



Terrestrial Vegetation Monitoring at Horseshoe Bend National Military Park

2022 Data Summary



In August 2022, the Southeast Coast Network's vegetation monitoring field crew established ten 20 × 20 meter (65.6 × 65.6 ft) plots within Horseshoe Bend National Military Park to assess long-term changes in the park's forest ecosystems and assess stressors and threats to vegetation resources.

NPS / M. FORBES BOYLE (SECN Botanist)

Terrestrial vegetation monitoring at Horseshoe Bend National Military Park: 2022 data summary

Science Report NPS/SR—2024/160

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Please cite this publication as:

Boyle, M. F., and M. A. Davis. 2024. Terrestrial vegetation monitoring at Horseshoe Bend National Military Park: 2022 data summary. Science Report NPS/SR—2024/160. National Park Service, Fort Collins, Colorado. <https://doi.org/10.36967/2305166>

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Abstract

Parks within the Southeast Coast Network (SECN) host a diverse assemblage of plants and terrestrial vegetation communities. Vegetation communities are dynamic entities whose species composition, abundance, distribution, and structure are influenced by environmental factors and impacted over time by natural and anthropogenic disturbances. Determining trends in vegetation communities over time and identifying plant stressors is vital to understanding the ecological health of terrestrial ecosystems within SECN parks. Horseshoe Bend National Military Park lies within the Southern Inner Piedmont ecoregion of Alabama. The distribution and composition of forested habitats within the park are largely determined by former land-use patterns (including clearing land for agriculture and timber removal), as well as by localized edaphic conditions. Stressors and threats to vegetation resources are present within the park, many of which are related to large-scale land-use changes of the 19th and 20th centuries, current impacts from upstream and downstream dams along the Tallapoosa River, and adjacent land use. Other threats to the vegetation resources of Horseshoe Bend National Military Park include over-population of white-tailed deer (*Odocoileus virginianus*), outbreaks of southern pine beetle (*Dendroctonus frontalis*), and competition from invasive non-native vegetation. 2022 marked the first year of conducting this monitoring effort at Horseshoe Bend National Military Park. Ten vegetation plots were established throughout the park in August. Data collected in each plot included species richness across multiple spatial scales, species-specific cover and constancy, species-specific woody stem seedling/sapling counts and adult tree diameter at breast height (DBH), overall tree health, landform, soil, observed disturbance, and woody biomass estimates. Data were stratified across two dominant broadly defined habitats within the park: Piedmont Alluvial Wetlands and Piedmont Upland Forests. One hundred ninety-nine vascular plant taxa were detected during this monitoring effort, including 54 taxa not detected in previous lists.

List of Terms

Aspect: The compass direction that a slope faces.

Basal Area (BA): The cross-sectional area of woody stems at DBH; used to describe the amount of area occupied by a single or group of stems. BA is expressed in this report as m²/ha (square meters per hectare).

Coarse Woody Debris (CWD): Downed woody stems on the ground that are either lying prone on the ground, or at least one end of the broken bole of a dead tree is touching the ground at an angle of greater than 45° from vertical. Coarse woody debris includes pieces of wood greater than 8 centimeters (3.1 inch [in]) in diameter (approximately 1,000-hour fuel class).

Constancy: The percentage of plots in a given dataset in which a species occurs.

Cover: The vertical projection of vegetation from the ground as viewed from above, and in this protocol is estimated as a percentage of area that covers the ground above the ground surface (areal cover).

Density: The number of individual woody stems in a given area.

DBH: Diameter at breast height of an individual woody stem, or 1.37 meters (4.5 feet [ft]) above the ground surface.

Duff: An organic fuel layer that lies below the litter layer and above mineral soil. It is made up of litter material that has decomposed to the point where individual pieces are no longer identifiable. In general, the duff layer is darker than the litter layer.

Fine Woody Debris (FWD): Pieces of wood less than 8 centimeters (3.1 in) in diameter. They are either (1) not attached to the woody stem where they once grew and have fallen to the ground, (2) not attached to the stem where they once grew and are supported off the ground by live or dead material, or (3) attached to stems of woody material that are themselves considered “dead” and “down.” Fine woody debris is composed of the following fire size classes: 1-hour fuels (0–0.64 centimeters [0–0.2 in]), 10-hour fuels (0.64–2.54 centimeters [0.2–1 in]), and 100-hour fuels (2.54–8.1 centimeters [1–3.2 in]).

Global / State Status: Conservation status assessment ranks developed by NatureServe and individual state Natural Heritage Programs used to determine the extinction risk of species and ecosystems at the global and state scales. Global codes are as follows:

- **G1:** Critically imperiled-very high risk of extinction
- **G2:** Imperiled-high risk of extinction
- **G3:** Vulnerable-moderate risk of extinction

- **G4:** Apparently secure-fairly low risk of extinction
- **G5:** Secure-very low risk of extinction

Growth Form: The shape and physical appearance of a species, reflecting site conditions and genetics. In this report, the following growth forms, following definitions set by USDA (2024), are used:

- **Tree:** a perennial, woody plant with a single stem (trunk), normally greater than 4–5 meters (13.1–16.4 ft) in height
- **Shrub:** a perennial, multi-stemmed woody plant that is usually less than 4–5 meters (13.1–16.4 ft) in height
- **Vine:** a twining or climbing plant with relatively long stems; can be woody or herbaceous
- **Herb/Forb:** a plant without significant woody tissue and lacking significant thickening by secondary woody growth
- **Graminoid:** a grass or grass-like plant; includes grasses (*Poaceae*), sedges (*Cyperaceae*), and rushes (*Juncaceae*)

Litter: An organic fuel layer made up of twigs, dead grasses, recently fallen leaves, and pine or other needles where the individual pieces are still identifiable and not altered by decomposition.

Sapling: Any live woody stem more than 1.37 meters (4.5 ft) in height but less than 10 centimeters (3.9 in) in diameter at breast height (DBH).

Seedling: Any live woody stem with at least two true leaves that is less than 1.37 meters (4.5 ft) tall.

Slope: The rise and fall of a land surface.

Species Richness: The overall number of species, or groups of species, within a defined area.

Terrain Shape Index (TSI): A quantitative expression of the geometric shape (ranging from concave to convex) of the land surface. Negative TSI values indicate convex shape, positive values indicate concavity, and values around 0 indicate flat surfaces.

Tree: Any woody stem more than 1.37 meters (4.5 ft) in height and greater than or equal to 10 centimeters (3.9 in) in diameter at breast height (DBH). This term is also used to describe a specific growth form (see Growth Form above).

Acknowledgments

Several people were helpful to ensure that fieldwork was conducted efficiently, safely, and thoroughly during this monitoring effort. Brian Robinson, Horseshoe Bend National Military Park (HOBE) Maintenance Mechanic, offered valuable support prior to and throughout the duration of the field season. Brian helped the Southeast Coast Network (SECN) field crew procure lodging within the park, provided advice about site access, and maintained communication with the field crew during the sampling week. This project was also aided by those individuals who assisted with field work in August 2022. Field crew members included Tom Govus (private contractor), Bill Moore (Ecologist, Cumberland Piedmont Network), Richard Smith (intern, Appalachian Highlands Network), Scott Ward (University of North Carolina Botanical Gardens, NPS contractor), and this report's two authors. Tom and Scott also provided plant identification support.



The 2022 vegetation monitoring field crew at Horseshoe Bend National Military Park included (from left) Richard Smith, Bill Moore, Tom Govus, Mallorie Davis, Scott Ward (not pictured), and Forbes Boyle (not pictured). NPS / M. FORBES BOYLE (SECN Botanist)

Executive Summary

The Southeast Coast Network (SECN) conducts long-term terrestrial vegetation monitoring as part of the NPS Inventory and Monitoring Program. The vegetation community vital sign is one of the primary-tier resources identified by SECN park managers, and monitoring is conducted at 15 network parks (DeVivo et al. 2008). Monitoring plants and their associated communities over time allows for targeted understanding of ecosystems within the SECN geography, which provides managers information about the degree of change within their parks' natural vegetation.

The year 2022 marked the first year (baseline) of conducting this monitoring effort at Horseshoe Bend National Military Park. Ten vegetation plots were established throughout the park in August. Data collected in each plot included species richness across multiple spatial scales, species-specific cover and constancy, species-specific woody stem seedling/sapling counts and adult tree (greater than 10 centimeters [3.9 inches] diameter at breast height [DBH]), overall tree health, landform, soil, observed disturbance, and woody biomass (i.e., fuel load) estimates. Data were stratified across two dominant broadly defined habitats within the park—Piedmont Alluvial Wetlands and Piedmont Upland Forests. Noteworthy findings include:

- One hundred and ninety-nine vascular plant taxa were observed across 10 vegetation plots, including 54 species not previously documented within the park.
- The most abundant and frequently encountered species in each broadly defined habitat included:
 - Piedmont Alluvial Wetlands: sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), tulip-tree (*Liriodendron tulipifera* var. *tulipifera*), southern sugar maple (*Acer floridanum*), and muscadine (*Muscadinia rotundifolia* var. *rotundifolia*).
 - Piedmont Upland Forests: muscadine, white oak (*Quercus alba*), flowering dogwood (*Benthamidia florida*), common persimmon (*Diospyros virginiana*), and whiteleaf greenbrier (*Smilax glauca*).
- Six species listed by the Alabama Invasive Plant Council as invasive within the state were observed in monitoring plots, including one species not previously detected within the park—bull thistle (*Cirsium vulgare*). The frequency of invasive species within Piedmont Alluvial Wetland habitat was very high. Chinese privet (*Ligustrum sinense*) occurred in all four Piedmont Alluvial Vegetation plots, while Japanese honeysuckle (*Lonicera japonica*) occurred in three of the four plots.
- One rare vascular plant species tracked by the Alabama Natural Heritage Program was observed during this monitoring effort—butternut (*Juglans cinerea*); another species present within monitoring plots—little silverbell (*Halesia carolina*)—is listed as an S2 (imperiled) plant in Alabama.
- Water oak and sweetgum were the most dominant species within the tree stratum of Piedmont Alluvial Wetlands of Horseshoe Bend National Military Park; loblolly pine (*Pinus taeda*) was the most dominant within Piedmont Upland Forests.

- Impacts to forest regeneration patterns from overgrazing by white-tailed deer (*Odocoileus virginianus*) were not observed within either upland or alluvial monitoring plots.
- Fire scars were observed on three of the six Piedmont Upland Forest plots and one of the four Piedmont Alluvial Wetland plots. The park initiated a prescribed fire program in 2002 to promote natural regeneration of longleaf pine, reduce fuel loads within the park's forest ecosystems, and manage forests damaged by southern pine beetle.
- Of the nine flowering dogwood stems measured within these plots during this monitoring effort, three were dead and four exhibited foliar symptoms likely caused by dogwood anthracnose (*Discula destructiva*)—an introduced fungal pathogen first observed in the United States in the late 1970s and early 1980s. The disease has not been documented within Tallapoosa County, Alabama (USDA 2019). Infected trees initially exhibit tan leaf spot, often with a purple-red border; infection spreads from leaves to small twigs, branches, and eventually to the main stem where cankers form eventually killing the tree.
- All plots are scheduled to be resampled during the spring/summer of 2026.

Introduction

Overview

Vegetation communities are the primary drivers of a range of ecological processes and are integral to the proper function of park ecosystems. Moreover, vegetation communities integrate the biological and physical environment—they serve as the foundation for food webs, provide wildlife habitat for many species, function as a carbon sink, produce oxygen, and cycle nutrients and energy through an ecosystem. Parks within the Southeast Coast Network (SECN) host a diverse assemblage of plants and terrestrial communities. Vegetation communities vary widely. Approximately 180 vegetation associations (i.e., fine-resolution floristic description), as defined by the National Vegetation and Classification Standard, Version 2.0 (FGDC 2008), occur in SECN park units. A diversity of vegetation resources is found in these parks, including dry grassland dunes, maritime oak and pine dominated forests, pyrogenic pine flatwoods, black and brown water floodplain forests, and Piedmont upland forests.

Vegetation communities are dynamic entities whose species composition, abundance, distribution, and structure are influenced by environmental factors and impacted over time by natural and anthropogenic disturbances. For communities to be considered “natural,” native species must be predominately distributed across the landscape because of disturbance factors (i.e., stressors) or site condition (i.e., environmental factors, e.g., soil nutrients, landform; Comer et al. 2003). The timing, type, and extent of a disturbance generally evoke a distinguishable response in vegetation across the landscape (Turner et al. 1990; Foster et al. 1998). Natural disturbance processes in SECN parks include those brought about by fire regimes and weather patterns (e.g., hurricanes and drought), while anthropogenic influences include landscape fragmentation, fire suppression, altered hydrology, shifts in seasonal weather patterns, and non-native species introduction.

Determining trends in vegetation communities over time and identifying plant stressors is vital to understanding the ecological health of terrestrial ecosystems within SECN parks. Collectively, this information can be used to guide management actions that sustain a park’s ecological integrity and support plant conservation across a diversity of spatial scales. The Southeast Coast Network collects long-term data on vegetation communities using a protocol largely based on the forest monitoring approaches used by the Cumberland Piedmont Network (White et al. 2011) and Gulf Coast Network (Carlson et al. 2018).

This report provides a summary of data collected during August 2022 within Horseshoe Bend National Military Park (HOBE) as part of the SECN’s terrestrial vegetation monitoring effort. This report is intended to provide HOBE resource managers and partners with (a) baseline information on the composition, abundance, and structure of vegetation across broad habitat types, (b) documentation of observable stressors to park vegetation resources, and (c) a summary of ancillary data associated with terrestrial ecosystems (e.g., soil nutrient status and fuel abundance).

Monitoring Objectives

The overall objective of this effort is to detect meaningful changes in species composition and vegetation structure within natural and semi-natural vegetation communities of SECN parks and determine whether these changes are correlated with trends in key stressors.

The data presented herein are from the first iteration of sampling activities in Horseshoe Bend National Military Park utilizing the SECN terrestrial vegetation monitoring protocol (Boyle et al. 2019). For this “baseline” status report, 2022 data were synthesized to answer the following questions across broad habitat types within the park:

- How does species richness vary across terrestrial vegetation communities?
- What is the status of composition and abundance among native versus non-native, invasive species?
- What are the most common plants encountered during the monitoring effort, and conversely, were there rare species detected?
- In forests, woodlands, and shrublands, what is the relative frequency of woody seedlings, saplings, and subcanopy or canopy species?
- Do observable stressors appear to impact vegetation communities?
- What is the current condition of soil nutrient chemistry and fuel volume?



Forests of Horseshoe Bend National Military Park provide habitat for understory herbaceous plants, including crane fly orchid (*Tipularia discolor*). This is one of the most common orchids in the eastern United States, identifiable by its lemon yellow-green pendulant flowers and its accordion-style leaf with acuminate apex and deep purple beneath. NPS / M. FORBES BOYLE (SECN Botanist)

Methods

Study Area

Horseshoe Bend National Military Park (HOBE) is in eastern-central Alabama (Tallapoosa County) approximately 24 kilometers (15 miles [mi]) east of Alexander City. The park is situated on and named for the horseshoe-shaped meander of the Tallapoosa River—a tributary of the Mobile River. The Tallapoosa River is the park's dominant physical and cultural feature. The river bend was used as a strategic military position by Major General Andrew Jackson during the Creek War (1813–1814), while the battlefield within the park's boundary was the location of the final conflict of the war in March 1814. Horseshoe Bend National Military Park was established in July 1956 and was opened to the public in March 1964. The boundary of the park has not changed significantly since its establishment, and today includes 829 hectares (2,049 acres [ac]) of mostly mid-successional pine (*Pinus sp.*)-mixed hardwood upland forests, mid-successional sweetgum (*Liquidambar styraciflua*)-pine forests, and park-maintained open fields of the original battlefield (Cotten et al. 2019).

Horseshoe Bend National Military Park lies within the Southern Inner Piedmont ecoregion of Alabama. This ecoregion typically has higher elevations and steeper slopes than the rest of the Piedmont, with gneiss and schist rocks yielding nutrient-poor, acidic soil (Griffith et al. 2001). For more than 100 years prior to park establishment, the land of Horseshoe Bend National Military Park was farmed (Burkholder et al. 2015). The distribution and composition of forested habitats within the park are largely determined by former land-use patterns, as well as by localized edaphic conditions.

Numerous stressors and threats to vegetation resources are present within the park, many of which are related to large-scale land-use changes of the 19th and 20th centuries, current impacts from upstream and downstream dams along the Tallapoosa River, and adjacent land use (DeVivo et al. 2008). Other threats to the vegetation resources of Horseshoe Bend National Military Park include over-population of white-tailed deer (*Odocoileus virginianus*), outbreaks of southern pine beetle (*Dendroctonus frontalis*), and competition from invasive non-native vegetation (Burkholder et al. 2015). Another management concern within the park is the re-establishment of longleaf pine (*Pinus palustris*), which historically would have been located on ridgetops and upper slopes of the park's terrestrial uplands. The southeastern Coastal Plain and parts of the Piedmont once contained a vast mosaic of pine woodlands, typically dominated by an open canopy of longleaf pine, that covered over 90 million acres (36.4 million ha) from Virginia to Florida and west to Mississippi (Ware et al. 1993). Land use patterns over the past several hundred years—such as conversion to agriculture, grazing, logging, and fire suppression—have eliminated all but 2% (3.8 million acres [1.2 million ha]) of these terrestrial communities (Landers et al. 1995). Although these woodlands could occur across a range of edaphic conditions—from xeric sandy soils of rolling uplands to wet-mesic soils of low-lying flats (“flatwoods”)—they all were maintained by relatively frequent (generally three years or less), low intensity fire. Horseshoe Bend National Military Park initiated a prescribed fire program in 2002 to promote natural regeneration of longleaf pine, reduce fuel loads within the park's forest ecosystems, and manage forests damaged by southern pine beetle (Burkholder et al. 2015). The

park's first prescribed burn occurred in 2006, and a second burn was conducted in 2011. The goal is to maintain a five-year burn rotation within the park.

