Devil's Hopyard Burn Study

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Devil's Hop Yard State Park, located in East Haddam, Connecticut, is covered in large part by forest. This forest is comprised of mixed hardwoods and hemlock. In the past few years, the hemlock has been in decline, allowing more sun and wind into the stand. This, combined with storms which deposited an excess of woody debris on the forest floor, raised the fire potential of this forest very high in the spring of 2012. The park suffered a mild to moderate burning on March 19th of that year. The burn was thought to have originated in the vicinity of the Youth Group area off of Foxtown Road, suggesting human activity as the source of the fire. The most severely burned area encompassed about 19 acres, and burned mostly along the western slope from the Youth Group area down to the Eightmile River. State fire fighters created fire breaks and also used water as a retardant from roadways. Controlled backburning was also employed, and the fire was successfully kept away from nearby houses on Jones Hill Rd. Including the more minor ground scorching caused by the backburning, some 133 acres of the 892 acre park was damaged.

Six months later, in September of 2012, a study was undertaken to determine possible effects of the fire on the forest in the area. It is intended that this study be continued for a number of years, to explore long-term developments. The data laid out in this report is a summary of just the first round of sampling, which is to be repeated one to two times per successive year. The most severely burned area was compared to a nearby area outside the burn, of the same or similar soil, slope, and stand type. Ten sample points were installed in the most intensely burned area, and ten were located outside the burn. Soil survey maps were used to determine which areas share similar soil types; rocky, well-drained tills. See Figure 2 for specific soil types. Aerial photos were used to ensure that the sample comparison areas shared the same forest types; mixed hardwood and hemlock (see Figure 3).

Within the sample plots, vegetation was inventoried in terms of species, number, health and size. The type of ground cover was also recorded. The presence of common groundcover plants such as fern, grasses, moss and other herbaceous species was observed, as well as components such as rock, coarse woody material, leafy litter and fine duff. The amount of standing deadwood was also recorded, and in the burned areas, the amount of fire-damaged (significantly charred) living trees was noted.

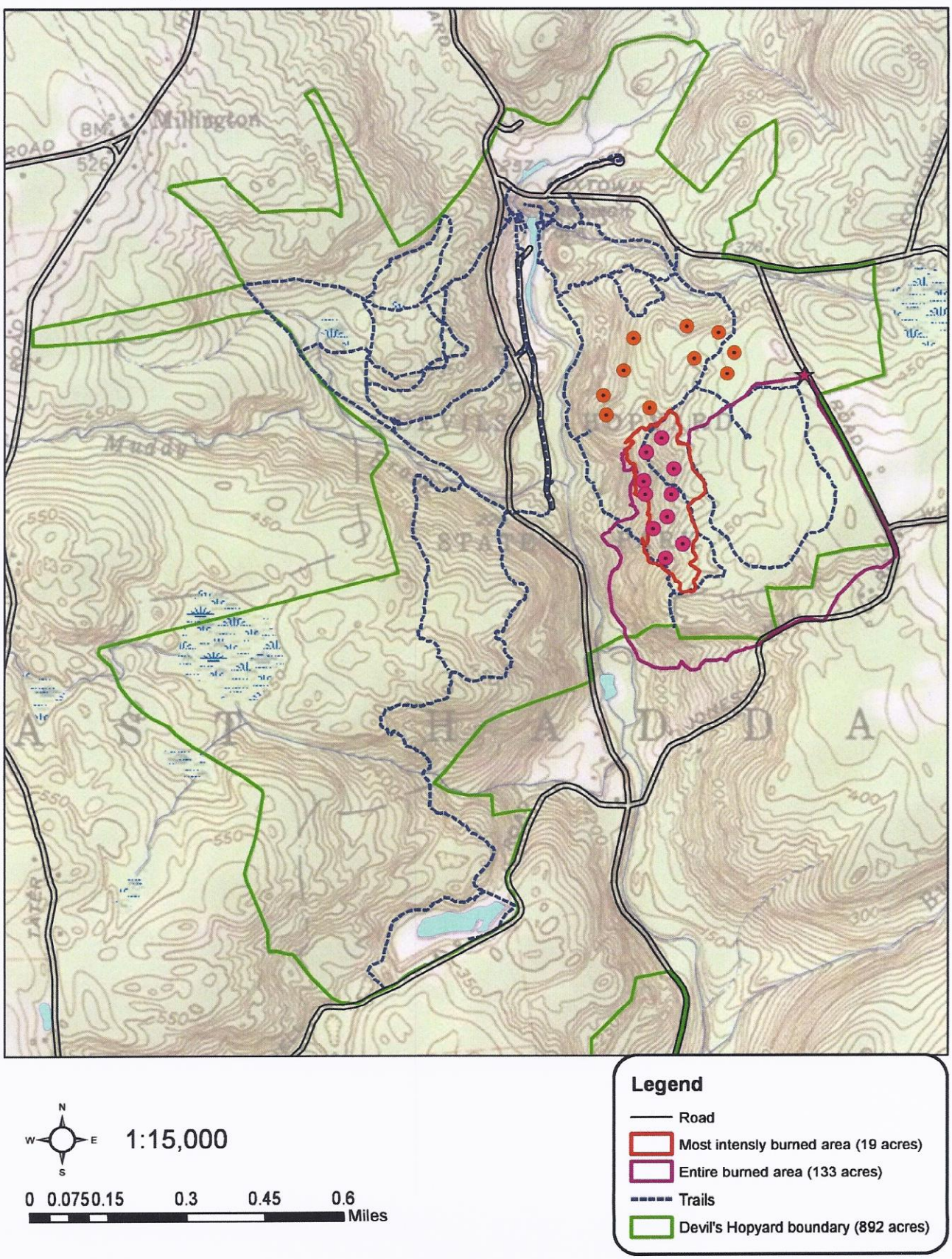
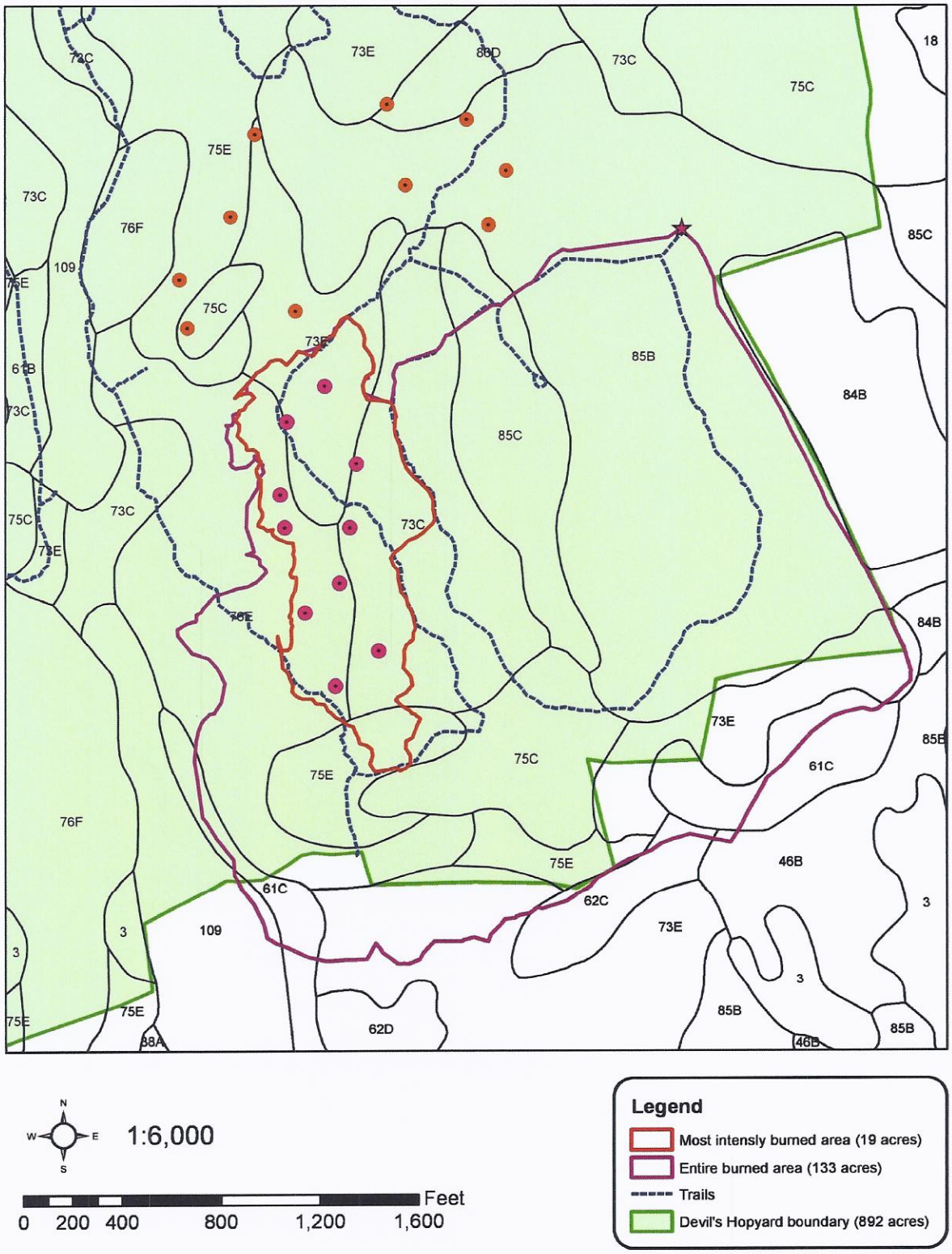


