Imminent Failure of Forest Regeneration Requires Sustained Management in Manassas National Battlefield Park

Introduction

Forests are one of the key parts of the natural and cultural landscape and visitor experience in Manassas National Battlefield Park (MANA). 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 MANA. 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 publication listed 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), MANA has a forest regeneration status of **Imminent Failure**. This designation means that the park is experiencing severe regeneration failure and may no longer be recognizable forest in the future. Since park forests don't contain enough seedlings and saplings of native canopy-forming trees, canopy gaps caused by storms or insect pests are likely to convert to impenetrable thickets of invasive shrubs, leading to forest loss.

Forests in MANA also have regeneration mismatch, meaning that the species found in the forest canopy layer do not match the species found in the seedling layer. The seedling layer at MANA is dominated by ash, which is also a concern. While ash trees were once a common component of the canopy, the recent wave of emerald ash borer infestation has sharply reduced ash populations. This pest has made it unlikely ash will be a part of future canopies. As overstory trees die in MANA, these forests may experience compositional or structural changes, such as further invasion by established invasive shrub species (e.g., autumn olive or Japanese honeysuckle) and/or recruitment by species that are not currently represented in the tree canopy of the park. Oak species, in particular, are not well-represented in the regeneration layer, whereas they are common canopy trees in the park.

The nonnative shrub, autumn olive (*Elaeagnus umbellata*), is a common invasive species at MANA and can crowd out native tree seedlings in a forest.
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 MANA:

- Continue deer population reductions, ongoing at MANA since 2019, to protect forest regeneration from browse impacts and allow seedlings and saplings to recover.
- 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 expanding prescribed burn actions to include dry, fire-adapted forests in order to promote canopy tree regeneration.
- Consider additional tools to address impacts of forest insect pests and pathogens. Assess forest stands at risk or already impacted (e.g. by emerald ash borer) and prioritize invasive plant management where canopy gaps have increased or may increase soon.
- Continue to explore improvements to management practices (e.g., forthcoming woodland restoration project at Chinn Ridge), using an adaptive management approach.

Not only continuing but expanding these management efforts are especially important for MANA since without them, the park is at high 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)