

Restoration of Northeastern Interior Dry-Mesic Oak Forests: Invasive species control and native plant recommendations in Maryland

March 2022

Identifying and restoring the most common native plant species is key to effectively managing invasive species. A restoration centered approach to management can buffer the ecosystem level effects of invasive species and help prevent reintroduction. The Chesapeake and Ohio (C&O) Canal National Historical Park has utilized many different invasive species removal techniques, but could benefit from adding restoration methods that are suitable for the dry-mesic oak forest habitat contained within. Although this document is tailored to the C&O Canal National Historic Park, much of the information and recommendations are applicable to other dry-mesic oak forests in the region.

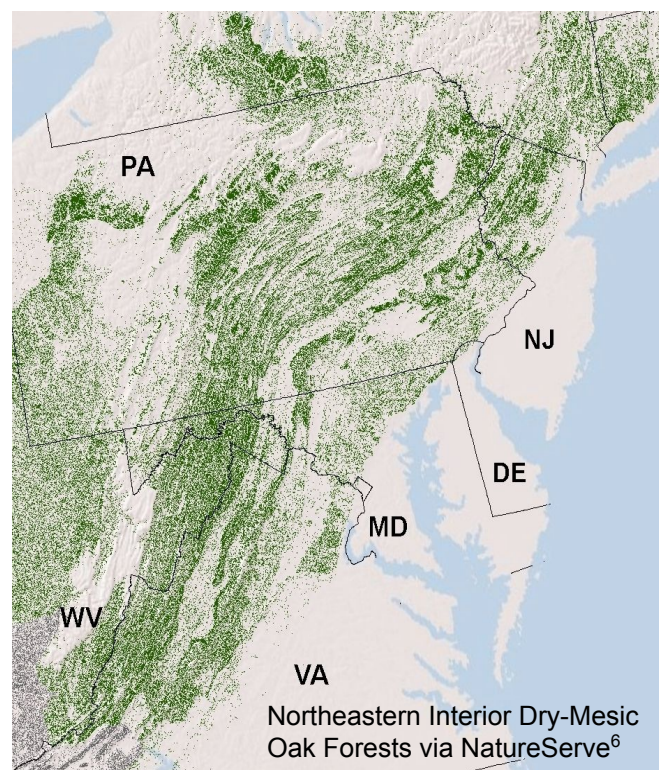
KEY FINDINGS

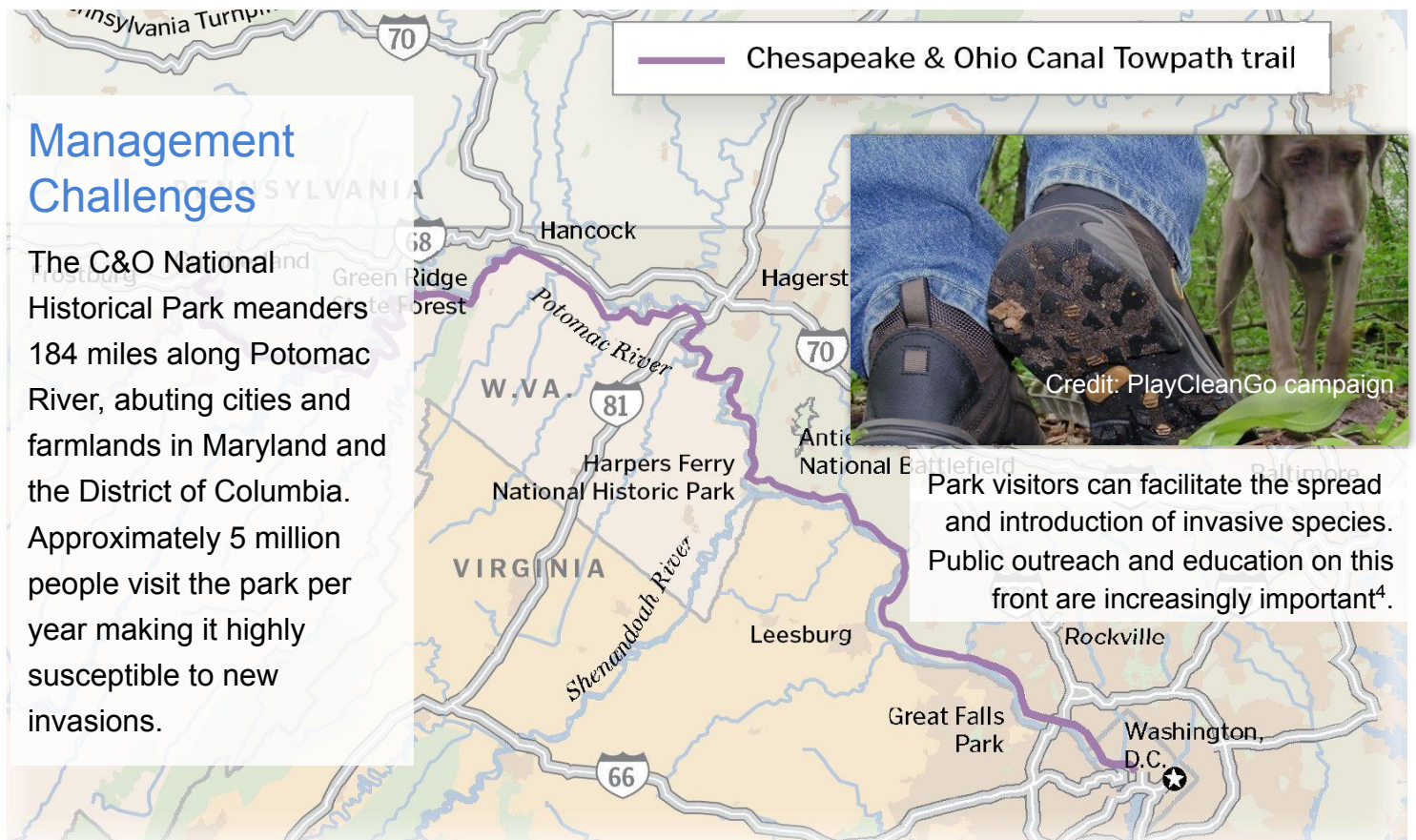
- Tree-of-heaven and Japanese knotweed are two especially pervasive and harmful species of invasive plant.
- New and ongoing research points to an effective new biocontrol method for Japanese knotweed and an optimized herbicide treatment plan for tree-of-heaven.
- Planting a selection of native plant species facilitates restoration better than removal alone
- An existing online Restoration Planting Tool can help select the best native species for restoration.

Worst Invaders

