

Imminent Failure of Forest Regeneration Requires Sustained Management in Catoctin Mountain Park

Introduction

Forests are a key part of the landscape and visitor experience in Catoctin Mountain Park (CATO). 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. In combination, 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 tree regeneration in 39 parks from 2008 to 2019, including at CATO. 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 for Catoctin

As of data collected through 2019, on the four-category scale (Secure, Insecure, Probable Failure, and Imminent Failure), CATO 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. Even though Catoctin has seen a 19-fold increase in seedling density since implementing deer management in 2010, park forests are still recovering from many years of overabundant deer and don't yet contain enough seedlings and saplings of native canopy-forming trees to replace trees as they die. Without continued management, canopy gaps caused by storms, insect pests, or other disturbances are likely to convert to impenetrable thickets of invasive shrubs, leading to forest loss.

Forests in CATO also have regeneration mismatch, meaning that the species making up the forest canopy do not match the species found in the seedling layer. Further, the seedling layer at CATO is dominated by ash, which was once a common component of the canopy, but whose populations were sharply reduced by the recent wave of emerald ash borer (EAB) infestation. The continued presence of EAB in the Mid-Atlantic makes it unlikely these ash seedlings will survive to be a part of future canopies. As these forests mature and overstory trees die, shrub species like native spicebush or invasive Japanese barberry may rapidly increase, further limiting the ability of canopy tree species to regenerate and eventually altering the composition and structure of the forests.



The nonnative Japanese barberry (*Berberis thunbergii*) threatens to outcompete native seedlings in CATO's forests.
NPS Photo/Alicia Lafever

Management Recommendations

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

- Continue deer population reductions, ongoing at CATO since 2010, to protect forest regeneration from browse impacts and allow new and future seedlings and saplings to recover and grow.
- 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.
- Continue exploring novel methods for removing recalcitrant exotic shrubs, such as masticators for removing Japanese barberry.
- Continue prescribed burns in dry, fire-adapted forests (such as those with table mountain pine) to promote tree regeneration.
- Consider additional tools to manage forest insect pests and pathogens (such as treating eastern hemlocks for hemlock woolly adelgid). Assess forest stands at risk or already impacted by pests (such as those damaged by emerald ash borer) and prioritize invasive plant management where canopy gaps have formed or may form soon.
- Consider tree planting in areas of severely degraded forests, where restoration is more appropriate than limited management.
- Continue to explore improvements to management practices, such as the forthcoming Bipartisan Infrastructure Law (BIL) project to promote regeneration of preferred tree species in canopy gaps

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

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 \(U.S. National Park Service\) \(nps.gov\)](#)