



Abraham Lincoln Birthplace National Historical Park

Forest communities were selected as one of the highest priority vital signs across the network, in part because forests are such a dominant part of the landscape within the Cumberland Piedmont Network (CUPN) parks. In addition to providing recreational opportunities, forests provide wildlife habitat, protect soil and water, influence weather patterns, and store carbon that would otherwise contribute to climate change.

Studying the components of a forest provides information on the overall health of the forest ecosystem, which in turn allows park managers to make informed decisions on how to manage this resource for current and future generations. Stressors affecting these systems include exotic species, forest pests, and climate change, just to name a few. CUPN's monitoring effort is designed to detect meaningful changes in species composition and vegetation structure within each park's forested habitat and determine whether these changes are correlated with trends in 'key stressors' over time.

Monitoring plots consist of a 20 x 20 m square with multiple nested sampling frames ranging in size from 1 m² to 100 m². Data collection is intensive, taking about 3-4 hours for a team to complete a plot on average, with data being grouped into the following broad categories.

- ✂ Plot Characteristics (slope, landform, etc.)
- ✂ Species presence, frequency and cover - Tree, Sapling, Seedling and Herb layers
- ✂ Canopy Cover
- ✂ Tree growth and health
- ✂ Evidence of forest pests
- ✂ Snags
- ✂ Coarse Woody Debris (CWD)
- ✂ Community Characterization/Classification

To date, 16 plots have been established on Abraham Lincoln Birthplace National Historic Site (ABLI) (Figure 1). An additional eight plots are planned for establishment on the Knob Creek Unit in 2013-14 (Figure 1). Once established, plots will be revisited to monitor changes in forest condition and trend. Some highlights from the 2011-2012 field efforts are included in this brief.

Forest Composition and Regeneration

Field crews classified seven of the eight plots established on the Birthplace Unit as being in a successional or

Forest Monitoring Plot Locations



Figure 1. Location of forest monitoring plots on ABLI.

human modified vegetation association. The successional nature of these plots is reflected in the 'mix' of tree species found with species such as tulip tree, eastern red cedar, black walnut, and black cherry comprising just over 60% of the basal area in the Birthplace Unit plots (Figure 2.). By contrast, just over 60% of basal area within the Boyhood Home Unit is composed of oak-hickory, and upland maple. The majority of plots on this unit were classified as natural oak or hickory vegetation associations (as opposed to human modified or successional).

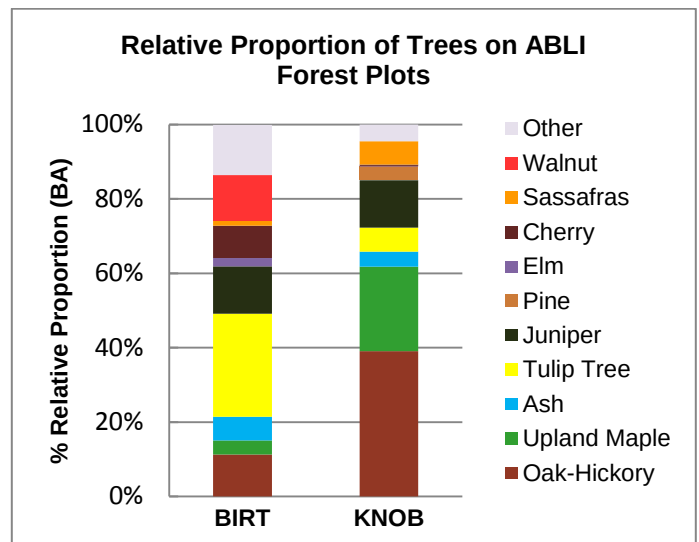


Figure 2. Tree species composition based on basal area within forest plots in ABLI park units (102 cm DBH).



Prevalence of Exotic Species

Exotic or non-native species are displacing native flora and fauna on each of the 14 parks within CUPN. Initial plot work confirms that exotics are widespread at ABLI with exotics being detected within all 16 plots established ($\bar{x} = 3.9$ exotics/400m² plot). Number of exotics was greater in the Birthplace Unit plots ($\bar{x} = 6.0$) as compared to plots on the Boyhood Home Unit ($\bar{x} = 1.9$).

Within each 400 m² plot a series of 1 m² frames were also sampled to measure the overall prevalence or frequency of species (Figure 3). On average 7.4 species were detected within the 1 m² subplots for ABLI, of which 0.63 were exotic (Figure 3). In other words, on average 8% of the species detected within the 1 m² sampling frames were determined to be exotic. While these numbers are preliminary, they certainly indicate the overall occurrence and prevalence of exotic species on ABLI is a concern. The occurrence and prevalence (or frequency within plots) of exotics are high priority metrics for monitoring by CUPN as additional plots are established and plot revisits begin.