The most recent floristic survey within Horseshoe Bend National Military Park was conducted in 1997 and 1998 and documented 215 vascular plants (ANHP and Tyler 1999). According to the current National Park Service Certified Species List (NPSpecies), there are 431 vascular plants that are reported for the park and 31 of those are non-native—7% of the total (NPS 2024). Many of these non-native plants occupy ruderal sites, manicured lawns, and roadsides or have only a single site occurrence. Non-native plants that are classified as invasive by the Alabama Invasive Plant Council (AIPC 2012) that have been documented within the park include:

- Mimosa (*Albizia julibrissin*; Rank 1—extensive and dense infestations throughout Alabama)
- Chinese yam (*Dioscorea polystachya*; Rank 2—scattered and localized infestations throughout Alabama)
- Chinese lespedeza (*Lespedeza cuneata*; Rank 1)
- Chinese privet (*Ligustrum sinense*; Rank 1)
- Japanese honeysuckle (*Lonicera japonica*; Rank 1)
- Chinaberry (*Melia azedarach*; Rank 2)
- Kudzu (*Pueraria montanta* var. *lobata*; Rank 1)
- Johnson grass (*Sorghum halepense*; Rank 2)

There have not been any federal or state listed endangered or threatened species observed within Horseshoe Bend National Military Park to date. However, two species tracked by the Alabama Natural Heritage Program (ANHP 2019) have been documented for the park, including butternut (*Juglans cinerea*) and great yellow wood-sorrel (*Oxalis grandis*). Little silverbell (*Halesia carolina*), which is currently not tracked by ANHP but is listed as Imperiled (S2) within the state by NatureServe (2024), is also known to occur within the park.

Sampling Design

The Southeast Coast Network monitors vegetation in long-term plots located in natural and semi-natural habitats of targeted parks, including Horseshoe Bend National Military Park. Sample size (i.e., number of plots) is determined by a combination of factors: (1) priority plots are located in broadly defined habitats that cover more than 30% of the total area of the park's natural and semi-natural vegetation (i.e., dominant and co-dominant habitat); (2) the number of priority plots is scaled according to the overall size of dominant/co-dominant mapped polygons, such that the distribution of plots is between 1 and 25 per 100 hectares (247 ac) of these habitat types; (3) the secondary sample target is any broadly defined habitat that covers between 1 and 30% of a park's natural and semi-natural vegetation; (4) each of the secondary sample target habitat types is allotted four plots.

Ten vegetation plots were established and sampled within Horseshoe Bend National Military Park during August 2022 (Figure 1). These plots were in the following broadly defined habitats of the

park: Piedmont Alluvial Wetlands (4 plots) and Piedmont Upland Forests (6 plots). Plot locations were determined using the generalized random-tessellation stratified (GRTS) sampling methodology, which creates a spatially-balanced array of sample points across an area of interest while maintaining flexibility in a project's sample size (Stevens and Olsen 2004).

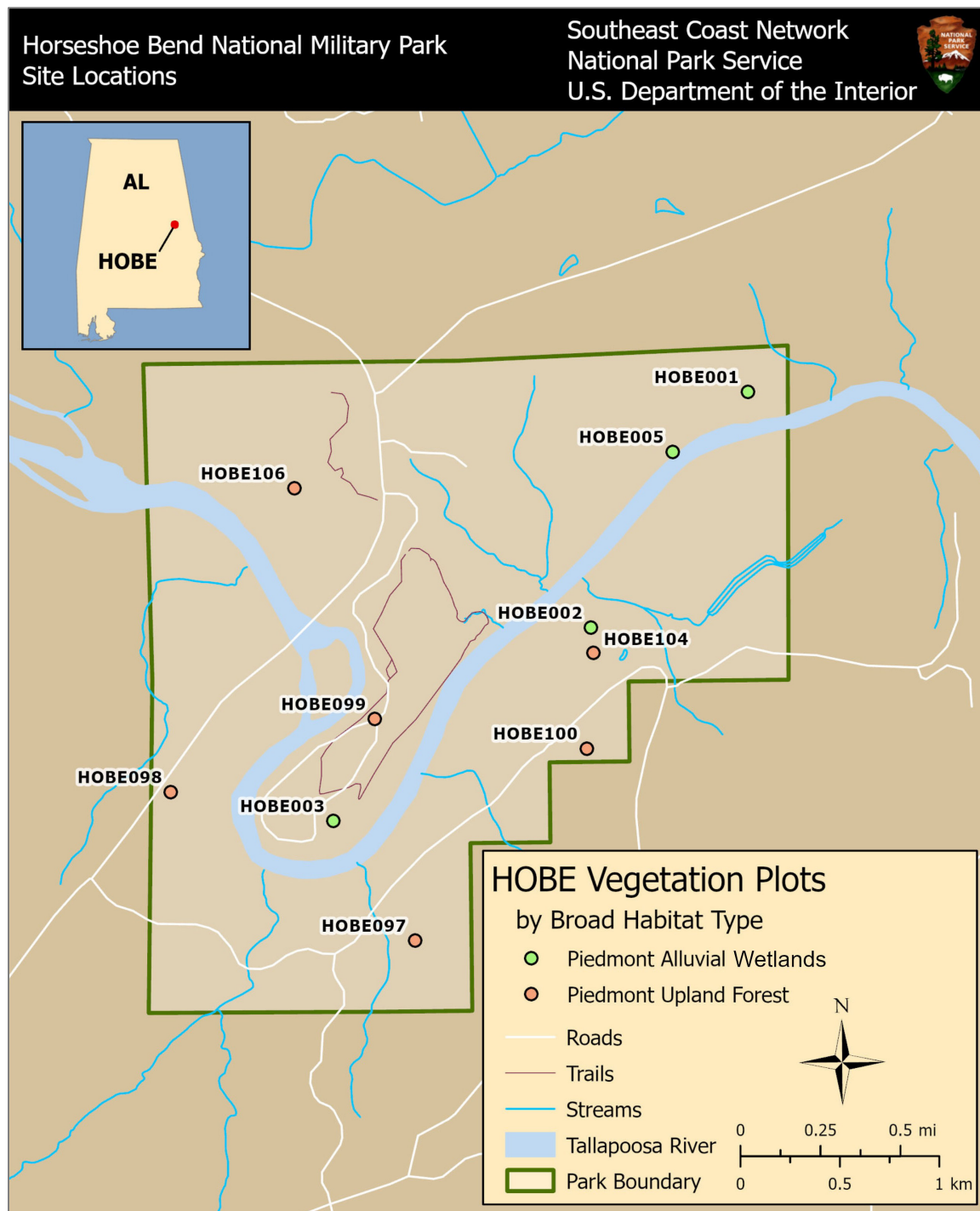


Figure 1. Southeast Coast Network terrestrial vegetation monitoring plot locations within Horseshoe Bend National Military Park.

Nomenclature Standard, Growth Form Determination, and Conservation Status

Species nomenclature for this report follows the Flora of the Southern and Mid-Atlantic States (Weakley 2020). Every attempt was made to identify all plants to species, variety, or subspecies; when this was not possible, the lowest level of identifiable taxa (e.g., genera, family) was used. Once the final list was determined, each species was cross-referenced with the USDA Plants Database (USDA 2024) to determine growth form, native status, federal/state noxious status, and to provide a unique common name. When a single taxon linked to multiple growth forms, the lead author subjectively chose a single growth form to link with the taxa. The species list was also cross-referenced with Alabama rare plant lists to determine the state and federal conservation status (e.g., Endangered, Threatened, Rarity) of each species (ANHP 2019) and the list of non-native invasive plants in Alabama to determine the degree of invasiveness (AIPC 2012).

Sampling Methodology

The vegetation plot layout for this monitoring effort is based upon the plot design used by the Carolina Vegetation Survey (Peet et al. 1998; Lee et al. 2008) and the Cumberland Piedmont Network (White et al. 2011). The plot array consists of a 20 × 20 meter (65.6 × 65.6 ft) bounded square with multiple nested sampling frames ranging from 1 square meter (10.8 square feet [ft²]) to 400 square meters (4,305.5 ft²), three 25 meter (82.0 ft) fuel transects that cross both inside and outside the bounded square, and three soil sample frames located adjacent to the bounded square (Figure 2).

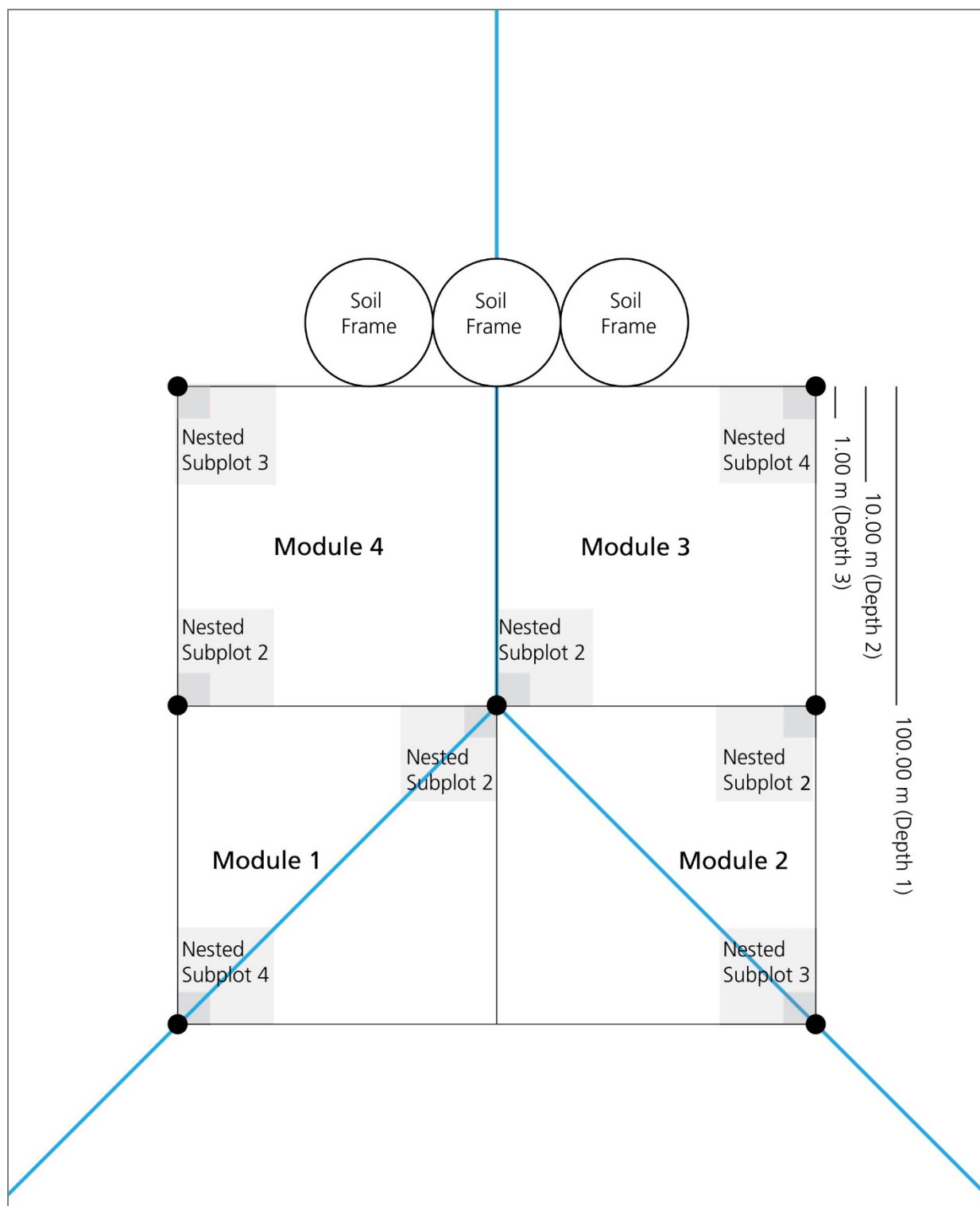


Figure 2. The layout of the sampling plot for the Southeast Coast Network, which is a modified version of the standard Level 5 Carolina Vegetation Survey plot. Ideal locations of rebar used as permanent structures to monument the plot are represented by black shaded circles. Blue lines represent locations of the three 25-meter (82-foot) fuel transects.

Vascular plant species presence was determined at three scales within each of the four 100 square meter (1,076.4 ft²) modules: the 1 square meter (10.8 ft²) nested depth, the 10 square meter (107.6 ft²) nested depth, and the full modular depth. The nested depth “quadrats” were in two of the four corners within each module. For each species either rooted in or overhanging a module, an areal cover value was assigned using the cover class codes developed by the Carolina Vegetation Survey (Peet et al. 1998; Table 1).

Table 1. Vascular plant cover metrics of the Carolina Vegetation Survey (Peet et al. 1998) and used by the SECN terrestrial vegetation monitoring protocol (Boyle et al. 2019).

Cover Class	Cover Range (%)	Geometric Mean
1	0–0.1	0.03
2	0.1–1.0	0.32
3	1.0–2.0	1.41
4	2.0–5.0	3.16
5	5.0–10.0	7.07
6	10.0–25.0	15.81
7	25.0–50.0	35.36
8	50.0–75.0	61.24
9	75.0–95.0	84.41
10	95.0–100.0	97.47

Individual woody stem data were also calculated within each module. For each stem greater than or equal to 10 centimeters (3.9 inches [in]; tree) in diameter at 1.4 meter (4.5 ft) linear distance from the ground layer, its species, DBH, and health status were recorded. Within the two 10 square-meter (107.6 ft²) nested depth “quadrats” used for detecting overall species presence (see above), each woody stem that reached 1.4 meter (4.5 ft) in linear distance from the ground layer but was less than 10 centimeters (3.9 in) in diameter at this height (sapling) was identified to species and DBH was determined.

Finally, within the two 1 square meter (10.8 ft²) nested depth “quadrats” used for detecting overall species presence (see above), each woody stem less than 1.4 meters (4.5 ft) in linear distance from the ground layer (seedling) was identified to species and a height class was determined: 5–15 centimeters (2–5.9 in); 15–30 centimeters (5.9–11.8 in); 30–50 centimeters (11.8–19.7 in); or 50–137 centimeters (19.7–53.9 in). Surface fuels were assessed at each Piedmont Upland Forest plot using the planar transect method for the standard fuel size classes: 1-hour (0–0.6 cm), 10-hour (0.6–2.5 cm), 100-hour (2.5–7.6 cm), and 1000-hour (> 7.6 cm), and duff and litter depths (Brown 1974). Counts of each fuel size class were tallied across three fuel transects, with diameter and decay class recorded for each piece of 1000-hour fuel. These field data were incorporated into equations using constant multipliers defined by Brown (1974)—including quadratric mean diameter, nonhorizontal

correction factor, specific gravity, and bulk density—to estimate fuel load weight (units=tons/acre) within each plot.

Additional site characteristics were also measured at each plot. Elements taken from the center of each plot included dominant slope, aspect, and terrain shape; basic hydrological condition; and presence and abundance of disturbance indicators. General canopy conditions were assessed, including canopy closure and average height. Closure was measured from the center of each module using a spherical densiometer, and height was taken from three representative trees within (or just outside) the plot. Soil samples were collected from the upper 10 centimeters (0.3 ft) of mineral soil in three sampling frames located adjacent to each vegetation plot. These samples were combined by plot upon return from the field and dried prior to shipping to a soil testing laboratory for standard nutrient analysis. Each plot was qualitatively assigned to one or two National Vegetation Classification (NVC) vegetation association types that best matched the sample site. Finally, two-dimensional photo points were taken with a point-and-shoot camera at the western and eastern center edge of each plot; a third photo point was made from the plot center using a 360-degree camera.

Results and Discussion

One hundred and ninety-nine vascular plant taxa were detected during this monitoring effort (Appendix A), including 54 taxa not detected in previous lists of Horseshoe Bend National Military Park documented in ANHP and Tyler (1999), Heath and Byrne (2014), NPSpecies (NPS 2024), or Southeast Regional Network of Expertise and Collections (SERNEC 2024; Table 2). One of the species—bull thistle (*Cirsium vulgare*)—is new to the park and on the Alabama Invasive Plant Council list of invasive plants in the Watch List category (AIPC 2012). Native species richness ranged from 28 to 84 species per plot, while non-native richness ranged from zero to five species per plot (Table 2). Native species observed in these plots are common throughout the Piedmont of Alabama, and there were no federally-listed or state-listed species observed on these plots during monitoring. However, one rare species (butternut; state status=S1) tracked by the Alabama Natural Heritage Program (ANHP 2019) was observed within a single monitoring plot. Little silverbell, which is currently not tracked by ANHP but is listed as Imperiled (S2) within the state by NatureServe (2024), was observed in two monitoring plots. Six species listed by the Alabama Invasive Plant Council as invasive within the state were observed in monitoring plots, and the frequency of invasive species within Piedmont Alluvial Wetland habitat was very high. Invasive species that were observed within the park during this monitoring effort included mimosa, bull thistle, Chinese lespedeza, Chinese privet, Japanese honeysuckle, and Japanese stilt grass (*Microstegium vimineum*).

Table 2. Vascular plant species, subspecies, or varieties not reported from ANHP and Tyler (1999), Heath and Byrne (2014), NPSpecies (NPS 2024), or Southeast Regional Network of Expertise and Collections (SERNEC 2024) but documented within Horseshoe Bend National Military Park through this 2022 monitoring effort.

Scientific Name	Common Name ¹	Growth Form ¹	Native Status ¹	Global Rank ²	State Rank ² (Alabama)
<i>Acalypha rhomboidea</i>	common threeseed mercury	Forb/herb	Native	G5	SNR
<i>Andropogon ternarius</i>	split beard bluestem	Graminoid	Native	G5	SNR
<i>Aronia arbutifolia</i>	red chokeberry	Shrub, Tree	Native	G5	SNR
<i>Arundinaria appalachiana</i>	hill cane	Subshrub, Graminoid, Shrub	Native	G4	SNR
<i>Arundinaria tecta</i>	switch cane	Subshrub, Graminoid, Shrub	Native	G5	SNR
<i>Bidens frondosa</i>	devil's beggartick	Forb/herb	Native	G5	SNR
<i>Brachyelytrum erectum</i>	bearded shorthusk	Graminoid	Native	G5	SNR
<i>Calycanthus floridus</i>	eastern sweetshrub	Shrub	Native	G5	SNR

¹ Information obtained from the PLANTS database (USDA 2024).

² Conservation Status (G5: Species Secure; T5: Variety Secure; G4: Apparently Secure; S3: Vulnerable; SNR: no ranking) obtained from NatureServe Explorer 2.0 (NatureServe 2024).

Table 2 (continued). Vascular plant species, subspecies, or varieties not reported from ANHP and Tyler (1999), Heath and Byrne (2014), NPSpecies (NPS 2024), or Southeast Regional Network of Expertise and Collections (SERNEC 2024) but documented within Horseshoe Bend National Military Park through this 2022 monitoring effort.

