

Forest Vegetation

2013 Resource Brief

National Park Service Southeast Region
U.S. Department of the Interior
Cumberland Piedmont Network
Inventory and Monitoring Program



Carl Sandburg Home National Historic Site

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 Carl Sandburg Home National Historic Site (CARL) (Figure 1). An additional four plots are scheduled for establishment in 2013 (Figure 1). Each of these plots will be re-visited every five years to monitor changes in forest condition and trend. Following are a few highlights from the 2011-2012 data collection.

Forest Composition and Regeneration

Oak and hickory species dominate the canopy within established plots at CARL (see figure 2), but are less

Forest Monitoring Plot Locations

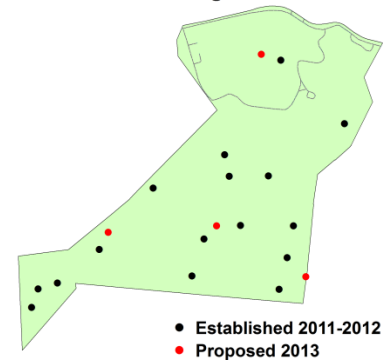


Figure 1. Location of forest monitoring plots on CARL.

common in the sapling and seedling layers. In contrast, upland maple species are relatively rare in the canopy but comprise large portions of the sapling and seedling layers in plots. Pine species can be found in the canopy and sapling layer, but almost no seedling regeneration is occurring. This preliminary data suggests that upland maple seedlings and saplings may be suppressing oak/hickory/pine regeneration within the park. While these data are preliminary and much more study is needed, it is worth noting that a potential future shift in composition of the canopy could be underway. CUPN will be tracking these and similar metrics as additional plots are established and plot revisits begin.

Relative Proportion by Forest Strata

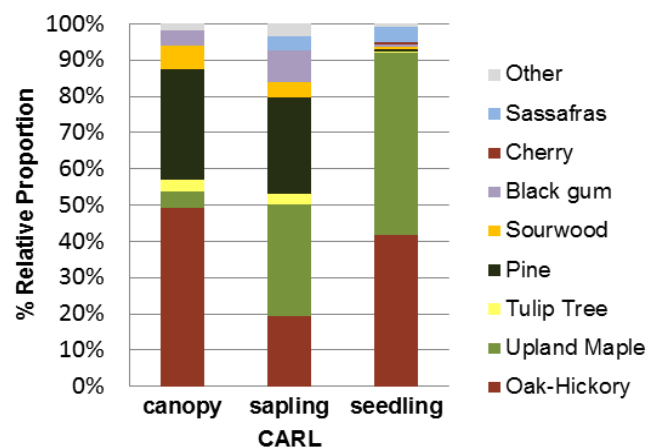


Figure 2. Tree species composition (10+ cm DBH) based on basal area and sapling/seedling composition based on counts within forest plots on CARL.

Forest Vegetation

2013 Resource Brief

National Park Service Southeast Region
U.S. Department of the Interior
Cumberland Piedmont Network
Inventory and Monitoring Program



Prevalence of Exotic Species

Exotic or non-native species are displacing native flora and fauna on each of the 14 parks within CUPN. Every park has its known 'hot spots' where exotic species are well established. These areas tend to be around park boundaries, disturbed areas, floodplains, and/or high visitor use areas.

Based on 2011-12 plot establishment, CARL has one of the lowest incidences of exotic species amongst CUPN parks, with exotics being detected within three of the 16 established plots. By comparison, exotics were detected on ~10 plots per park on average across the network.

Within each 400 m² plot a series of 1 m² frames were also sampled to measure the overall prevalence or frequency of species. On average 3.1 species were detected within the 1 m² frames within CARL plots, of which only 0.08 were exotic (Figure 3). In other words, on average 2% of the species detected within the 1 m² sampling frames were determined to be exotic. 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.

A total of 12 exotics were detected within plots on CARL. Those occurring on more than one plot include: Japanese meadowsweet (*Spiraea japonica*) (3 plots), Japanese honeysuckle (*Lonicera japonica*) (2 plots), and Japanese stiltgrass (*Microstegium vimineum*) (2 plots).

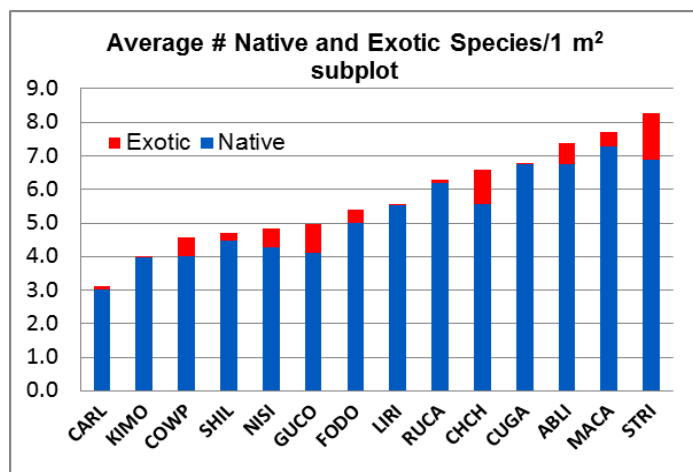


Figure 3. Average number and nativity of species detected in 1 m² subplots within CUPN's forest monitoring plots.

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 at that scale. 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 species community composition and diversity numbers are higher or lower than expected for a particular community type, and whether rare or sensitive species presence/absence is changing over time.

Table 1. Average number of species detected on 20x20 m forest monitoring plots in CUPN Parks, 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 and Notes

- No new discernible issues related to tree health or decline were detected.
- No new exotics (i.e., not previously on the park's species list) were detected during this monitoring effort.
- Three new native species (i.e., not previously on the park's species list) were detected during this monitoring effort. These include Allegheny chinkapin (*Castanea pumila*), hotspots panicum (*Dichanthelium acuminatum*), and whitehair rosette grass (*Dichanthelium villosissimum*).

For More Information

Bill Moore, CUPN Ecologist/ Data Manager
Teresa Leibfreid, CUPN Program Manager

Currently 16 plots have been established on CARL with plans to establish four more in 2013. These additional plots are needed to assure a representative sample of the park is taken and statistically meaningful results can be reported. As such, results presented within this resource brief should be viewed as preliminary.