



Forest Vegetation Monitoring Summary, 2011–2015

Overview

The monitoring of forest vegetation communities is a key vital sign for the 14 Cumberland Piedmont Network (CUPN) parks. 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 at STRI. This brief summarizes monitoring data collected from these 20 plots established at STRI (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 moderate at STRI, averaging 58 species per plot (see Figure 2), which is relatively high considering the park's small size and urban location. The park also contains one of the 20 most diverse plots in the network, with 92 species. Most of the plot-level diversity is due to the limestone bedrock that supports rich soils found in the park.

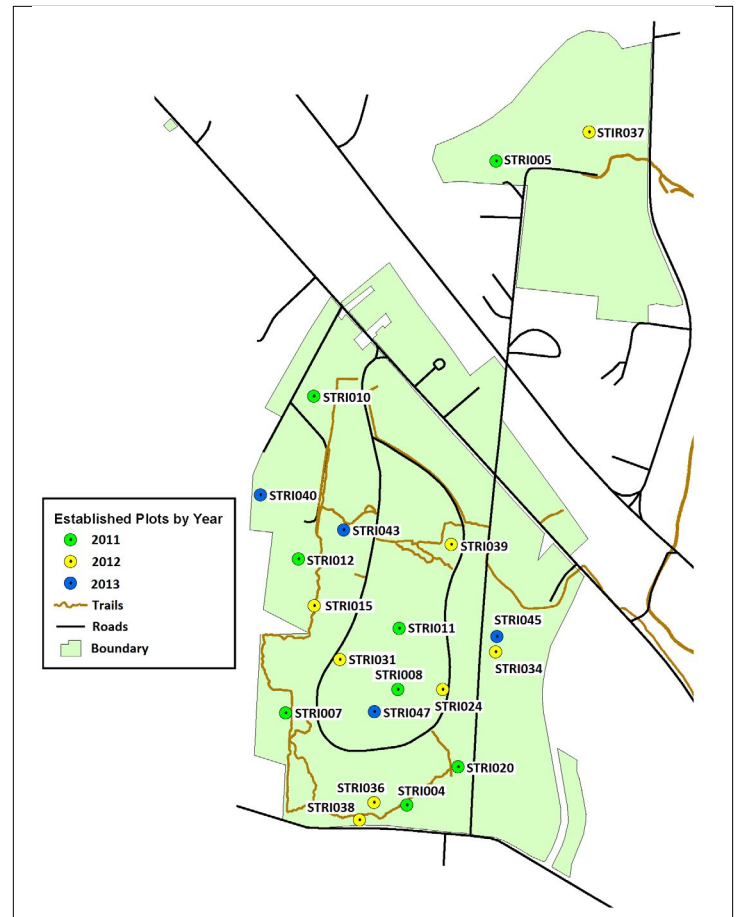


Figure 1. Map of forest vegetation monitoring sites at Stones River National Battlefield, Tennessee. NPS map by Lillian Scoggins.

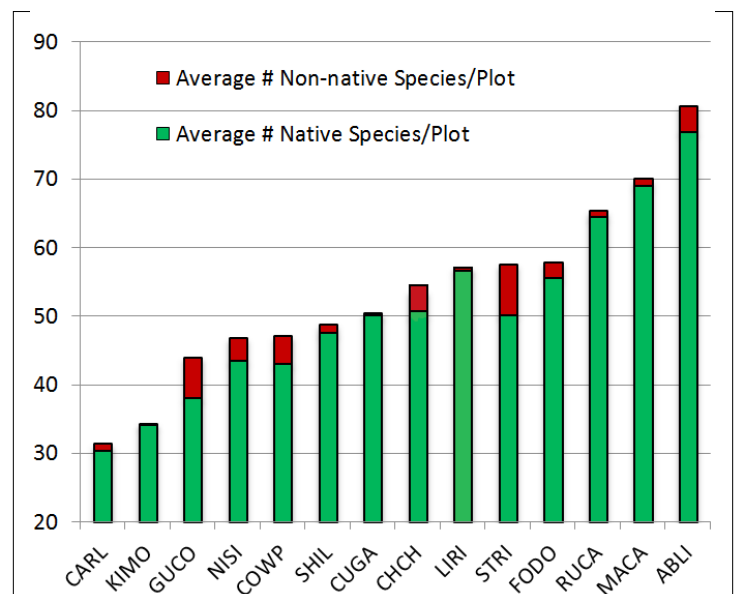


Figure 2. Plot-level average species diversity across CUPN parks, with native species shown in green and non-native species shown in red.