Scientific Name	Common Name ¹	Growth Form ¹	Native Status ¹	Global Rank ²	State Rank ² (Alabama)
<i>Carex complanata</i>	hirsute sedge	Graminoid	Native	G5	SNR
<i>Carex cumberlandensis</i>	Cumberland sedge	Graminoid	Native	SNR	SNR
<i>Carex debilis</i>	white edge sedge	Graminoid	Native	G5	SNR
<i>Carex laxiflora</i>	broad looseflower sedge	Graminoid	Native	G5	SNR
<i>Carex longii</i>	Long's sedge	Graminoid	Native	G5	SNR
<i>Carex nigromarginata</i>	black edge sedge	Graminoid	Native	G5	SNR
<i>Carex oligocarpa</i>	richwoods sedge	Graminoid	Native	G4	SNR
<i>Carex picta</i>	Boott's sedge	Graminoid	Native	G4	SNR
<i>Carex reznicekii</i>	Reznicek's sedge	Graminoid	Native	G5	SNR
<i>Carex rosea</i>	rosy sedge	Graminoid	Native	G5	SNR
<i>Carya ovalis</i>	red hickory	Tree	Native	G5	SNR
<i>Carya pallida</i>	sand hickory	Tree	Native	G5	SNR
<i>Celtis laevigata</i>	sugarberry	Tree, Shrub	Native	SNR	SNR
<i>Celtis pumila</i>	dwarf hackberry	Tree, Shrub	Native	SNR	SNR
<i>Chamaecrista nictitans</i> var. <i>nictitans</i>	sensitive partridge pea	Subshrub, Forb/herb	Native	T5	SNR
<i>Chasmanthium laxum</i>	slender woodoats	Graminoid	Native	G5	SNR
<i>Cirsium horridulum</i> var. <i>horridulum</i>	yellow thistle	Forb/herb	Native	T5	SNR
<i>Cirsium vulgare</i>	bull thistle	Forb/herb	Non-native	SNR	SNR
<i>Crataegus macrosperma</i>	bigfruit hawthorn	Shrub, Tree	Native	G5	SNR
<i>Desmodium glabellum</i>	Dillenius' ticktrefoil	Forb/herb	Native	G5	SNR
<i>Desmodium paniculatum</i> var. <i>paniculatum</i>	panickedleaf ticktrefoil	Forb/herb	Native	T5	SNR
<i>Desmodium perplexum</i>	perplexed ticktrefoil	Forb/herb	Native	G5	SNR
<i>Desmodium rotundifolium</i>	prostrate ticktrefoil	Forb/herb	Native	G5	SNR
<i>Dichanthelium depauperatum</i>	starved panicgrass	Graminoid	Native	G5	SNR
<i>Dichanthelium dichotomum</i> var. <i>dichotomum</i>	cypress panicgrass	Graminoid	Native	T5	SNR
<i>Dichanthelium laxiflorum</i>	openflower rosette grass	Graminoid	Native	G5	SNR
<i>Erianthus alopecuroides</i>	silver plumegrass	Graminoid	Native	G5	SNR

¹ Information obtained from the PLANTS database (USDA 2024).

² Conservation Status (G5: Species Secure; T5: Variety Secure; G4: Apparently Secure; S3: Vulnerable; SNR: no ranking) obtained from NatureServe Explorer 2.0 (NatureServe 2024).

Table 2 (continued). Vascular plant species, subspecies, or varieties not reported from ANHP and Tyler (1999), Heath and Byrne (2014), NPSpecies (NPS 2024), or Southeast Regional Network of Expertise and Collections (SERNEC 2024) but documented within Horseshoe Bend National Military Park through this 2022 monitoring effort.

Scientific Name	Common Name ¹	Growth Form ¹	Native Status ¹	Global Rank ²	State Rank ² (Alabama)
<i>Fraxinus americana</i>	white ash	Tree	Native	G5	SNR
<i>Galium bermudense</i>	coastal bedstraw	Forb/herb	Native	G5	SNR
<i>Galium circaeazans</i>	licorice bedstraw	Forb/herb	Native	G5	SNR
<i>Gentiana villosa</i>	striped gentian	Forb/herb	Native	G4	S3
<i>Halesia tetraptera</i>	common silverbell	Tree	Native	G5	SNR
<i>Lactuca canadensis</i>	Canada lettuce	Forb/herb	Native	G5	SNR
<i>Magnolia tripetala</i>	umbrella-tree	Tree	Native	G5	SNR
<i>Matelea carolinensis</i>	Carolina milkvine / maroon Carolina milkvine	Forb/herb, Vine	Native	G4	SNR
<i>Nabulus serpentarius</i>	Gall of the Earth / cankerweed	Forb/herb	Native	G5	SNR
<i>Oxalis dillenii</i>	slender yellow woodsorrel	Forb/herb	Native	G5	SNR
<i>Physalis pubescens</i>	husk tomato	Forb/herb	Native	G5	SNR
<i>Quercus coccinea</i>	scarlet oak	Tree	Native	G5	SNR
<i>Scleria ciliata</i>	fringed nutrush	Graminoid	Native	G5	SNR
<i>Scleria oligantha</i>	littlehead nutrush	Graminoid	Native	G5	SNR
<i>Thysantherella difformis</i>	climbing dogbane	Vine	Native	G4	SNR
<i>Tilia americana</i> var. <i>caroliniana</i>	Carolina basswood / southern basswood	Tree	Native	T5	SNR
<i>Vicia caroliniana</i>	Carolina vetch	Forb/herb, Vine	Native	G5	SNR
<i>Viola sororia</i>	common blue violet	Forb/herb	Native	G5	SNR
<i>Vitis cinerea</i>	pigeon grape / graybark grape	Vine	Native	SNR	SNR

¹ Information obtained from the PLANTS database (USDA 2024).

² Conservation Status (G5: Species Secure; T5: Variety Secure; G4: Apparently Secure; S3: Vulnerable; SNR: no ranking) obtained from NatureServe Explorer 2.0 (NatureServe 2024).

Within the Piedmont of the southeastern United States, plant species composition and structure patterns within natural vegetation community types are determined by variations in soil and topography, climatic factor, and former land use patterns across the landscape. What follows is a synopsis of vegetation and environmental data stratified by each of the broadly defined habitats sampled within the park.

Piedmont Alluvial Wetlands

Alluvial habitats of the southeastern Piedmont include forested and non-forested wetlands adjacent to rivers and streams often influenced by occasional or periodic flooding. The wet nature of floodplain soils protects these sites from fire and drought, and thus would have historically supported larger diameter, older-growth trees than surrounding uplands; early-successional zones of floodplains would have occurred specifically in small-scale windfall gaps or active flood zones (e.g., willow-bars; Sharitz and Mitsch 1993; Christensen 2000). In contrast to the Coastal Plain, whose well-developed, wide floodplains support numerous, complex geomorphologic features (e.g., point bars, sloughs, oxbow lakes, backswamps), Piedmont floodplains are narrow and often do not include complex geomorphologic features (Edwards et al. 2013). Most rivers within the southeastern Piedmont are constrained by geologic features, with lateral movement limited by the hard substrate (Edwards et al. 2013). Flooding is not as extensive within Piedmont floodplains and alluvial material is often limited to narrow bands along the river or stream channel.

Rivers and streams of the Piedmont have been modified by two centuries of intense anthropogenic land-use, including wide-spread clearing for agriculture. Farming practices which emphasized heavy rotations removed most of the nutrients from the soil and caused severe erosion. In some instances, sediments from erosion raised streambeds over 12 feet (3.7 meters [m]) and created unnatural bottomlands in lower slope (e.g., mesic) uplands (Trimble 1974). Over time, streams have down cut rapidly through this higher sediment, causing steep terraces to form on either side of the streambank that prevent natural flooding (Edwards et al. 2013). Other threats and stressors to Piedmont alluvial wetlands include the high density of commercial, industrial, and residential land coupled with high density of impervious surfaces leading to increases in point- and non-point-sources of contamination; hydrologic pattern disruption from upstream dams; and increases in density of non-native, invasive plant species (e.g., Chinese privet; DeVivo et al. 2008; Edwards et al. 2013).

At Horseshoe Bend National Military Park, alluvial wetlands in bottomland hardwood- and pine-dominated mid-successional forests are found along the floodplain of the Tallapoosa River and its major tributaries (Cotten et al. 2019; Figure 3). These alluvial forests are the most common type along the river corridor and its tributaries. Other alluvial wetlands present in the park include canebrakes dominated by a short shrub layer of silky dogwood (*Swida amomum*) and common elderberry (*Sambucus canadensis*) with giant cane (*Arundinaria gigantea*) in the herbaceous strata; graminoid-dominated marshes dominated by redtop panic grass (*Coleataenia rigidula* ssp. *rigidula*) or rice cutgrass (*Leersia oryzoides*); and early-successional sites dominated by a tall shrub layer of tag alder (*Alnus serrulata*; Cotten et al. 2019). Several vegetation associations corresponding with this broadly defined habitat type were sampled within the park during this monitoring effort, including (descriptions from Cotten et al. 2019 and NatureServe 2024):

- Ruderal Loblolly Pine – Sweetgum Forest (CEGL008462; 1 plot): Mid- to late-successional Piedmont forests that are strongly co-dominated by loblolly pine (*Pinus taeda*) and sweetgum; sites where these forests have developed were typically farmed (Global Status: No Status Rank; State [AL] Status: No Status Rank).

- Ruderal Sweetgum Forest (CEGL007216; 1 plot): Early- to mid-successional Piedmont forests that are dominated by an even-age canopy of sweetgum and a highly variable understory component (Global Status: No Status Rank; State [AL] Status: No Status Rank).
- Georgia Fall-line Overcup Oak – Sweetgum Floodplain Forest (CEGL008583; 1 plot): Seasonally flooded forests of floodplains in Alabama and Georgia dominated by a variable canopy of overcup oak (*Quercus lyrata*), willow oak (*Quercus phellos*), and sweetgum; sites where this forest occurs flood more often as a result of rainfall accumulation rather than river overflow; the subcanopy typically contains American hornbeam (*Carpinus caroliniana*), red maple (*Acer rubrum*), and winged elm (*Ulmus alata*) (Global Status: G3—Vulnerable; State [AL] Status: S2—Imperiled).
- Southeastern Coastal Plain Green Ash – Elm Bottomland Forest (CEGL007806; 1 plot): Forests dominated by green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and sugarberry (*Celtis laevigata*) occurring on a variety of topographic positions of Atlantic and Gulf Coast floodplains; soils are clay or silt loams with alluvial deposition (Global Status: G4—Apparently Secure; State [AL] Status: No Status Rank).



Figure 3. Four plots were established within Piedmont Alluvial Wetlands of Horseshoe Bend National Military Park during this monitoring effort (August 2022). This broadly defined habitat type included mid-successional sweetgum- and oak-dominated forests located along flat slopes adjacent to rivers and lower slopes adjacent to floodplains. NPS / M. FORBES BOYLE (SECN Botanist)

Species Diversity and Abundance

Native species richness ranged from 36 to 69 (mean = 50.8) within plots of this broadly defined habitat type in Horseshoe Bend National Military Park and all plots had at least one non-native species present (Table 3). Five of the six invasive plants found within the park during this monitoring effort were encountered in these Piedmont Alluvial Wetland plots. Invasive species that occurred in 50% or more of these plots included Chinese privet, Japanese honeysuckle, Japanese stilt grass, and Chinese lespedeza (see Appendix B, Table 9). Native vascular plants observed in these plots are common across the southeastern Piedmont. Trees represented the most diverse growth form across all spatial scales except the 1 m²-scale within these plots; vines were the most diverse growth form within the nested 1 m² quadrats (Table 3). One hundred sixteen vascular plants were found collectively within these four plots and 47 of these were only found within plots of this broadly defined habitat (Appendix B, Table 9). A complete species list, along with constancy and average cover per species, is in Appendix B, Table 9. Species with high constancy in this habitat are listed below, by growth form (constancy values in parentheses):

Trees

- Sweetgum (100%)
- Water oak (*Quercus nigra*; 100%)
- Southern sugar maple (*Acer floridanum*; 100%)
- Tulip-tree (*Liriodendron tulipifera* var. *tulipifera*; 100%)
- Red maple (100%)
- Winged elm (100%)
- Bitternut hickory (*Carya cordiformis*; 100%)
- Chinese privet (100%)

Shrubs

- American beautyberry (*Callicarpa americana*; 75%)

Vines

- Muscadine (*Muscadinia rotundifolia* var. *rotundifolia*; 100%)
- Virginia creeper (*Parthenocissus quinquefolia*; 100%)
- Saw greenbrier (*Smilax bona-nox* var. *bona-nox*; 100%)
- Roundleaf greenbrier (*Smilax rotundifolia*; 100%)
- Eastern poison ivy (*Toxicodendron radicans* var. *radicans*; 100%)

Herbs and Graminoids

- White edge sedge (*Carex debilis*; 100%)
- Longleaf woodoats (*Chasmanthium sessiliflorum* var. *sessiliflorum*; 100%)
- Eastern blackberry (*Rubus pensilvanicus*; 100%)

Table 3. Vascular plant species richness across multiple spatial scales on Southeast Coast Network vegetation plots located within Horseshoe Bend National Military Park. The data are summarized by total number of native versus non-native species/plot, and by vegetative growth forms (T: tree, S: shrub, V: vine, H: herbs/forbs, G: graminoids). Growth form information and nativity was obtained from the USDA Plants Database (USDA 2024). Full plot data are total species richness in each 400 m² plot, while modular 100 m², nested 10 m², and nested 1 m² data are mean species richness averaged over modules/subplots within each plot.

Broadly Defined Habitat	Plot	Native	Non-Native	Full Plot 400 m ² (4,305.6 ft ²)					Modular 100 m ² (1,076.3 ft ²)					Nested 10 m ² (107.6 ft ²)					Nested 1 m ² (10.8 ft ²)				
				T	S	V	H	G	T	S	V	H	G	T	S	V	H	G	T	S	V	H	G
Piedmont Alluvial Wetlands	HOBE001	53.0	5.0	19.0	1.0	13.0	20.0	5.0	11.3	0.3	9.3	10.3	2.3	4.1	0.1	4.3	4.1	1.3	1.0	0.1	2.5	1.4	1.1
	HOBE002	45.0	4.0	17.0	3.0	10.0	10.0	9.0	10.0	2.3	7.3	4.5	4.3	5.4	0.6	4.8	2.1	1.6	2.3	0.5	2.3	0.8	0.5
	HOBE003	36.0	1.0	17.0	3.0	7.0	6.0	4.0	10.5	1.5	4.8	3.3	1.5	5.5	0.8	3.8	1.4	1.1	3.0	0.4	2.9	0.6	0.6
	HOBE005	69.0	3.0	20.0	3.0	16.0	22.0	11.0	11.3	1.8	9.8	9.8	5.0	5.5	1.1	5.0	4.3	2.4	2.9	0.6	2.6	1.6	0.9
	average	50.8	3.3	18.3	2.5	11.5	14.5	7.3	10.8	1.4	7.8	6.9	3.3	5.1	0.7	4.4	3.0	1.6	2.3	0.4	2.6	1.1	0.8
	standard deviation	14.0	1.7	1.5	1.0	3.9	7.7	3.3	0.6	0.9	2.3	3.6	1.6	0.7	0.4	0.6	1.4	0.6	0.9	0.2	0.3	0.5	0.3
Piedmont Upland Forests	HOBE097	62.0	2.0	28.0	4.0	8.0	15.0	9.0	17.0	2.5	4.3	7.8	5.3	7.5	1.4	2.0	3.3	3.3	2.4	0.8	1.1	1.5	1.9
	HOBE098	56.0	0.0	25.0	2.0	6.0	16.0	7.0	15.3	1.5	4.5	6.5	3.5	7.6	0.8	3.0	2.6	0.8	2.6	0.3	2.4	1.0	0.1
	HOBE099	49.0	3.0	23.0	3.0	9.0	12.0	5.0	16.8	1.5	5.3	5.3	3.8	8.5	0.4	3.4	2.0	1.4	4.0	0.0	2.1	0.5	0.5
	HOBE100	28.0	0.0	15.0	5.0	4.0	2.0	2.0	9.5	2.0	4.0	1.0	1.3	3.0	1.3	2.9	0.3	0.5	0.8	0.6	1.8	0.0	0.3
	HOBE104	36.0	0.0	14.0	3.0	7.0	7.0	5.0	8.8	1.8	6.3	3.0	2.0	4.0	0.9	3.8	1.3	0.9	2.3	0.1	2.8	0.5	0.5
	HOBE106	84.0	0.0	27.0	8.0	10.0	28.0	11.0	16.0	3.5	7.8	11.5	6.8	6.0	0.9	4.0	3.6	3.9	2.0	0.1	2.1	1.4	1.8
	average	52.5	0.8	22.0	4.2	7.3	13.3	6.5	13.9	2.1	5.3	5.8	3.8	6.1	0.9	3.2	2.2	1.8	2.3	0.3	2.0	0.8	0.8
	standard deviation	19.9	1.3	6.1	2.1	2.2	8.9	3.2	3.7	0.8	1.4	3.7	2.0	2.2	0.4	0.7	1.3	1.4	1.0	0.3	0.6	0.6	0.8

Woody Stem Metrics

Total BA of tree stems ranged from 21.5 to 43.0 m²/ha in these plots, with an overall average of 33.8 m²/ha; density of canopy stems ranged from 14 to 28 per plot, with an average of 19 (Table 4).

Canopy height ranged from 24.7 to 38.3 meters (average = 33.0), and canopy cover ranged from 86% to 93% (average = 90.5%; Table 4). The most dominant canopy species included water oak (mean BA = 12.90 m²/ha, mean density = 69/ha), sweetgum (mean BA = 4.79 m²/ha, mean density = 200/ha), and tulip-tree (mean BA = 3.69 m²/ha, mean density = 75/ha; Appendix B, Table 10).

Sapling density at the 80-square meter scale ranged from 10 to 16 stems, with an average of 13.1, while seedling density at the 8-square meter scale ranged from 51 to 121 stems, with an average of 90.1 across all plots (Table 4). Dominant sapling species included sweetgum, common two-wing silverbell (*Halesia diptera* var. *diptera*), Elliott's blueberry (*Vaccinium elliotii*), and southern sugar maple; dominant seedlings included switch cane (*Arundinaria tecta*), loblolly pine, tulip-tree, and an array of woody vine species (Appendix B, Table 10).

