



Forest Vegetation Monitoring Summary, 2011–2015

Overview

Forest vegetation communities were selected as a high priority resource for monitoring by all the parks within the Cumberland Piedmont Network (CUPN). Forests are a dominant part of the CUPN landscape and provide recreational opportunities and wildlife habitat, protect soil and water resources, 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 vegetation community. Key stressors affecting forest vegetation communities include non-native plant species, insect/fungal pests, and climate change, just to name a few. The network's monitoring effort is designed to detect meaningful changes in species composition and vegetation structure within each park's forested habitats and determine whether these changes are correlated with trends in key stressors (e.g., forest pests) over time.

In the first phase of vegetation monitoring, permanent plots were established across all CUPN parks over a five year period (2011–2015). These plots will be revisited every five years in order to monitor changes and trends in forest vegetation conditions. By the conclusion of the 2015 field season, 384 permanent plots had been established across the network, including 20 plots in Carl Sandburg Home National Historic Site (CARL). This brief summarizes monitoring data collected from these 20 plots established at the park (see map of plots in Figure 1).

Monitoring plots are 20 × 20 meters with multiple nested sampling frames ranging in size from 1 to 100 square meters. Data collection is intensive, 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, and coarse woody debris (CWD); and community characterization/classification. The CUPN [Forest Vegetation Monitoring Protocol](#) provides detailed descriptions of the field and analytical techniques used for forest vegetation monitoring.

Significant Findings

Species Diversity

Species diversity is a function of community type which is influenced significantly by geology, slope position, slope aspect, and disturbance. In temperate regions, acidic forest types tend to have fewer overall species, while sites with more alkaline soils (i.e., limestone parent material) typically have more. Compared to other CUPN parks, plot-level plant species diversity is the lowest at CARL, averaging only 31 species per plot (see Figure 2). This low plant diversity is primarily explained by the highly acidic soils of the park and the lack of geologic diversity. Unlike some parks in the network, there are no areas of higher pH in the park, limiting the numbers of species likely to occur on plots. In addition, the park's forest cover is very high, meaning light in the understory has become a limiting resource, supporting only the most shade tolerant species.

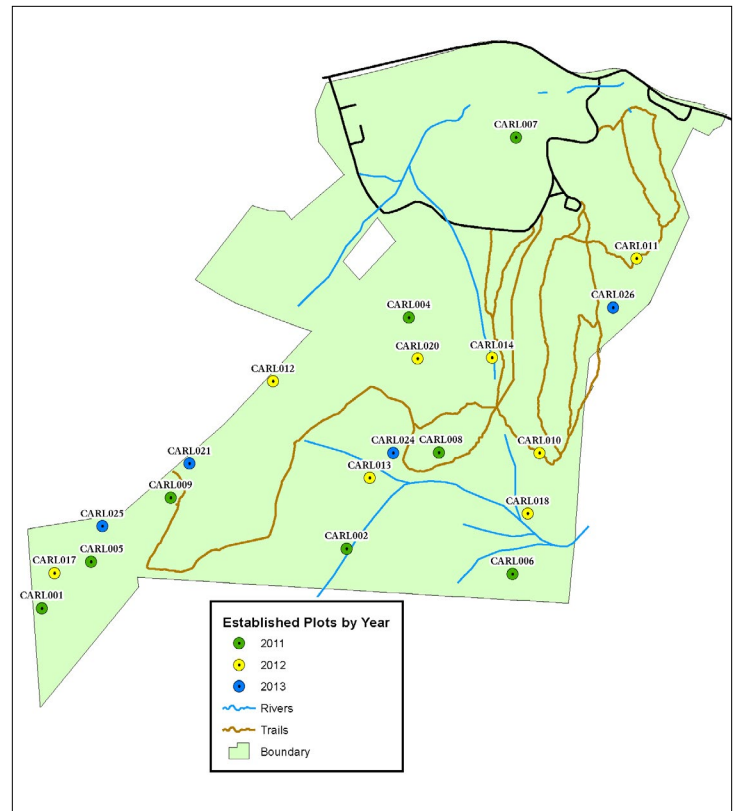


Figure 1. Map of forest vegetation monitoring sites at Carl Sandburg Home National Historic Site, North Carolina. NPS map by Lillian Scoggins.