Fig 1. Showing the outline of the park and the entrance on Foxtown Rd (located as a pink star), as well as the outlines of the fire and sample points.

Devils Hopyard Burn Area - Soils

East Haddam, CT



N
W E
S

1:6,000

0 200 400 800 1,200 1,600 Feet

Legend

- Most intensly burned area (19 acres)
- Entire burned area (133 acres)
- Trails
- Devil's Hopyard boundary (892 acres)

Fig. 2

- 73C - Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky. Well drained. Melt-out Till. Moderate to Bedrock
- 73E - Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky. Well drained. Melt-out Till. Moderate to Bedrock
- 75C - Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes. Well drained. Melt-out Till. Shallow to Bedrock.
- 75E - Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes. Well drained. Melt-out Till. Shallow to Bedrock.
- 76E - Rock outcrop-Hollis complex, 3 to 45 percent slopes. Somewhat excessively drained. Shallow to Bedrock.
- 85B - Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony. Well drained. Lodgement Till.

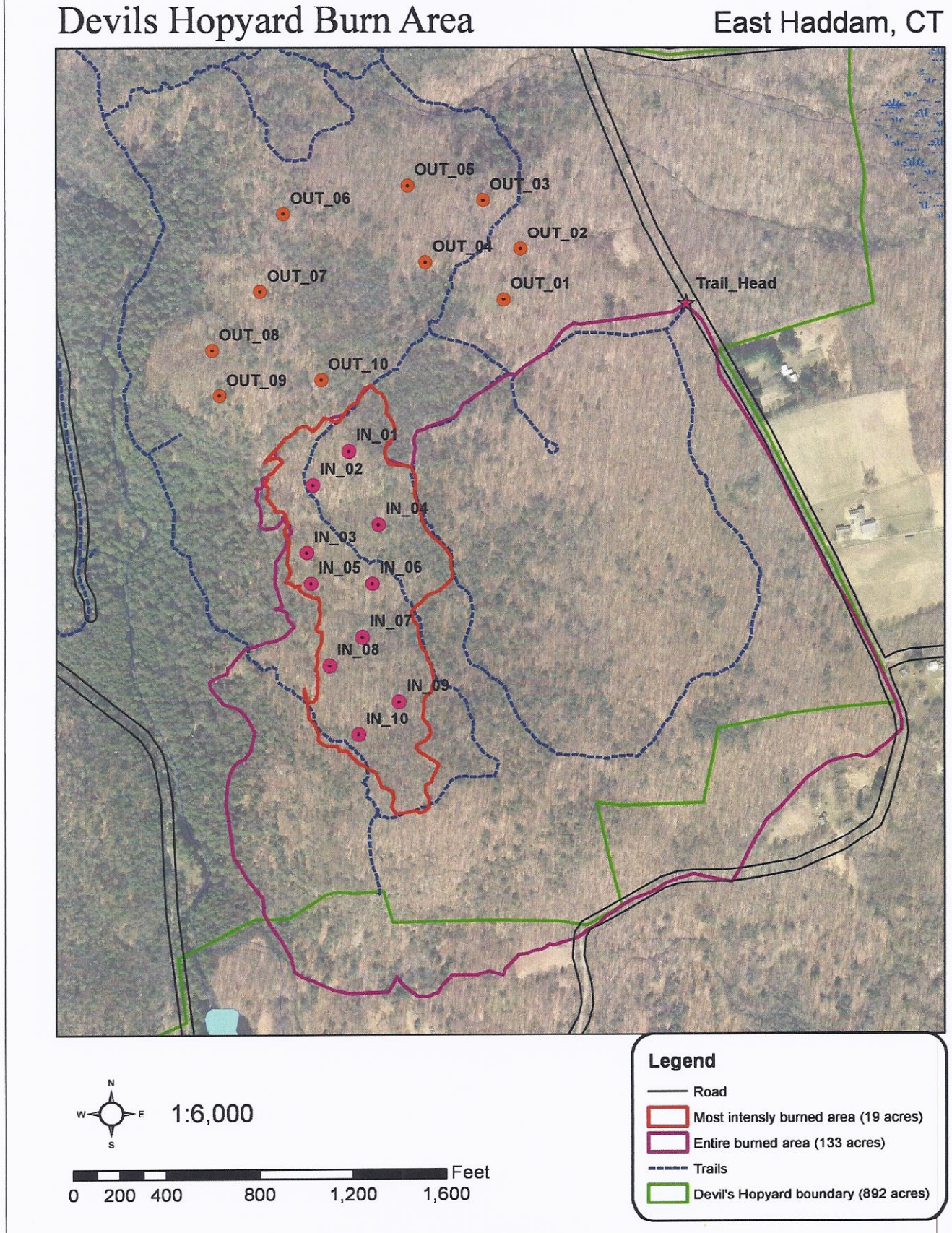

Devils Hopyard Burn Area
East Haddam, CT
OUT_05
OUT_03
OUT_06
OUT_02
OUT_04
OUT_07
OUT_01
Trail_Head
OUT_08
OUT_10
OUT_09
IN_01
IN_02
IN_04
IN_03
IN_05
IN_06
IN_07
IN_08
IN_09
IN_10
N
W
E
S
1:6,000
Feet
0 200 400 800 1,200 1,600
Legend
Road
Most intensly burned area (19 acres)
Entire burned area (133 acres)
Trails
Devil's Hopyard boundary (892 acres)

Fig. 3

In many regards, the findings of this study are consistent with what one might expect from any event which would result in ground scarification and increased canopy openings, such as a harvest operation. These conditions would naturally encourage regeneration of tree and herbaceous species. This is clearly illustrated in the comparison between the burned and non-burned forest areas of this study.

