Probable Failure of Forest Regeneration Requires Sustained Management in Prince William Forest Park

Introduction

Forests are a key part of the landscape and visitor experience in Prince William Forest Park (PRWI). 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 PRWI. 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), PRWI has a forest regeneration status of **Probable Failure**. This designation means that the park has an insufficient number of seedlings and saplings and is experiencing declines in both native seedling and native saplings park-wide.

A major concern at PRWI is Beech Leaf Disease (BLD), discovered in the park in 2021. American beech (*Fagus grandifolia*) makes up 21% of PRWI's trees and 36% of its saplings—making it the most abundant species in both categories. For now, BLD exists only within a few locations of the park, but it will likely spread and cause major mortality of beech in both the canopy and sapling layers.
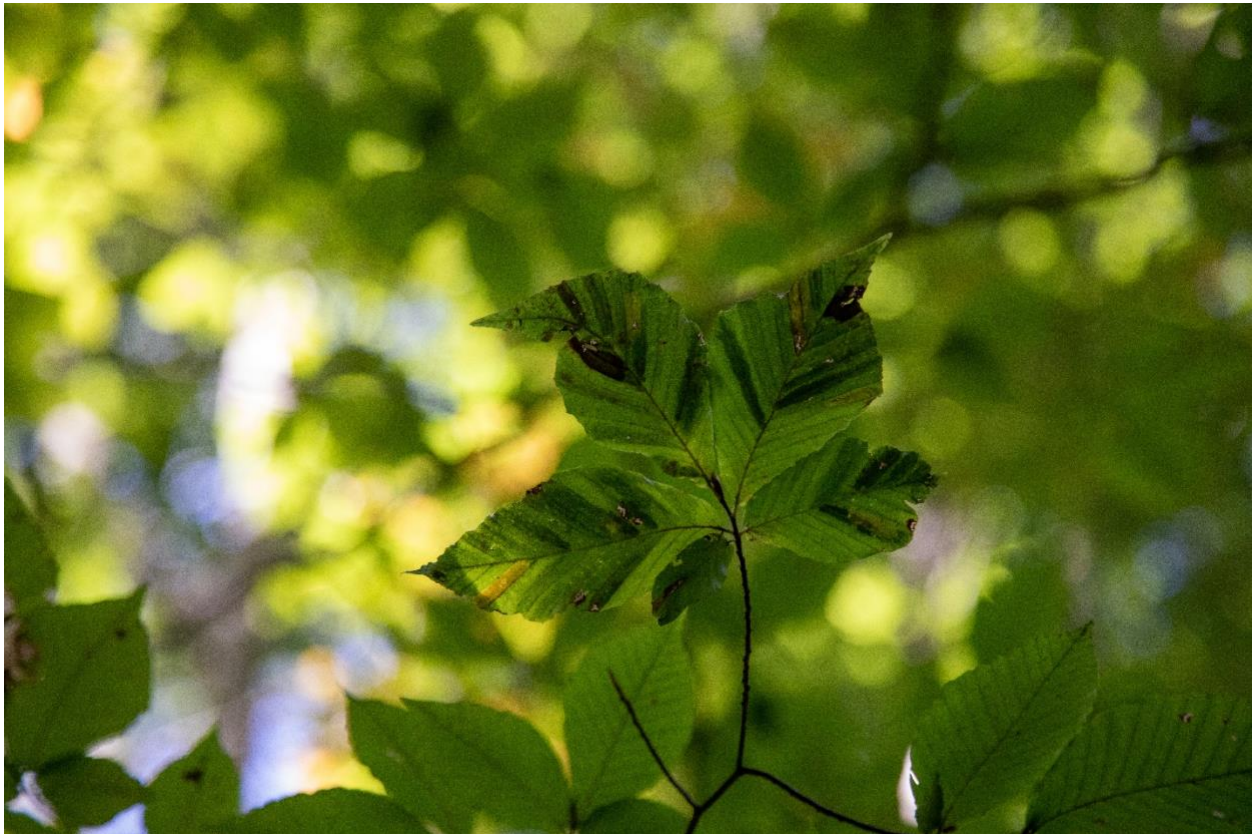
Beech leaves at PRWI showing characteristic striping of beech leaf disease.
NPS/Claire Hassler

Management Recommendations

Eastern national parks need sustained, integrated forest management to secure sufficient regeneration and avoid future forest loss. We suggest that managers at PRWI:

- Maintain the park's status as one with the lowest levels of invasive plants in the northeast by continuing 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 when available.

- Continue prescribed burns in dry, fire-adapted forests to promote canopy tree regeneration. Areas of the park burned during the 2006 B-Loop Fire show significantly more regeneration than areas that did not burn (3.5 times more tree seedlings, 5 times more shrub seedlings, and less deer browse overall).
- Continue to address forest insect pests and pathogens (such as treating eastern hemlocks for hemlock woolly adelgid). Assess forest stands at risk or already impacted (e.g. by Beech Leaf Disease) and prioritize invasive plant management where canopy gaps have increased or may increase soon.
- Implement deer population reductions to protect forest regeneration from browse impacts and allow seedling and sapling recovery.

Not only continuing but expanding these management efforts are especially important for PRWI 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

Contact: Elizabeth Matthews, Program Manager, NCR Inventory & Monitoring Network (elizabeth_matthews@nps.gov)

Links:

Trends in woody forest vegetation in Prince William Forest Park, 2006–2017 (nps.gov)

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)