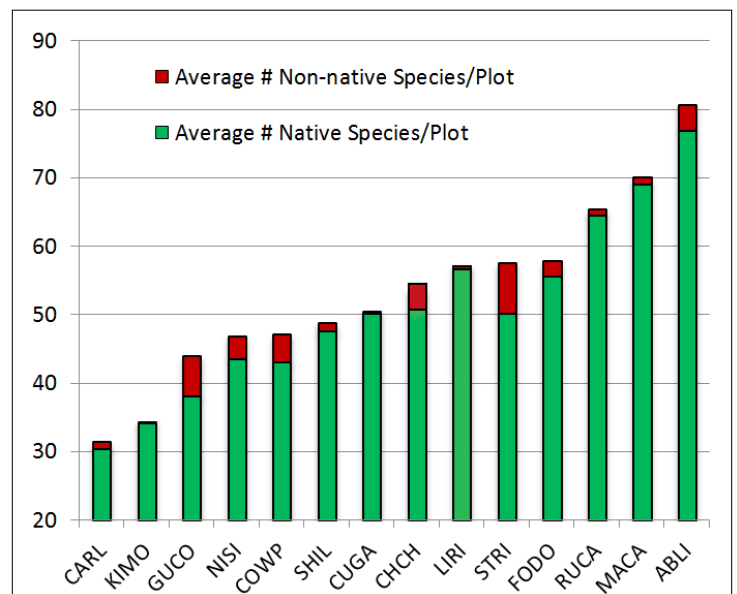


Figure 2. Plot-level average species diversity across CUPN parks, with native species shown in green and non-native species shown in red.

Significant Findings

Non-native Plants

Non-native species are present at each of the 14 parks within the network. Ideally, forest vegetation baseline monitoring and revisits to plots will help park managers understand how heavily non-native plants are affecting the native plant populations in their parks. Even though CARL is a very small park, it is located in one of the most rapidly growing counties in North Carolina and is thus an important refuge for native plants threatened by non-native species and development. Of the 153 plant species identified at the park during forest vegetation monitoring, 14 of them (9%) were non-native. Non-native plants comprised 1.9% of the plot-level species diversity at the site, which was fairly low among CUPN parks (see Figure 3). Only four of the twenty plots at CARL contained non-native plants. The most commonly found non-native plant species included Japanese spiraea (*Spiraea japonica*), Japanese honeysuckle (*Lonicera japonica*), English ivy (*Hedera helix*), and Japanese stiltgrass (*Microstegium vimineum*), occurring at four (20%), three (15%), two (10%), and two (10%) plots, respectively. Only one non-native plant species not previously documented at the park was detected during monitoring—sweet breath of spring (*Lonicera fragrantissima*). The shallow, xeric, and poorly developed soils at CARL likely contribute to the park's low non-native plant prevalence compared to other CUPN parks.

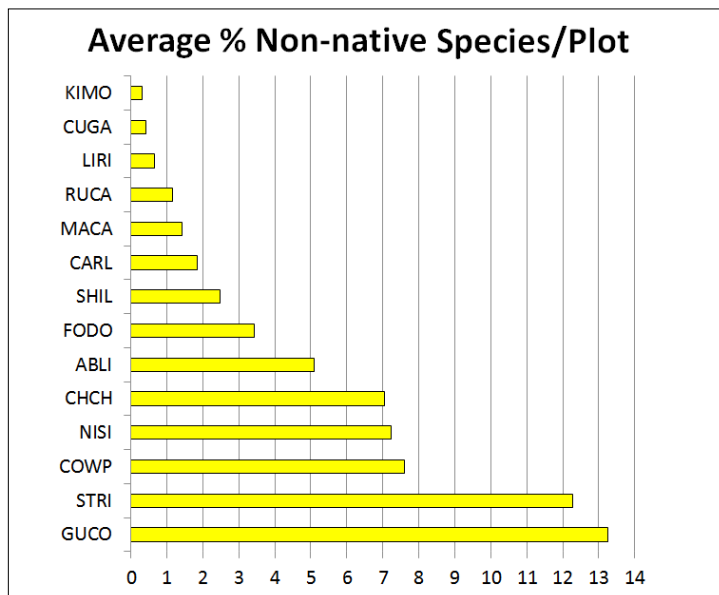


Figure 3. Plot level average non-native plant species diversity across CUPN parks by percent.

Other Findings

Some uncommon plants encountered at CARL during monitoring include Appalachian goldenbanner (*Thermopsis mollis*) and Biltmore carrionflower (*Smilax biltmoreana*). Appalachian goldenbanner is notable because it is uncommon (G3G4) and has specific habitat requirements of open canopied oak-pine woodlands/forests. It will likely only flower in areas where there has been a disturbance and the canopy is relatively open. Biltmore carrionflower, an important groundcover component of several plots, is a narrow endemic apparently limited to NC, SC, and GA (primarily in the Blue Ridge Escarpment region) and is considered a species of special concern in North Carolina (S3 – Vulnerable). Additionally, NatureServe botanists added 10 new species to the park's current list as "present in park" as a result of this monitoring effort. Plots are monitored at CARL during the first week of August.

About the Cumberland Piedmont Network

In 1999, the National Park Service initiated a long-term ecological monitoring program, known as "Vital Signs Monitoring," to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource condition. The overarching purpose of natural resource monitoring in parks is to develop scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and to determine how well current management practices are sustaining those ecosystems.

The NPS Vital Signs Monitoring Program addresses five goals for all parks with significant natural resources:

- Determine the status and trends in selected indicators of the condition of park ecosystem,
- Provide early warning of abnormal conditions,
- Provide data to better understand the dynamic nature and condition of park ecosystems,
- Provide data to meet certain legal and congressional mandates, and
- Provide a means of measuring progress towards performance goals.

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Figure 4. A tagged tree in a vegetation monitoring plot at CARL.