Table 4. Woody stem abundance and canopy metrics on Southeast Coast Network vegetation plots located in Horseshoe Bend National Military Park [m = meters; ha = hectares].

Broadly Defined Habitat	Plot	Tree Basal Area (m ² /ha)	Tree Density (400 m ²)	Sapling Basal Area (m ² /ha)	Sapling Density (80 m ²)	Seedling Density (8 m ²)	Mean Canopy Cover (%)	Mean Height (m)
Piedmont Alluvial Wetlands	HOBE001	37.66	23.00	6.00	10.22	51.00	86.25	35.67
	HOBE002	21.52	28.00	12.00	15.62	96.00	90.88	24.67
	HOBE003	43.05	14.00	8.00	10.92	95.00	93.00	33.33
	HOBE005	32.89	11.00	10.00	15.56	121.00	91.75	38.33
	average	33.78	19.00	9.00	13.08	90.75	90.47	33.00
	standard deviation	9.17	7.87	2.58	2.91	29.10	2.94	5.92
Piedmont Upland Forests	HOBE097	19.58	12.00	6.00	0.78	153.00	51.56	28.33
	HOBE098	23.56	22.00	26.00	6.90	151.00	57.75	27.67
	HOBE099	42.55	23.00	7.00	20.98	91.00	88.50	38.33
	HOBE100	24.94	30.00	9.00	0.84	140.00	63.50	21.67
	HOBE104	40.11	22.00	12.00	18.71	88.00	85.38	27.67
	HOBE106	28.47	17.00	8.00	16.83	57.00	91.50	33.67
	average	29.87	21.00	11.33	10.84	113.33	73.03	29.56
	standard deviation	9.36	6.07	7.47	9.14	40.04	17.42	5.74

Based on stem count alone, sweetgum comprised 42% of the relative abundance among species within the tree stratum, while oaks (mostly water oak) and tulip-tree comprised 17% and 16%, respectively (Figure 4). The sapling stratum was dominated by sweetgum, maples, and silverbell, while the seedling stratum was dominated by loblolly pine, oaks, and tulip-tree (Figure 4). Most of the trees in Horseshoe Bend National Military Park’s Piedmont Alluvial Wetland plots were living (95%) and characterized with healthy vigor (91%) and minimal dieback (91%; Figure 5).

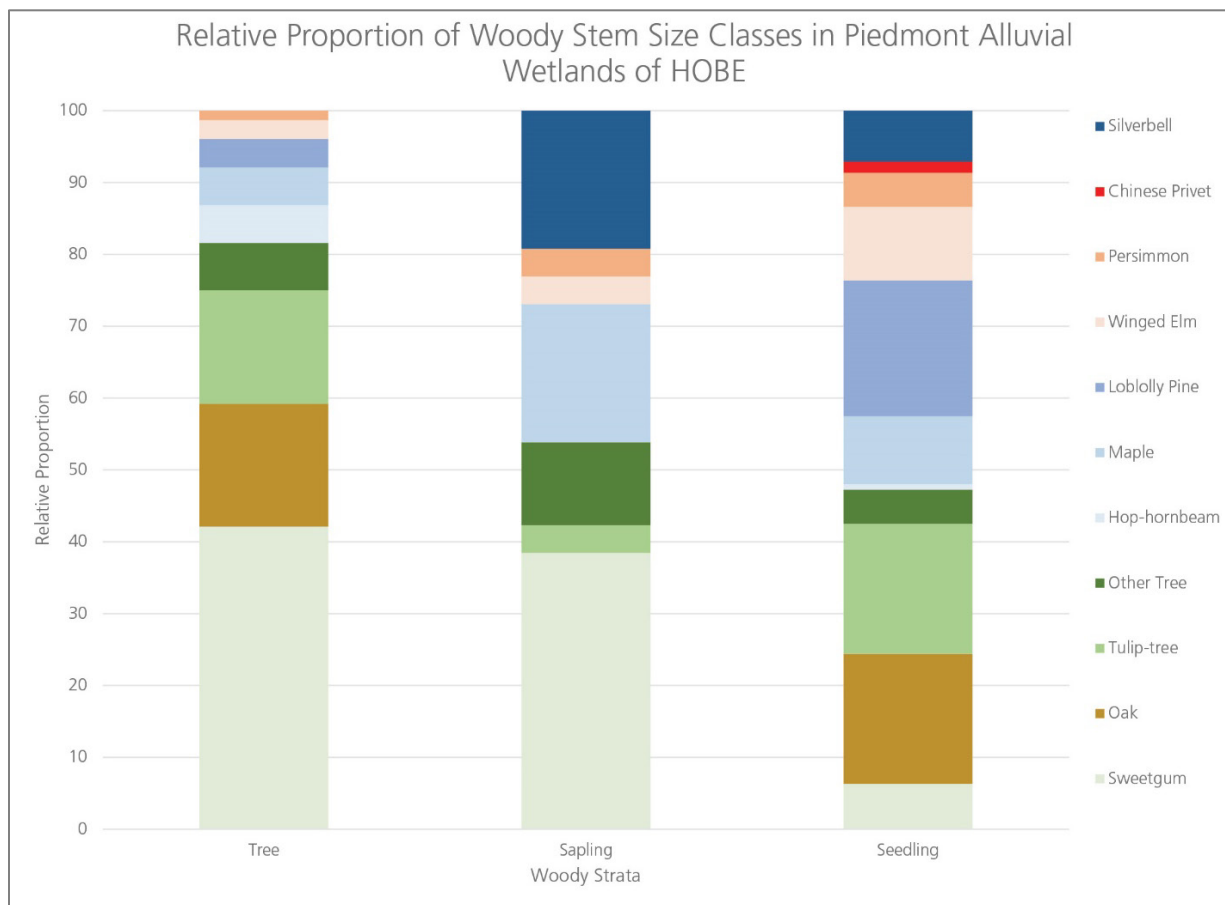


Figure 4. Relative proportion of species groups across three woody stem strata—trees, saplings, and seedlings—within Piedmont Alluvial Wetland monitoring plots of Horseshoe Bend National Military Park.

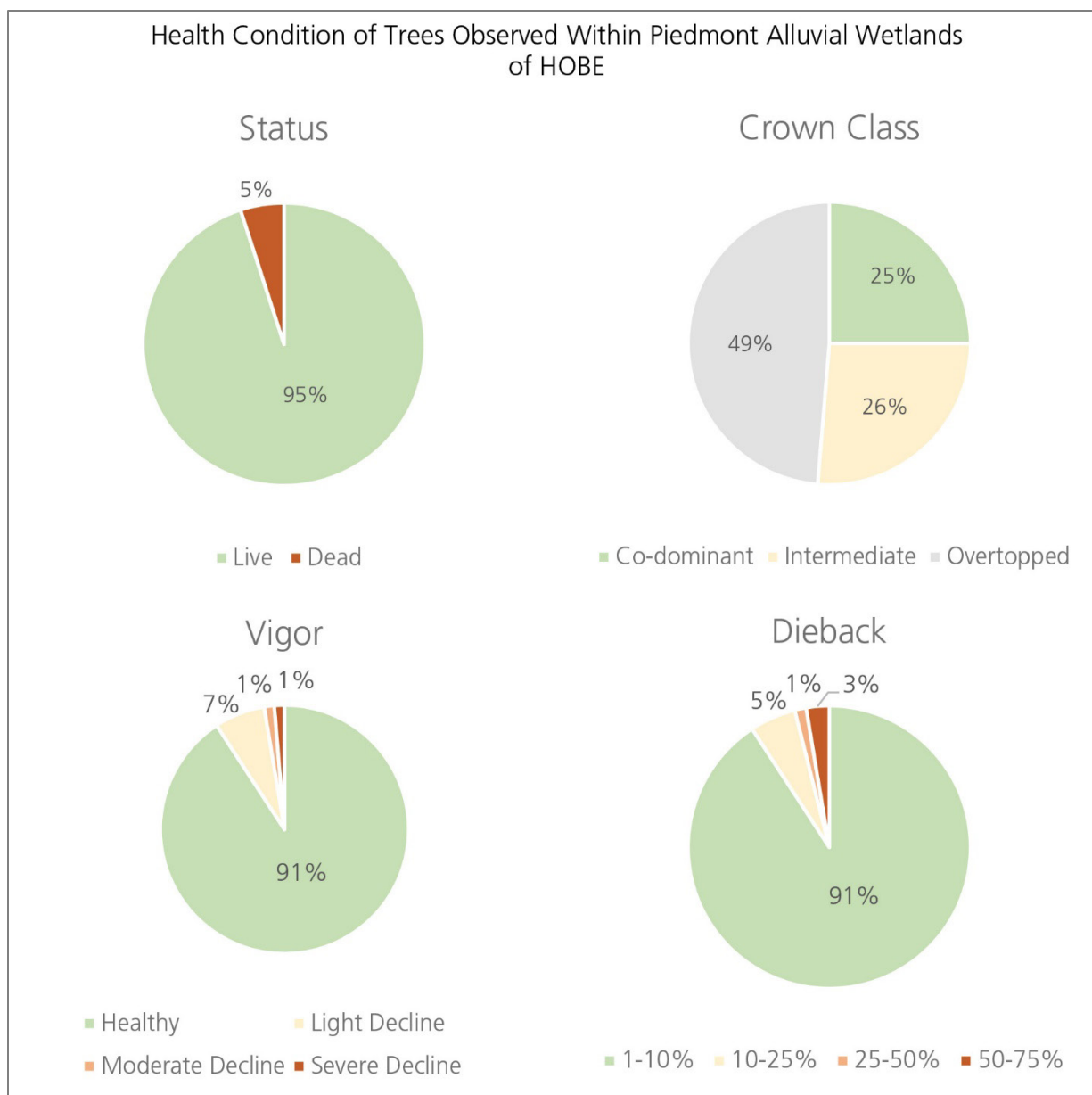


Figure 5. Health status of woody stems greater than or equal to 10 centimeters (3.9 in) DBH (“trees”) measured on Piedmont Alluvial Wetland monitoring plots of Horseshoe Bend National Military Park.

Disturbance and Threats

Observed disturbances to vegetation resources were minimal within these sites of Horseshoe Bend National Military Park. Fire scars from an historical burn event were observed on several trees of one of the Piedmont Alluvial Wetland plots (HOBE001; Table 5). This burn did not appear to negatively impact the health of the trees within the plot or understory plants.

The most noticeable threat to these ecosystems within the park is the presence of non-native invasive species (see Species Diversity and Abundance). The impacts of invasive species on native ecosystems and biodiversity are well-documented, and increased rates of habitat alteration and

climate change are providing more opportunities for invasion (Vitousek et al. 1996; Chornesky and Randall 2003). Furthermore, management efforts that target reduction of certain non-native species can lead to increased abundances of undesirable native species, other non-native species, or the targeted non-native species (see Royo and Carson 2006), which may have consequences on forest regeneration and ground cover diversity. It is difficult to predict how an invasive species, like Chinese privet or Japanese honeysuckle, will respond to both local-scale management efforts and landscape-scale changes (e.g., climate change). However, data from vegetation monitoring plots which track trends over time of non-native and native species abundance and forest regeneration patterns with regards to specific non-native control efforts can provide keen insight to park managers on the condition of their forest vegetation resources.

Table 5. Disturbance observations and abundance (% cover) measured on vegetation monitoring plots of Horseshoe Bend National Military Park.

Broadly Defined Habitat	Plot	Recent Fire	Historic Fire	Historic Plowing
Piedmont Alluvial Wetlands	HOBE001	–	100	–
	HOBE002	–	–	–
	HOBE003	–	–	–
	HOBE005	–	–	–
Piedmont Upland Forests	HOBE097	100	–	–
	HOBE098	–	100	100
	HOBE099	–	–	–
	HOBE100	–	100	100
	HOBE104	–	–	–
	HOBE106	–	–	–

Geomorphology and Soil

Plots located within Piedmont Alluvial Wetlands of Horseshoe Bend National Military Park typically occurred on flat (0 degree) landforms of floodplains or slightly raised levees adjacent to rivers (Table 6). Nutrient analysis of soil samples collected from these plots indicated pH ranges from 4.7 to 5.6 (very strongly to moderately acidic, Table 7). Alluvial floodplains of the Piedmont are typically fairly fertile, as these data suggest, owing to the periodic input of nutrients from flood events, which can lead to rapid tree growth. It should be noted that total exchange capacity of soils from these alluvial plots at Horseshoe Bend National Military Park were lower than values from a similar habitat at Chattahoochee River National Recreation Area. Total exchange capacity is an indicator of the ability of soil to retain cations, or positive molecules (e.g., calcium, magnesium, potassium) and can be used often as a proxy for soil fertility in alluvial soils.

Table 6. Local landform and hydrologic condition of vegetation monitoring plots at Horseshoe Bend National Military Park.

Broadly Defined Habitat	Plot	Slope (°)	Aspect (°)	TSI ¹ (°)	Landform Type	Water Source	Submerged (%)
Piedmont Alluvial Wetlands	HOBE001	0	–	0.0	alluvial plain	Flood zones	0
	HOBE002	0	–	0.0	alluvial plain	Flood zones	0
	HOBE003	0	–	0.0	alluvial plain	Flood zones	0
	HOBE005	6	180	0.7	levee	Flood zones	0
Piedmont Upland Forests	HOBE097	13	225	2.7	side slope	None	0
	HOBE098	3	45	–0.6	slope bench	None	0
	HOBE099	9	0	1.3	side slope	None	0
	HOBE100	13	270	–4.1	interfluv	None	0
	HOBE104	2	315	0.7	slope bench	None	0
	HOBE106	14	180	–0.1	side slope	None	0

¹ Terrain Shape Index: the larger the value, the higher degree of microsite concavity; the lower the value, the higher degree of microsite convexity; “0” values indicate a completely flat shape.

Table 7. Soil nutrient status from vegetation monitoring plots at Horseshoe Bend National Military Park. The Mehlich III method was used to obtain volume of exchangeable cations and extractable minor elements within soil samples. Methods to obtain other soil chemistry metrics (e.g., total exchange capacity [TEC], pH, and organic matter content [OM]) can be found at Brookside Laboratories, Inc (BL 2024).

Broadly Defined Habitat	Plot	TEC (ME/100 g)	pH	OM (%)	P ¹	Ca ¹	Mg ¹	K ¹	Na ¹	B ¹	Fe ¹	Mn ¹	Cu ¹	Zn ¹	Al ¹
Piedmont Alluvial Wetlands	HOBE001	5.8	5.2	4.6	13.0	464.0	83.0	35.0	10.0	0.1	206.0	196.0	0.8	1.6	502.0
	HOBE002	9.1	5.6	4.7	11.0	1049.0	79.0	55.0	8.0	0.3	116.0	178.0	0.2	0.7	480.0
	HOBE003	3.2	4.7	4.6	13.0	174.0	37.0	29.0	10.0	0.1	213.0	58.0	1.3	1.6	668.0
	HOBE005	6.9	5.2	6.0	16.0	478.0	134.0	69.0	13.0	0.1	158.0	58.0	0.7	3.0	529.0
	average	6.3	5.2	5.0	13.3	541.3	83.3	47.0	10.3	0.2	173.3	122.5	0.7	1.7	544.8
	standard deviation	2.5	0.4	0.7	2.1	366.4	39.7	18.4	2.1	0.1	45.3	74.8	0.4	0.9	84.6
Piedmont Upland Forests	HOBE097	4.5	5.1	6.7	15.0	339.0	48.0	45.0	11.0	0.1	160.0	54.0	0.7	1.2	1198.0
	HOBE098	10.3	4.2	12.1	17.0	435.0	84.0	63.0	9.0	0.1	202.0	38.0	0.1	2.7	463.0
	HOBE099	4.9	5.8	3.9	22.0	523.0	91.0	63.0	8.0	0.2	110.0	169.0	0.4	1.2	732.0
	HOBE100	10.5	3.9	15.4	13.0	374.0	64.0	37.0	14.0	0.1	193.0	19.0	0.1	1.1	284.0
	HOBE104	5.8	4.1	4.5	18.0	222.0	44.0	40.0	9.0	0.1	128.0	50.0	0.2	0.9	484.0
	HOBE106	3.6	4.5	4.6	23.0	132.0	56.0	54.0	9.0	0.1	200.0	42.0	0.1	1.4	746.0
	average	6.6	4.6	7.9	18.0	337.5	64.5	50.3	10.0	0.1	165.5	62.0	0.3	1.4	651.2
	standard deviation	3.0	0.7	4.8	3.9	142.0	19.2	11.4	2.2	0.0	39.5	53.8	0.2	0.6	320.2

¹ Anions (P: Phosphorous); Exchangeable Cations (Ca: Calcium, Mg: Magnesium, K: Potassium, Na: Sodium); Extractable Minors (B: Boron, Fe: Iron, Mn: Manganese, Cu: Copper, Zn: Zinc, Al: Aluminum). Data reported in parts per million (ppm).

Piedmont Upland Forests

Piedmont Upland Forests and Shrublands of Horseshoe Bend National Military Park include early- to mid-successional mixed hardwood and pine forests on dry slopes or ridge tops and more mesic forests on lower slopes adjacent to alluvial habitats (Cotten et al. 2019; Figure 6). The canopy and subcanopy of these forests within the park are dominated by loblolly pine, tulip-tree, oaks, and hickories (Cotten et al. 2019). Species composition and structure within these forests can be highly variable, and dependent on soil moisture, available soil nutrients, and former land use. Mesophytic forests typically develop along lower slope positions, flatter topography, northeastern aspects, and where soil depths are higher. These forests are dominated by a diversity of hardwood species. Xeric forests are found on upper slopes and ridgetops where sunlight exposure and edaphic factors contribute to drier, often droughty, conditions. The canopy of these forests is often dominated by dry-site oaks (e.g., chestnut oak) and, when fire is frequent, longleaf pine and/or shortleaf pine (*Pinus echinata*). The most commonly occurring natural upland Piedmont forests of Alabama are oak-hickory forests that occur on intermediate, submesic, or subxeric soils; these are the matrix forests that occur between the driest ridgetops and most mesic lower slopes (Griffith et al. 2001).

