaria canadensis	5
C		Acer pensylvanicum	1
C		Dioscorea villosa	1
C	6	Acer rubrum	21
C		Sanguinaria canadensis	67
C		Tsuga canadensis	1
C	7	Acer rubrum	28
C		Smilax rotundifolia	2
C		Tsuga canadensis	1
C		Lirodendron tulipifera	2
C		Pinus strobus	1
C		Viola hastata	1
C	8	Acer rubrum	15
C		Acer pensylvanicum	1
C		Sanguinaria canadensis	29
C		Smilax bona-nox	1
C	9	Acer rubrum	14
C		Desmodium nudiflorum	2
C		Smilax rotundifolia	2
C		Viola hastata	2
C		Goodyera repens	2
C	10	Rhododendron maximum	1

Flatwoods SS Control Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	12
A		Smilax bona-nox	2
A		Sanguinaria canadensis	13
A		Smilacena racemosa	1
A		Oxydendrum arboreum	1
A	2	Acer rubrum	7

A		Acer pensylvanicum	2
A		Smilacena racemosa	1
A		Smilax bona-nox	1
A		Oxydendrum arboreum	2
A	3	Acer rubrum	8
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A	4	Acer rubrum	7
A		Smilax rotundifolia	1
A	5	Acer rubrum	7
A		Acer saccharum	2
A		Pinus strobus	1
A		Oxydendrum arboreum	1
A	6	Acer rubrum	14
A		Smilax rotundifolia	1
A		Pinus strobus	1
A		Toxicodendron radicans	1
A	7	Acer rubrum	4
A		Sanguinaria canadensis	7
A		Smilax bona-nox	2
A	8	Acer rubrum	4
A		Smilax bona-nox	4
A		Smilax rotundifolia	2
A		Toxicodendron radicans	1
A		Smilacena racemosa	1
A	9	Acer rubrum	12
A		Smilax rotundifolia	4
A		Sassafras albidium	1
A		Sanguinaria canadensis	2
A	10	Acer rubrum	9
A		Sanguinaria canadensis	24
A		Lindera benzoin	1
B	1	Acer rubrum	17
B		Acer pensylvanicum	1
B		Sanguinaria canadensis	9
B		Desmodium nudiflorum	1
B	2	Acer rubrum	12
B		Sanguinaria canadensis	1
B		Desmodium nudiflorum	2
B		Quercus rubrum	1
B		Liriodendron tulipifera	1
B	3	Acer rubrum	16
B		Acer pensylvanicum	1
B		Dioscorea villosa	1
B	4	Acer rubrum	5
B		Rhododendron maximum	1
B		Viola canadensis	2
B	5	Acer rubrum	13
B		Acer pensylvanicum	1

B		Oxydendrum arboreum	1
B		Sanguinaria canadensis	10
B		Desmodium nudiflorum	2
B		Liriodendron tulipifera	1
B	6	Acer rubrum	16
B		Sanguinaria canadensis	25
B		Tsuga canadensis	1
B	7	Acer rubrum	14
B		Smilax rotundifolia	3
B		Sanguinaria canadensis	16
B	8	Acer rubrum	6
B		Sanguinaria canadensis	2
B		Toxicodendron radicans	1
B		Smilax rotundifolia	1
B		Rhododendron maximum	1
B	9	Acer rubrum	9
B		Smilax rotundifolia	1
B		Sanguinaria canadensis	3
B		Oxydendrum arboreum	1
B	10	Acer rubrum	5
B		Smilax rotundifolia	1
B		Sanguinaria canadensis	3
C	1	Acer rubrum	15
C		Tsuga canadensis	1
C		Acer pensylvanicum	2
C		Desmodium nudiflorum	1
C	2	Acer rubrum	23
C		Sanguinaria canadensis	4
C		Desmodium nudiflorum	1
C	3	Acer rubrum	2
C		Smilax rotundifolia	2
C		Sanguinaria canadensis	5
C		Goodyera repens	3
C	4	Acer rubrum	23
C		Smilacena racemosa	2
C		Sanguinaria canadensis	16
C		Goodyera repens	1
C	5	Acer rubrum	14
C		Smilax rotundifolia	1
C		Sanguinaria canadensis	4
C		Acer pensylvanicum	1
C		Dioscorea villosa	1
C		Smilacena racemosa	1
C	6	Acer rubrum	23
C		Sanguinaria canadensis	70
C		Tsuga canadensis	1
C	7	Acer rubrum	29
C		Smilax rotundifolia	2
C		Tsuga canadensis	1

C		Lirodendron tulipifera	2
C		Pinus strobus	1
C		Viola hastata	1
C	8	Acer rubrum	15
C		Acer pensylvanicum	1
C		Sanguinaria canadensis	31
C		Smilax bona-nox	1
C	9	Acer rubrum	15
C		Desmodium nudiflorum	2
C		Smilax rotundifolia	2
C		Viola hastata	2
C		Goodyera repens	2
C	10	Rhododendron maximum	1
C		Viola canadensis	2

Horse Cove Burn Sample 1

Transect	Plot	Species	#
A	1	Kalmia latifolia	2
A		Quercus alba	1
A	2	Acer rubrum	2
A		Smilax rotundifolia	4
A	3	Smilax bona-nox	2
A		Toxicodendron radicans	1
A	4	Acer rubrum	1
A		Smilax bona-nox	1
A	5	Kalmia latifolia	1
A	6	Smilax rotundifolia	1
A		Kalmia latifolia	2
A	7	Acer rubrum	2
A		Smilax bona-nox	1
A		Sassafras albidium	1
A		Toxicodendron radicans	1
A	8	Smilax rotundifolia	4
A		Sassafras albidium	1
A		Kalmia latifolia	1
A		Goodyera repens	1
A	9	Acer rubrum	2
A	10	Sassafras albidium	1
A		Kalmia latifolia	1
B	1	Smilax rotundifolia	1
B		Kalmia latifolia	1
B		Pteridium aquilinum	1
B	2	Smilax rotundifolia	1
B		Kalmia latifolia	3
B	3	Smilax rotundifolia	1
B		Smilax bona-nox	3
B		Kalmia latifolia	1
B		Galax aphylla	12
B	4	Acer rubrum	5

B		Quercus alba	1
B		Galax aphylla	5
B		Viola hastata	3
B		Rubus occidentalis	2
B	5	Acer rubrum	1
B		Smilax rotundifolia	2
B	6	Kalmia latifolia	2
B	7	Smilax rotundifolia	2
B		Kalmia latifolia	2
B		Pteridium aquilinum	3
B	8	Acer rubrum	3
B		Sassafras albidium	1
B		Sanguinaria canadensis	6
B		Viburnum acerifolia	1
B		Viola canadensis	6
B		Pteridium aquilinum	3
B	9	Acer rubrum	3
B		Smilax rotundifolia	1
B		Kalmia latifolia	3
B	10	Smilax rotundifolia	3
B		Kalmia latifolia	2
B		Goodyera repens	6
C	1	Smilax rotundifolia	2
C		Kalmia latifolia	1
C		Galax aphylla	2
C	2	Galax aphylla	9
C		Smilax bona-nox	1
C		Quercus alba	1
C	3	Acer rubrum	2
C		Smilax rotundifolia	5
C	4	Smilax rotundifolia	1
C		Oxydendrum arboreum	3
C		Pteridium aquilinum	2
C	5	Acer rubrum	5
C		Sassafras albidium	1
C		Viola canadensis	1
C	6	Smilax rotundifolia	1
C		Smilax bona-nox	1
C		Goodyera repens	5
C	7	Kalmia latifolia	2
C		Pteridium aquilinum	3
C	8	Acer rubrum	2
C		Pteridium aquilinum	2
C		Quercus rubrum	1
C	9	Acer rubrum	1
C		Smilax rotundifolia	1
C		Smilax bona-nox	1
C		Smilacena racemosa	1
C		Pteridium aquilinum	3

