Mid-Atlantic Network

Forest Vegetation Resource Brief

Valley Forge National Historical Park 2013 Status & Trends

In 2013, seven plots established in 2009 at Valley Forge NHP (VAFO) were revisited. With three-quarters of the total plots in the park resampled, the following highlights of temporal trends are preliminary, however, no substantial changes have been observed with the addition of the 2013 data compared to last year's results.

All trees with a diameter at breast height (DBH) equal to or greater than 10 cm were measured and their condition was assessed. Trees that had died since the last census were noted, while recruited trees, those reaching the minimum DBH of 10 cm, were identified, measured, mapped, marked, and tagged. Most of the tree mortality occurred in the tulip poplar community, at a rate higher than the network average. Recruitment was highest in the oak hickory dominated community. Growth rates were generally higher than observed across the network, but lower than average among the smaller diameter size classes (Figure 1).

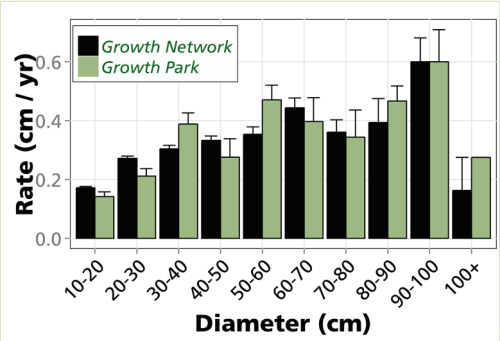

Figure 1. Growth rates of mature trees in different diameter size classes at Valley Forge NHP.

Three microplots in each plot were sampled for tree saplings and shrubs with diameters greater than 1 cm and less than 10 cm. Sapling mortality was lower than observed across the network except in the tulip poplar community. Recruitment was only documented in mixed forest community type. Growth rates among saplings were substantially above average in the oak hickory community,

Objectives

1. *Determine the status and trends in forest structure, composition, and dynamics of canopy and understory woody species.*
2. *Determine the status and trends in the density and composition of native tree seedlings and selected herbaceous species that are indicators of deer browse.*
3. *Detect and monitor the presence of invasive exotic plants, exotic plant diseases and pathogens, and forest pests.*
4. *Determine the status and trends in forest coarse woody debris and the availability of snags.*
5. *Determine the status and trends in soil Ca:Al and C:N ratios to assess the extent of base cation depletion, change in aluminum availability, and nitrogen saturation impacting MIDN forest soils.*

Importance

The Mid-Atlantic region is primarily a forested ecoregion and all Mid-Atlantic Network parks have forests that form an essential part of the landscape and provide habitat for a diversity of wildlife. Forest structure, composition, and dynamics are important measures of forest condition and health. Changes in these metrics can be indicative of stressors that may result in alterations in the future ecological integrity of forest communities. For example, high tree mortality rates can signal a change in the canopy species; declines in seedling and sapling densities can indicate a reduced capacity of the forest to regenerate; or increases in invasive exotic plants can exclude other herbaceous plants in the forest understory.

Management Applications

- *Provide a measure of forest health and changes over time.*
- *Indicate composition and trends in invasive exotic plants, pests, and pathogens in the park.*
- *Evaluate the impact of and trends in white-tailed deer browse on forest understory communities.*

Long-term Monitoring

Plot locations were randomly selected from a 250-m sampling grid. Each plot consists of a 20 x 20 m square where all trees and shrubs with a diameter at breast height (dbh) ≥ 10 cm are identified, measured, tagged, marked, and mapped, and their condition is assessed. Trees and shrubs with a dbh ≥ 1 cm are identified, measured, marked, and tagged in each of three microplots. The number and height of tree seedlings and cover of a select group of native and invasive herbaceous indicator plants are recorded in 12 quadrats. Coarse woody debris is measured along three transects. Soil samples are collected from outside each plot. A variety of parameters are measured to describe the overall plot characteristics, including vegetation cover at different strata or layers, evidence of disturbance and deer-browse, slope, and aspect. The plots are revisited every four years to evaluate changes.

2013 Status & Trends...

so we anticipate increased recruitment rates in the future.

Tree seedlings are identified in each of 12 quadrats, and their heights measured. The number and height of seedlings determines whether there is adequate regeneration to sustain the forest canopy. In parks where deer densities are high, a larger number of seedlings are required due to the heavier browse pressure than in parks where deer densities are low. Thus, regeneration is considered as "Good" if it exceeds the high deer density stocking index, and "Significant Concern" when it falls below the low deer density stocking index in any park. Valley Forge NHP did show a slight increase in the tree seedling regeneration score between measurements. However, seedling regeneration in the park is still classified as "Significant Concern" (Figure 2). Continued monitoring will determine whether regeneration is improving across the park.

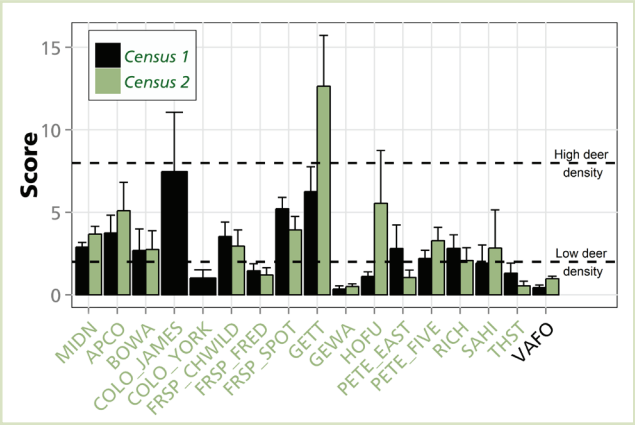

Figure 2. Mean regeneration scores for the Mid-Atlantic Network and individual parks in 2007 to 2009 (Census 1) and 2011 to 2013 (Census 2). Lines indicate minimum score needed to maintain sustainable regeneration under low and high deer densities. Codes refer to the parks monitored (see below; full report at science.nature.nps.gov/im/units/midn).

Invasive exotic and native indicator species are also monitored in the quadrats. Compared to the rest of the network, Valley Forge NHP had a high average percent cover of exotics in the plots sampled with the most common species being Japanese stiltgrass (*Microstegium vimineum*), which showed a decline in cover over the previous four years. Among the native indicators, grasses (*Poaceae* spp.) and sedges (*Cyperaceae* spp.) were the most abundant.

In 2014, field crews revisited plots established in 2010, providing the first complete revisit of all plots. That information will be the basis for a forest dynamics trend report.

Photos by James Comiskey.

A Final Note

It is important to note that the data presented here is preliminary. Three-quarters of the park's plots have been revisited; therefore the trends we report are likely to change as we add more data. However, these early results illustrate the analyses and indicators derived from long-term monitoring and their value to park management.

We would like to thank Kris Heister and Amy Ruhe, VAFO Natural Resource Managers, for their continued support and input, as well as the field crews that dedicated long, hot summer days to sample the plots across the network.

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Parks monitored: *Appomattox Court House NHP • Booker T. Washington NM • Colonial NHP • Fredericksburg & Spotsylvania NMP • Gettysburg NMP • George Washington Birthplace NM • Hopewell Furnace NHS • Petersburg NB • Richmond NBP • Sagamore Hill NHS • Thomas Stone NHS • Valley Forge NHP*

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