



ARTICLE

Ash Tree Update 2021

[Anacostia Park](https://www.nps.gov/anac/) (<https://www.nps.gov/anac/>), [Antietam National Battlefield](https://www.nps.gov/anti/) (<https://www.nps.gov/anti/>), [Baltimore-Washington Parkway](https://www.nps.gov/bawa/) (<https://www.nps.gov/bawa/>), [Catoctin Mountain Park](https://www.nps.gov/cato/) (<https://www.nps.gov/cato/>), [Chesapeake & Ohio Canal National Historical Park](https://www.nps.gov/choh/) (<https://www.nps.gov/choh/>), [Fort Dupont Park](https://www.nps.gov/fodu/) (<https://www.nps.gov/fodu/>), [George Washington Memorial Parkway](https://www.nps.gov/gwmp/) (<https://www.nps.gov/gwmp/>), [Great Falls Park](https://www.nps.gov/grfa/) (<https://www.nps.gov/grfa/>), [Harpers Ferry National Historical Park](https://www.nps.gov/keaq/) (<https://www.nps.gov/keaq/>), [Kenilworth Park & Aquatic Gardens](https://www.nps.gov/keaq/) (<https://www.nps.gov/keaq/>), [Manassas National Battlefield Park](https://www.nps.gov/mana/) (<https://www.nps.gov/mana/>), [Monocacy National Battlefield](https://www.nps.gov/mono/) (<https://www.nps.gov/mono/>), [National Capital Parks-East](https://www.nps.gov/nace/) (<https://www.nps.gov/nace/>), [Piscataway Park](https://www.nps.gov/pisc/) (<https://www.nps.gov/pisc/>), [Prince William Forest Park](https://www.nps.gov/prwi/) (<https://www.nps.gov/prwi/>), [Rock Creek Park](https://www.nps.gov/rocr/) (<https://www.nps.gov/rocr/>), [Theodore Roosevelt Island](https://www.nps.gov/this/) (<https://www.nps.gov/this/>), [Wolf Trap National Park for the Performing Arts](https://www.nps.gov/wotr/) (<https://www.nps.gov/wotr/>)

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Left image

2007 (before EAB attack)



Right image

2019 (after EAB attack)

Before and after emerald ash borer impacts in an ash-dominated swamp in Piscataway Park in 2007 (on left) and in 2019 (on right), showing loss of canopy cover and increased light as well as green and pumpkin ash stump resprouting.

Key Points

- The non-native, invasive emerald ash borer (EAB) killed a majority of the 300,000 ash trees in National Capital Region (NCR) parks since 2014. Monitoring data from 2017-2021 indicate that fewer than 80,000 living ash trees remain.

- *Ash trees once grew at densities of 17-18 trees per hectare throughout NCR parks. Now, densities are no more than 5 trees per hectare.*
- *Some ash-dominated swamps transformed into shrublands as ash root systems resprouted after EAB attack. In dry habitats, EAB proved more quickly fatal.*
- *The density of snags (standing dead trees) increased, but will decline as they fall to the forest floor.*

Decline of Ash Trees

Emerald Ash Borer Basics

Emerald ash borer, or EAB (*Agrilus planipennis*) is an invasive beetle that targets ash tree species. Evidence of EAB activity has been present in National Capital Region (NCR) parks since at least 2014. In areas of the US where the beetle has been present since the early 2000s, EAB was fatal to nearly 100% of ash trees. In NCR, results are similar, with the exception of ash-dominated swamps (regularly flooded forest wetlands).