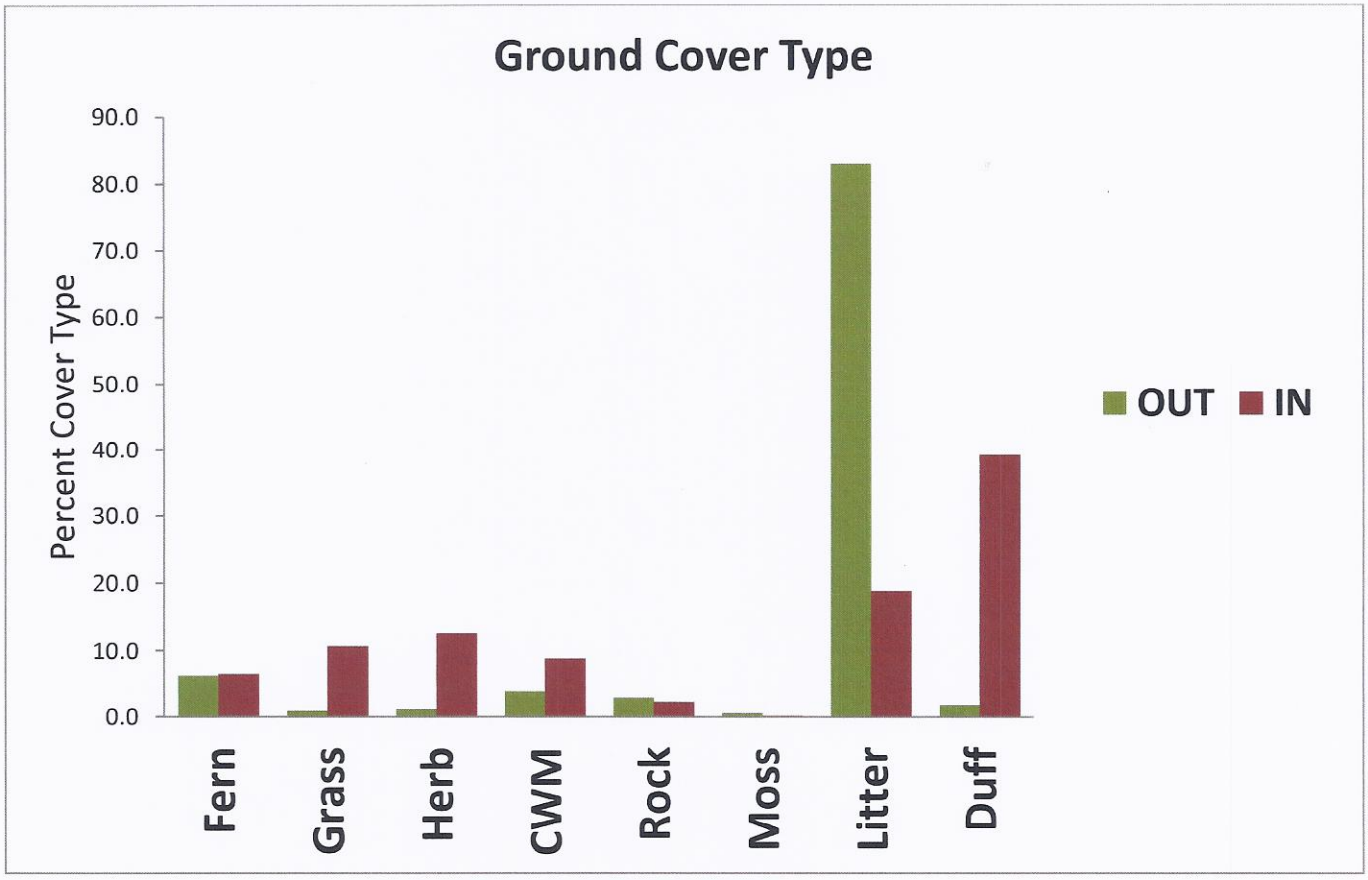


Fig. 4

In Figure 4 it is shown how effective the fire was in clearing away leafy litter from the forest floor. The higher percentage of soil-like fine duff exposed in the burned ("IN") areas provides a more encouraging seed bed. While the higher percentage of ground covered by a leafy litter barrier in the unburned ("OUT") area accounts in large part for the much lower amount of recent regeneration there. Compare the much barer ground in Figure 5 (a photo of a plot in the burned area) to the leafy ground cover of Figure 6 (a photo from an unburned area.) Also encouraging regeneration is the more open canopy in the burned areas, allowing more light to the forest floor (see Figures 7 and 8).

Fig. 5

Fig. 6

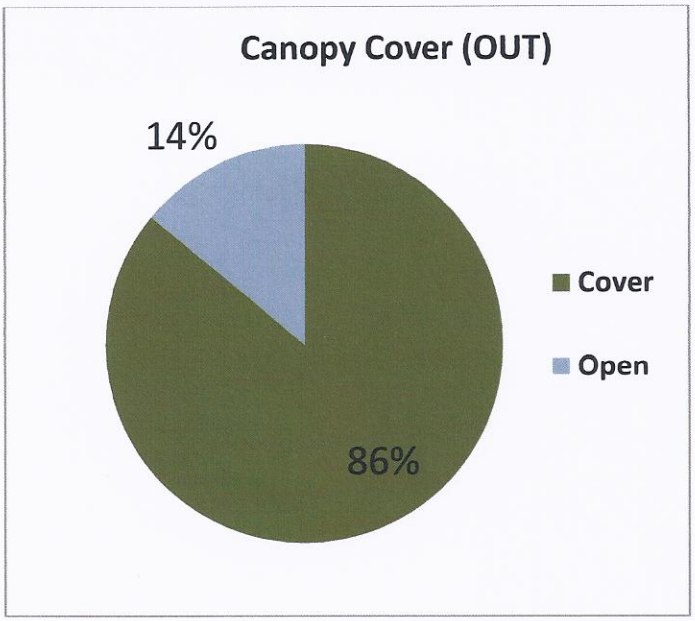


Fig. 7

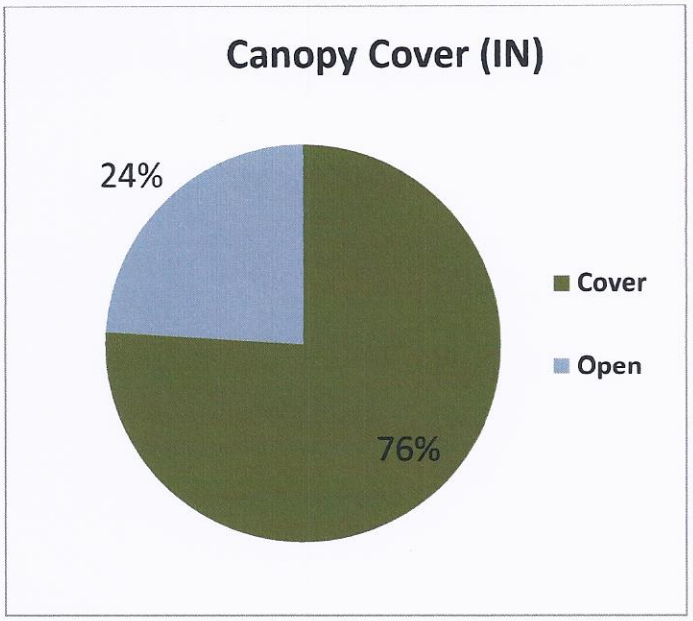


Fig.8

The difference in the presence of vegetation with a diameter of less than an inch between the unburned and burned areas can be seen below in Figure 9. Much of this difference is accounted for by the great amount of new seedlings in the burned areas.

