

Probable Failure of Forest Regeneration Requires Sustained Management in Antietam National Battlefield

Introduction

Forests are one of the key parts of the natural and cultural landscape and visitor experience in Antietam National Battlefield (ANTI). Forest ecosystems are facing many stressors, including non-native plants, invasive tree pests, overabundant deer, lack of fire, and adjacent development affecting incoming water levels and wind exposure. These stressors diminish forest resilience, defined as 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.

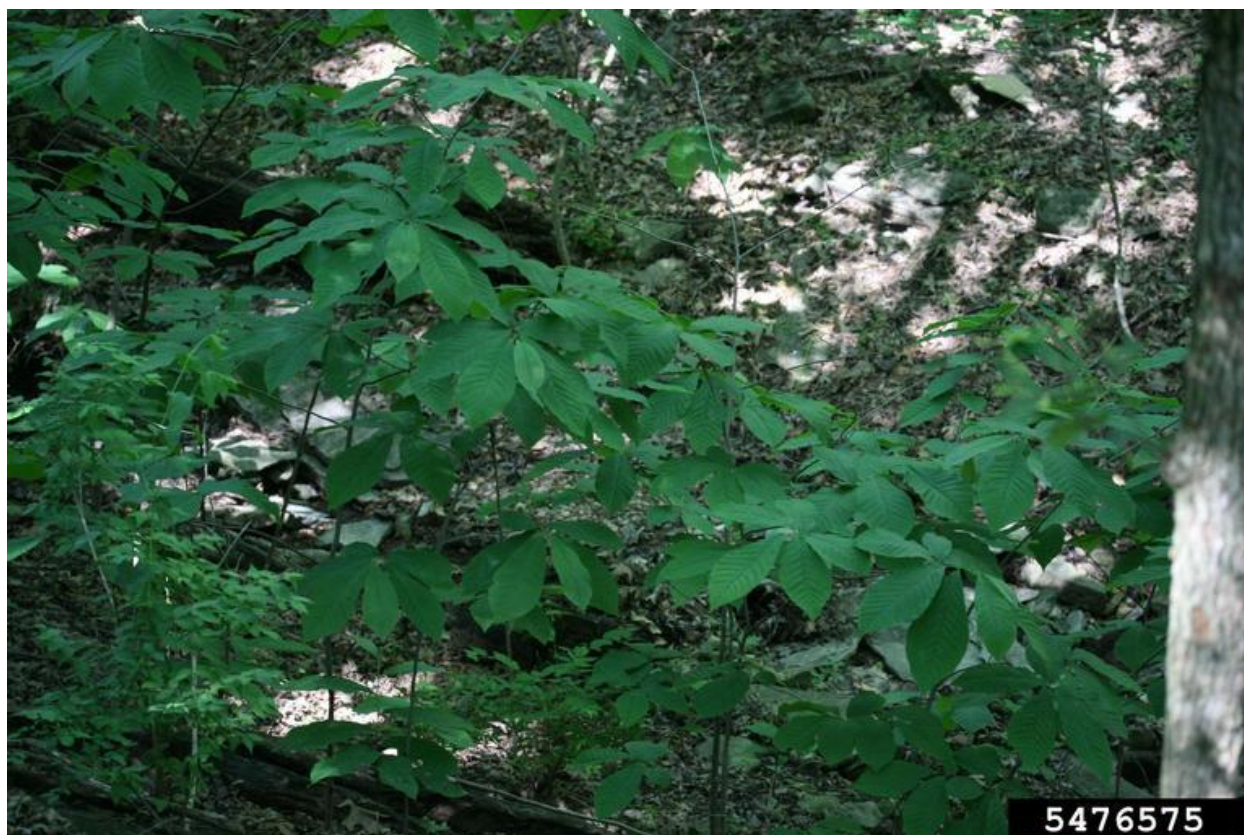
A recent study by several NPS Inventory and Monitoring networks assessed regeneration metrics in 39 parks from 2008 to 2019, including at ANTI. Parks were placed in one of four regeneration categories (Secure, Insecure, Probable Failure, and Imminent Failure), based a variety of metrics that represent the amount and diversity of tree regeneration. Forests in 27 of 39 parks were classified in either imminent or probable failure categories due to a lack of seedlings and saplings in the understory. *The study identified overabundant white-tailed deer and invasive plants as the leading causes of concern for forest regeneration.* For more detailed information on the full study, see the source publication in the Resources section below.



Hungry white-tailed deer can eat much of the vegetation in a forest that is within their reach.
NPS

Main Findings

As of data collected through 2019, on a four-category scale (Secure, Insecure, Probable Failure, and Imminent Failure), ANTI has a forest regeneration status of **Probable Failure**. This designation means that the park forests have insufficient regeneration to replace canopy trees, as indicated by inadequate and/or decreasing number of saplings and low numbers of seedlings. Forests in ANTI also have poor sapling and seedling composition due to an abundance of regeneration from species which do not form an overstory canopy, including pawpaw (*Asimina triloba*), box elder (*Acer negundo*), and the exotic tree-of-heaven (*Ailanthus altissima*). As park forests mature and overstory trees die, these short-statured and non-native trees may rapidly increase, further limiting the ability of canopy tree species to regenerate and eventually altering the composition and structure of the forests.



The understory tree, pawpaw (*Asimina triloba*), is very common at ANTI as it is unpalatable to deer and does not face the same level of browse stress as other native species.

Credit: Chris Evans, University of Illinois, Bugwood.org

Management Recommendations

Eastern national parks need sustained, [integrated forest management](#) to secure sufficient regeneration and avoid future forest loss. We suggest that managers at ANTI:

- Continue deer population reductions, ongoing at ANTI since 2017, to protect forest regeneration from browse impacts and allow seedling and sapling recovery.
- Continue to remove invasive plants through methods including early detection and rapid response and strategic invasive plant management in high priority habitats. Also consider release of approved biological controls.
- Consider tools available to address forest insect pests and pathogens. Assess forest stands at risk or already impacted (like those damaged by emerald ash borer) and prioritize invasive plant management where canopy gaps have increased or may increase soon.
- Continue to reforest historic woodlots, and riparian areas..

Not only continuing but expanding these management efforts are especially important for ANTI since without them, the park is at risk of losing forest cover along with its ecosystem services, habitat for vulnerable species of plants and animals, and connectivity with other natural areas. With conditions changing rapidly, NPS park and regional staff should continue to use an adaptive management lens by frequently re-assessing forest conditions and assessing management effectiveness using long-term ecological monitoring data collected by the park and the Inventory and Monitoring program. 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., Perles S., Schmit J.P., Matthews E., Weed A., Comiskey J., Marshall M., Nelson P., Fisichelli N. (2023). Overabundant deer and invasive plants drive widespread regeneration debt in eastern 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>

NPS News Release: [Reducing deer numbers and removing invasive plants are key to long-term forest health - Catoctin Mountain Park \(U.S. National Park Service\) \(nps.gov\)](#)