



Chickamauga and Chattanooga National Military 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 Chickamauga and Chattanooga National Military Park (CHCH) with an additional 16 - 24 plots planned for establishment in 2013-2015 (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 Monitoring Plot Locations

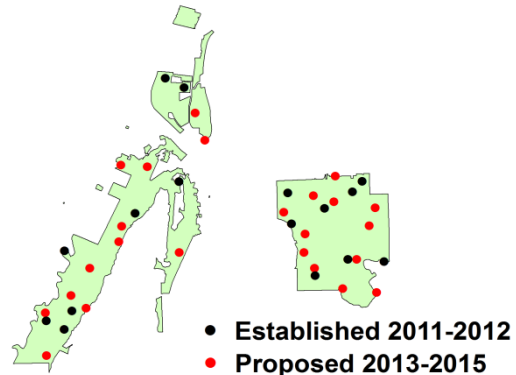


Figure 1. Location of forest monitoring plots on CHCH.

Forest Composition and Regeneration

Based on plot work thus far (see note at end of brief), oak-hickory species comprise greater than 40% of the canopy on both the Chickamauga Battlefield and Lookout Mountain/Moccasin Bend units (Figure 2). However, less than 20% of saplings were found to be oak-hickory species. By contrast, upland maple was only a minor component of the canopies on both units, but the sapling layers included a high percentage of upland maple. More study is needed to determine the implications of this finding, but it signals a potential future shift in composition of the canopy away from oak-hickory and towards more

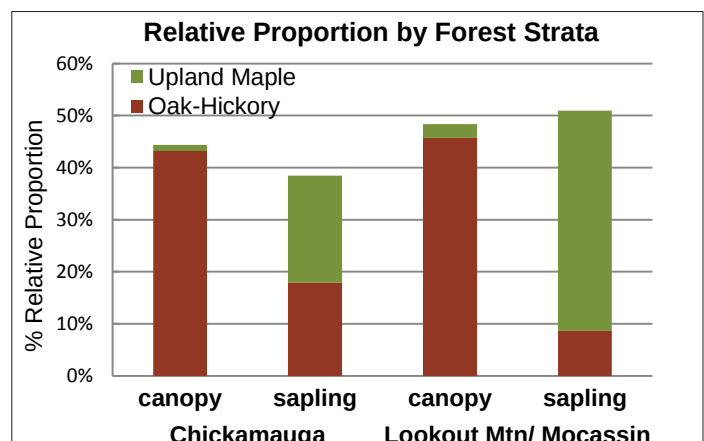


Figure 2. Relative proportion of oak-hickory and upland maple in the canopy vs. sapling layers.

Forest Vegetation

2013 Resource Brief

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



shade tolerant species. In other words, future forests may well contain fewer oaks and hickories and more maple and other shade tolerant species. Such a shift would have negative consequences for many wildlife species.

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 CHCH with exotics being detected within 15 of the 16 plots established on CHCH ($\bar{x} = 4.69$ exotics/400m² plot).

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 6.6 species were detected within the 1 m² frames, of which 1.0 were exotic (Figure 3). While these numbers are preliminary (see note at end of brief), they point to the overall prevalence of exotics within the forested community on CHCH. The prevalence of exotics, as well as any resultant trends, is one of many metrics CUPN will be tracking as additional plots are established and plot revisits begin.

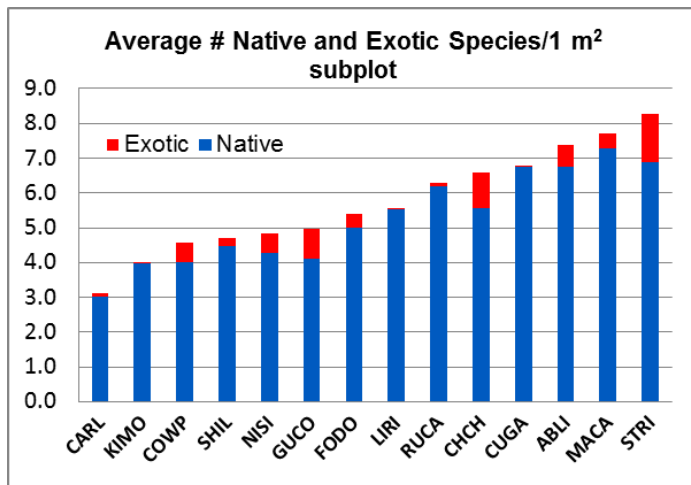


Figure 3. Average number and nativity of species detected within 1 m² sampling frames (subplots) within CUPN's forest monitoring plots.

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 the Cumberland Piedmont Network, 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 some basic (limestone, dolomite, etc.) rock parent material also tend to be the most diverse based on our initial plot work (Table 1). While these raw numbers are of interest, the important questions include whether all

the species that should be on a site are present, particularly species that are rare or sensitive to disturbance. 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 some examples of questions related to diversity that CUPN hopes to address through its monitoring efforts moving forward.

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

- No new discernible issues related to tree health or decline were detected.
- Of the more than 200 plots established across the network by CUPN in 2011 and 2012, the most diverse plot (i.e., greatest number of species) occurs near the base of Lookout Mountain above the Lower Truck Trail.
- A total of 32 exotic species were detected within the 16 plots established on CHCH with Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*) being the most prevalent with both occurring on 13 plots.

For More Information

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Currently 16 plots have been established on CHCH with plans to establish an additional 16 - 24 plots over the next two to three field seasons. 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.