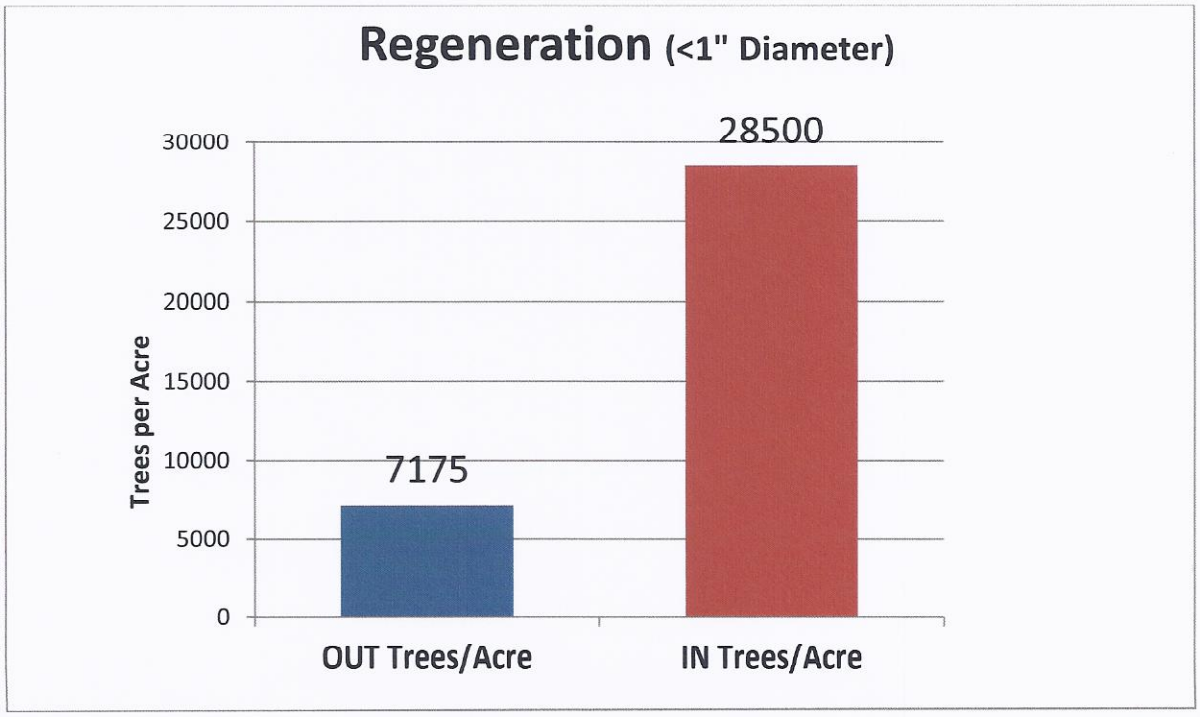


Fig. 9

However, while the burned area leads in growth under one inch in diameter, the unburned area has a much higher density of vegetation with a DBH between one and four inches (see Figure 10.) Keep in mind, Figure 10 does not include vegetation under one inch in diameter due to the huge difference in scale.

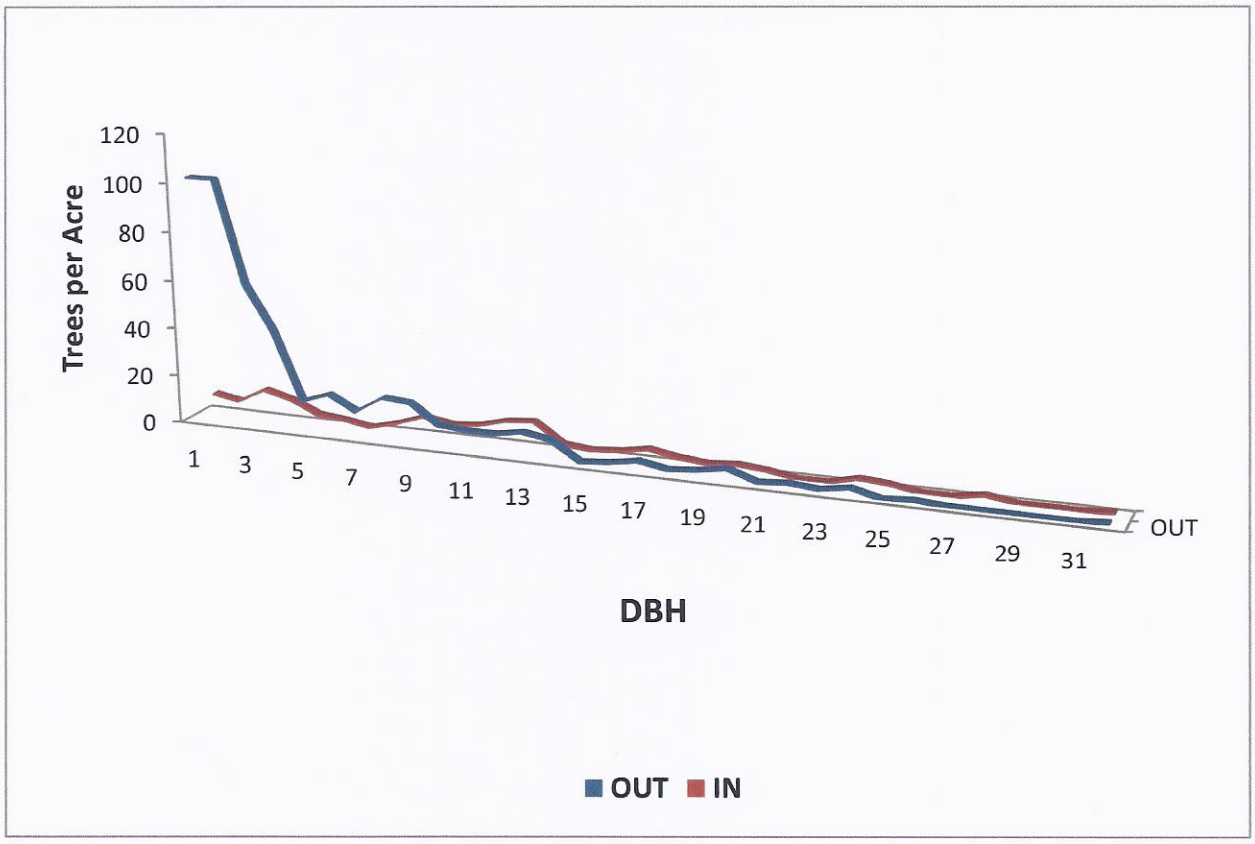


Fig. 10

The conditions illustrated in Figure 10 can be explained at least in part by the deaths of some of the more fire-vulnerable, small diameter trees in the burned areas (see Figure 11.) As you can see in Figure 12 below, almost three quarters of all trees tallied in the 1-3" diameter category of the burned area, is standing deadwood. There are few "charred" living trees in that size category because at that size, the fire damage was enough to kill them. And in the 4-32" category, though there are many fewer trees currently dead, there is a good half of all trees tallied which are fire damaged (significantly charred), (see Figure 13). It may be that in subsequent inventories, the number of dead trees continues to rise as these fire-weakened trees succumb to additional stresses, such as drought or disease.