C	10	Acer rubrum	1
C		Podophyllum peltatum	1
C		Sassafras albidium	1

Horse Cove Burn Sample 2

Transect	Plot	Species	#
A	1	Kalmia latifolia	2
A		Quercus alba	1
A	2	Acer rubrum	2
A		Smilax rotundifolia	4
A	3	Smilax bona-nox	2
A		Toxicodendron radicans	1
A	4	Acer rubrum	1
A		Smilax bona-nox	1
A	5	Kalmia latifolia	1
A	6	Smilax rotundifolia	1
A		Kalmia latifolia	2
A	7	Acer rubrum	2
A		Smilax bona-nox	1
A		Smilax rotundifolia	1
A		Toxicodendron radicans	1
A		Sassafras albidium	1
A	8	Smilax rotundifolia	4
A		Sassafras albidium	1
A		Kalmia latifolia	1
A		Goodyera repens	1
A	9	Acer rubrum	2
A	10	Sassafras albidium	1
A		Kalmia latifolia	1
B	1	Smilax rotundifolia	1
B		Kalmia latifolia	1
B		Pteridium aquilinum	1
B	2	Smilax rotundifolia	1
B		Kalmia latifolia	3
B	3	Smilax rotundifolia	1
B		Smilax bona-nox	3
B		Kalmia latifolia	1
B		Galax aphylla	12
B	4	Acer rubrum	5
B		Quercus alba	1
B		Galax aphylla	5
B		Viola hastata	4
B		Rubus occidentalis	1
B	5	Acer rubrum	2
B		Smilax rotundifolia	2
B	6	Kalmia latifolia	2
B	7	Smilax rotundifolia	2
B		Kalmia latifolia	2
B		Pteridium aquilinum	3

B	8	Acer rubrum	2
B		Sassafras albidium	1
B		Sanguinaria canadensis	5
B		Vibrunum	1
B		Viola canadensis	6
B		Pteridium aquilinum	3
B	9	Acer rubrum	3
B		Smilax rotundifolia	1
B		Kalmia latifolia	3
B	10	Smilax rotundifolia	3
B		Kalmia latifolia	2
B		Goodyera repens	6
C	1	Smilax rotundifolia	2
C		Kalmia latifolia	1
C		Galax aphylla	2
C	2	Galax aphylla	9
C		Smilax bona-nox	1
C		Quercus alba	1
C		Sassafras albidium	1
C	3	Acer rubrum	3
C		Smilax rotundifolia	5
C	4	Smilax rotundifolia	1
C		Oxydendrum arboreum	3
C		Pteridium aquilinum	2
C	5	Acer rubrum	5
C		Sassafras albidium	1
C		Viola canadensis	2
C	6	Smilax rotundifolia	1
C		Smilax bona-nox	1
C		Goodyera repens	5
C	7	Kalmia latifolia	3
C		Pteridium aquilinum	3
C	8	Acer rubrum	2
C		Pteridium aquilinum	2
C		Quercus rubrum	1
C	9	Acer rubrum	1
C		Smilax rotundifolia	1
C		Smilax bona-nox	1
C		Smilacena racemosa	1
C		Pteridium aquilinum	3
C	10	Acer rubrum	1
C		Podophyllum peltatum	1
C		Sassafras albidium	1

Horse Cove Control Sample 1

Transect	Plot	Species	#
A	1	Smilax rotundifolia	3
A		Sassafras albidium	1
A		Kalmia latifolia	1
A		Acer rubrum	4

A		Goodyera repens	1
A	2	Acer rubrum	5
A		Galax aphylla	3
A		Vaccinium pallidum	1
A	3	Acer rubrum	4
A		Sanguinaria canadensis	2
A		Oxydendrum arboreum	1
A		Kalmia latifolia	1
A	4	Kalmia latifolia	1
A	5	Acer pensylvanicum	1
A		Quercus alba	1
A	6	Acer rubrum	5
A		Smilax rotundifolia	1
A		Sassafras albidium	1
A		Galax aphylla	3
A	7	Acer rubrum	1
A		Smilax rotundifolia	2
A		Vaccinium pallidum	1
A	8	Acer rubrum	1
A		Toxicodendron radicans	1
A		Oxydendrum arboreum	1
A		Viola hastata	2
A		Cypripedium reginae	1
A	9	Acer rubrum	9
A		Smilax rotundifolia	2
A		Quercus rubrum	1
A	10	Acer rubrum	3
A		Smilax rotundifolia	2
A		Smilax bona-nox	1
B	1	Acer rubrum	7
B		Smilax bona-nox	1
B		Galax aphylla	2
B		Goodyera repens	4
B		Cypripedium reginae	1
B	2	Acer rubrum	5
B		Acer pensylvanicum	1
B		Galax aphylla	5
B	3	Acer rubrum	3
B		Kalmia latifolia	1
B	4	Acer rubrum	4
B		Smilax rotundifolia	5
B		Goodyera repens	2
B		Vaccinium pallidum	1
B	5	Acer rubrum	9
B		Sanguinaria canadensis	8
B	6	Acer rubrum	5
B		Sanguinaria canadensis	7
B		Liriodendron tulipifera	1
B	7	Acer rubrum	3

B		Smilax rotundifolia	1
B		Smilax bona-nox	2
B		Smilacena racemosa	1
B		Sassafras albidium	1
B	8	Acer rubrum	8
B		Kalmia latifolia	1
B		Vaccinium pallidum	1
B	9	Smilax rotundifolia	1
B		Kalmia latifolia	1
B	10	Acer rubrum	2
B		Quercus alba	1
B		Smilacena racemosa	1
C	1	Smilax rotundifolia	1
C		Kalmia latifolia	1
C	2	Acer rubrum	2
C		Lindera benzoin	1
C		Smilacena racemosa	2
C		Goodyera repens	1
C		Cypripedium reginae	1
C	3	Acer rubrum	1
C		Smilax bona-nox	1
C	4	Acer rubrum	6
C		Acer pensylvanicum	1
C		Smilax rotundifolia	1
C		Goodyera repens	4
C		Sassafras albidium	1
C	5	Acer rubrum	5
C		Smilax rotundifolia	2
C		Lindera benzoin	1
C	6	Acer rubrum	6
C		Acer pensylvanicum	1
C		Smilax rotundifolia	1
C		Smilax bona-nox	1
C	7	Acer rubrum	11
C		Kalmia latifolia	2
C		Galax aphylla	4
C	8	Acer rubrum	8
C		Smilax bona-nox	2
C		Galax aphylla	3
C	9	Acer rubrum	6
C		Galax aphylla	4
C		Goodyera repens	1
C		Quercus alba	2
C	10	Acer rubrum	1
C		Sassafras albidium	2
C		Smilax rotundifolia	2
C		Sanguinaria canadensis	2

Horse Cove Control Sample 2

Transect	Plot	Species	#

A	1	Smilax rotundifolia	3
A		Sassafras albidium	1
A		Kalmia latifolia	1
A		Acer rubrum	5
A		Goodyera repens	1
A	2	Acer rubrum	5
A		Galax aphylla	6
A		Vaccinium pallidum	1
A	3	Acer rubrum	5
A		Sanguinaria canadensis	3
A		Oxydendrum arboreum	1
A		Kalmia latifolia	2
A	4	Kalmia latifolia	1
A	5	Acer pensylvanicum	1
A		Quercus alba	1
A	6	Acer rubrum	6
A		Smilax rotundifolia	1
A		Sassafras albidium	1
A		Galax aphylla	4
A	7	Acer rubrum	1
A		Smilax rotundifolia	2
A		Vaccinium pallidum	1
A		Smilax bona-nox	1
A	8	Acer rubrum	1
A		Toxicodendron radicans	1
A		Oxydendrum arboreum	1
A		Viola hastata	2
A		Cypripedium reginae	1
A	9	Acer rubrum	13
A		Smilax rotundifolia	2
A		Quercus rubrum	1
A		Galax aphylla	1
A	10	Acer rubrum	3
A		Smilax rotundifolia	2
A		Smilax bona-nox	2
B	1	Acer rubrum	10
B		Smilax bona-nox	1
B		Galax aphylla	5
B		Goodyera repens	4
B		Cypripedium reginae	1
B	2	Acer rubrum	5
B		Acer pensylvanicum	1
B		Galax aphylla	4
B	3	Acer rubrum	6
B		Kalmia latifolia	1
B	4	Acer rubrum	4
B		Smilax rotundifolia	2
B		Goodyera repens	2
B		Vaccinium pallidum	1

