



# Probable Failure of Forest Regeneration Requires Sustained Management in Hopewell Furnace National Historic Site

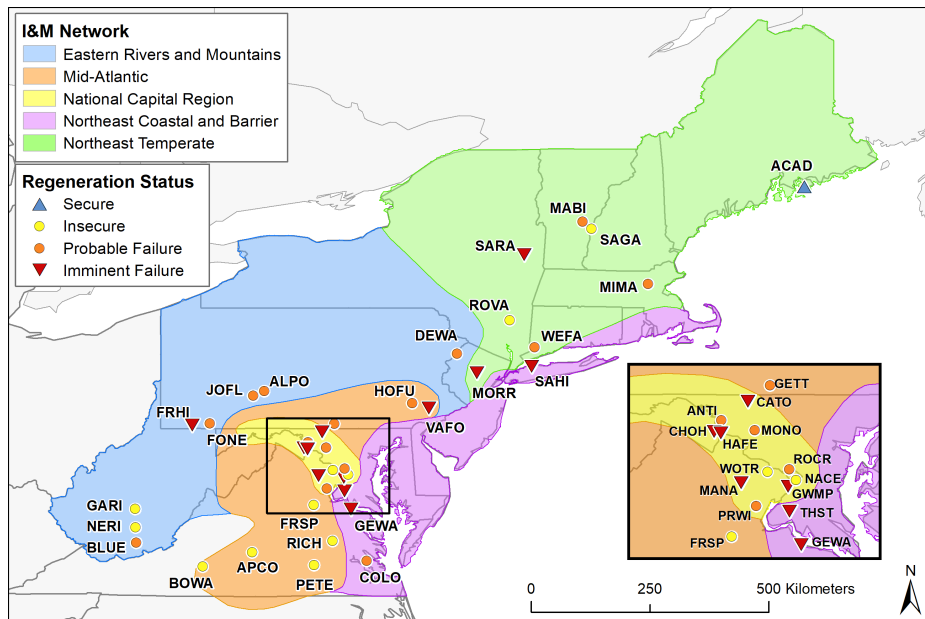
## Introduction

Forests are a key part of the landscape and visitor experience in eastern parks. These ecosystems are facing many stressors, including non-native plants, invasive tree pests, overabundant deer, and altered fire regimes. These stressors diminish forest resilience, which is the ability of an ecosystem to experience disturbance and rebound to similar functions, structure, and composition. A lack of tree regeneration - seedlings and saplings of canopy-forming trees - is an early indicator of reduced resilience and potential for future forest loss.

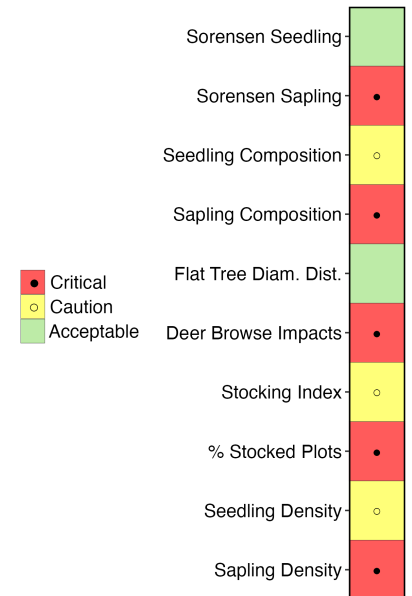
Five NPS Inventory and Monitoring Networks assessed 10 regeneration metrics in 39 parks (Figure 1) containing about 1,500 permanent forest health monitoring plots sampled every four years (2008-2019). Here, we share results for Hopewell Furnace National Historic Site (HOFU). For more detailed information on the full study, see the source publication in the Resources section below.