Fig. 11

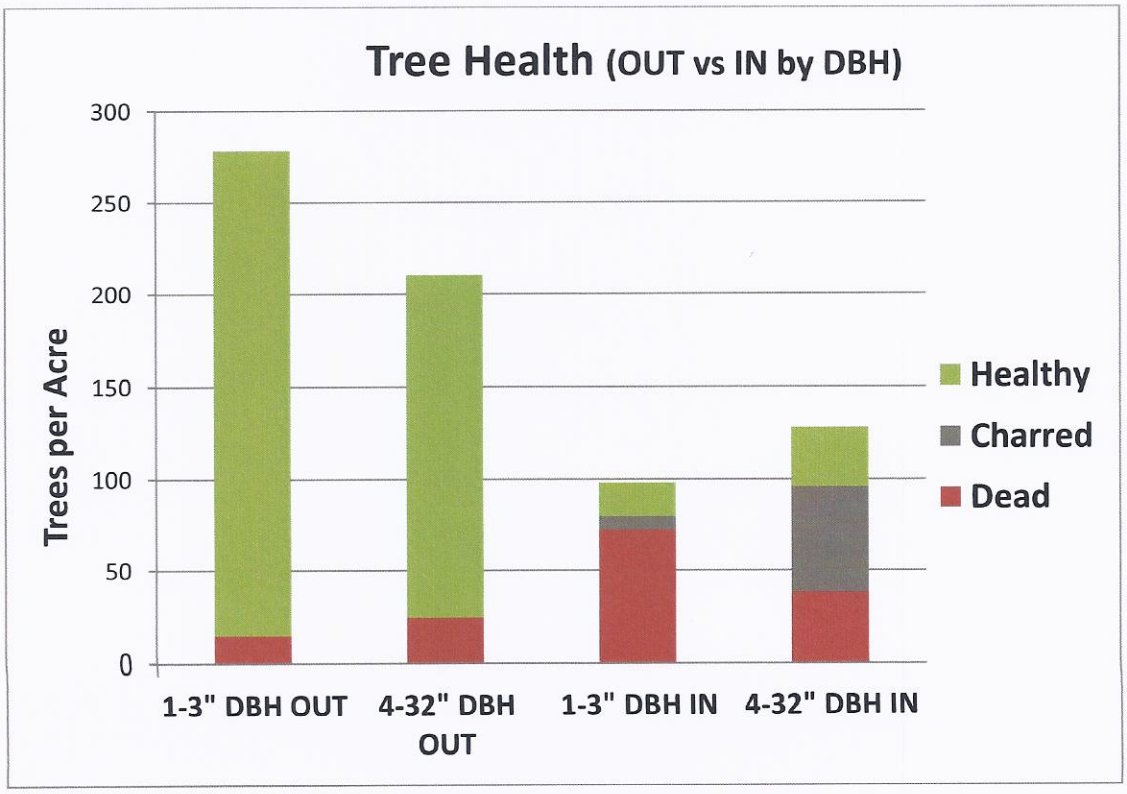

Tree Health (OUT vs IN by DBH)
Trees per Acre
300
250
200
150
100
50
0
1-3" DBH OUT
4-32" DBH OUT
1-3" DBH IN
4-32" DBH IN
Healthy
Charred
Dead

Fig. 12

Fig. 13

In short, the fire came through; killing many small diameter trees, damaging larger diameter trees and exposing bare soil. This cleared the way for many new seedlings, which sprouted shortly before this study was performed. In the charts below, the characteristics of the stands are illustrated in terms of species. In Figure 14, we see the species composition of the overstory in both the burned and unburned areas. In both zones, birch is strongly dominant. In the unburned area, hemlock, red maple and black/scarlet oak are also strong leaders. In Figure 15, which shows the smaller diameter classes, we see a sharp drop in the presence of birch in the burned section, from 52 trees/acre to 4 trees/acre. As well we see an increase in the density of birch in the unburned section from 63 to 170 trees/acre. All other species are far behind, with only hemlock showing a decent presence of 38 trees/acre in the unburned section. Finally, in Figure 16 the regeneration species are shown. Here you see that birch is the dominant species of regeneration, and that to a much greater degree in the burned area. Unsurprising, considering the prolific seeding and high germination rate of the species. All other species (except red maple by a small margin) also show better success in regeneration in the burned area.