B	5	Acer rubrum	10
B		Sanguinaria canadensis	9
B	6	Acer rubrum	5
B		Sanguinaria canadensis	9
B		Liriodendron tulipifera	1
B	7	Acer rubrum	3
B		Smilax rotundifolia	1
B		Smilax bona-nox	2
B		Smilacena racemosa	1
B		Sassafras albidium	1
B	8	Acer rubrum	10
B		Kalmia latifolia	1
B		Vaccinium pallidum	1
B	9	Smilax rotundifolia	1
B		Kalmia latifolia	1
B	10	Acer rubrum	2
B		Quercus alba	1
B		Smilacena racemosa	1
C	1	Smilax rotundifolia	1
C		Kalmia latifolia	1
C	2	Acer rubrum	3
C		Lindera benzoin	1
C		Smilacena racemosa	2
C		Goodyera repens	1
C		Cypripedium reginae	1
C	3	Acer rubrum	1
C		Smilax bona-nox	1
C	4	Acer rubrum	7
C		Acer pensylvanicum	1
C		Smilax rotundifolia	1
C		Goodyera repens	4
C		Sassafras albidium	1
C	5	Acer rubrum	5
C		Smilax rotundifolia	2
C		Lindera benzoin	1
C	6	Acer rubrum	6
C		Acer pensylvanicum	1
C		Smilax rotundifolia	1
C		Smilax bona-nox	1
C	7	Acer rubrum	13
C		Kalmia latifolia	2
C		Galax aphylla	4
C	8	Acer rubrum	10
C		Smilax bona-nox	1
C		Galax aphylla	3
C	9	Acer rubrum	6
C		Galax aphylla	6
C		Goodyera repens	1
C		Quercus alba	2

C	10	Acer rubrum	2
C		Sassafras albidium	2
C		Smilax rotundifolia	2
C		Sanguinaria canadensis	4

Flatwoods NS Burn Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	1
A		Pinus strobus	1
A		Toxicodendron radicans	4
A		Liriodendron tulipifera	1
A		Dichanthelium sp.	2
A	2	Smilax rotundifolia	1
A		Sassafras albidium	2
A		Oxydendrum arboreum	1
A		Dichanthelium sp.	2
A	3	Sassafras albidium	2
A		Toxicodendron radicans	1
A	4	Acer rubrum	1
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A	5	Smilax rotundifolia	1
A		Kalmia latifolia	1
A	6	Smilax rotundifolia	1
A		Quercus rubrum	1
A		Morus alba	1
A	7	Acer rubrum	3
A		Liriodendron tulipifera	1
A		Quercus alba	1
A	8	Acer rubrum	3
A	9	Acer rubrum	8
A	10	Smilax rotundifolia	5
B	1	Acer rubrum	1
B		Smilax rotundifolia	6
B		Toxicodendron radicans	1
B		Dichanthelium sp.	3
B	2	Smilax rotundifolia	2
B		Sassafras albidium	1
B		Liriodendron tulipifera	1
B		Toxicodendron radicans	1
B	3	Acer rubrum	2
B		Toxicodendron radicans	2
B		Lindera benzion	1
B	4	Acer rubrum	4
B		Smilax rotundifolia	1
B		Sassafras albidium	2
B		Lindera benzion	1
B		Toxicodendron radicans	1
B		Vaccinium pallidum	3
B	5	Smilax rotundifolia	2

B		Sassafras albidium	1
B		Lindera benzion	1
B		Liriodendron tulipifera	1
B		Toxicodendron radicans	2
B	6	Acer rubrum	4
B		Smilax rotundifolia	1
B		Sassafras albidium	1
B		Toxicodendron radicans	1
B	7	Smilax rotundifolia	1
B		Sassafras albidium	1
B		Lindera benzion	1
B		Vaccinium pallidum	1
B	8	Smilax rotundifolia	1
B		Quercus alba	1
B		Oxydendrum arboreum	1
B	9	Acer rubrum	2
B		Kalmia latifolia	1
B		Liriodendron tulipifera	1
B		Lindera benzion	1
B		Toxicodendron radicans	2
B	10	Smilax rotundifolia	3
B		Viburnum acerifolia	1
C	1	Acer rubrum	9
C		Lindera benzion	1
C		Quercus alba	1
C	2	Acer rubrum	4
C		Smilax rotundifolia	2
C		Oxydendrum arboreum	1
C	3	Acer rubrum	3
C		Smilax rotundifolia	2
C		Quercus alba	1
C		Viburnum acerifolia	6
C		Pinus strobus	2
C	4	Acer rubrum	5
C		Lindera benzion	2
C		Pinus strobus	2
C		Toxicodendron radicans	1
C	5	Viburnum acerifolia	5
C		Magnolia fraseri	1
C	6	Kalmia latifolia	1
C		Viburnum acerifolia	6
C	7	Viburnum acerifolia	2
C		Lindera benzion	2
C		Sassafras albidium	1
C		Liriodendron tulipifera	1
C	8	Acer rubrum	7
C		Viburnum acerifolia	6
C		Sassafras albidium	1
C	9	Acer rubrum	2

C		Smilax rotundifolia	4
C		Smilacena racemosa	1
C	10	Smilax rotundifolia	3
C		Sassafras albidium	1
C		Lindera benzion	1
C		Galax aphylla	9

Flatwoods NS Burn Sample2

Transect	Plot	Species	#
A	1	Acer rubrum	1
A		Pinus strobus	1
A		Toxicodendron radicans	4
A		Liriodendron tulipifera	1
A		Dichanthelium sp.	2
A	2	Smilax rotundifolia	1
A		Sassafras albidium	2
A		Oxydendrum arboreum	1
A		Dichanthelium sp.	1
A	3	Sassafras albidium	1
A		Toxicodendron radicans	1
A	4	Acer rubrum	1
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A	5	Smilax rotundifolia	1
A		Kalmia latifolia	1
A	6	Smilax rotundifolia	1
A		Quercus rubrum	1
A		Morus alba	1
A	7	Acer rubrum	3
A		Liriodendron tulipifera	1
A		Quercus alba	1
A	8	Acer rubrum	3
A	9	Acer rubrum	7
A	10	Smilax rotundifolia	4
B	1	Acer rubrum	1
B		Smilax rotundifolia	6
B		Toxicodendron radicans	1
B		Dichanthelium sp.	3
B	2	Smilax rotundifolia	2
B		Sassafras albidium	1
B		Liriodendron tulipifera	1
B		Toxicodendron radicans	1
B	3	Acer rubrum	2
B		Toxicodendron radicans	2
B		Lindera benzion	1
B	4	Acer rubrum	4
B		Smilax rotundifolia	1
B		Sassafras albidium	2
B		Lindera benzion	1
B		Toxicodendron radicans	1

B		Vaccinium pallidum	3
B	5	Smilax rotundifolia	2
B		Sassafras albidium	1
B		Lindera benzion	1
B		Liriodendron tulipifera	1
B		Toxicodendron radicans	2
B	6	Acer rubrum	4
B		Smilax rotundifolia	1
B		Sassafras albidium	1
B		Toxicodendron radicans	1
B	7	Smilax rotundifolia	1
B		Sassafras albidium	1
B		Lindera benzion	2
B		Vaccinium pallidum	1
B	8	Smilax rotundifolia	1
B		Quercus alba	1
B		Oxydendrum arboreum	1
B	9	Acer rubrum	2
B		Kalmia latifolia	1
B		Liriodendron tulipifera	1
B		Lindera benzion	1
B		Toxicodendron radicans	2
B	10	Smilax rotundifolia	3
B		Viburnum acerifolia	1
C	1	Acer rubrum	9
C		Lindera benzion	1
C		Quercus alba	1
C	2	Acer rubrum	3
C		Smilax rotundifolia	2
C		Oxydendrum arboreum	1
C		Viola canadensis	1
C	3	Acer rubrum	3
C		Smilax rotundifolia	2
C		Quercus alba	2
C		Viburnum acerifolia	6
C		Pinus strobus	1
C	4	Acer rubrum	6
C		Lindera benzion	2
C		Pinus strobus	2
C		Toxicodendron radicans	1
C	5	Viburnum acerifolia	5
C		Magnolia fraseri	1
C	6	Kalmia latifolia	1
C		Viburnum acerifolia	6
C	7	Viburnum acerifolia	2
C		Lindera benzion	2
C		Sassafras albidium	1
C		Liriodendron tulipifera	1
C	8	Acer rubrum	7