The Piedmont Upland Forest and Shrubland habitat type is the most dominant habitat within Horseshoe Bend National Military Park, occupying about 60% coverage of natural vegetation and other land use types (Cotten et al. 2019). Vegetation associations sampled within the park that belong to this habitat type include (descriptions from Cotten et al. 2019 and NatureServe 2024):

- Ruderal Loblolly Pine / Sweetgum – Red Maple Forest (CEGL006011; 2 plots): Early- to mid-successional forests that develop on former sites utilized for agriculture or timber, that are typically dominated by loblolly pine; hardwoods could also co-dominate, such as sweetgum, red maple, and a host of oaks and hickories (Global Status: No Status Rank; State [AL] Status: No Status Rank).
- Ruderal Interior Sweetgum – Oak Forest (CEGL7217; 1 plot): Early- to mid-successional forests that develop on former sites utilized for agriculture or timber, that are typically dominated by a combination of sweetgum, white oak (*Quercus alba*), and tulip-tree in the canopy; the sub-canopy and shrub layers are dominated by a combination of hardwood species, including canopy species, American beech (*Fagus grandifolia*), sourwood (*Oxydendrum arboreum*), and flowering dogwood (*Benthamidia florida*); the herbaceous layer is typically sparse within this forest type (Global Status: No Status Rank; State [AL] Status: No Status Rank).
- Piedmont Dry-Mesic Basic Oak – Hickory Forest (CEGL007232; 1 plot): Forests developing on a variety of soil moisture types (dry to mesic), but with base-rich, well-drained soil fertility; sites are typically found along mid- to lower-slope positions and are generally underlain by mafic rock (e.g., diabase, amphibolite); canopy species typically found within this community type include white oak, northern red oak (*Quercus rubra*), hickories, and a variety of other hardwoods; the herbaceous layer is typically well-developed, particularly in sites not subject by heavy deer browse (Global Status: G3—Vulnerable; State [AL] Status: No Status Rank).

- Ruderal Loblolly Pine – Sweetgum Forest (CEGL008462; 1 plot): Mid- to late-successional upland forests strongly co-dominated by loblolly pine and sweetgum occurring on sites of past disturbance (e.g., agriculture, logging); over time, this ecosystem generally succeeds to oak-dominated forests (Global Status: No Status Rank; State [AL] Status: No Status Rank).
- East Gulf Coastal Plain Shortleaf Pine – Loblolly Pine Forest (CEGL008493; 1 plot): Forests with a more open canopy than other surrounding forests dominated by a mixture of both loblolly and shortleaf pine, along with mixed hardwoods like pignut hickory (*Carya glabra*), tulip-tree, and scarlet oak (*Quercus coccinea*); the short-shrub layer is dominated by hillside blueberry (*Vaccinium pallidum*); this association is threatened by fire suppression and increased pine mortality brought on by southern pine beetle (Global Status: G2—Imperiled; State [AL] Status: No Status Rank).



Figure 6. Upland forests within Horseshoe Bend National Military Park are distributed along topographic and edaphic gradients, from ridgetops and upper slopes dominated by pines (e.g., shortleaf, loblolly, and longleaf) and dry-site oaks (e.g., chestnut, scarlet, southern red; left image) to mesic lower slopes dominated by sweetgum, tulip-tree, loblolly pine, and wide range of other hardwoods (right image). Upland forests represent the dominant matrix habitat of the park. Six plots were established in this broadly defined habitat of Horseshoe Bend National Military Park during this monitoring effort (August 2022). NPS / M. FORBES BOYLE (SECN Botanist)

Species Diversity and Abundance

Native species richness ranged from 28 to 84 (mean = 52.5) within vegetation plots of this broadly defined habitat type, and two plots had at least one non-native species present (Table 3). Tree species exhibited the highest richness across all spatial scales within these plots (Table 3). Overall species richness was highest in HOBE106—classified as a Piedmont Dry-Mesic Basic Oak – Hickory Forest association. Invasive species were infrequent within these plots, particularly when compared to Piedmont Alluvial Wetlands of the park. Native vascular plants observed in these plots are common across the Southeastern Coastal Plain, and there were no state or federally listed rare plants encountered. One-hundred fifty-two vascular plant species were found within these six plots, and 83 of these were only found in this broadly defined habitat (Appendix B, Table 9). A complete species list, along with constancy and average cover per species, is in Appendix B, Table 9. Species with high constancy in this habitat are listed below, by growth form (constancy values in parentheses):

Trees

- White oak (100%)
- Flowering dogwood (100%)
- Common persimmon (*Diospyros virginiana*; 100%)
- Loblolly pine (83%)
- Sweetgum (83%)
- Water oak (83%)
- Red maple (83%)
- Sourwood (83%)
- Black cherry (*Prunus serotina* var. *serotina*; 83%)

Shrubs

- Elliott's blueberry (83%)
- American beautyberry (83%)

Vines

- Muscadine (100%)
- Whiteleaf greenbrier (*Smilax glauca*; 100%)
- Carolina jessamine (*Gelsemium sempervirens*; 83%)
- Virginia creeper (*Parthenocissus quinquefolia*; 83%)
- Roundleaf greenbrier (*Smilax rotundifolia*; 83%)

Herbs and Graminoids

- Christmas fern (*Polystichum acrostichoides*; 67%)
- Bosc's witchgrass (*Dichanthelium boscii*; 67%)
- Eastern blackberry (67%)
- Spotted wintergreen (*Chimaphila maculata*; 67%)

Woody Stem Metrics

Total basal area (BA) of trees ranged from 19.6 to 43.0 m²/ha with an overall average of 29.9 m²/ha, while tree density ranged from 12 to 30 stems per plot with an overall average of 21 stems per plot (Table 4). Canopy height ranged from 21.7 to 38.3 meters (average = 29.6) and canopy cover ranged from 52 to 91% (average = 73%; Table 4). The most dominant canopy species within these collective plots was loblolly pine (mean BA = 13.68 m²/ha, mean density = 158 stems/ha), while 20 other species were present within the tree stratum (Appendix B, Table 10). Sapling density at the 80-meter square scale among these plots was highly variable and ranged from 0.8 to 21.0 stems with an overall average of 10.8, while seedling density at the 8-meter square scale ranged from 57 to 153 stems, with an average of 113.3 across all plots (Table 4). The most dominant sapling species within these plots included sweetgum and red maple; dominant seedlings included hillside blueberry and several species of woody vines (muscadine, Carolina jessamine, and whiteleaf greenbrier; Appendix B, Table 10).

Based on stem count (density), pines comprised about 36% of the relative abundance among species within the tree stratum while oaks and sweetgum comprised 17% and 15%, respectively (Figure 7). The sapling stratum was co-dominated by sweetgum and maples; there was no clear dominant species within the seedling stratum (Figure 7).

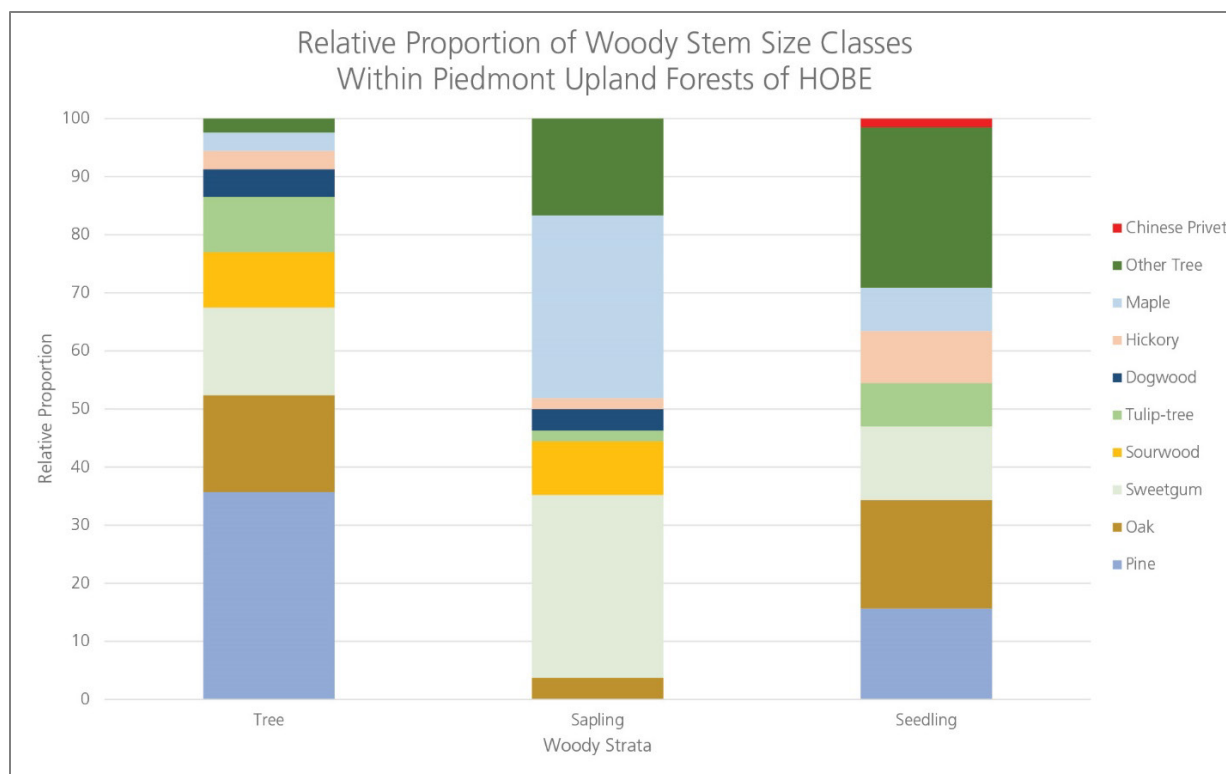


Figure 7. Relative proportion of species groups across three woody stem strata—trees, saplings, and seedlings—within Piedmont Upland Forest monitoring plots of Horseshoe Bend National Military Park.

Most of the measured trees in these monitoring plots were living (86%) and the majority were categorized with healthy vigor and minimal dieback (Figure 8). Of the 146 trees measured within these six plots, 20 were dead. Thirteen of the 20 dead trees were pines. Forests within this broad habitat of the park were characterized by an uneven-age structure, with multiple size-classes of woody stems present across the canopy and subcanopy. About 40% of the trees measured in these plots made up the forest canopy (dominant or co-dominant), while 37% were of intermediate height class, and 23% were completely overtopped (Figure 8). The only observable disease detected during this monitoring effort was dogwood anthracnose (*Discula destructiva*)—an introduced fungal pathogen impacting flowering dogwood, a common subcanopy tree of Piedmont Upland Forests. Of the nine dogwood stems measured within these plots, three were dead and four exhibited foliar symptoms like anthracnose-affected trees. The disease was first observed in the northeastern United States in the late 1970s and early 1980s, and by 2019 it had spread to most of the Piedmont, Appalachian Mountains, and Interior Plateau of the southeastern United States (USDA 2019). The disease has not been documented within Tallapoosa County, Alabama (USDA 2019). Infected trees initially exhibit tan leaf spot, often with a purple-red border; infection spreads from leaves to small twigs, branches, and eventually to the main stem where cankers form, ultimately killing the tree (Anderson et al. date unknown). Mortality rates across much of the range of flowering dogwood have been high. In one study within Great Smoky Mountain National Park (GRSM), between the late 1970s and 2000 density of flowering dogwood declined by 69% in oak-pine uplands to over 90% in mesic cove forests (Jenkins and White 2002). The sudden and dramatic decrease in flowering

dogwood has had profound ecological implications within native forests of the eastern United States. Flowering dogwood is thought to improve calcium (Ca) cycling and Ca availability within forest soils due to high Ca concentrations within its foliage and rapid litter decomposition (Blair 1988). The decline of flowering dogwood within Great Smoky Mountain National Park between the late 1970s to 2000 has resulted in loss of flowering dogwood leaf biomass and foliar litter Ca content within five dominant forest types within the park (Jenkins et al. 2007).

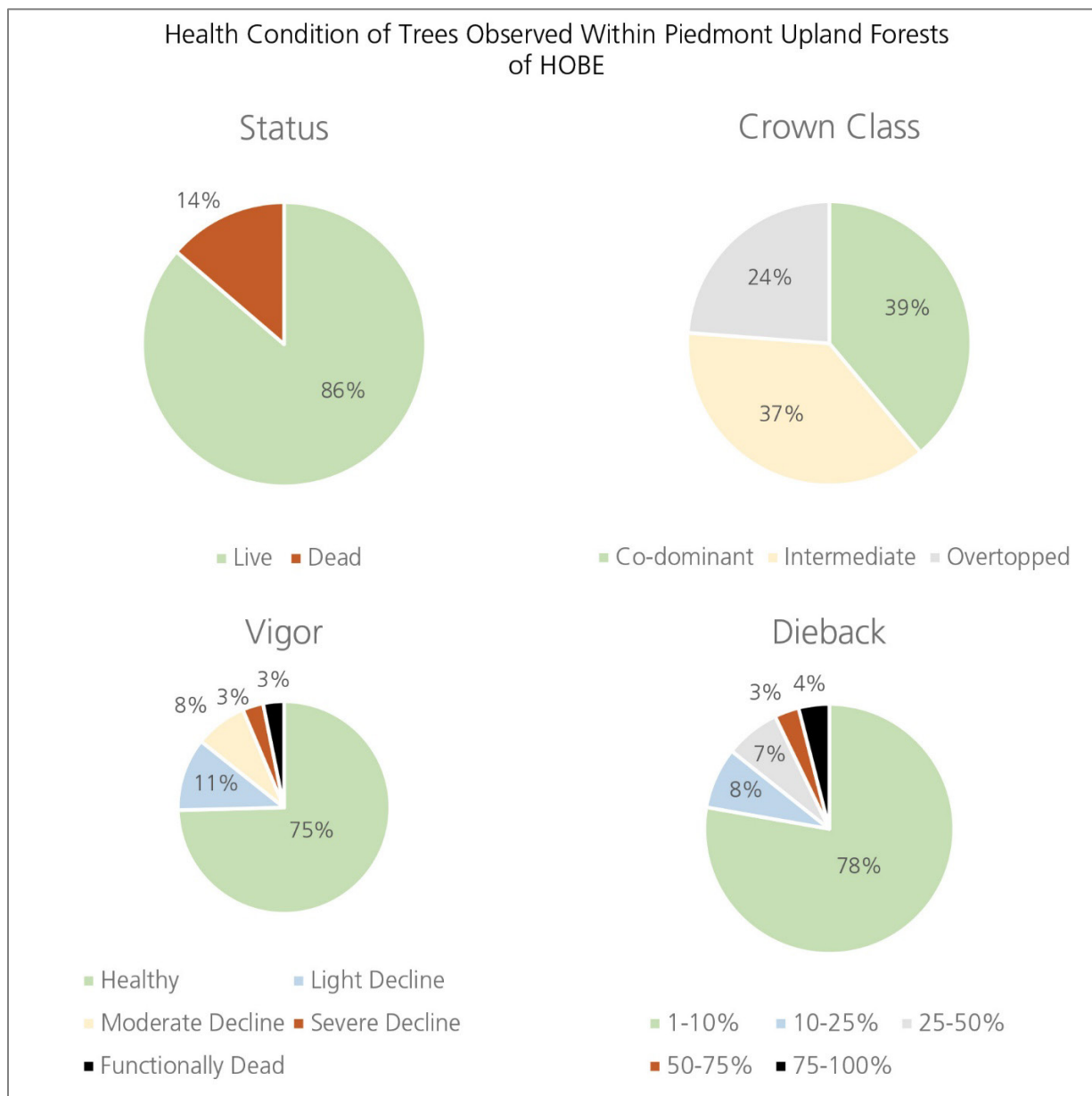


Figure 8. Health status of woody stems greater than or equal to 10 centimeters (3.9 in) DBH (“trees”) measured on Piedmont Upland Forest monitoring plots of Horseshoe Bend National Military Park.

Disturbance and Threats

Fire scars from historic and recent burns were observed within three of the six Piedmont Upland Forest plots (Table 5, Figure 9). Although fire scars and other effects were not observed in HOBE106, this plot is in an active burn unit of the park. As noted above, the park initiated a prescribed fire program in 2002 to improve and restore upland longleaf pine ecosystems, reduce hazardous fuels, and manage bark beetle killed stands. In the southeastern Piedmont, fire has been critical in the creation of montane longleaf pine woodlands, xeric pine and pine-oak woodlands, and Piedmont prairies; furthermore, fire promoted oaks and pines on sites of intermediate moisture regime (Edwards et al. 2013). Prior to European settlement, the Piedmont was dominated by tree species that required fire for regeneration or were tolerant of fire (Cowell 1995). Although natural fire compartments were likely smaller in the Piedmont than in the neighboring Coastal Plain where there were large distances between natural fire breaks (e.g., floodplains), fires ignited both naturally (e.g., lightning) and by Native Americans still impacted the landscape, creating a mosaic patchwork of forested systems composed of fire-adapted and fire-intolerant (i.e., mesophytic) species. By removing a natural ecological disturbance regime, fire exclusion over the past century has resulted in the decline in quality and extent of pine-oak woodlands and oak-hickory forests within the Southeastern Piedmont (Edwards et al. 2013). Use of fire as a tool to restore these sites is often challenging due to the proximity of roads, houses, and other urban features. Fire events raise public concern about air quality, reduced visibility on highways (e.g., smoke management), and structure damage. Historically, the park's drier ridgetops and gentle slopes undoubtedly supported fire-adapted ecosystems. Without fire, or other fire surrogate treatments, these forests likely will become dominated by a higher frequency of mesophytic, fire-intolerant hardwoods (e.g., red maple, tulip-tree, sweetgum). The true threat to these forest ecosystems is an absence of fire disturbance.

Other threats to forest and vegetation health described in the park's most recent Natural Resource Condition Assessment (Burkholder 2015), such as overgrazing by white-tailed deer and competition from non-native, invasive species, were not frequently observed within these Piedmont Upland Forest plots.