The dry-mesic oak forest is one of the most abundant habitats in the Ridge and Valley region of Maryland, featuring an oak-dominated closed canopy of red, white, black, and scarlet oaks, and other tree species including hickories, red-maple, black birch, and yellow birch⁶.

Tree-of-heaven (*Ailanthus altissima*) and Japanese knotweed (*Fallopia japonica*) are two of the most harmful invasive plant species in the region. Tree-of-heaven is a prolific seeder and knotweed has an extensive root system which allows them to spread rapidly, outcompeting native plants and making removal extremely difficult¹.





Management Challenges

The C&O National Historical Park meanders 184 miles along Potomac River, abutting cities and farmlands in Maryland and the District of Columbia. Approximately 5 million people visit the park per year making it highly susceptible to new invasions.



Credit: PlayCleanGo campaign

Park visitors can facilitate the spread and introduction of invasive species. Public outreach and education on this front are increasingly important⁴.

SOURCES: ESRI; TeleAtlas; C & O Canal Towpath; National Park Service

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Novel Management Strategies

The use of biocontrol shows promise as a new method to mitigate the tree-of-heaven invasion. Two weevils, *Eucryptorrhynchus brandti* and *E. chinensis*, that attack tree-of-heaven in its native habitat of China show high host-specificity — indicating they are unlikely to damage non-target plant species².

