



Shiloh 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 Shiloh National Military Park (SHIL) with an additional eight plots planned 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

The relative proportion of species among different strata of a forest stand provides information on the current and future composition of the forest. Based on plots completed

Forest Monitoring Plot Locations

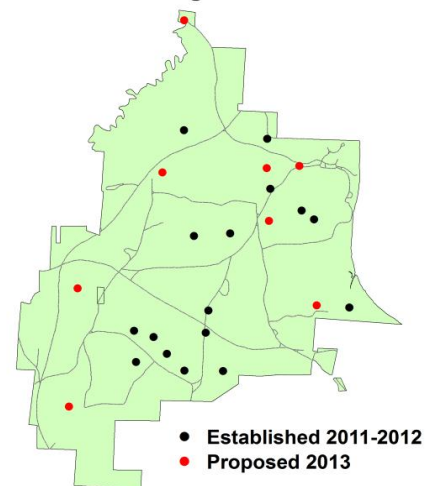


Figure 1. Location of forest monitoring plots on SHIL.

thus far, species of oak (*Quercus sp.*) and hickory (*Carya sp.*) comprise nearly 60% of the canopy trees within plots on SHIL (Figure 2). Oak-hickory is relatively common in the sapling and seedling strata as well (30% and 37% of all stems, respectively), especially when compared to other parks in CUPN where oak-hickory comprises 14% of sapling and 24% of seedlings. While these raw numbers suggest SHIL may have better oak-hickory regeneration

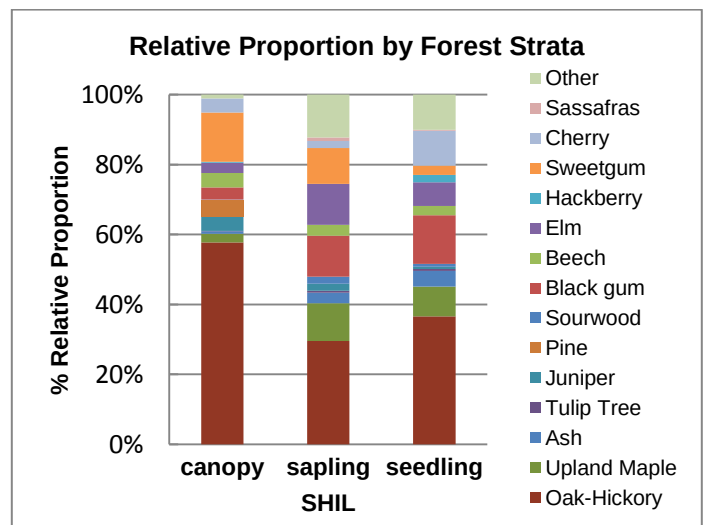


Figure 2. Tree species composition among forest strata.



than other parks in the network, more study is needed to determine whether these numbers are enough to “restock” the canopy. The increased relative proportion of shade tolerant species, such as upland maple (*Acer sp.*) in the understory, should also be noted. Poor tree regeneration, particularly in oak species has been documented throughout eastern deciduous forests. This failure has been attributed to several factors including dense overstory shade, fire suppression, and browse pressure from white-tailed deer (*Odocoileus virginianus*). As more data are collected, CUPN will be monitoring these strata as an early warning to any potential changes in the composition of forests on SHIL.

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 throughout SHIL with exotics being detected within 10 of the 16 plots established ($\bar{x} = 1.44$ exotic species/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, 4.72 species were detected within each of the 1 m² frames, of which 0.25 were exotic (Figure 3). While exotics appear to be widespread these preliminary numbers (see note at end of brief) indicate their overall prevalence appears to be relatively low compared to other CUPN parks. 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.

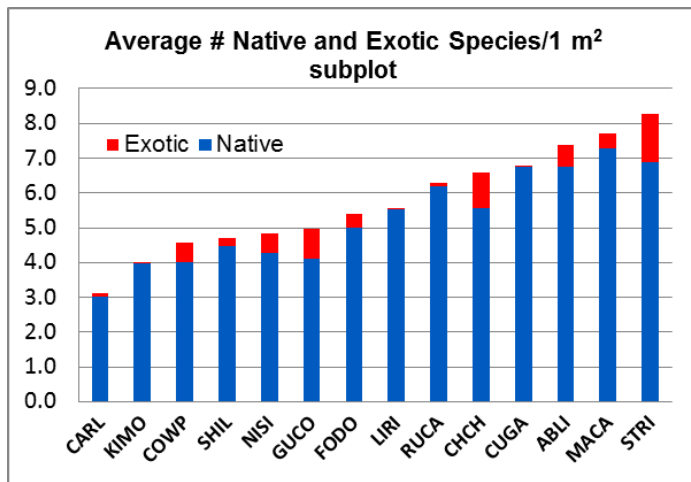


Figure 3. Average number and nativity of species detected within 1 m² sampling frames (subplots) within CUPN's forest monitoring plots.

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 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 rock parent 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 per 400 m² 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

- A total of eight exotic species were detected within plots on SHIL. The most common include Japanese honeysuckle (*Lonicera japonica*) (8 plots) and Chinese privet (*Ligustrum sinense*) (6 plots).
- Based purely on qualitative assessments, field teams indicated deer browsing pressure may be a concern on portions of SHIL.

For More Information Contact Bill Moore, CUPN Ecologist/ Data Mgr.

Currently 16 plots have been established on SHIL with plans to establish eight 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.