Emerald ash borer
Howard Russell, Bugwood.org

Decline of Ash Trees in NCR Parks

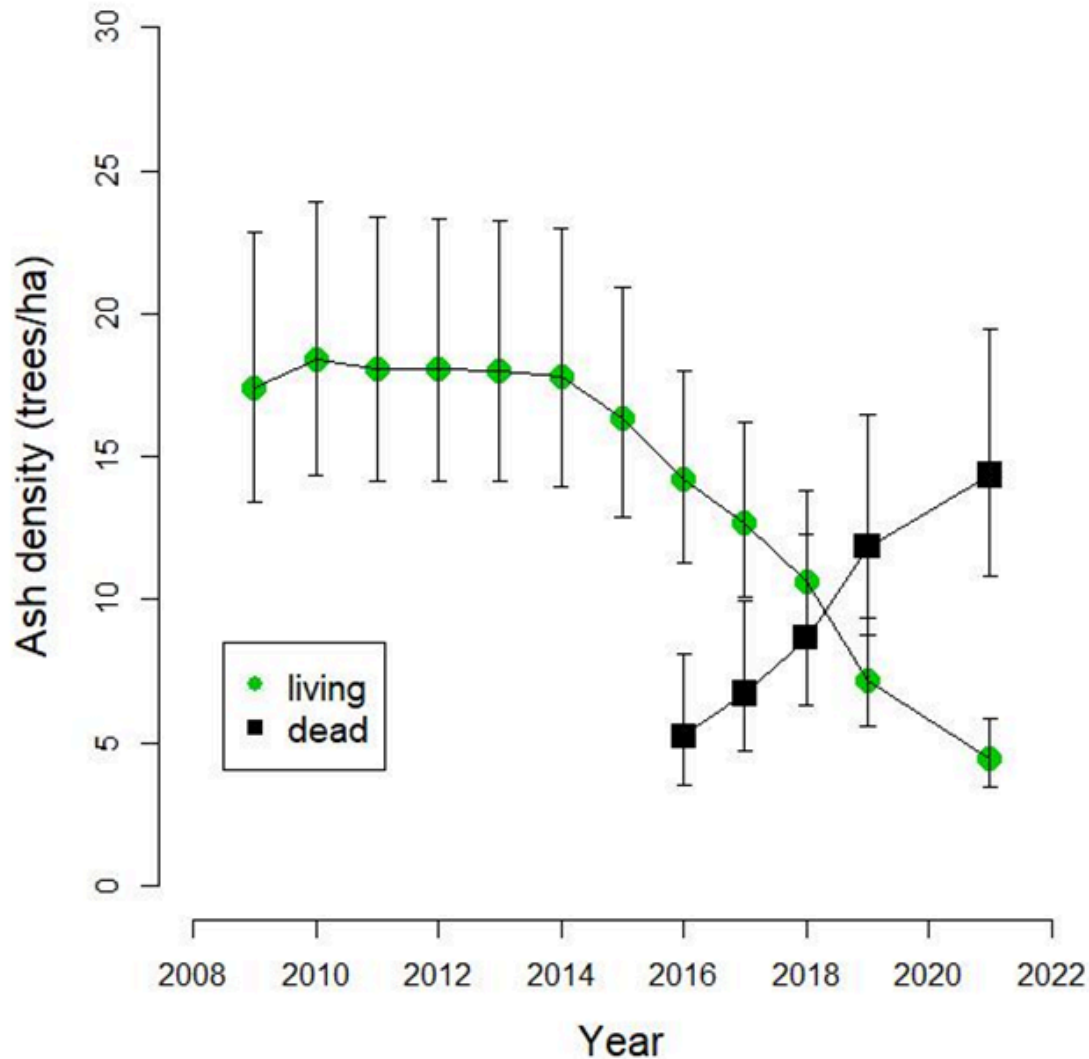


Figure 1. Ash tree density in NCR parks. Rolling 4-year periods are labelled by ending year (e.g., 2016 point shows data for 2013-2016) except for 2021 which shows 2017-2021. Green dots show living tree density. Black squares show standing dead tree density. Vertical lines show estimated error.

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Continued Decline of Ash Trees in 2021

Now, more than ten years into the EAB invasion of NCR forests, ash tree density continues to decline (Figure 1). According to forest data collected by the National Capital Region Inventory and Monitoring Program (NCRN I&M), over 300,000 ash trees lived in NCR's national park forests before EAB's arrival. The initial spread of the beetle made for dramatic displays of ash mortality, and monitoring data from 2017-2021 indicate there are fewer than 80,000 surviving ash trees (Table 1).

Those that died continue to swell the number of standing dead trees (snags), which may be nearing their peak (Figure 1). In the next few years, these snags will decline (both literally and numerically) as they fall to the forest floor.

Park	# Plots	Live Ash Trees (2010-13)	Live Ash Trees (2017-21)
National Capital Parks – East	48	69,000	4,000
Manassas National Battlefield Park	17	49,600	3,900
GW Memorial Parkway	20	56,200	10,300
Antietam National Battlefield	13	3,200	700
Catoctin Mountain Park	49	48,400	16,100
C&O Canal National Historical Park	75	73,100	28,100
Harpers Ferry National Historical Park	20	18,500	7,700
Prince William Forest Park	145	7,600	3,300
Wolf Trap National Park for the Performing Arts	6	120	600
Monocacy National Battlefield	15	3,100	2,100
Rock Creek Park	19	6,000	4,200
National Capital Region TOTAL:	427	334,820	80,400

Table 1. **Change in estimated live ash tree populations 2010-2013 to 2017-2021.** Estimated error is not shown but with fewer ash or fewer plots.