C		Viburnum acerifolia	5
C		Sassafras albidium	1
C	9	Acer rubrum	3
C		Smilax rotundifolia	4
C		Smilacena racemosa	1
C	10	Smilax rotundifolia	3
C		Sassafras albidium	1
C		Lindera benzion	1
C		Galax aphylla	9

Flatwoods NS Control Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	3
A		Smilax rotundifolia	1
A		Sassafras albidium	2
A	2	Acer rubrum	3
A		Smilax rotundifolia	1
A	3	Acer rubrum	1
A		Smilax rotundifolia	1
A	4	Acer rubrum	6
A		Smilax rotundifolia	1
A		Pinus strobus	2
A		Viola hastata	4
A	5	Acer rubrum	1
A		Smilax rotundifolia	1
A	6	Acer rubrum	2
A		Smilax rotundifolia	2
A	7	Smilax rotundifolia	2
A		Sassafras albidium	1
A		Oxydendron arboreum	1
A	8	Acer rubrum	4
A		Smilax rotundifolia	3
A		Quercus alba	1
A	9	Acer rubrum	8
A		Smilax rotundifolia	3
A		Viola hastata	1
A	10	Acer rubrum	6
A		Sassafras albidium	1
A		Desmodium nudiflorum	2
B	1	Acer rubrum	6
B		Smilax rotundifolia	2
B	2	Acer rubrum	4
B		Smilax rotundifolia	2
B		Goodyera repens	3
B	3	Smilax rotundifolia	2
B		Smilacena racemosa	1
B		Viola hastata	5
B		Smilax bona-nox	1
B		Chimaphila maculata	3
B	4	Acer rubrum	3

B		Smilax rotundifolia	1
B	5	Acer rubrum	3
B		Sassafras albidium	2
B		Rubus occidentalis	1
B	6	Acer rubrum	1
B		Smilax rotundifolia	5
B	7	Acer rubrum	2
B		Smilax rotundifolia	4
B		Vaccinium pallidum	1
B	8	Acer rubrum	3
B		Smilax rotundifolia	2
B		Lindera benzoin	1
B		Viola hastata	2
B		Acer pensylvanicum	1
B	9	Acer rubrum	4
B		Smilax rotundifolia	3
B		Goodyera repens	3
B		Viola hastata	1
B		Pinus strobus	1
B		Chimaphila maculata	1
B	10	Acer rubrum	3
B		Smilax rotundifolia	2
B		Viola hastata	2
C	1	Acer rubrum	3
C		Smilax rotundifolia	1
C		Chimaphila maculata	2
C		LLH	1
C	2	Acer rubrum	1
C		Acer pensylvanicum	1
C		Smilacena racemosa	3
C		Smilax rotundifolia	1
C		Viola canadensis	3
C	3	Acer rubrum	4
C		Smilax rotundifolia	4
C	4	Acer rubrum	3
C		Viola hastata	1
C		Smilax rotundifolia	1
C		Vaccinium pallidum	2
C	5	Smilax rotundifolia	3
C		Vaccinium pallidum	1
C	6	Acer rubrum	2
C		Oxydendron arboreum	1
C	7	Acer rubrum	2
C		Smilax rotundifolia	5
C		Smilax bona-nox	1
C		Pinus strobus	1
C		Dioscorea villosa	1
C	8	Acer rubrum	5
C		Smilax rotundifolia	3

C	9	Acer rubrum	3
C		Smilax bona-nox	2
C		Sassafras albidium	1
C	10	Acer rubrum	4
C		Desmodium nudiflorum	1
		Vaccinium pallidum	2

Flatwoods NS Control Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	3
A		Smilax rotundifolia	1
A		Sassafras albidium	2
A	2	Acer rubrum	4
A		Smilax rotundifolia	1
A	3	Acer rubrum	1
A		Smilax rotundifolia	1
A	4	Acer rubrum	6
A		Smilax rotundifolia	1
A		Pinus strobus	2
A		Viola hastata	4
A	5	Acer rubrum	2
A		Smilax rotundifolia	1
A	6	Acer rubrum	3
A		Smilax rotundifolia	2
A	7	Smilax rotundifolia	2
A		Sassafras albidium	1
A		Oxydendron arboreum	1
A	8	Acer rubrum	4
A		Smilax rotundifolia	3
A		Quercus alba	1
A	9	Acer rubrum	8
A		Smilax rotundifolia	4
A		Viola hastata	1
A	10	Acer rubrum	6
A		Sassafras albidium	1
A		Desmodium nudiflorum	2
A		Viola hastata	1
B	1	Acer rubrum	6
B		Smilax rotundifolia	2
B	2	Acer rubrum	5
B		Smilax rotundifolia	2
B		Goodyera repens	5
B	3	Smilax rotundifolia	2
B		Smilacena racemosa	1
B		Viola hastata	6
B		Smilax bona-nox	1
B		Chimaphila maculata	3
B	4	Acer rubrum	3
B		Smilax rotundifolia	1
B	5	Acer rubrum	4

B		Sassafras albidium	1
B		Rubus occidentalis	1
B	6	Acer rubrum	1
B		Smilax rotundifolia	5
B	7	Acer rubrum	2
B		Smilax rotundifolia	5
B		Vaccinium pallidum	1
B	8	Acer rubrum	3
B		Smilax rotundifolia	2
B		Lindera benzoin	1
B		Viola hastata	1
B		Acer pensylvanicum	1
B	9	Acer rubrum	5
B		Smilax rotundifolia	3
B		Goodyera repens	3
B		Viola hastata	2
B		Pinus strobus	1
B		Chimaphila maculata	1
B	10	Acer rubrum	4
B		Smilax rotundifolia	2
B		Viola hastata	2
C	1	Acer rubrum	3
C		Smilax rotundifolia	1
C		Chimaphila maculata	2
C		LLH	1
C	2	Acer rubrum	1
C		Acer pensylvanicum	1
C		Smilacena racemosa	3
C		Smilax rotundifolia	2
C		Viola canadensis	3
C	3	Acer rubrum	4
C		Smilax rotundifolia	3
C	4	Acer rubrum	3
C		Viola hastata	1
C		Smilax rotundifolia	1
C		Vaccinium pallidum	2
C	5	Smilax rotundifolia	3
C		Vaccinium pallidum	1
C	6	Acer rubrum	4
C		Oxydendron arboreum	1
C	7	Acer rubrum	2
C		Smilax rotundifolia	5
C		Smilax bona-nox	1
C		Pinus strobus	1
C		Dioscorea villosa	2
C	8	Acer rubrum	7
C		Smilax rotundifolia	4
C	9	Acer rubrum	3
C		Smilax bona-nox	2

C		Sassafras albidium	1
C	10	Acer rubrum	5
C		Desmodium nudiflorum	1
C		Vaccinium pallidum	2