## Main Findings

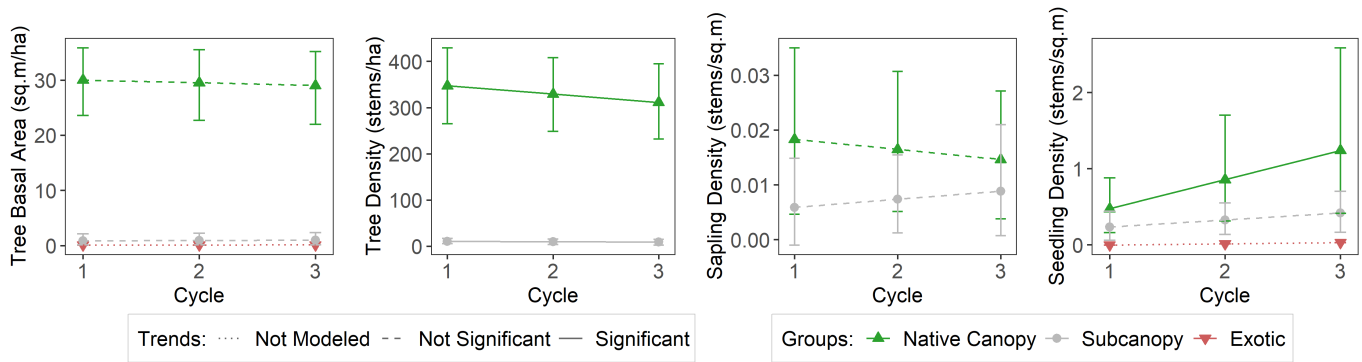
On a four-category scale (Secure, Insecure, Probable Failure, and Imminent Failure), HOFU has a forest regeneration status of **Probable Failure** (Figure 2). This means that the park is experiencing regeneration failure as indicated by inadequate and/or decreasing saplings, and low numbers of seedlings. Forests in HOFU have regeneration mismatch between the forest canopy layer and seedling layer due to an abundance of regeneration from species which do not form an overstory canopy, including abundant ash. As these forests mature, the dominance of short-statured trees will alter the composition and structure of the forests. The trends over time in tree, sapling, and seedling abundance by native canopy, subcanopy, and exotics are shown in Figure 3.



**Figure 1.** Map of parks included in regional regeneration project and forest regeneration status. Hopewell Furnace National Historic Site is located in the Mid-Atlantic (MIDN) Inventory and Monitoring Network.



**Figure 2.** Regeneration status for each of the 10 metrics in Hopewell Furnace National Historic Site.



**Figure 3.** Trends in tree, sapling, and seedling abundance by species group. Trends are based on change over time across three complete survey cycles: Cycle 1 (2008 – 2011), Cycle 2 (2012 – 2015), and Cycle 3 (2016 – 2019).

## Management Recommendations

Eastern national parks need a sustained commitment to reducing deer browse impacts, managing invasive plants, and enhancing forest structural complexity and diversity to secure sufficient regeneration and avoid future forest loss. We suggest that managers of HOFU:

- implement protection of forest regeneration from browse impacts through sustained deer culling to maintain ecologically-sustainable deer numbers.
- continue to reduce invasive plants through early detection and rapid response, release of approved biological controls, and strategic invasive plant management in high priority habitats.
- use prescribed burning in dry, fire-adapted forests to promote canopy tree regeneration.

These management efforts are especially important for HOFU as the park is at high risk of losing forest cover without intervention. Conditions are changing rapidly across parks, therefore continued monitoring and reassessment of management actions is necessary to avoid future forest loss in the park. Please refer to the source publication for more information on management strategies and reach out to the contact below for further assistance.

## Resources

**Source Publication:** Miller, K.M., Perles, S.J., Schmit, J.P., Matthews, E.R., Weed, A.S., Comiskey, J.A., Marshall, M.R., Nelson, P. and Fisichelli, N. (2023). Overabundant deer and invasive plants drive widespread regeneration debt in eastern United States national parks. *Ecological Applications*. <https://doi.org/10.1002/eap.2837>

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### Links:

[Managing Resilient Forests Initiative for Eastern National Parks](#)

To see more park briefs, visit this link: <https://schoodicinstitute.org/park-forests>

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