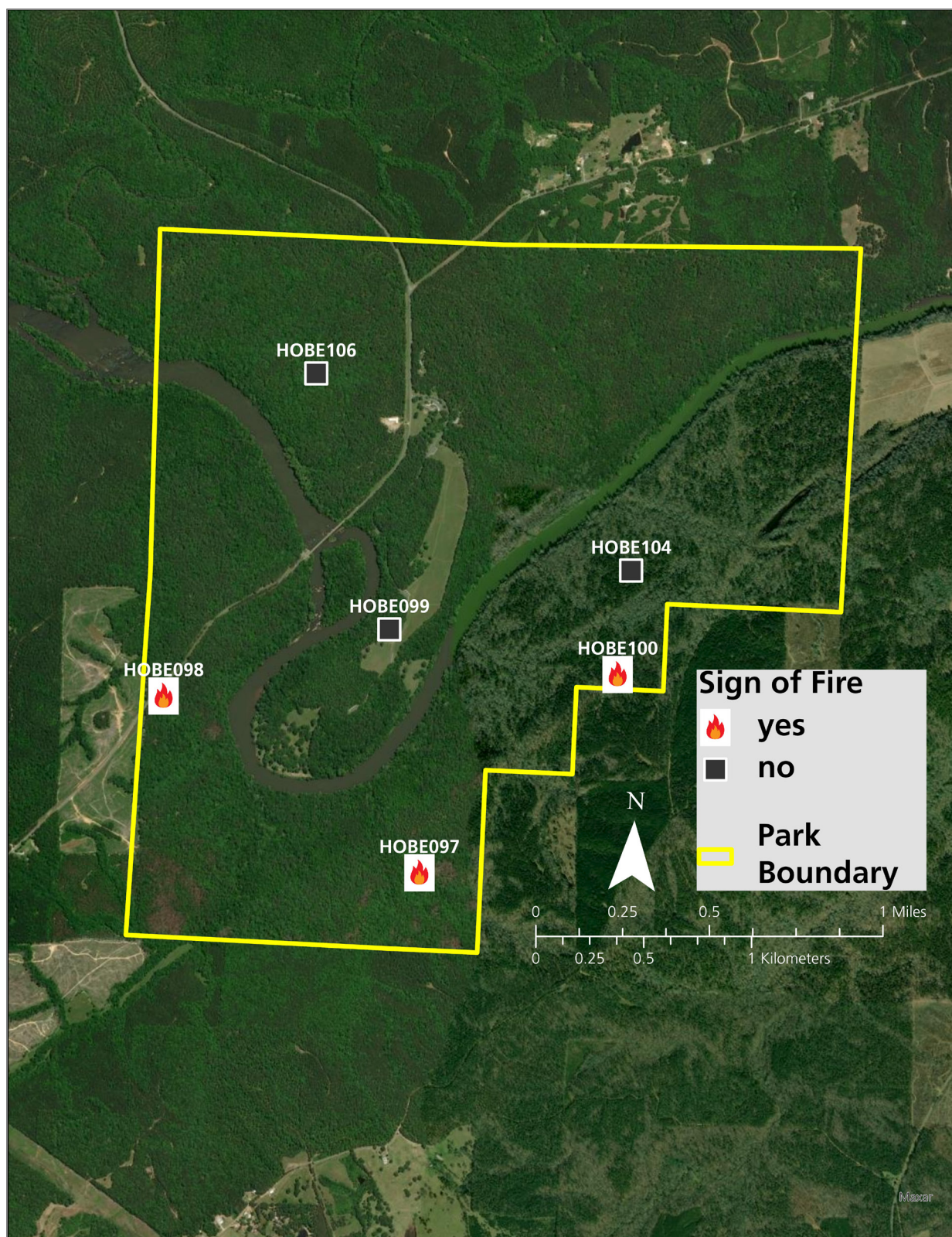


Figure 9. Observed evidence of past fire events (e.g., fire scars on trees) within Piedmont Upland Forest monitoring plots of Horseshoe Bend National Military Park.

Geomorphology and Soil

Piedmont Upland Forest plots of Horseshoe Bend National Military Park occurred across a wide range of slopes (from 2° to 14°), aspects (northerly to southerly and easterly to westerly slope directions), and terrain shapes (convex to concave; Table 6). The soils collected from these plots were acidic (average pH = 4.6) and had low cation content (Total Exchange Capacity [TEC] = 6.6; Table 7).

Fuel Load Estimates

Fuel load totals ranged from 14.0 to 40.9 tons/acre (3.2 to 9.7 kg/m²) within Piedmont Upland Forest plots of Horseshoe Bend National Military Park (Figure 10). Duff and litter volume contributed the highest percent among fuel types within these sites (Figure 10). The higher depths of duff and litter and higher volume of 1000-hour (coarse woody debris) contributed to elevated fuel loads of HOBE100 (Figure 3). It should be noted that there was high variability between fuel loads among vegetation plots in the park. Variation in fuel loads is typical and related to differences in vegetation structure (e.g., abundance and height) and disturbance history between sites.

Horseshoe Bend National Military Park
Fuel Loads

Southeast Coast Network
National Park Service
U.S. Department of the Interior

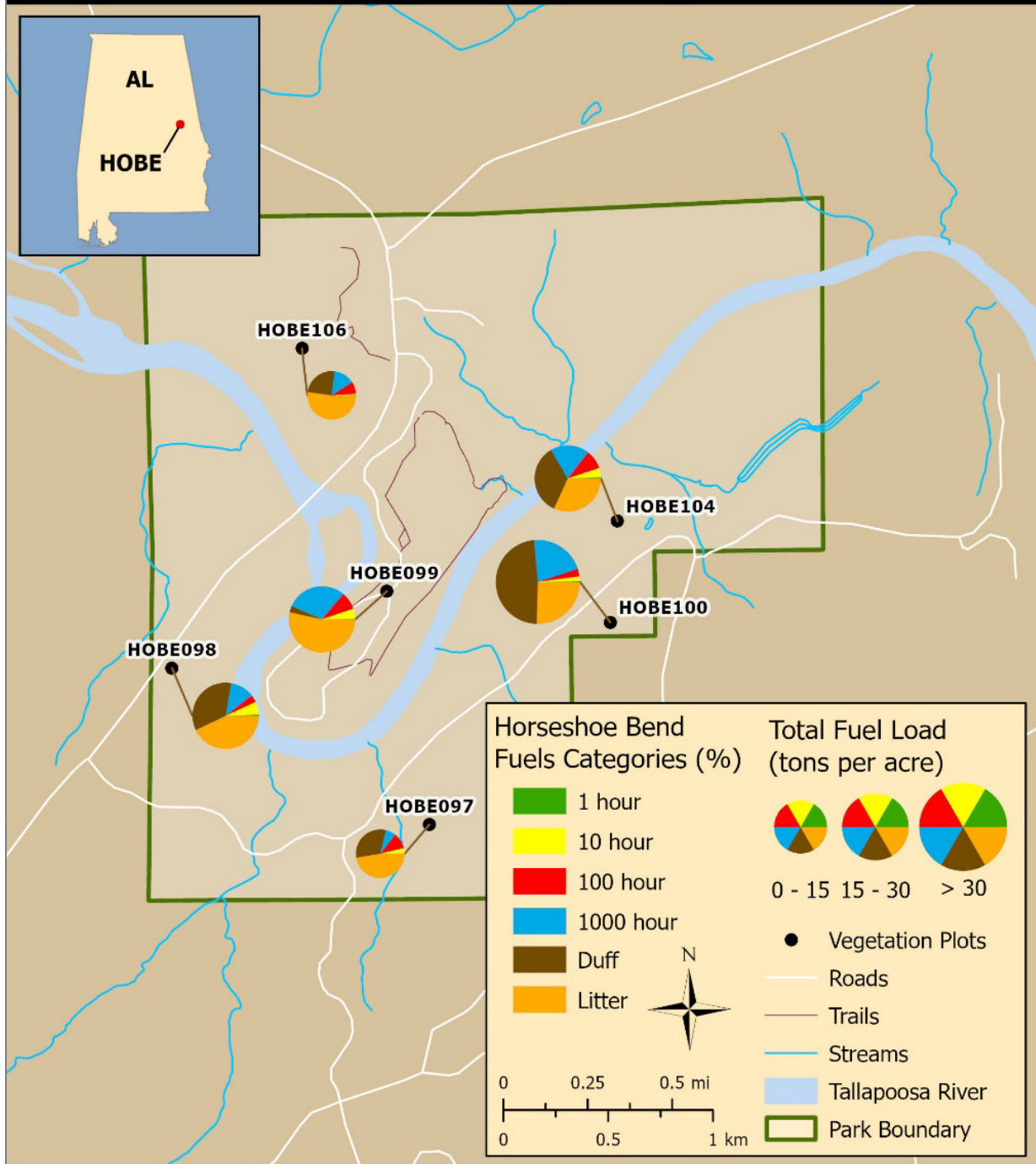


Figure 10. Fuel load estimates from vegetation monitoring plots located within Horseshoe Bend National Military Park.

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Appendix A. Vascular Plants Observed During the 2022 Southeast Coast Network Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park

Table 8. Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Euphorbiales	Euphorbiaceae	<i>Acalypha rhomboidea</i>	common threeseed mercury	Native	Forb/herb	–	–
Sapindales	Aceraceae	<i>Acer floridanum</i>	southern sugar maple	Native	Tree	–	–
Sapindales	Aceraceae	<i>Acer negundo</i> var. <i>negundo</i>	boxelder	Native	Tree	–	–
Sapindales	Aceraceae	<i>Acer rubrum</i>	red maple	Native	Tree	–	–
Fabales	Fabaceae	<i>Albizia julibrissin</i>	mimosa / silktree	Non-native	Shrub, Tree	1	–
Cyperales	Poaceae	<i>Andropogon ternarius</i>	split beard bluestem	Native	Graminoid	–	–
Cyperales	Poaceae	<i>Andropogon virginicus</i> var. <i>virginicus</i>	broomsedge	Native	Graminoid	–	–
Apiales	Araliaceae	<i>Aralia spinosa</i>	devil's walkingstick	Native	Shrub, Tree	–	–
Arales	Araceae	<i>Arisaema dracontium</i>	green dragon	Native	Forb/herb	–	–
Arales	Araceae	<i>Arisaema triphyllum</i>	Jack in the pulpit	Native	Forb/herb	–	–
Cyperales	Poaceae	<i>Aristida</i>	threeawn	Native	Graminoid	–	–
Rosales	Rosaceae	<i>Aronia arbutifolia</i>	red chokeberry	Native	Shrub, Tree	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Cyperales	Poaceae	<i>Arundinaria appalachiana</i>	hill cane	Native	Subshrub, Graminoid, Shrub	–	–
Cyperales	Poaceae	<i>Arundinaria gigantea</i>	giant cane	Native	Subshrub, Graminoid, Shrub	–	–
Cyperales	Poaceae	<i>Arundinaria tecta</i>	switch cane	Native	Subshrub, Graminoid, Shrub	–	–
Magnoliales	Annonaceae	<i>Asimina parviflora</i>	smallflower pawpaw	Native	Shrub, Tree	–	–
Polypodiales	Aspleniaceae	<i>Asplenium platyneuron</i>	ebony spleenwort	Native	Forb/herb	–	–
Polypodiales	Dryopteridaceae	<i>Athyrium asplenioides</i>	southern lady fern	Native	Forb/herb	–	–
Cornales	Cornaceae	<i>Benthamidia florida</i>	flowering dogwood	Native	Shrub, Tree	–	–
Asterales	Asteraceae	<i>Bidens frondosa</i>	devil's beggartick	Native	Forb/herb	–	–
Scrophulariales	Bignoniaceae	<i>Bignonia capreolata</i>	crossvine	Native	Vine	–	–
Urticales	Urticaceae	<i>Boehmeria cylindrica</i>	smallspike false nettle	Native	Forb/herb	–	–
Ophioglossales	Ophioglossaceae	<i>Botrypus virginianus</i>	rattlesnake fern	Native	Forb/herb	–	–
Cyperales	Poaceae	<i>Brachyelytrum erectum</i>	bearded shorthusk	Native	Graminoid	–	–
Lamiales	Verbenaceae	<i>Callicarpa americana</i>	American beautyberry	Native	Shrub	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

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³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Laurales	Calycanthaceae	<i>Calycanthus floridus</i>	eastern sweetshrub	Native	Shrub	—	—
Scrophulariales	Bignoniaceae	<i>Campsis radicans</i>	trumpet creeper	Native	Vine	—	—
Cyperales	Cyperaceae	<i>Carex complanata</i>	hirsute sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex cumberlandensis</i>	Cumberland sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex debilis</i>	white edge sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex laxiflora</i>	broad looseflower sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex longii</i>	Long's sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex nigromarginata</i>	black edge sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex oligocarpa</i>	richwoods sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex picta</i>	Boott's sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex reznicekii</i>	Reznicek's sedge	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Carex rosea</i>	rosy sedge	Native	Graminoid	—	—
Fagales	Betulaceae	<i>Carpinus caroliniana</i> var. <i>caroliniana</i>	American hornbeam	Native	Tree, Shrub	—	—
Juglandales	Juglandaceae	<i>Carya cordiformis</i>	bitternut hickory	Native	Tree	—	—
Juglandales	Juglandaceae	<i>Carya glabra</i>	pignut hickory	Native	Tree	—	—
Juglandales	Juglandaceae	<i>Carya ovalis</i>	red hickory	Native	Tree	—	—
Juglandales	Juglandaceae	<i>Carya pallida</i>	sand hickory	Native	Tree	—	—
Juglandales	Juglandaceae	<i>Carya tomentosa</i>	mockernut hickory	Native	Tree	—	—

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHPP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Urticales	Ulmaceae	<i>Celtis laevigata</i>	sugarberry	Native	Tree, Shrub	–	–
Urticales	Ulmaceae	<i>Celtis pumila</i>	dwarf hackberry	Native	Tree, Shrub	–	–
Fabales	Fabaceae	<i>Centrosema virginianum</i>	spurred butterfly pea	Native	Vine, Forb/herb	–	–
Fabales	Fabaceae	<i>Cercis canadensis</i>	eastern redbud	Native	Shrub, Tree	–	–
Fabales	Fabaceae	<i>Chamaecrista nictitans</i> var. <i>nictitans</i>	sensitive partridge pea	Native	Subshrub, Forb/herb	–	–
Cyperales	Poaceae	<i>Chasmanthium latifolium</i>	Indian woodoats	Native	Graminoid	–	–
Cyperales	Poaceae	<i>Chasmanthium laxum</i>	slender woodoats	Native	Graminoid	–	–
Cyperales	Poaceae	<i>Chasmanthium sessiliflorum</i> var. <i>sessiliflorum</i>	longleaf woodoats	Native	Graminoid	–	–
Ericales	Pyrolaceae	<i>Chimaphila maculata</i>	spotted wintergreen / striped prince's pine	Native	Subshrub	–	–
Asterales	Asteraceae	<i>Cirsium horridulum</i> var. <i>horridulum</i>	yellow thistle	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Cirsium vulgare</i>	bull thistle	Non-native	Forb/herb	W	–
Ranunculales	Menispermaceae	<i>Cocculus carolinus</i>	Carolina coralbead	Native	Vine	–	–
Lamiales	Lamiaceae	<i>Collinsonia anisata</i>	Blue Ridge horsebalm	Native	Forb/herb	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Asterales	Asteraceae	<i>Coreopsis major</i>	greater tickseed	Native	Forb/herb	—	—
Rosales	Rosaceae	<i>Crataegus</i>	hawthorn	Native	Tree	—	—
Rosales	Rosaceae	<i>Crataegus macrosperma</i>	bigfruit hawthorn	Native	Shrub, Tree	—	—
Fabales	Fabaceae	<i>Desmodium glabellum</i>	Dillenius' ticktrefoil	Native	Forb/herb	—	—
Fabales	Fabaceae	<i>Desmodium lineatum</i>	sand ticktrefoil	Native	Forb/herb	—	—
Fabales	Fabaceae	<i>Desmodium paniculatum</i> var. <i>paniculatum</i>	panickedleaf ticktrefoil	Native	Forb/herb	—	—
Fabales	Fabaceae	<i>Desmodium perplexum</i>	perplexed ticktrefoil	Native	Forb/herb	—	—
Fabales	Fabaceae	<i>Desmodium rotundifolium</i>	prostrate ticktrefoil	Native	Forb/herb	—	—
Cyperales	Poaceae	<i>Dichanthelium</i>	rosette grass	Native	Graminoid	—	—
Cyperales	Poaceae	<i>Dichanthelium boscii</i>	Bosc's witchgrass / Bosc's panicgrass	Native	Graminoid	—	—
Cyperales	Poaceae	<i>Dichanthelium commutatum</i>	variable panicgrass	Native	Graminoid	—	—
Cyperales	Poaceae	<i>Dichanthelium depauperatum</i>	starved panicgrass	Native	Graminoid	—	—
Cyperales	Poaceae	<i>Dichanthelium dichotomum</i> var. <i>dichotomum</i>	cypress panicgrass	Native	Graminoid	—	—
Cyperales	Poaceae	<i>Dichanthelium laxiflorum</i>	openflower rosette grass	Native	Graminoid	—	—
Liliales	Dioscoreaceae	<i>Dioscorea villosa</i>	wild yam	Native	Forb/herb, Vine	—	—