Buffalo Mountain Control Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	9
A		Smilax rotundifolia	2
A		Sassafras albidium	3
A		Galax aphylla	3
A	2	Acer rubrum	6
A		Smilax rotundifolia	1
A		Galax aphylla	4
A		Goodyera repens	2
A		Acer pensylvanicum	1
A	3	Acer rubrum	10
A		Kalmia latifolia	1
A		Liriodendron tulipifera	1
A	4	Acer rubrum	6
A		Lindera benzoin	1
A		Galax aphylla	7
A	5	Acer rubrum	2
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A		Quercus alba	1
A	6	Smilax rotundifolia	2
A		Kalmia latifolia	1
A	7	Acer rubrum	2
A		Lindera benzoin	2
A		Viola canadensis	2
A		Viola hastata	3
A	8	Acer rubrum	8
A		Acer pensylvanicum	1
A		Sassafras albidium	2
A		Smilax bona-nox	1
A	9	Acer rubrum	7
A		Smilax rotundifolia	4
A		Goodyera repens	3
A	10	Kalmia latifolia	3
A		Viola hastata	2
B	1	Acer rubrum	4
B		Smilax rotundifolia	2
B		Galax aphylla	2
B	2	Acer rubrum	11
B		Smilax rotundifolia	4
B		Lindera benzoin	2
B		Oxydendrum arboreum	1
B		Conopholis americana	9
B	3	Acer rubrum	14

B		Smilax rotundifolia	2
B		Sassafras albidium	1
B	4	Acer rubrum	5
B		Acer pensylvanicum	1
B		Oxydendrum arboreum	1
B		Goodyera repens	2
B		Viola hastata	2
B	5	Acer rubrum	7
B		Smilax rotundifolia	1
B		Smilax bona-nox	4
B		Goodyera repens	3
B	6	Acer rubrum	8
B		Smilax rotundifolia	3
B		Smilacena racemosa	2
B		Viola canadensis	3
B	7	Acer rubrum	4
B		Rhododendron	1
B	8	Acer rubrum	6
B		Acer pensylvanicum	1
B		Smilax rotundifolia	7
B	9	Acer rubrum	3
B		Smilax rotundifolia	2
B		Galax aphylla	6
B		Smilacena racemosa	1
B	10	Acer rubrum	4
B		Viola canadensis	2
B		Conopholis americana	6
B		Oxydendrum arboreum	1
C	1	Acer rubrum	12
C		Smilax rotundifolia	2
C		Conopholis americana	7
C		Goodyera repens	3
C	2	Acer rubrum	6
C		Smilax rotundifolia	3
C		Viola canadensis	1
C		Oxydendrum arboreum	1
C	3	Acer rubrum	6
C		Viola canadensis	3
C		Goodyera repens	2
C		Betula alleghaniensis	1
C	4	Acer rubrum	3
C		Smilax rotundifolia	1
C		Galax aphylla	7
C		Liriodendron tulipifera	1
C		Quercus velutina	1
C	5	Acer rubrum	9
C		Sanguinaria canadensis	4
C		Viola canadensis	2
C		Smilax bona-nox	2

C		Lindera benzoin	1
C	6	Acer rubrum	10
C		Goodyera repens	2
C		Sassafras albidium	2
C	7	Acer rubrum	8
C		Smilax rotundifolia	2
C		Sassafras albidium	2
C		Viola hastata	1
C	8	Acer rubrum	9
C		Sanguinaria canadensis	3
C		Goodyera repens	2
C		Oxydendrum arboreum	1
C	9	Acer rubrum	1
C		Smilax rotundifolia	4
C		Smilax bona-nox	2
C		Galax aphylla	9
C		Sanguinaria canadensis	11
C	10	Acer rubrum	6
C		Smilax rotundifolia	1
C		Sanguinaria canadensis	3
C		Viola hastata	2
C		Viola canadensis	4

Buffalo Mountain Control Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	11
A		Smilax rotundifolia	2
A		Sassafras albidium	3
A		Galax aphylla	5
A	2	Acer rubrum	7
A		Smilax rotundifolia	1
A		Galax aphylla	4
A		Goodyera repens	3
A		Acer pensylvanicum	1
A	3	Acer rubrum	9
A		Kalmia latifolia	1
A		Liriodendron tulipifera	3
A	4	Acer rubrum	8
A		Lindera benzoin	1
A		Galax aphylla	8
A	5	Acer rubrum	4
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A		Quercus alba	1
A	6	Smilax rotundifolia	2
A		Kalmia latifolia	1
A	7	Acer rubrum	1
A		Lindera benzoin	2
A		Viola canadensis	4
A		Viola hastata	3

A	8	Acer rubrum	8
A		Acer pensylvanicum	1
A		Sassafras albidium	2
A		Smilax bona-nox	1
A	9	Acer rubrum	7
A		Smilax rotundifolia	4
A		Goodyera repens	4
A	10	Kalmia latifolia	3
A		Viola hastata	3
B	1	Acer rubrum	5
B		Smilax rotundifolia	2
B		Galax aphylla	2
B	2	Acer rubrum	14
B		Smilax rotundifolia	5
B		Lindera benzoin	2
B		Oxydendrum arboreum	1
B		Conopholis americana	9
B	3	Acer rubrum	14
B		Smilax rotundifolia	2
B		Sassafras albidium	2
B	4	Acer rubrum	6
B		Acer pensylvanicum	1
B		Oxydendrum arboreum	1
B		Goodyera repens	2
B		Viola hastata	2
B	5	Acer rubrum	8
B		Smilax rotundifolia	1
B		Smilax bona-nox	4
B		Goodyera repens	5
B	6	Acer rubrum	9
B		Smilax rotundifolia	3
B		Smilacena racemosa	2
B		Viola canadensis	4
B	7	Acer rubrum	4
B		Rhododendron	1
B	8	Acer rubrum	5
B		Acer pensylvanicum	1
B		Smilax rotundifolia	7
B	9	Acer rubrum	4
B		Smilax rotundifolia	2
B		Galax aphylla	6
B		Smilacena racemosa	1
B	10	Acer rubrum	4
B		Viola canadensis	2
B		Conopholis americana	6
B		Oxydendrum arboreum	1
C	1	Acer rubrum	12
C		Smilax rotundifolia	2
C		Conopholis americana	7

C		Goodyera repens	3
C	2	Acer rubrum	7
C		Smilax rotundifolia	3
C		Viola canadensis	2
C		Oxydendrum arboreum	1
C	3	Acer rubrum	6
C		Viola canadensis	3
C		Goodyera repens	2
C		Betula alleghaniensis	1
C	4	Acer rubrum	3
C		Smilax rotundifolia	1
C		Galax aphylla	7
C		Liriodendron tulipifera	1
C		Quercus velutina	1
C	5	Acer rubrum	8
C		Sanguinaria canadensis	4
C		Viola canadensis	1
C		Smilax bona-nox	2
C		Lindera benzoin	1
C	6	Acer rubrum	11
C		Goodyera repens	2
C		Sassafras albidium	2
C	7	Acer rubrum	8
C		Smilax rotundifolia	2
C		Sassafras albidium	2
C		Viola hastata	1
C	8	Acer rubrum	8
C		Sanguinaria canadensis	3
C		Goodyera repens	2
C		Oxydendrum arboreum	1
C	9	Acer rubrum	1
C		Smilax rotundifolia	4
C		Smilax bona-nox	2
C		Galax aphylla	9
C		Sanguinaria canadensis	13
C	10	Acer rubrum	7
C		Smilax rotundifolia	1
C		Sanguinaria canadensis	3
C		Viola hastata	2
C		Viola canadensis	4

Buffalo Mountain Burn Sample 1

Transect	Plot	Species	#
A	1	Smilax rotundifolia	1
A		Kalmia latifolia	1
A	2	Acer rubrum	9
A		Smilax rotundifolia	1
A		Quercus alba	1
A	3	Acer rubrum	6
A		Smilax rotundifolia	2