In a three-year study comparing the efficacy of different herbicides against Japanese knotweed, researchers found that foliar glyphosate should be applied biannually in the summer and autumn for best results. Results were also not improved by increasing the amount of herbicide or adding other herbicides³.

Why plant natives?

- Revegetation with natives can suppress reinvastion⁷.
- Native tree seedlings can succeed despite dense invasive species cover⁵.
- Native leaf litter mediates biogeochemical impact of invasive species on soil⁸.

Restoration Tool

West Virginia Department of Environmental Protection (WVDEP) has created a [Restoration Planting Tool](#) that allows users to input site characteristic to generate a list of native species likely to thrive with minimal maintenance. Ideally, characteristics should be measured on site; however, information can be gathered using the supplied interactive map. For characteristics that are not provided for Maryland (e.g. hydrology and geology), nearby values across the Potomac River may provide suitable estimates.

Restoration in practice

Integrating knowledge of invasive plant removal and restoration practices looks like:

1. Apply glyphosate in the early spring and autumn to control Japanese knotweed.
2. Plant seedlings of common pawpaw (*Asimina triloba*) before May*.
3. Complement by seeding with the shade tolerant golden alexanders (*Zizia aurea*) in the fall* for germination next year.

* [Maryland Planting Guide \(2017\)](#)

Native Plant Recommendations

Native plants adapted to Northeastern Interior Dry-Mesic Oak Forests were compiled from NatureServe⁶, WVDEP Restoration Tool, and iNaturalist (www.iNaturalist.org). Soil moisture (Dry, Average, Moist) and light requirements (Sun, Partial Sun, Shade) are listed for each species and can be purchased from American Native Plants (ANP) of Middle River, MD (www.americannativeplants.com) or Ernst Seed (ES) of Meadville, PA (www.ernstseed.com).



Mapleleaf Viburnum Credit: Plant Image Library

Scientific Name	Common Name	Soil Moisture	Light Requirements	Available
<i>Acer rubrum</i>	Red Maple	All	Sun & Partial	ANP
<i>Ageratina altissima</i>	White Snakeroot	Average-Moist	Partial Sun	ES
<i>Asimina triloba</i>	Common Pawpaw	Average-Moist	Sun & Partial	ANP
<i>Betula nigra</i>	River Birch	Average-Moist	Partial Sun	ANP
<i>Carya glabra</i>	Pignut Hickory	Dry-Average	Sun & Partial	ANP
<i>Carya tomentosa</i>	Mockernut Hickory	Dry - Moist	Sun & Partial	ANP
<i>Celtis occidentalis</i>	Common Hackberry	Average-Moist	Sun & Partial	ANP
<i>Cercis canadensis</i>	Eastern Redbud	Dry-Average	Sun & Partial	ANP
<i>Cornus florida</i>	Flowering Dogwood	Dry-Average	Sun & Partial	ANP
<i>Elymus hystrix</i>	Bottlebrush Grass	Dry-Average	Shade & Partial	ES
<i>Hamamelis virginiana</i>	American Witch-hazel	Dry-Average	Sun & Partial	ANP
<i>Lindera benzoin</i>	Northern Spicebush	Average-Moist	Shade & Partial	ANP
<i>Quercus alba</i>	White Oak	Dry-Average	Sun & Partial	ANP
<i>Quercus coccinea</i>	Scarlet Oak	Dry-Average	Partial Sun	ANP
<i>Quercus prinus</i>	Chestnut Oak	Dry-Average	Sun & Partial	ANP
<i>Quercus rubra</i>	Northern Red Oak	Dry-Average	Sun & Partial	ANP
<i>Viburnum acerfolium</i>	Mapleleaf Viburnum	Dry-Average	Shade & Partial	ANP
<i>Zizia aurea</i>	Golden Alexanders	Moist	Sun & Partial	ES
<i>Viburnum prunifolium</i>	Blackhaw Viburnum	Average-Moist	Sun & Partial	ANP

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