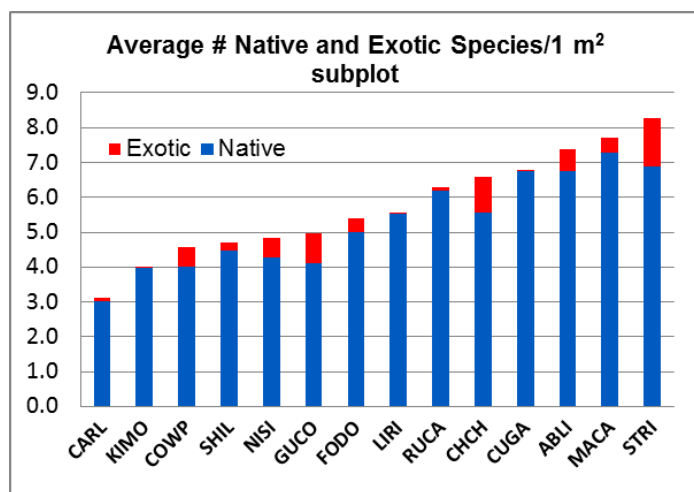


Figure 3. Average number and nativity of species detected within 1 m² sampling frames (subplots) within CUPN's forest monitoring plots.

Species Diversity

Species diversity is a function of community type which is influenced significantly by geology, slope position, slope aspect, and natural disturbance regime. Within CUPN, acidic forest types tend to have fewer overall species at the 20 x 20m plot level while sites with more alkaline soils typically have more. As evidence to this trend one can see from the table below that parks with a larger diversity of pH and topography (basic and acidic parent rock both present combined with high amounts of topographic variation) also tend to be the most diverse (Table 1). While these raw numbers are of interest, the important questions

include whether all the species that should be on a site based on its ecological community type are present, particularly species that are rare or sensitive to change. In addition, the comparison amongst parks is not nearly as important as comparisons over time. Are diversity levels changing over time? What about the composition of that diversity? Are parks gaining or losing species that are sensitive to human-caused disturbance? These are examples of questions related to diversity that CUPN hopes to address through its continued monitoring.

Table 1. Average number of species detected on 20x20 m forest monitoring plots in the Cumberland Piedmont Network, 2011-2012

	Park Code	Number of Plots	Mean Species (Mean ± SE)
Abraham Lincoln Birthplace NHS	ABLI	16	72 ± 3.69
Carl Sandburg Home NHS	CARL	16	30 ± 3.34
Chickamauga and Chattanooga NMP	CHCH	16	54 ± 5.15
Cowpens National Battlefield	COWP	16	47 ± 4.43
Cumberland Gap NHP	CUGA	16	52 ± 5.3
Fort Donelson National Battlefield	FODO	16	57 ± 4.27
Guilford Courthouse NMP	GUCO	16	44 ± 2.27
Kings Mountain NMP	KIMO	16	34 ± 3.09
Little River Canyon National Preserve	LIRI	16	59 ± 4.13
Mammoth Cave National Park	MACA	16	66 ± 4.42
Ninety Six NHS	NISI	16	46 ± 2.57
Russell Cave National Monument	RUCA	16	64 ± 3.63
Shiloh NMP	SHIL	16	48 ± 3.63
Stones River National Battlefield	STRI	16	55 ± 3.69

Other Preliminary Findings

- ABLI had the greatest species diversity ($\bar{x} = 72$) amongst CUPN parks at the 20 x 20m plot level. Most of this diversity is attributed to the Knob Creek Unit where mean number of species was over 80 species per plot (n=8).
- No new discernible issues related to tree health or decline were detected though it should be noted the emerald ash borer (*Agrilus planipennis*) continues to expand its range in Kentucky and has been detected in neighboring Hardin County.
- A total of 17 exotics were detected within plots on ABLI. The most commonly occurring species include Japanese honeysuckle (*Lonicera japonica*) (15 plots), Japanese stiltgrass (*Microstegium vimineum*) (11 plots), and multiflora rose (*Rosa multiflora*) (8 plots).
- Three new exotics (i.e., not previously on the park's species list) were detected during this monitoring effort. These include silk tree mimosa (*Albizia julibrissin*), sweet autumn virginsbower (*Clematis terniflora*), and lesser burdock (*Arctium minus*).

For More Information

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