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³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Ebenales	Ebenaceae	<i>Diospyros virginiana</i>	common persimmon	Native	Tree	–	–
Asterales	Asteraceae	<i>Elephantopus carolinianus</i>	Carolina elephantsfoot	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Elephantopus tomentosus</i>	devil's grandmother	Native	Forb/herb	–	–
Cyperales	Poaceae	<i>Elymus virginicus</i>	Virginia wild rye	Native	Graminoid	–	–
Aristolochiales	Aristolochiaceae	<i>Endodeca serpentaria</i>	Virginia snakeroot	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Erechtites hieraciifolius</i>	American burnweed	Native	Forb/herb	–	–
Cyperales	Poaceae	<i>Erianthus alopecuroides</i>	silver plumegrass	Native	Graminoid	–	–
Asterales	Asteraceae	<i>Erigeron canadensis</i>	common horseweed	Native	Forb/herb	–	–
Celastrales	Celastraceae	<i>Euonymus americanus</i>	bursting-heart	Native	Forb/herb, Subshrub	–	–
Asterales	Asteraceae	<i>Eupatorium capillifolium</i>	dogfennel	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Eupatorium serotinum</i>	lateflowering thoroughwort	Native	Forb/herb	–	–
Euphorbiales	Euphorbiaceae	<i>Euphorbia pubentissima</i>	false flowering spurge	Native	Forb/herb	–	–
Fagales	Fagaceae	<i>Fagus grandifolia</i> var. <i>caroliniana</i>	American beech	Native	Tree	–	–
Scrophulariales	Oleaceae	<i>Fraxinus americana</i>	white ash	Native	Tree	–	–
Scrophulariales	Oleaceae	<i>Fraxinus pennsylvanica</i>	green ash	Native	Tree	–	–
Rubiales	Rubiaceae	<i>Galium bermudense</i>	coastal bedstraw	Native	Forb/herb	–	–
Rubiales	Rubiaceae	<i>Galium circaeans</i>	licorice bedstraw	Native	Forb/herb	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHPP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Gentianales	Loganiaceae	<i>Gelsemium sempervirens</i>	Carolina jessamine / evening trumpetflower	Native	Vine, Shrub	–	–
Gentianales	Gentianaceae	<i>Gentiana villosa</i>	striped gentian	Native	Forb/herb	–	–
Orchidales	Orchidaceae	<i>Goodyera pubescens</i>	downy rattlesnake plantain	Native	Forb/herb	–	–
Ebenales	Styracaceae	<i>Halesia diptera</i> var. <i>diptera</i>	common two-wing silverbell	Native	Shrub, Tree	–	–
Ebenales	Styracaceae	<i>Halesia carolina</i>	common silverbell	Native	Tree	–	–
Hamamelidales	Hamamelidaceae	<i>Hamamelis virginiana</i> var. <i>virginiana</i>	American witchhazel	Native	Shrub, Tree	–	–
Aristolochiales	Aristolochiaceae	<i>Hexastylis arifolia</i>	littlebrownjug	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Hieracium gronovii</i>	hairy hawkweek / queen devil	Native	Forb/herb	–	–
Rosales	Hydrangeaceae	<i>Hydrangea barbara</i>	climbing hydrangea / woodvamp	Native	Vine	–	–
Theales	Clusiaceae	<i>Hypericum hypericoides</i>	St. Andrew's cross	Native	Shrub, Subshrub	–	–
Theales	Clusiaceae	<i>Hypericum punctatum</i>	spotted St. Johnswort	Native	Forb/herb	–	–
Liliales	Liliaceae	<i>Hypoxis hirsuta</i>	common goldstar	Native	Forb/herb	–	–
Celastrales	Aquifoliaceae	<i>Ilex opaca</i>	American holly	Native	Tree, Shrub	–	–
Liliales	Iridaceae	<i>Iris verna</i> var. <i>verna</i>	dwarf violet iris	Native	Forb/herb	–	–

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² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Aristolochiales	Aristolochiaceae	<i>Isotrema tomentosum</i>	wooly dutchman's pipe	Native	Vine	–	–
Juglandales	Juglandaceae	<i>Juglans cinerea</i>	butternut	Native	Tree	–	S1
Juncales	Juncaceae	<i>Juncus coriaceus</i>	leathery rush	Native	Graminoid	–	–
Pinales	Cupressaceae	<i>Juniperus virginiana</i>	eastern redcedar	Native	Tree	–	–
Asterales	Asteraceae	<i>Lactuca canadensis</i>	Canada lettuce	Native	Forb/herb	–	–
Urticales	Urticaceae	<i>Laportea canadensis</i>	Canadian woodnettle	Native	Forb/herb	–	–
Fabales	Fabaceae	<i>Lespedeza cuneata</i>	Chinese lespedeza / sericea lespedeza	Non–native	Forb/herb, Subshrub	1	–
Scrophulariales	Oleaceae	<i>Ligustrum sinense</i>	Chinese privet	Non–native	Tree, Shrub	1	–
Hamamelidales	Hamamelidaceae	<i>Liquidambar styraciflua</i>	sweetgum	Native	Tree	–	–
Magnoliales	Magnoliaceae	<i>Liriodendron tulipifera</i> var. <i>tulipifera</i>	tulip–tree / yellow poplar	Native	Tree	–	–
Dipsacales	Caprifoliaceae	<i>Lonicera japonica</i>	Japanese honeysuckle	Non–native	Vine	1	–
Magnoliales	Magnoliaceae	<i>Magnolia acuminata</i>	cucumber magnolia / cucumber tree	Native	Tree	–	–
Magnoliales	Magnoliaceae	<i>Magnolia tripetala</i>	umbrella–tree	Native	Tree	–	–
Magnoliales	Magnoliaceae	<i>Magnolia virginiana</i> var. <i>australis</i>	sweet bay magnolia	Native	Tree	–	–
Gentianales	Asclepiadaceae	<i>Matelea carolinensis</i>	Carolina milkvine / maroon Carolina milkvine	Native	Forb/herb, Vine	–	–

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³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Cyperales	Poaceae	<i>Microstegium vimineum</i>	Japanese stilt grass / Nepalese browntop	Non-native	Graminoid	1	–
Asterales	Asteraceae	<i>Mikania scandens</i>	climbing hempvine	Native	Vine, Forb/herb	–	–
Rubiales	Rubiaceae	<i>Mitchella repens</i>	partridgeberry	Native	Subshrub, Forb/herb	–	–
Rhamnales	Vitaceae	<i>Muscadinia rotundifolia</i> var. <i>rotundifolia</i>	muscadine	Native	Vine	–	–
Asterales	Asteraceae	<i>Nabalus serpentarius</i>	Gall of the Earth / cankerweed	Native	Forb/herb	–	–
Cornales	Cornaceae	<i>Nyssa sylvatica</i>	blackgum	Native	Tree	–	–
Fagales	Betulaceae	<i>Ostrya virginiana</i>	hophornbeam	Native	Shrub, Tree	–	–
Geraniales	Oxalidaceae	<i>Oxalis dillenii</i>	slender yellow woodsorrel	Native	Forb/herb	–	–
Geraniales	Oxalidaceae	<i>Oxalis violacea</i>	violet woodsorrel	Native	Forb/herb	–	–
Ericales	Ericaceae	<i>Oxydendrum arboreum</i>	sourwood	Native	Shrub, Tree	–	–
Asterales	Asteraceae	<i>Packera anonyma</i>	Small's ragwort	Native	Forb/herb	–	–
Rhamnales	Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia creeper	Native	Vine	–	–
Violales	Passifloraceae	<i>Passiflora lutea</i>	yellow passionflower	Native	Forb/herb, Vine	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Polygonales	Polygonaceae	<i>Persicaria longiseta</i>	Oriental lady's thumb	Non-native	Forb/herb	–	–
Polygonales	Polygonaceae	<i>Persicaria virginiana</i>	jumpseed	Native	Forb/herb	–	–
Polypodiales	Thelypteridaceae	<i>Phegopteris hexagonoptera</i>	broad beechfern	Native	Forb/herb	–	–
Solanales	Solanaceae	<i>Physalis pubescens</i>	husk tomato	Native	Forb/herb	–	–
Caryophyllales	Phytolaccaceae	<i>Phytolacca americana</i>	American pokeweed	Native	Forb/herb	–	–
Pinales	Pinaceae	<i>Pinus echinata</i>	shortleaf pine	Native	Tree	–	–
Pinales	Pinaceae	<i>Pinus palustris</i>	longleaf pine	Native	Tree	–	–
Pinales	Pinaceae	<i>Pinus taeda</i>	loblolly pine	Native	Tree	–	–
Cyperales	Poaceae	<i>Piptochaetium avenaceum</i>	blackseed speargrass	Native	Graminoid	–	–
Hamamelidales	Platanaceae	<i>Platanus occidentalis</i>	American sycamore	Native	Tree	–	–
Polypodiales	Polypodiaceae	<i>Pleopeltis michauxiana</i>	resurrection fern	Native	Forb/herb	–	–
Liliales	Liliaceae	<i>Polygonatum biflorum</i> var. <i>biflorum</i>	smooth Solomon's seal	Native	Forb/herb	–	–
Polypodiales	Dryopteridaceae	<i>Polystichum acrostichoides</i>	Christmas fern	Native	Forb/herb	–	–
Rosales	Rosaceae	<i>Prunus serotina</i> var. <i>serotina</i>	black cherry	Native	Shrub, Tree	–	–
Asterales	Asteraceae	<i>Pseudognaphalium obtusifolium</i>	rabbit-tobacco	Native	Forb/herb	–	–
Fagales	Fagaceae	<i>Quercus alba</i>	white oak	Native	Tree	–	–
Fagales	Fagaceae	<i>Quercus coccinea</i>	scarlet oak	Native	Tree	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHPP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Fagales	Fagaceae	<i>Quercus falcata</i>	southern red oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus marilandica</i> var. <i>marilandica</i>	blackjack oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus montana</i>	chestnut oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus nigra</i>	water oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus rubra</i> var. <i>rubra</i>	northern red oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus stellata</i>	post oak	Native	Tree	—	—
Fagales	Fagaceae	<i>Quercus velutina</i>	black oak	Native	Tree	—	—
Ericales	Ericaceae	<i>Rhododendron canescens</i>	mountain azalea	Native	Shrub	—	—
Sapindales	Anacardiaceae	<i>Rhus copallinum</i> var. <i>copallinum</i>	winged sumac	Native	Shrub, Tree	—	—
Sapindales	Anacardiaceae	<i>Rhus glabra</i>	smooth sumac	Native	Shrub, Tree	—	—
Rosales	Rosaceae	<i>Rubus pensilvanicus</i>	eastern blackberry / sawtooth blackberry	Native	Subshrub	—	—
Scrophulariales	Acanthaceae	<i>Ruellia caroliniensis</i>	Carolina wild petunia	Native	Forb/herb	—	—
Apiales	Apiaceae	<i>Sanicula canadensis</i> var. <i>canadensis</i>	Canadian blacksnakeroot	Native	Forb/herb	—	—
Laurales	Lauraceae	<i>Sassafras albidum</i>	sassafras	Native	Shrub, Tree	—	—

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Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Piperales	Saururaceae	<i>Saururus cernuus</i>	lizard's tail	Native	Forb/herb	—	—
Ophioglossales	Ophioglossaceae	<i>Sceptridium bitematum</i>	southern grapefern / sparselobe grapefern	Native	Forb/herb	—	—
Ophioglossales	Ophioglossaceae	<i>Sceptridium dissectum</i>	cutleaf grapefern	Native	Forb/herb	—	—
Cyperales	Cyperaceae	<i>Scleria ciliata</i>	fringed nutrush	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Scleria oligantha</i>	littlehead nutrush	Native	Graminoid	—	—
Cyperales	Cyperaceae	<i>Scleria triglomerata</i>	whip nutrush	Native	Graminoid	—	—
Lamiales	Lamiaceae	<i>Scutellaria</i>	skullcap	Native	Forb/herb	—	—
Lamiales	Lamiaceae	<i>Scutellaria lateriflora</i>	blue skullcap	Native	Forb/herb	—	—
Asterales	Asteraceae	<i>Sericocarpus asteroides</i>	toothed whitetop aster	Native	Forb/herb	—	—
Malvales	Malvaceae	<i>Sida rhombifolia</i> var. <i>rhombifolia</i>	Cuban jute	Native	Forb/herb, Subshrub	—	—
Liliales	Iridaceae	<i>Sisyrinchium fuscatum</i>	coastal plain blue-eyed grass	Native	Forb/herb	—	—
Liliales	Smilacaceae	<i>Smilax bona-nox</i> var. <i>bona-nox</i>	saw greenbrier	Native	Shrub, Vine	—	—
Liliales	Smilacaceae	<i>Smilax glauca</i>	whiteleaf greenbrier / cat greenbrier	Native	Shrub, Vine	—	—
Liliales	Smilacaceae	<i>Smilax hispida</i>	bristle greebrier	Native	Shrub, Vine	—	—

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Liliales	Smilacaceae	<i>Smilax rotundifolia</i>	roundleaf greenbrier	Native	Vine, Shrub	–	–
Solanales	Solanaceae	<i>Solanum carolinense</i> var. <i>carolinense</i>	Carolina horsenettle	Native	Forb/herb, Subshrub	–	–
Asterales	Asteraceae	<i>Solidago caesia</i> var. <i>caesia</i>	wreath goldenrod	Native	Forb/herb	–	–
Asterales	Asteraceae	<i>Solidago rugosa</i> var. <i>rugosa</i>	wrinkleleaf goldenrod	Native	Forb/herb	–	–
Cornales	Cornaceae	<i>Swida foemina</i>	stiff dogwood	Native	Shrub, Tree	–	–
Asterales	Asteraceae	<i>Symphyotrichum lateriflorum</i>	calico aster	Native	Forb/herb	–	–
Fabales	Fabaceae	<i>Tephrosia virginiana</i>	Virginia tephrosia	Native	Forb/herb, Subshrub	–	–
Gentianales	Apocynaceae	<i>Thyrsanthella difformis</i>	climbing dogbane	Native	Vine	–	–
Malvales	Tiliaceae	<i>Tilia americana</i> var. <i>caroliniana</i>	Carolina basswood / southern basswood	Native	Tree	–	–
Orchidales	Orchidaceae	<i>Tipularia discolor</i>	crane fly orchid / crippled crane fly	Native	Forb/herb	–	–
Sapindales	Anacardiaceae	<i>Toxicodendron radicans</i> var. <i>radicans</i>	eastern poison ivy	Native	Forb/herb, Shrub, Subshrub, Vine	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Table 8 (continued). Vascular Plants Observed During the 2022 SECN Terrestrial Vegetation Monitoring Effort at Horseshoe Bend National Military Park.

Order ¹	Family ¹	Scientific Name	Common Name ¹	Native Status ¹	Growth Form ¹	State Invasive Status ²	Alabama Rare Protected Status ³
Liliales	Liliaceae	<i>Trillium catesbaei</i>	Catesby's trillium / bashful wakerobin	Native	Forb/herb	–	–
Urticales	Ulmaceae	<i>Ulmus alata</i>	winged elm	Native	Tree	–	–
Ericales	Ericaceae	<i>Vaccinium</i>	blueberry	Native	Shrub	–	–
Ericales	Ericaceae	<i>Vaccinium arboreum</i>	farkleberry	Native	Tree, Shrub	–	–
Ericales	Ericaceae	<i>Vaccinium elliotii</i>	Elliott's blueberry	Native	Shrub	–	–
Ericales	Ericaceae	<i>Vaccinium pallidum</i>	hillside blueberry / Blue Ridge blueberry	Native	Shrub	–	–
Ericales	Ericaceae	<i>Vaccinium stamineum</i> var. <i>stamineum</i>	deerberry	Native	Shrub	–	–
Asterales	Asteraceae	<i>Verbesina occidentalis</i>	yellow crownbeard	Native	Forb/herb	–	–
Fabales	Fabaceae	<i>Vicia caroliniana</i>	Carolina vetch	Native	Forb/herb, Vine	–	–
Violales	Violaceae	<i>Viola sororia</i>	common blue violet	Native	Forb/herb	–	–
Rhamnales	Vitaceae	<i>Vitis baileyana</i>	possum grape / graybark grape	Native	Vine	–	–
Rhamnales	Vitaceae	<i>Vitis cinerea</i>	pigeon grape / graybark grape	Native	Vine	–	–
Liliales	Agavaceae	<i>Yucca filamentosa</i>	Adam's needle	Native	Forb/herb, Shrub, Subshrub	–	–

¹ Information obtained from the PLANTS database (USDA 2024).

² Information obtained from the Alabama Invasive Plant Council. Status Ranks are as follows: 1=extensive and dense infestations in Alabama; W=watch list (AIPC 2012).

³ Information obtained from the Alabama Natural Heritage Program. Conservation Status Ranks are as follows: S1=Critically Imperiled within Alabama (ANHP 2019).

Appendix B. Species Diversity, Abundance, and Woody Stem Metrics Summarized by Broadly Defined Habitats at Horseshoe Bend National Military Park

Table 9. Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Acalypha rhomboidea</i>	50	1	–	–
<i>Acer floridanum</i>	100	6	50	5
<i>Acer negundo</i> var. <i>negundo</i>	25	2	17	1
<i>Acer rubrum</i>	100	4	83	5
<i>Albizia julibrissin</i>	–	–	17	1
<i>Andropogon ternarius</i>	–	–	33	2
<i>Andropogon virginicus</i> var. <i>virginicus</i>	–	–	17	1
<i>Aralia spinosa</i>	25	1	17	2
<i>Arisaema dracontium</i>	25	1	17	1
<i>Arisaema triphyllum</i>	–	–	17	1
<i>Aristida</i>	–	–	17	1
<i>Aronia arbutifolia</i>	–	–	17	1
<i>Arundinaria appalachiana</i>	–	–	17	3
<i>Arundinaria gigantea</i>	25	2	–	–
<i>Arundinaria tecta</i>	25	6	–	–
<i>Asimina parviflora</i>	25	2	67	2
<i>Asplenium platyneuron</i>	–	–	33	2
<i>Athyrium asplenoides</i>	25	1	17	1
<i>Benthamidia florida</i>	50	3	100	5
<i>Bidens frondosa</i>	25	1	–	–
<i>Bignonia capreolata</i>	75	2	50	2
<i>Boehmeria cylindrica</i>	25	2	–	–
<i>Botrypus virginianus</i>	–	–	17	2
<i>Brachyelytrum erectum</i>	–	–	17	2
<i>Callicarpa americana</i>	75	2	83	2
<i>Calycanthus floridus</i>	–	–	17	2
<i>Campsis radicans</i>	75	3	–	–
<i>Carex complanata</i>	25	3	17	1

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Carex cumberlandensis</i>	75	4	17	2
<i>Carex debilis</i>	100	2	–	–
<i>Carex laxiflora</i>	25	2	17	2
<i>Carex longii</i>	50	1	–	–
<i>Carex nigromarginata</i>	–	–	50	3
<i>Carex oligocarpa</i>	25	2	–	–
<i>Carex picta</i>	–	–	17	1
<i>Carex reznicekii</i>	–	–	17	1
<i>Carex rosea</i>	25	1	–	–
<i>Carpinus caroliniana</i> var. <i>caroliniana</i>	75	5	33	4
<i>Carya cordiformis</i>	100	3	50	2
<i>Carya glabra</i>	–	–	50	2
<i>Carya ovalis</i>	–	–	17	2
<i>Carya pallida</i>	–	–	33	2
<i>Carya tomentosa</i>	–	–	67	4
<i>Celtis laevigata</i>	25	1	–	–
<i>Celtis pumila</i>	–	–	17	2
<i>Centrosema virginianum</i>	–	–	17	2
<i>Cercis canadensis</i>	50	3	33	4
<i>Chamaecrista nictitans</i> var. <i>nictitans</i>	25	2	–	–
<i>Chasmanthium latifolium</i>	25	2	–	–
<i>Chasmanthium laxum</i>	25	4	–	–
<i>Chasmanthium sessiliflorum</i> var. <i>sessiliflorum</i>	100	2	50	3
<i>Chimaphila maculata</i>	25	2	67	2
<i>Cirsium horridulum</i> var. <i>horridulum</i>	–	–	17	1
<i>Cirsium vulgare</i>	25	1	–	–
<i>Cocculus carolinus</i>	50	2	–	–
<i>Collinsonia anisata</i>	–	–	17	2
<i>Coreopsis major</i>	–	–	17	1
<i>Crataegus</i>	25	1	–	–
<i>Crataegus macrosperma</i>	–	–	17	1
<i>Desmodium glabellum</i>	–	–	17	1
<i>Desmodium lineatum</i>	–	–	17	2