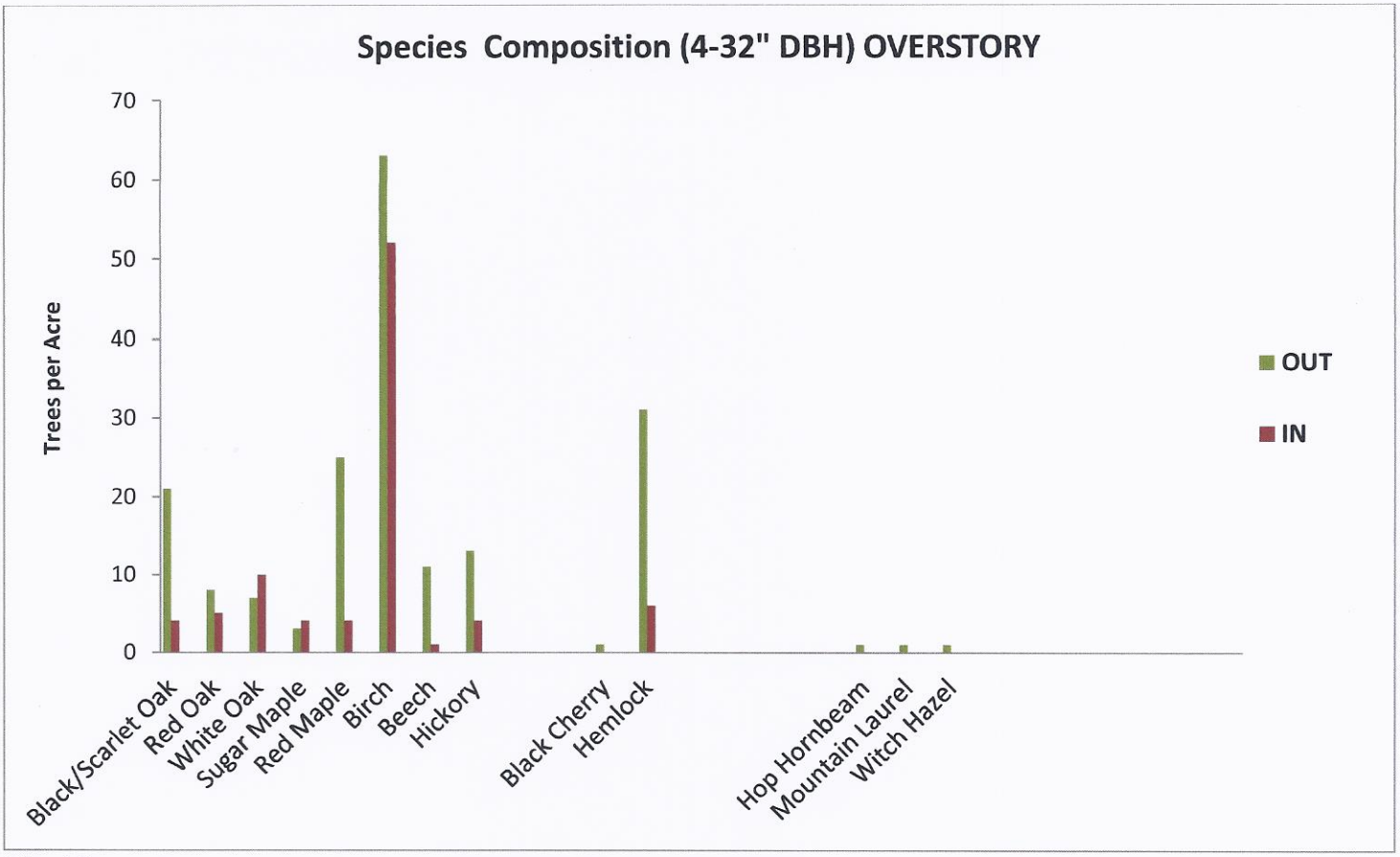

Species Composition (4-32" DBH) OVERSTORY
Trees per Acre
70
60
50
40
30
20
10
0
OUT
IN
Black/Scarlet Oak
Red Oak
White Oak
Sugar Maple
Red Maple
Birch
Beech
Hickory
Black Cherry
Hemlock
Hop Hornbeam
Mountain Laurel
Witch Hazel