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. Of the 226 plants identified to species at STRI during forest vegetation monitoring, 39 of them (17%) were non-native. Non-native plants comprised 12.3% of the overall average plot-level species diversity at STRI (see Figure 3), the second-highest in the network. Of the 20 plots established across STRI, the most commonly found non-native plant species included Chinese privet (*Ligustrum sinense*), Amur honeysuckle (*Lonicera maackii*), Japanese honeysuckle (*Lonicera japonica*), osage orange (*Maclura pomifera*), wintercreeper (*Euonymus fortunei*), and sacred bamboo (*Nandina domestica*), occurring at 20 (100%), 18 (90%), 17 (85%), 14 (70%), 11 (55%), and 10 (50%) plots, respectively. Additionally, four non-native plant species not previously documented at STRI were found during monitoring plots. These included sweet wormwood (*Artemisia annua*), winged burning bush (*Euonymus alata*), Standish's honeysuckle (*Lonicera standishii*), and leatherleaf mahonia (*Mahonia bealei*).

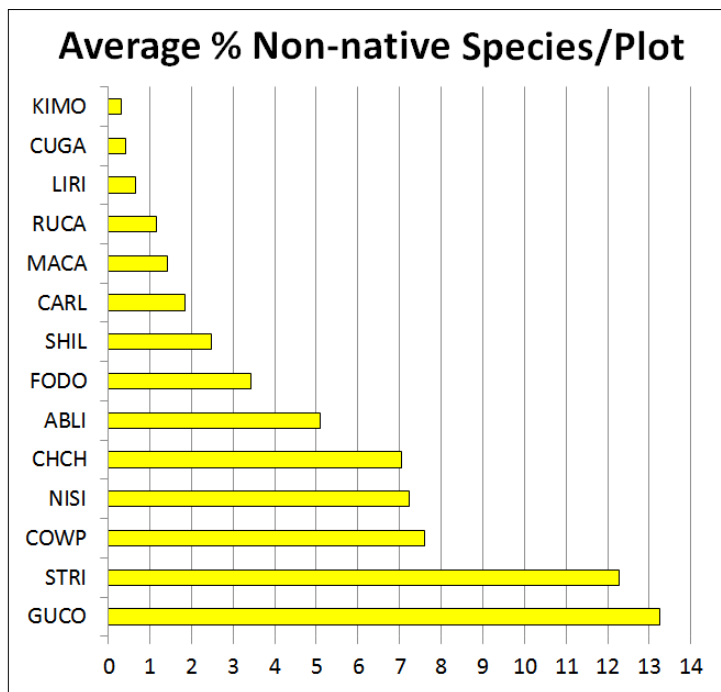


Figure 3. Plot level average non-native plant species diversity across CUPN parks by percent.

Other Findings

No new discernible issues related to tree health or decline were detected at STRI during the first phase of monitoring. However, emerald ash borer (*Agrilus planipennis*) continues to expand its range in Tennessee and was confirmed in Rutherford County in 2016 (visit http://emeraldashborer.info/documents/MultiState_EABpos.pdf for current map of known emerald ash borer extent). Although plot revisits took place at eight of the STRI vegetation monitoring plots in July 2016, and no signs of emerald ash borer were found, park staff noted several dead ash trees later in the year; thus, emerald ash borer will likely be confirmed at the park before the 2017 field season. At the completion of the 2015 field season, NatureServe botanists added 18 species to the park's current list as "present in park" as a result of this monitoring effort. Plots are monitored at STRI in July.

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.

CUPN Home Page:

<http://science.nature.nps.gov/im/units/cupn/index.cfm>

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About the NPS Inventory & Monitoring Division:

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Figure 4. Monitoring plot STRI020, with exposed limestone bedrock boulders.