A		Sassafras albidium	1
A	4	Acer pensylvanicum	1
A		Smilax rotundifolia	3
A		Smilax bona-nox	1
A	5	Acer rubrum	12
A	6	Acer rubrum	8
A		Smilax rotundifolia	3
A	7	Acer rubrum	8
A		Smilax rotundifolia	1
A		Kalmia latifolia	1
A	8	Acer rubrum	13
A		Kalmia latifolia	1
A	9	Acer rubrum	9
A		Smilax rotundifolia	2
A	10	Acer rubrum	5
A		Kalmia latifolia	1
A		Viburnum acerifolia	1
B	1	Acer rubrum	4
B		Smilax rotundifolia	3
B	2	Kalmia latifolia	2
B	3	Acer rubrum	7
B		Quercus rubrum	1
B	4	Acer rubrum	9
B		Sassafras albidium	1
B		Viola canadensis	1
B	5	Kalmia latifolia	2
B	6	Acer rubrum	8
B		Smilax rotundifolia	1
B		Sassafras albidium	1
B		Quercus alba	1
B		Acer pensylvanicum	1
B	7	Acer rubrum	10
B		Kalmia latifolia	1
B	8	Acer rubrum	16
B	9	Smilax rotundifolia	1
B		Kalmia latifolia	1
B	10	Acer rubrum	11
C	1	Acer rubrum	4
C		Viola canadensis	2
C	2	Acer rubrum	1
C		Smilax rotundifolia	2
C		Smilax bona-nox	1
C	3	Smilax rotundifolia	3
C	4	Rhododendron maximum	1
C	5	Smilax rotundifolia	3
C		Viola hastata	1
C	6	Acer rubrum	10
C		Smilax rotundifolia	3

C	7	Acer rubrum	8
C		Smilax rotundifolia	1
C		Viola canadensis	1
C	8	Acer rubrum	6
C		Kalmia latifolia	2
C	9	Acer rubrum	10
C		Smilax rotundifolia	2
C	10	Acer rubrum	15
C		Kalmia latifolia	1

Buffalo Mountain Burn Sample 2

Transect	Plot	Species	#
A	1	Smilax rotundifolia	1
A		Kalmia latifolia	1
A	2	Acer rubrum	12
A		Smilax rotundifolia	1
A		Quercus alba	1
A	3	Acer rubrum	5
A		Smilax rotundifolia	2
A		Sassafras albidium	1
A	4	Acer pensylvanicum	1
A		Smilax rotundifolia	3
A		Smilax bona-nox	1
A	5	Acer rubrum	13
A	6	Acer rubrum	10
A		Smilax rotundifolia	3
A	7	Acer rubrum	8
A		Smilax rotundifolia	1
A		Kalmia latifolia	1
A	8	Acer rubrum	12
A		Kalmia latifolia	1
A	9	Acer rubrum	10
A		Smilax rotundifolia	2
A	10	Acer rubrum	5
A		Kalmia latifolia	1
A		Viburnum acerifolia	1
B	1	Acer rubrum	4
B		Smilax rotundifolia	3
B	2	Kalmia latifolia	2
B	3	Acer rubrum	9
B		Quercus rubrum	1
B	4	Acer rubrum	9
B		Sassafras albidium	1
B		Viola canadensis	1
B	5	Kalmia latifolia	2
B	6	Acer rubrum	8
B		Smilax rotundifolia	1
B		Sassafras albidium	1
B		Quercus alba	1

B		Acer pensylvanicum	1
B	7	Acer rubrum	13
B		Kalmia latifolia	1
B	8	Acer rubrum	17
B	9	Smilax rotundifolia	1
B		Kalmia latifolia	1
B	10	Acer rubrum	11
B		Viola hastata	2
C	1	Acer rubrum	4
C		Viola canadensis	3
C	2	Acer rubrum	1
C		Smilax rotundifolia	2
C		Smilax bona-nox	1
C	3	Smilax rotundifolia	3
C	4	Rhododendron maximum	1
C	5	Smilax rotundifolia	3
C		Viola hastata	1
C	6	Acer rubrum	9
C		Smilax rotundifolia	3
C	7	Acer rubrum	8
C		Smilax rotundifolia	1
C		Viola canadensis	2
C	8	Acer rubrum	6
C		Kalmia latifolia	2
C	9	Acer rubrum	14
C		Smilax rotundifolia	2
C	10	Acer rubrum	15
C		Kalmia latifolia	1

Holston Mountain Burn Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	12
A		Smilax rotundifolia	1
A		Smilax bona-nox	1
A	2	Acer rubrum	5
A		Goodyera repens	3
A		Viola canadensis	1
A	3	Acer rubrum	5
A		Smilax rotundifolia	1
A		Smilax bona-nox	1
A	4	Acer rubrum	4
A		Viola canadensis	1
A		Viola hastata	1
A	5	Acer rubrum	6
A		Lindera benzoin	2
A	6	Acer rubrum	2
A		Smilax rotundifolia	1
A	7	Acer rubrum	3
A		Duchesnia indica	1

A		Oxydendrum arboreum	1
A	8	Acer rubrum	5
A		Quercus rubrum	1
A		Goodyera repens	2
A		Sassafras albidium	2
A	9	Smilax rotundifolia	1
A		Carya alba	1
A	10	Smilax bona-nox	2
A		Smilax rotundifolia	1
B	1	Acer rubrum	4
B		Smilax rotundifolia	1
B	2	Acer rubrum	2
B		Quercus velutina	1
B	3	Smilax bona-nox	3
B		Parthenocissus quinquefolia	1
B		Viola canadensis	1
B		Smilax rotundifolia	1
B	4	Acer rubrum	5
B		Smilax bona-nox	3
B	5	Acer rubrum	5
B		Toxicodendron radicans	3
B	6	Acer rubrum	3
B		Carya alba	1
B	7	Acer rubrum	5
B		Oxydendrum arboreum	1
B		Sassafras albidium	1
B		Vaccinium pallidum	1
B	8	Acer rubrum	5
B		Quercus velutina	1
B	9	Toxicodendron radicans	7
B		Acer rubrum	1
B		Quercus velutina	1
B		Smilax bona-nox	1
B	10	Quercus rubrum	3
B		Toxicodendron radicans	2
C	1	Acer rubrum	1
C		Smilax rotundifolia	2
C	2	Acer rubrum	3
C		Quercus velutina	1
C		Toxicodendron radicans	1
C	3	Acer rubrum	3
C		Smilax rotundifolia	4
C		Smilax bona-nox	2
C		Sassafras albidium	1
C	4	Acer rubrum	3
C		Smilax rotundifolia	4
C	5	Acer rubrum	3
C		Smilax rotundifolia	1

C		Smilacena racemosa	3
C		Lindera benzoin	2
C	6	Acer rubrum	5
C	7	Acer rubrum	8
C		Sassafras albidium	1
C		Smilax rotundifolia	1
C	8	Acer rubrum	2
C		Smilax bona-nox	2
C	9	Acer rubrum	4
C		Sassafras albidium	1
C		Vaccinium pallidum	1
C	10	Acer rubrum	1
C		Smilax bona-nox	1
C		Sassafras albidium	1
C		Oxydendrum arboreum	1
C		Toxicodendron radicans	2

Holston Mountain Burn Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	10
A		Smilax rotundifolia	1
A		Smilax bona-nox	1
A	2	Acer rubrum	6
A		Goodyera repens	3
A		Viola canadensis	2
A	3	Acer rubrum	2
A		Smilax rotundifolia	1
A		Smilax bona-nox	1
A	4	Acer rubrum	4
A		Viola canadensis	2
A		Viola hastata	1
A	5	Acer rubrum	6
A		Lindera benzoin	2
A	6	Acer rubrum	3
A		Smilax rotundifolia	2
A	7	Acer rubrum	4
A		Duchesnia indica	1
A		Oxydendrum arboreum	1
A		Smilax rotundifolia	1
A	8	Acer rubrum	6
A		Quercus rubrum	1
A		Goodyera repens	3
A		Sassafras albidium	2
A	9	Smilax rotundifolia	2
A		Carya alba	1
A	10	Smilax bona-nox	2
A		Smilax rotundifolia	2
B	1	Acer rubrum	4
B		Smilax rotundifolia	1
B		Viola hastata	1

