

Forest Vegetation

2013 Resource Brief

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



Little River Canyon National Preserve

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 Little River Canyon National Preserve (LIRI) with an additional 16 plots planned for establishment in 2013-2014 (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

Based on plot work thus far (*see note at end of brief*), oak-hickory species comprise 47% of the canopy and upland

Forest Monitoring Plot Locations

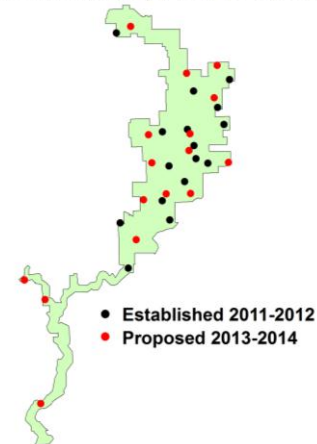


Figure 1. Location of forest monitoring plots on LIRI.

maple comprises only 8% (Figure 2). These proportions are much different in the sapling and seedling strata where the proportion of oak-hickory species is less (25% and 31% respectively) and upland maple is much more common (36% and 40% respectively). While this pattern of fewer oak-hickory and more shade tolerant species in the understory is not as dramatic at LIRI as has been observed at other parks within CUPN, it is worth noting that a potential future shift in composition of the canopy could be underway. Such a shift would have negative consequences for many wildlife species. However, more study is needed before any conclusions can be drawn.

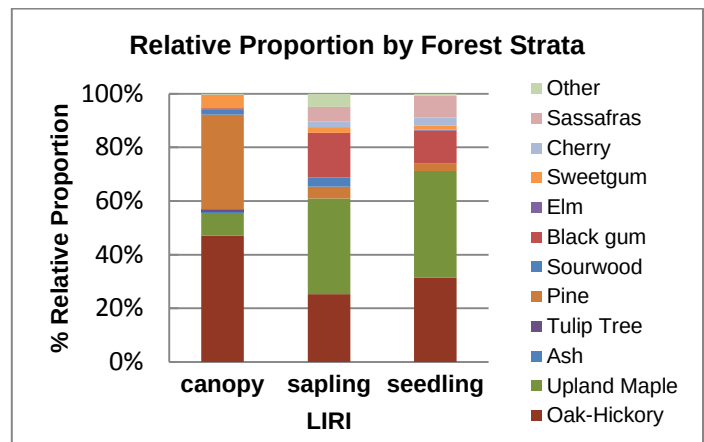


Figure 2. Tree species composition among forest strata.

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Prevalence of Exotic Species

Exotic species are a threat to 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.

While exotics were detected within plots and subplots established on LIRI, their low proportion in relation to native species would indicate exotics are not prolific throughout the forest community (Figure 3). These proportions and trends will be monitored as additional plots are established and plot revisits begin.

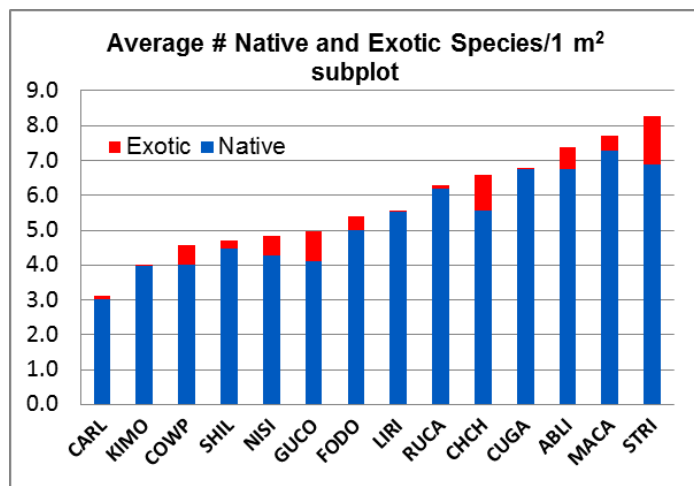


Figure 3. Average number and nativity of species detected within 1 m² sampling frames (subplots) within CUPN's forest monitoring plots.

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.
- Exotics were detected on four of the 16 (25%) plots established thus far on LIRI. While the ideal would be no exotics, this ranks well when compared to other CUPN parks where exotics were found on at least half of the plots (50%) on 10 of the 14 parks in the network.
- Exotics detected within plots on LIRI include Japanese honeysuckle (*Lonicera japonica*), common dandelion (*Taraxacum officinale*), Japanese stiltgrass (*Microstegium vimineum*), Chinese lespedeza (*Lespedeza cuneata*), and silktree mimosa (*Albizia julibrissin*). No new exotics (i.e., not previously on the park list) were detected during monitoring efforts.

For More Information

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Currently 16 plots have been established on LIRI with plans to establish an additional 16 plots over the next two 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.