Imminent Failure of Forest Regeneration Requires Sustained Management in Chesapeake and Ohio Canal National Historical Park

Introduction

Forests are a key part of the natural and cultural landscape and the visitor experience in Chesapeake and Ohio Canal National Historical Park (CHOH). Forest ecosystems are facing many stressors, including non-native plants, invasive 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, say from climate change or an insect pest, 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 CHOH. 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 the 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), CHOH has a forest regeneration status of **Imminent Failure**. This designation means that park forests are in 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 may convert to impenetrable thickets of invasive shrubs, ultimately leading to forest loss. Common invasive shrubs at CHOH include multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), and autumn olive (*Elaeagnus umbellata*).

Less than 50% of the seedlings and saplings at CHOH are composed of native canopy-forming tree species. A large proportion of the regeneration is pawpaw (*Asimina triloba*), which is native, but short-statured. As park forests mature and overstory trees die, these short-statured trees and non-native shrubs 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 CHOH 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 CHOH:

- Continue reductions of deer population, ongoing at CHOH since 2019, and consider expanding geographic scope of deer management to protect forest regeneration from browse impacts and allow seedling and sapling recovery.
- Substantially increase control of invasive plants through methods including: early detection and rapid response, release of approved biological controls (such as the release of the knotweed psyllid to suppress Japanese knotweed), and strategic invasive plant management in high priority habitats.
- Consider expanding prescribed burn actions to include dry, fire-adapted forests in order to promote canopy tree regeneration.
- Consider additional tools to address forest insect pests and pathogens. Assess forest stands at risk or already impacted (such as those damaged by emerald ash borer) and prioritize invasive plant management where canopy gaps have increased or may increase soon.

Not only continuing, but expanding these management efforts are especially important for CHOH 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 & 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:

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)

NCRN I&M Forest Vegetation Monitoring webpage