Ash Seedling Increases

NCRN field crews monitor ash trees of all sizes, from seedlings to saplings to adult trees. Distribution across these size classes is changing (Figure 2). While ash sapling and tree density declined steeply, seedling density spiked. There are several possible reasons why ash seedlings increased:

- Prolific seed production year(s) (i.e., a mast year).
- Stressed canopy trees producing a burst of seeds before they die.
- Park [deer management](https://www.nps.gov/articles/000/resilient-forests-initiative-deer.htm) (<https://www.nps.gov/articles/000/resilient-forests-initiative-deer.htm>) is increasing seedling survival.
- Dying canopy trees allow more sunlight to reach the seedlings on the forest floor.

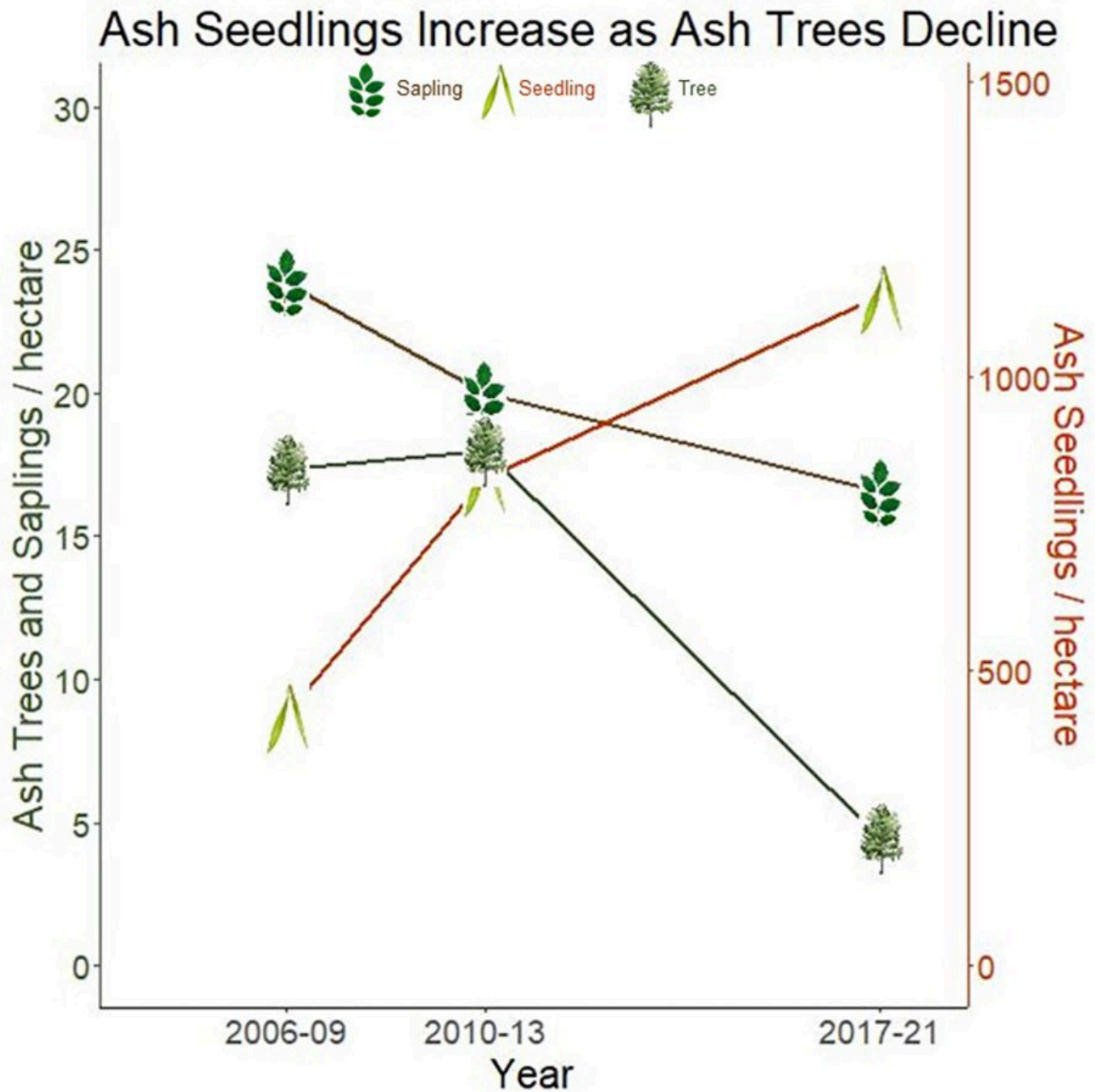


Figure 2. Density (individuals/hectare) of ash trees and saplings on left axis, and ash seedlings on the right axis, at 3 time intervals. Vegetation is monitored on a 4-yr rotation; each point represents a full sample. Monitoring was paused in 2020 due to COVID-19, so the last time interval spans 5 years. Seedlings are >15cm tall, but less than 1cm diameter at breast height (DBH).