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Desmodium paniculatum</i> var. <i>paniculatum</i>	25	2	–	–
<i>Desmodium perplexum</i>	25	4	–	–
<i>Desmodium rotundifolium</i>	–	–	17	2
<i>Dichanthelium</i>	–	–	33	3
<i>Dichanthelium boscii</i>	50	1	67	3
<i>Dichanthelium commutatum</i>	50	3	50	3
<i>Dichanthelium depauperatum</i>	–	–	17	2
<i>Dichanthelium dichotomum</i> var. <i>dichotomum</i>	–	–	33	1
<i>Dichanthelium laxiflorum</i>	25	1	33	1
<i>Dioscorea villosa</i>	–	–	17	2
<i>Diospyros virginiana</i>	75	4	100	3
<i>Elephantopus carolinianus</i>	50	2	–	–
<i>Elephantopus tomentosus</i>	–	–	17	1
<i>Elymus virginicus</i>	25	1	–	–
<i>Endodeca serpentaria</i>	25	1	50	2
<i>Erechtites hieraciifolius</i>	50	2	50	2
<i>Erianthus alopecuroides</i>	–	–	17	1
<i>Erigeron canadensis</i>	25	1	33	3
<i>Euonymus americanus</i>	–	–	33	3
<i>Eupatorium capillifolium</i>	–	–	33	2
<i>Eupatorium serotinum</i>	25	2	33	2
<i>Euphorbia pubentissima</i>	–	–	50	2
<i>Fagus grandifolia</i> var. <i>caroliniana</i>	25	2	33	6
<i>Fraxinus americana</i>	–	–	17	1
<i>Fraxinus pennsylvanica</i>	75	2	–	–
<i>Galium bermudense</i>	25	1	50	2
<i>Galium circaezans</i>	–	–	17	2
<i>Gelsemium sempervirens</i>	75	2	83	5
<i>Gentiana villosa</i>	25	1	–	–
<i>Goodyera pubescens</i>	25	1	–	–
<i>Halesia diptera</i> var. <i>diptera</i>	75	5	–	–
<i>Halesia carolina</i>	25	6	17	1
<i>Hamamelis virginiana</i> var. <i>virginiana</i>	–	–	17	1

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Hexastylis arifolia</i>	–	–	17	3
<i>Hieracium gronovii</i>	–	–	17	2
<i>Hydrangea barbara</i>	25	1	–	–
<i>Hypericum hypericoides</i>	25	3	50	2
<i>Hypericum punctatum</i>	25	1	–	–
<i>Hypoxis hirsuta</i>	–	–	17	1
<i>Ilex opaca</i>	25	4	–	–
<i>Iris verna</i> var. <i>verna</i>	–	–	17	1
<i>Isotrema tomentosum</i>	25	2	–	–
<i>Juglans cinerea</i>	25	2	–	–
<i>Juncus coriaceus</i>	25	1	–	–
<i>Juniperus virginiana</i>	25	4	33	4
<i>Lactuca canadensis</i>	–	–	17	1
<i>Laportea canadensis</i>	25	2	–	–
<i>Lespedeza cuneata</i>	50	2	17	2
<i>Ligustrum sinense</i>	100	2	17	2
<i>Liquidambar styraciflua</i>	100	7	83	6
<i>Liriodendron tulipifera</i> var. <i>tulipifera</i>	100	6	67	6
<i>Lonicera japonica</i>	75	2	17	2
<i>Magnolia acuminata</i>	25	2	17	6
<i>Magnolia tripetala</i>	–	–	17	1
<i>Magnolia virginiana</i> var. <i>australis</i>	25	1	–	–
<i>Matelea carolinensis</i>	50	2	–	–
<i>Microstegium vimineum</i>	50	7	17	3
<i>Mikania scandens</i>	25	2	17	1
<i>Mitchella repens</i>	50	2	50	2
<i>Muscadinia rotundifolia</i> var. <i>rotundifolia</i>	100	5	100	6
<i>Nabalus serpentarius</i>	–	–	17	1
<i>Nyssa sylvatica</i>	–	–	67	3
<i>Ostrya virginiana</i>	75	6	50	3
<i>Oxalis dillenii</i>	50	2	17	2
<i>Oxalis violacea</i>	–	–	17	1
<i>Oxydendrum arboreum</i>	–	–	83	5

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Packera anonyma</i>	–	–	17	2
<i>Parthenocissus quinquefolia</i>	100	4	83	3
<i>Passiflora lutea</i>	25	1	–	–
<i>Persicaria longiseta</i>	25	1	–	–
<i>Persicaria virginiana</i>	25	2	–	–
<i>Phegopteris hexagonoptera</i>	–	–	17	2
<i>Physalis pubescens</i>	–	–	17	1
<i>Phytolacca americana</i>	–	–	17	2
<i>Pinus echinata</i>	–	–	50	5
<i>Pinus palustris</i>	–	–	17	2
<i>Pinus taeda</i>	50	6	83	7
<i>Piptochaetium avenaceum</i>	25	2	33	2
<i>Platanus occidentalis</i>	25	5	–	–
<i>Pleopeltis michauxiana</i>	–	–	17	2
<i>Polygonatum biflorum</i> var. <i>biflorum</i>	–	–	17	1
<i>Polystichum acrostichoides</i>	100	2	67	5
<i>Prunus serotina</i> var. <i>serotina</i>	75	3	83	2
<i>Pseudognaphalium obtusifolium</i>	–	–	17	1
<i>Quercus alba</i>	75	3	100	5
<i>Quercus coccinea</i>	–	–	33	3
<i>Quercus falcata</i>	25	6	67	6
<i>Quercus marilandica</i> var. <i>marilandica</i>	–	–	17	4
<i>Quercus montana</i>	–	–	17	4
<i>Quercus nigra</i>	100	7	83	5
<i>Quercus rubra</i> var. <i>rubra</i>	–	–	33	4
<i>Quercus stellata</i>	–	–	67	5
<i>Quercus velutina</i>	50	1	33	2
<i>Rhododendron canescens</i>	–	–	17	3
<i>Rhus copallinum</i> var. <i>copallinum</i>	–	–	50	2
<i>Rhus glabra</i>	–	–	33	3
<i>Rubus pensilvanicus</i>	100	2	67	2
<i>Ruellia caroliniensis</i>	25	1	–	–
<i>Sanicula canadensis</i> var. <i>canadensis</i>	75	2	50	2

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Sassafras albidum</i>	25	1	67	3
<i>Saururus cernuus</i>	25	1	–	–
<i>Sceptridium bitermum</i>	75	2	33	2
<i>Sceptridium dissectum</i>	25	1	–	–
<i>Scleria ciliata</i>	–	–	17	2
<i>Scleria oligantha</i>	–	–	17	2
<i>Scleria triglomerata</i>	–	–	50	2
<i>Scutellaria</i>	25	1	–	–
<i>Scutellaria lateriflora</i>	–	–	17	2
<i>Sericocarpus asteroides</i>	–	–	17	1
<i>Sida rhombifolia</i> var. <i>rhombifolia</i>	25	1	–	–
<i>Sisyrinchium fuscum</i>	–	–	17	1
<i>Smilax bona-nox</i> var. <i>bona-nox</i>	100	3	50	2
<i>Smilax glauca</i>	75	2	100	3
<i>Smilax hispida</i>	50	1	17	1
<i>Smilax rotundifolia</i>	100	2	83	3
<i>Solanum carolinense</i> var. <i>carolinense</i>	25	1	–	–
<i>Solidago caesia</i> var. <i>caesia</i>	–	–	17	1
<i>Solidago rugosa</i> var. <i>rugosa</i>	25	1	–	–
<i>Swida foemina</i>	–	–	17	1
<i>Symphyotrichum lateriflorum</i>	25	2	17	1
<i>Tephrosia virginiana</i>	–	–	17	3
<i>Thysanthera diffusum</i>	25	1	–	–
<i>Tilia americana</i> var. <i>caroliniana</i>	25	2	17	2
<i>Tipularia discolor</i>	–	–	17	2
<i>Toxicodendron radicans</i> var. <i>radicans</i>	100	2	50	3
<i>Trillium catesbaei</i>	–	–	17	2
<i>Ulmus alata</i>	100	4	50	4
<i>Vaccinium</i>	–	–	17	1
<i>Vaccinium arboreum</i>	25	2	67	3
<i>Vaccinium elliotii</i>	50	4	83	4
<i>Vaccinium pallidum</i>	–	–	33	8
<i>Vaccinium stamineum</i> var. <i>stamineum</i>	–	–	33	2

Table 9 (continued). Constancy and average cover class for all vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: PAW = Piedmont Alluvial Wetlands (4 plots) and PUF = Piedmont Upland Forests (6 plots). Cover classes are as follows: 1: 0–0.1%, 2: 0.1–1%, 3: 1–2%, 4: 2–5%, 5: 5–10%, 6: 10–25%, 7: 25–50%, 8: 50–75%, 9: 75–95%, 10: 95–100%.

Species	PAW Constancy	PAW Cover	PUF Constancy	PUF Cover
<i>Verbesina occidentalis</i>	75	2	17	1
<i>Vicia caroliniana</i>	–	–	17	3
<i>Viola sororia</i>	50	2	17	1
<i>Vitis baileyana</i>	–	–	17	2
<i>Vitis cinerea</i>	–	–	17	1
<i>Yucca filamentosa</i>	25	1	–	–

Table 10. Basal area (BA, m²/ha) and density (Den, count/ha) of woody vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: Piedmont Alluvial Wetlands (PAW; 4 plots) and Piedmont Upland Forests (PUF; 6 plots). [Sap—Sapling; Seed—Seedling].

Species	PAW Tree BA	PAW Tree Den	PAW Sap BA	PAW Sap Den	PAW Seed Den	PUF Tree BA	PUF Tree Den	PUF Sap BA	PUF Sap Den	PUF Seed Den
<i>Acer floridanum</i>	0.57	12.50	1.28	1000.00	312.50	0.16	8.33	0.18	166.67	416.67
<i>Acer negundo</i> var. <i>negundo</i>	—	—	—	—	1250.00	—	—	—	—	—
<i>Acer rubrum</i>	0.21	12.50	0.06	250.00	2187.50	0.20	8.33	0.31	2666.67	1666.67
<i>Arundinaria appalachiana</i>	—	—	—	—	—	—	—	0.00	166.67	—
<i>Arundinaria gigantea</i>	—	—	0.01	750.00	—	—	—	—	—	—
<i>Arundinaria tecta</i>	—	—	—	—	15937.50	—	—	—	—	—
<i>Asimina parviflora</i>	—	—	—	—	1250.00	—	—	—	—	—
<i>Benthamidia florida</i>	—	—	—	—	—	0.39	25.00	0.78	333.33	—
<i>Bignonia capreolata</i>	—	—	—	—	1562.50	—	—	—	—	208.33
<i>Callicarpa americana</i>	—	—	—	—	312.50	—	—	—	—	—
<i>Calycanthus floridus</i>	—	—	—	—	—	—	—	—	—	208.33
<i>Carpinus caroliniana</i> var. <i>caroliniana</i>	0.17	12.50	1.10	250.00	—	0.03	4.17	0.92	333.33	208.33
<i>Carya cordiformis</i>	—	—	0.06	250.00	1562.50	—	—	—	—	1458.33
<i>Carya glabra</i>	—	—	—	—	—	—	—	—	—	833.33
<i>Carya ovalis</i>	—	—	—	—	—	—	—	—	—	208.33
<i>Carya pallida</i>	—	—	—	—	—	0.20	4.17	—	—	—
<i>Carya tomentosa</i>	—	—	—	—	—	0.58	12.50	0.74	166.67	—
<i>Cercis canadensis</i>	—	—	0.06	250.00	—	—	—	—	—	3541.67
<i>Diospyros virginiana</i>	0.13	6.25	0.28	250.00	1875.00	—	—	0.05	500.00	1666.67
<i>Fagus grandifolia</i> var. <i>caroliniana</i>	—	—	—	—	—	—	—	0.74	166.67	—
<i>Fraxinus americana</i>	—	—	—	—	—	—	—	—	—	208.33
<i>Fraxinus pennsylvanica</i>	—	—	—	—	312.50	—	—	—	—	—

Table 10 (continued). Basal area (BA, m²/ha) and density (Den, count/ha) of woody vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: Piedmont Alluvial Wetlands (PAW; 4 plots) and Piedmont Upland Forests (PUF; 6 plots). [Sap—Sapling; Seed—Seedling].

Species	PAW Tree BA	PAW Tree Den	PAW Sap BA	PAW Sap Den	PAW Seed Den	PUF Tree BA	PUF Tree Den	PUF Sap BA	PUF Sap Den	PUF Seed Den
<i>Gelsemium sempervirens</i>	—	—	—	—	5312.50	—	—	—	—	23958.33
<i>Halesia diptera</i> var. <i>diptera</i>	—	—	1.39	1000.00	312.50	—	—	—	—	—
<i>Halesia carolina</i>	—	—	0.00	250.00	2500.00	—	—	—	—	—
<i>Juniperus virginiana</i>	0.60	6.25	—	—	—	0.20	4.17	—	—	—
<i>Ligustrum sinense</i>	—	—	—	—	625.00	—	—	—	—	416.67
<i>Liquidambar styraciflua</i>	4.79	200.00	7.52	2500.00	2500.00	1.82	79.17	5.33	2833.33	3541.67
<i>Liriodendron tulipifera</i> var. <i>tulipifera</i>	3.69	75.00	0.06	250.00	7187.50	2.97	50.00	0.74	166.67	2083.33
<i>Lonicera japonica</i>	—	—	—	—	1250.00	—	—	—	—	208.33
<i>Magnolia acuminata</i>	—	—	—	—	—	0.06	4.17	—	—	—
<i>Muscadinia rotundifolia</i> var. <i>rotundifolia</i>	—	—	0.07	750.00	9375.00	—	—	0.23	666.67	15208.33
<i>Ostrya virginiana</i>	0.36	25.00	—	—	312.50	—	—	—	—	—
<i>Oxydendrum arboreum</i>	—	—	—	—	—	1.42	50.00	0.13	833.33	—
<i>Parthenocissus quinquefolia</i>	—	—	—	—	14375.00	—	—	—	—	7708.33
<i>Pinus echinata</i>	—	—	—	—	—	1.47	29.17	—	—	833.33
<i>Pinus taeda</i>	4.20	18.75	—	—	7500.00	13.68	158.33	—	—	3541.67
<i>Platanus occidentalis</i>	0.83	6.25	—	—	—	—	—	—	—	—
<i>Prunus serotina</i> var. <i>serotina</i>	0.26	6.25	—	—	—	—	—	—	—	625.00
<i>Quercus alba</i>	0.10	6.25	—	—	—	1.26	8.33	—	—	2291.67
<i>Quercus coccinea</i>	—	—	—	—	—	0.57	8.33	0.01	333.33	208.33
<i>Quercus falcata</i>	4.34	6.25	—	—	312.50	2.36	25.00	—	—	1041.67
<i>Quercus marilandica</i> var. <i>marilandica</i>	—	—	—	—	—	0.24	4.17	—	—	—

Table 10 (continued). Basal area (BA, m²/ha) and density (Den, count/ha) of woody vascular plant species observed in 10 Southeast Coast Network vegetation monitoring plots. Broad Habitat Type Codes are as follows: Piedmont Alluvial Wetlands (PAW; 4 plots) and Piedmont Upland Forests (PUF; 6 plots). [Sap—Sapling; Seed—Seedling].

Species	PAW Tree BA	PAW Tree Den	PAW Sap BA	PAW Sap Den	PAW Seed Den	PUF Tree BA	PUF Tree Den	PUF Sap BA	PUF Sap Den	PUF Seed Den
<i>Quercus montana</i>	—	—	—	—	—	0.20	4.17	—	—	—
<i>Quercus nigra</i>	12.90	68.75	—	—	6875.00	1.07	29.17	—	—	1666.67
<i>Quercus rubra</i> var. <i>rubra</i>	—	—	—	—	—	0.17	4.17	—	—	—
<i>Quercus stellata</i>	—	—	—	—	—	0.82	4.17	—	—	—
<i>Rhododendron canescens</i>	—	—	—	—	—	—	—	0.18	166.67	—
<i>Rhus copallinum</i> var. <i>copallinum</i>	—	—	—	—	—	—	—	0.08	333.33	416.67
<i>Rhus glabra</i>	—	—	—	—	—	—	—	0.00	166.67	208.33
<i>Sassafras albidum</i>	—	—	—	—	—	—	—	0.00	166.67	208.33
<i>Smilax bona-nox</i> var. <i>bona-nox</i>	—	—	—	—	6250.00	—	—	—	—	1458.33
<i>Smilax glauca</i>	—	—	—	—	3437.50	—	—	—	—	8125.00
<i>Smilax hispida</i>	—	—	—	—	312.50	—	—	—	—	208.33
<i>Smilax rotundifolia</i>	—	—	—	—	3750.00	—	—	0.00	166.67	5000.00
<i>Tilia americana</i> var. <i>caroliniana</i>	—	—	—	—	—	—	—	0.18	166.67	—
<i>Toxicodendron radicans</i> var. <i>radicans</i>	—	—	—	—	6875.00	—	—	—	—	2083.33
<i>Ulmus alata</i>	0.64	12.50	1.10	250.00	4062.50	—	—	0.18	166.67	1250.00
<i>Vaccinium arboreum</i>	—	—	—	—	—	—	—	0.01	500.00	3333.33
<i>Vaccinium elliotii</i>	—	—	0.07	1000.00	3750.00	—	—	0.04	166.67	833.33
<i>Vaccinium pallidum</i>	—	—	—	—	—	—	—	—	—	44583.33

National Park Service
U.S. Department of the Interior



Science Report NPS/SR—2024/160
<https://doi.org/10.36967/2305166>

Natural Resource Stewardship and Science

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