B	2	Acer rubrum	2
B		Quercus velutina	1
B		Quercus alba	1
B	3	Smilax bona-nox	1
B		Parthenocissus quinquefolia	1
B		Viola canadensis	1
B		Smilax rotundifolia	1
B	4	Acer rubrum	6
B		Smilax bona-nox	3
B	5	Acer rubrum	7
B		Toxicodendron radicans	3
B	6	Acer rubrum	4
B		Carya alba	1
B	7	Acer rubrum	5
B		Oxydendrum arboreum	1
B		Sassafras albidium	1
B		Vaccinium pallidum	1
B	8	Acer rubrum	7
B		Quercus velutina	1
B		Smilax bona-nox	1
B	9	Toxicodendron radicans	7
B		Acer rubrum	1
B		Quercus velutina	1
B		Smilax bona-nox	1
B		Smilax rotundifolia	1
B	10	Acer rubrum	2
B		Quercus rubrum	3
B		Toxicodendron radicans	2
C	1	Acer rubrum	2
C		Smilax rotundifolia	2
C	2	Acer rubrum	3
C		Quercus velutina	1
C		Toxicodendron radicans	1
C	3	Acer rubrum	6
C		Smilax rotundifolia	3
C		Smilax bona-nox	2
C		Sassafras albidium	1
C	4	Acer rubrum	4
C		Smilax rotundifolia	4
C		Goodyera repens	1
C	5	Acer rubrum	4
C		Smilax rotundifolia	1
C		Smilacena racemosa	4
C		Lindera benzoin	2
C	6	Acer rubrum	6
C		Smilax bona-nox	1
C	7	Acer rubrum	9
C		Sassafras albidium	1

C		Smilax rotundifolia	1
C	8	Acer rubrum	2
C		Smilax bona-nox	2
C		Smilax rotundifolia	1
C	9	Acer rubrum	5
C		Sassafras albidium	1
C		Vaccinium pallidum	1
C	10	Acer rubrum	2
C		Smilax bona-nox	1
C		Sassafras albidium	2
C		Oxydendrum arboreum	1
C		Toxicodendron radicans	2

Holston Mountain Control Sample 1

Transect	Plot	Species	#
A	1	Acer rubrum	8
A		Acer pensylvanicum	4
A		Smilax rotundifolia	2
A	2	Acer rubrum	14
A		Toxicodendron radicans	2
A		Smilacena racemosa	1
A	3	Acer rubrum	11
A		Acer pensylvanicum	1
A		Toxicodendron radicans	7
A		Smilax rotundifolia	2
A	4	Acer rubrum	4
A		Toxicodendron radicans	4
A		Quercus rubrum	1
A	5	Acer rubrum	13
A	6	Acer rubrum	9
A		Toxicodendron radicans	3
A		Viola canadensis	1
A		Smilax rotundifolia	5
A	7	Acer rubrum	8
A		Smilax bona-nox	1
A		Viola hastata	1
A	8	Acer rubrum	21
A		Smilax rotundifolia	3
A		Viola canadensis	2
A	9	Acer rubrum	5
A		Smilax rotundifolia	2
A		Lindera benzoin	1
A		Viola canadensis	2
A	10	Acer rubrum	2
A		Acer pensylvanicum	6
A		Quercus alba	1
A		Conopholis americana	29
A		Smilax rotundifolia	3
A		Viola canadensis	2
B	1	Acer rubrum	3

B		Acer pensylvanicum	1
B		Toxicodendron radicans	7
B		Smilax rotundifolia	2
B	2	Acer rubrum	3
B		Toxicodendron radicans	6
B		Smilax rotundifolia	1
B	3	Acer rubrum	5
B		Toxicodendron radicans	7
B		Smilax rotundifolia	1
B	4	Toxicodendron radicans	5
B	5	Acer rubrum	2
B		Toxicodendron radicans	1
B		Smilax rotundifolia	2
B	6	Prunus serotina	1
B		Lindera benzoin	1
B		Acer rubrum	3
B	7	Acer rubrum	2
B		Smilax rotundifolia	3
B		Parthenocissus quinquefolia	1
B	8	Prunus serotina	1
B		Smilacena racemosa	1
B		Smilax rotundifolia	1
B		Acer rubrum	3
B		Viola canadensis	3
B		Diosorea villosa	1
B	9	Acer rubrum	6
B		Goodyera repens	2
B		Viola hastata	1
B		Smilacena racemosa	3
B	10	Acer pensylvanicum	3
C	1	Acer rubrum	4
C	2	Acer rubrum	10
C		Smilax rotundifolia	4
C	3	Acer rubrum	1
C		Smilax bona-nox	1
C		Toxicodendron radicans	2
C	4	Acer rubrum	5
C		Smilax rotundifolia	2
C		Quercus rubrum	1
C	5	Acer rubrum	2
C		Acer pensylvanicum	1
C		Toxicodendron radicans	4
C	6	Acer rubrum	4
C	7	Acer rubrum	5
C		Prunus serotina	1
C		Toxicodendron radicans	3
C		Dichanthelium sp.	3
C		Viola canadensis	1

C	8	Acer rubrum	1
C		Liriodendron tulipifera	1
C		Toxicodendron radicans	2
C	9	Acer rubrum	3
C		Toxicodendron radicans	3
C		Lindera benzoin	1
C		Viola hastata	4
C	10	Acer rubrum	15
C		Smilax bona-nox	2
C		Viola hastata	4

Holston Mountain Control Sample 2

Transect	Plot	Species	#
A	1	Acer rubrum	9
A		Acer pensylvanicum	4
A		Smilax rotundifolia	2
A	2	Acer rubrum	17
A		Toxicodendron radicans	2
A		Smilacena racemosa	1
A		Smilax rotundifolia	1
A	3	Acer rubrum	9
A		Acer pensylvanicum	1
A		Toxicodendron radicans	7
A		Smilax rotundifolia	2
A	4	Acer rubrum	16
A		Toxicodendron radicans	4
A		Quercus rubrum	1
A	5	Acer rubrum	15
A	6	Acer rubrum	10
A		Toxicodendron radicans	5
A		Viola canadensis	1
A		Smilax rotundifolia	5
A	7	Acer rubrum	8
A		Smilax bona-nox	1
A		Viola hastata	1
A	8	Acer rubrum	23
A		Smilax rotundifolia	3
A		Viola canadensis	2
A	9	Acer rubrum	5
A		Smilax rotundifolia	3
A		Lindera benzoin	1
A		Viola canadensis	2
A	10	Acer rubrum	2
A		Acer pensylvanicum	6
A		Quercus alba	1
A		Conopholis americana	30
A		Smilax rotundifolia	3
A		Viola canadensis	2
B	1	Acer rubrum	3
B		Acer pensylvanicum	1

B		Toxicodendron radicans	7
B		Smilax rotundifolia	2
B	2	Acer rubrum	3
B		Toxicodendron radicans	6
B		Smilax rotundifolia	1
B	3	Acer rubrum	5
B		Toxicodendron radicans	7
B		Smilax rotundifolia	1
B	4	Toxicodendron radicans	5
B	5	Acer rubrum	2
B		Toxicodendron radicans	1
B		Smilax rotundifolia	2
B	6	Prunus serotina	1
B		Lindera benzoin	1
B		Acer rubrum	4
B	7	Acer rubrum	2
B		Smilax rotundifolia	3
B		Parthenocissus quinquefolia	1
B	8	Prunus serotina	1
B		Smilacena racemosa	2
B		Smilax rotundifolia	1
B		Acer rubrum	5
B		Viola canadensis	3
B		Dioscorea villosa	1
B	9	Acer rubrum	7
B		Goodyera repens	2
B		Viola hastata	2
B		Smilacena racemosa	3
B	10	Acer pensylvanicum	3
B		Acer rubrum	1
C	1	Acer rubrum	4
C	2	Acer rubrum	9
C		Smilax rotundifolia	4
C	3	Acer rubrum	1
C		Smilax bona-nox	2
C		Toxicodendron radicans	2
C	4	Acer rubrum	5
C		Smilax rotundifolia	2
C		Quercus rubrum	1
C	5	Acer rubrum	3
C		Acer pensylvanicum	2
C		Toxicodendron radicans	4
C	6	Acer rubrum	4
C	7	Acer rubrum	5
C		Prunus serotina	1
C		Toxicodendron radicans	3
C		Dichanthelium sp.	5
C		Viola canadensis	1