Fig. 14

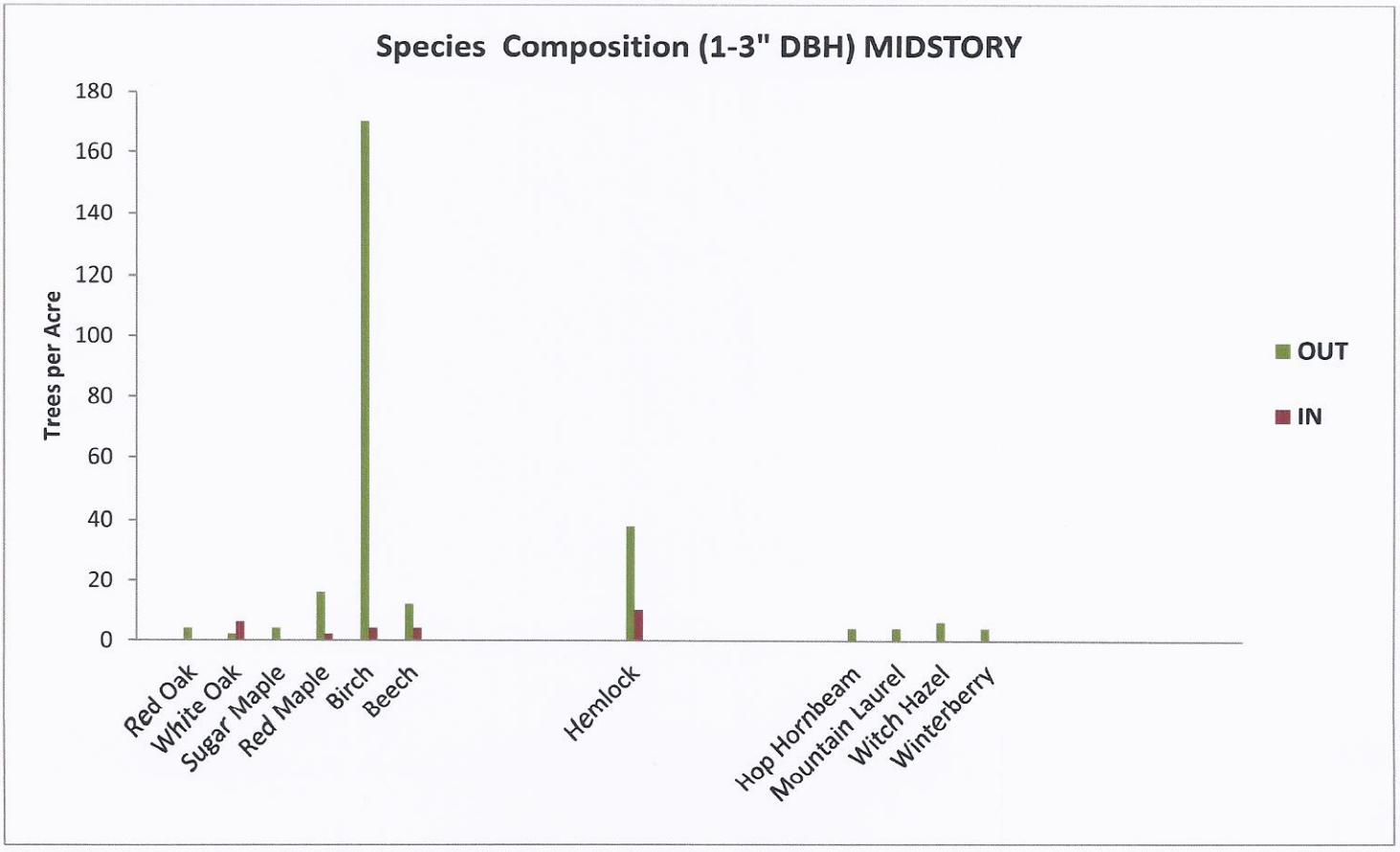

Species Composition (1-3" DBH) MIDSTORY
Trees per Acre
180
160
140
120
100
80
60
40
20
0
OUT
IN
Red Oak
White Oak
Sugar Maple
Red Maple
Birch
Beech
Hemlock
Hop Hornbeam
Mountain Laurel
Witch Hazel
Winterberry

Fig. 15

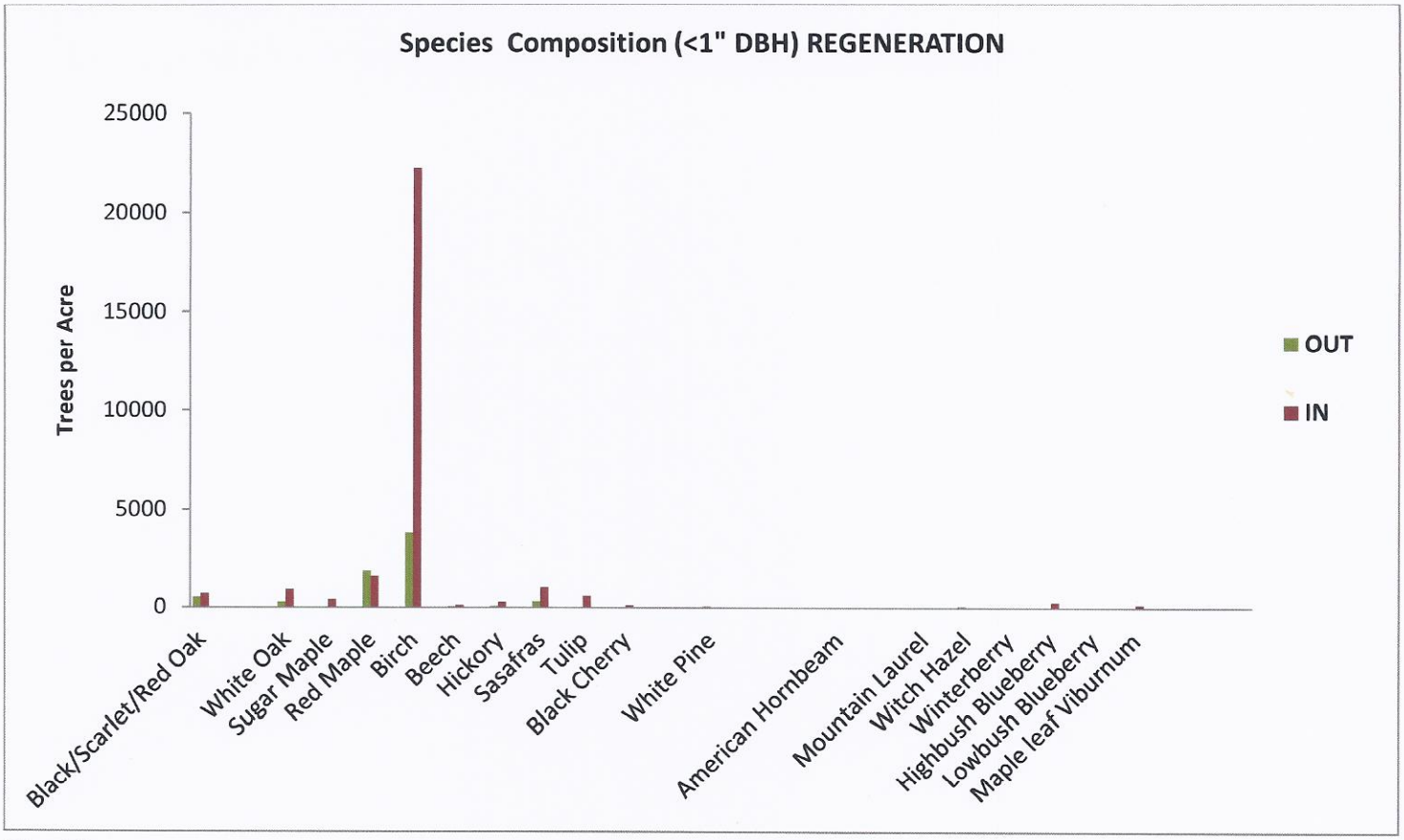


Fig. 16

One final consideration in this study is whether the burn will cause a large influx of invasive species into the area. This is a common concern whenever there is a large loss of native vegetation. In this round of inventory, there was very little in the way of invasive influence. There were only single plants of wineberry in plots "IN 03" "IN 06" and "IN07." There was significant presence of pokeweed in many of the "IN" plots as well (see Figure 13), though many do not consider it a harmful invasive. However, its hindering effect on tree regeneration may be a concern. The trend of invasive proliferation should become more apparent as the study continues.