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Wetland Ash Trees Become Shrubs and Other Habitat Changes

Dry and upland forests in NCR show similar responses to EAB as other infested areas of the country, with mostly white ash trees quickly dying and seedlings proliferating. However, something different is happening in the ash-dominated swamps along the Potomac River. (Swamps are forested wetlands that flood regularly.)

These swamps are part of the vital system that filters water flowing into the Chesapeake Bay. Wetland ash trees slow erosion and provide critical habitat to birds, plants, and semi-aquatic species. They also store carbon, slowing the effects of climate change, and

act as a buffer zone against increasingly powerful storms. These areas are of intense importance to everyone involved in the ongoing efforts to clean up the Chesapeake Bay.

Swamps along the Potomac River (like those at Piscataway Park - pictured at top) were once dominated by pumpkin and green ash trees. These trees are “ecosystem engineers” because they modify and create wetland habitats. Ash trees can thrive where virtually no other native tree species can, withstanding twice-daily incoming tides.

When EAB hit, many feared the swamps themselves would be endangered by complete tree loss. However, some former canopy ash trees have so far survived the death of their main trunk by resprouting from living root systems and now taking a shrub-like form. Notably, pumpkin ash is the only ash species where sapling numbers increased after EAB infestation, growing from 15 saplings per hectare in 2013-2016 to 25 in 2017-2021 in these swamps. While the loss of shady canopy marks a big habitat change, there is still much to learn about these shrubby ash and their long-term fate:

- Is it possible this adaptation will help wetland ash species survive?
- Will these ashes cycle indefinitely as shrubs and will they flower and produce seed? Or is this a stage leading to eventual death?
- How long will these ashes evade EAB attack before once again being desirable spots for EAB to lay eggs?
- Why is this happening only in swamps with green and pumpkin ash but not in drier areas? Is it a characteristic of the swamp itself, or of the ash species in these habitats?

We can easily observe changes in our wetlands because they already contain fewer species. Changes in drier and more diverse ecosystems are still playing out. As we continue monitoring ash in our forests, it will be interesting to see how habitats respond and change and what that means for the other plant and animal species that live alongside ashes.

Further Reading

To learn more about how National Park Service scientists are monitoring the health of parks in the National Capital Region, visit the [NCRN I&M website \(https://www.nps.gov/im/ncrn/index.htm\)](https://www.nps.gov/im/ncrn/index.htm).

Previous material on ash trees and emerald ash borer were published in a [2017 online article \(https://www.nps.gov/articles/ash-tree-update.htm\)](https://www.nps.gov/articles/ash-tree-update.htm) and in print-ready versions in [2017 \(https://irma.nps.gov/DataStore/Reference/Profile/2248346\)](https://irma.nps.gov/DataStore/Reference/Profile/2248346) and [2016 \(https://irma.nps.gov/DataStore/Reference/Profile/2240954\)](https://irma.nps.gov/DataStore/Reference/Profile/2240954).

[NPS Species Spotlight on White Ash \(https://www.nps.gov/articles/species-spotlight-white-ash.htm\)](https://www.nps.gov/articles/species-spotlight-white-ash.htm)

Gabriel Popkin. [Can a Hidden World Be Saved From an Invasive Scourge? \(https://www.nytimes.com/2022/02/21/opinion/invasive-pest-forest.html\)](https://www.nytimes.com/2022/02/21/opinion/invasive-pest-forest.html) 02/21/2022. New York Times.



anacostia park

antietam national battlefield

baltimore-washington parkway

catoctin mountain park

chesapeake & ohio canal national historical park

fort dupont park

george washington memorial parkway

great falls park

harpers ferry national historical park

kenilworth park & aquatic gardens

manassas national battlefield park

monocacy national battlefield

national capital parks-east

piscataway park

prince william forest park

rock creek park

theodore roosevelt island

wolf trap national park for the performing arts

emerald ash borer

ash

fraxinus americana

agrilus planipennis

invasive species

insect

invasive pests

ncrn

i&m

forest pests

forest

resilient forest management

swamp

chesapeake bay

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