C	8	Acer rubrum	1
C		Liriodendron tulipifera	1
C		Toxicodendron radicans	2
C	9	Acer rubrum	3
C		Toxicodendron radicans	3
C		Lindera benzoin	1
C		Viola hastata	4
C	10	Acer rubrum	16
C		Smilax bona-nox	2
C		Viola hastata	5

Harp Mountain Burn Sample 1

Transect	Plot	Species	#
A	1	Liriodendron tulipifera	1
A		Acer rubrum	1
A	2	None	---
A	3	Acer rubrum	1
A	4	None	---
A	5	Smilax bona-nox	1
A	6	Acer rubrum	7
A	7	Acer rubrum	30
A	8	Smilax rotundifolia	1
A		Acer rubrum	19
A		Sassafras albidium	2
A	9	Smilax bona-nox	3
A	10	Acer rubrum	3
A		Acer pensylvanicum	1
B	1	Acer rubrum	15
B		Smilax rotundifolia	3
B	2	Acer rubrum	2
B		Smilax rotundifolia	2
B		Dichanthelium sp.	1
B		Sassafras albidium	2
B		Pteridium aquilinum	2
B	3	Acer rubrum	15
B	4	Acer rubrum	4
B		Rubus occidentalis	1
B	5	Acer rubrum	2
B	6	Pteridium aquilinum	1
B	7	Acer rubrum	5
B		Galax aphylla	1
B		Medeola virginiana	1
B	8	Acer rubrum	7
B	9	Viola canadensis	3
B		Lindera benzoin	1
B	10	Acer rubrum	3
C	1	Smilax rotundifolia	1
C		Toxicodendron radicans	1
C	2	Sanguinaria canadensis	1

C	3	Acer rubrum	12
C		Smilax rotundifolia	1
C		Goodyera repens	9
C	4	Acer rubrum	4
C		Lindera benzoin	1
C	5	None	---
C	6	Acer rubrum	1
C	7	Acer rubrum	40
C	8	Acer rubrum	5
C		Smilax rotundifolia	1
C		Sassafras albidium	2
C		Pteridium aquilinum	1
C	9	Rubus occidentalis	2
C		Pteridium aquilinum	2
C	10	None	

Harp Mountain Burn Sample 2

Transect	Plot	Species	#
A	1	Liriodendron tulipifera	1
A		Acer rubrum	1
A	2	None	---
A	3	Acer rubrum	1
A	4	None	---
A	5	Smilax bona-nox	1
A	6	Acer rubrum	8
A	7	Acer rubrum	34
A	8	Smilax rotundifolia	1
A		Acer rubrum	19
A		Sassafras albidium	2
A	9	Smilax bona-nox	3
A	10	Acer rubrum	3
A		Acer pensylvanicum	1
B	1	Acer rubrum	17
B		Smilax rotundifolia	3
B	2	Acer rubrum	2
B		Smilax rotundifolia	2
B		Dichanthelium sp.	1
B		Sassafras albidium	2
B		Pteridium aquilinum	2
B	3	Acer rubrum	16
B	4	Acer rubrum	4
B		Rubus occidentalis	1
B	5	Acer rubrum	3
B	6	Pteridium aquilinum	1
B	7	Acer rubrum	5
B		Galax aphylla	1
B		Medeola virginiana	1
B	8	Acer rubrum	10
B	9	Viola canadensis	3

B		Lindera benzoin	1
B	10	Acer rubrum	3
C	1	Smilax rotundifolia	1
C		Toxicodendron radicans	1
C	2	Sanguinaria canadensis	1
C	3	Acer rubrum	11
C		Smilax rotundifolia	1
C		Goodyera repens	10
C	4	Acer rubrum	4
C		Lindera benzoin	1
C	5	None	---
C	6	Acer rubrum	1
C	7	Acer rubrum	40
C	8	Acer rubrum	6
C		Smilax rotundifolia	1
C		Sassafras albidium	2
C		Pteridium aquilinum	1
C	9	Rubus occidentalis	2
C		Pteridium aquilinum	2
C	10	None	---

Harp Mountain Control Sample 1

Transect	Plot	Species	#
A	1	Galax aphylla	25
A	2	Acer pensylvanicum	1
A	3	Lindera benzoin	1
A	4	Smilax rotundifolia	1
A	5	Smilax bona-nox	3
A		Kalmia latifolia	1
A	6	None	---
A	7	Smilax rotundifolia	1
A	8	Sassafras albidium	3
A	9	Smilax rotundifolia	1
A		Smilax bona-nox	3
A		Viola canadensis	2
A	10	Acer rubrum	2
A		Lindera benzoin	1
B	1	Acer rubrum	1
B	2	None	---
B	3	None	---
B	4	Smilax rotundifolia	1
B		Sassafras albidium	1
B		Acer rubrum	1
B	5	Acer rubrum	1
B		Carya alba	1
B	6	Acer pensylvanicum	1
B		Viola canadensis	2
B		Parthenocissus quinquefolia	1
B	7	Lindera benzoin	1

B	8	Smilax rotundifolia	1
B		Smilax bona-nox	1
B	9	Sanguinaria canadensis	3
B		Pteridium aquilinum	3
B	10	Acer rubrum	2
B		Smilax rotundifolia	1
B		Smilax bona-nox	5
B		Galax aphylla	1
B		Goodyera repens	1
B		Lindera benzoin	1
B		Sanguinaria canadensis	24
C	1	Acer rubrum	2
C	2	Acer rubrum	2
C	3	None	---
C	4	Viola canadensis	2
C	5	Acer rubrum	1
C		Acer pensylvanicum	1
C		Lindera benzoin	1
C		Viola hastata	1
C	6	Smilax rotundifolia	1
C		Viola hastata	2
C	7	Sassafras albidium	1
C	8	Lindera benzoin	1
C	9	Smilax rotundifolia	2
C		Oxydendrum arboreum	1
C		Pteridium aquilinum	2
C	10	Viola canadensis	1
C		Liriodendron tulipifera	3
C		Carya alba	1
C		Pteridium aquilinum	2

Harp Mountain Control Sample 2

Transect	Plot	Species	#
A	1	Galax aphylla	25
A	2	Acer pensylvanicum	1
A	3	Lindera benzoin	1
A	4	Smilax rotundifolia	1
A	5	Smilax bona-nox	1
A		Kalmia latifolia	3
A	6	None	---
A	7	Smilax rotundifolia	1
A	8	Sassafras albidium	3
A	9	Smilax rotundifolia	1
A		Smilax bona-nox	3
A		Viola canadensis	2
A	10	Acer rubrum	2
A		Lindera benzoin	1
B	1	Acer rubrum	1
B	2	None	---

B	3	None	---
B	4	Smilax rotundifolia	1
B		Sassafras albidium	1
B		Acer rubrum	1
B	5	Acer rubrum	1
B		Carya alba	1
B	6	Acer pensylvanicum	1
B		Viola canadensis	1
B		Parthenocissus quinquefolia	1
B	7	Lindera benzoin	2
B	8	Smilax rotundifolia	1
B		Smilax bona-nox	1
B	9	Sanguinaria canadensis	6
B		Pteridium aquilinum	3
B	10	Acer rubrum	2
B		Smilax rotundifolia	1
B		Smilax bona-nox	5
B		Galax aphylla	2
B		Goodyera repens	1
B		Lindera benzoin	1
B		Sanguinaria canadensis	25
C	1	Acer rubrum	4
C	2	Acer rubrum	2
C	3	Liriodendron tulipifera	1
C	4	Viola canadensis	3
C	5	Acer rubrum	1
C		Acer pensylvanicum	1
C		Lindera benzoin	1
C		Viola hastata	1
C	6	Smilax rotundifolia	1
C		Viola hastata	1
C	7	Sassafras albidium	1
C	8	Lindera benzoin	1
C	9	Smilax rotundifolia	2
C		Oxydendrum arboreum	1
C		Pteridium aquilinum	2
C	10	Viola canadensis	3
C		Liriodendron tulipifera	3
C		Carya alba	1
C		Pteridium aquilinum	2

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