



ARTICLE

What We're Learning and Why it Matters: Long-Term Monitoring in the National Capital Region

[Antietam National Battlefield \(https://www.nps.gov/anti/\)](https://www.nps.gov/anti/), [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/), [George Washington Memorial Parkway \(https://www.nps.gov/gwmp/\)](https://www.nps.gov/gwmp/), [Harpers Ferry National Historical Park \(https://www.nps.gov/hafe/\)](https://www.nps.gov/hafe/), [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/), [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/)

After more than fifteen years of monitoring, we've learned a lot about park ecosystems, how they're changing, and what they may look like in the future.

By Crystal Chen, NCRN I&M Science Communication Intern



The National Park Service preserves some of America's most special and treasured places. Knowing which key natural resources are found in the parks, and whether they are stable or changing, can help park managers make sound, science-based decisions about the future.

The [National Capital Region Network \(https://www.nps.gov/im/ncrn/about-us.htm\)](https://www.nps.gov/im/ncrn/about-us.htm) (NCRN) is one of 32 [Inventory & Monitoring \(https://www.nps.gov/im/index.htm\)](https://www.nps.gov/im/index.htm) networks building that knowledge. In 11 regional national parks, our scientists and partners collect long-term data on key [natural resources \(https://www.nps.gov/im/ncrn/monitoring.htm\)](https://www.nps.gov/im/ncrn/monitoring.htm)—like plant communities, birds, and water quality—that we call "[vital signs \(https://www.nps.gov/im/vital-signs.htm\)](https://www.nps.gov/im/vital-signs.htm)," because their condition can indicate the overall health of park resources. We analyze the results, track the changes, and provide information to decision-makers.

NCRN parks are a mix of natural and cultural areas that provide a unique glimpse into forest ecosystem health. We maintain precious biodiversity within a broader urban setting. There's still plenty we don't know, but there's a lot we do know.

What have you learned? What kinds of changes are you seeing?

The first few years of any monitoring program are devoted to figuring out what's "normal" for a given ecosystem. We collect data to establish a baseline, then determine the range of measurements that might be expected under typical conditions. With more than fifteen years of data for some resources, we've learned numerous key things about the ecosystems we study.

Forest Vegetation

- [NCRN forests are more diverse](https://irma.nps.gov/DataStore/Reference/Profile/2236966) (<https://irma.nps.gov/DataStore/Reference/Profile/2236966>) and [harbor more old-growth structure](https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.1404) (<https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.1404>), when compared with forests in the Eastern Deciduous biome.
- Our parks have small forest patches that provide crucial habitat for biota in an urban setting. But, [trees along the forest edge are vulnerable to climbing vines](https://cms.nps.gov/articles/000/vines-on-trees-at-forest-edges.htm) (<https://cms.nps.gov/articles/000/vines-on-trees-at-forest-edges.htm>). Once a vine reaches the crown of a tree, the tree's growth slows. At the forest edge, trees are already vulnerable to a more stressful environment (e.g., more wind and sun). Managing vines in trees along forest edges can help reduce tree mortality.
- [Non-native vines are more abundant and increasing faster](https://irma.nps.gov/DataStore/Reference/Profile/2210058) (<https://irma.nps.gov/DataStore/Reference/Profile/2210058>). Managing invasive vines is a great way to support trees along the forest edge, and forest patches.

◀▶ A Forest Plot at Rock Creek Park in 2012 and 2016 Showing Seedling and Understory Regrowth



Left image

2012, Before deer management



Right image

2016, On-going deer management

Forest Regeneration

Regeneration of trees is critical for the forest ecosystem. Trees provide habitat for plants and animals, filter water and air that we drink and breath, and provide the cool leafy shade enjoyed by visitors in the summer heat.

- [Forest regeneration is low \(https://www.nps.gov/articles/000/forest-regeneration-2023.htm\)](https://www.nps.gov/articles/000/forest-regeneration-2023.htm) for all parks.
- Our data are consistent with [forest research conducted across the Mid-Atlantic and Northeast \(https://www.nps.gov/articles/000/resilient-forests-initiative-deer.htm\)](https://www.nps.gov/articles/000/resilient-forests-initiative-deer.htm), showing that high populations of white-tailed deer [harm forest regeneration capacity \(https://www.nps.gov/cato/learn/news/reducing-deer-numbers-and-removing-invasive-plants-are-key-to-long-term-forest-health.htm\)](https://www.nps.gov/cato/learn/news/reducing-deer-numbers-and-removing-invasive-plants-are-key-to-long-term-forest-health.htm). In general, NCRN [parks that practice deer management \(https://www.nps.gov/articles/000/eastern-parks-reduce-herds-to-benefit-forests-deer-and-people.htm\)](https://www.nps.gov/articles/000/eastern-parks-reduce-herds-to-benefit-forests-deer-and-people.htm) have seen [a recovery in seedlings \(https://www.nps.gov/articles/000/forest-regeneration-2023.htm\)](https://www.nps.gov/articles/000/forest-regeneration-2023.htm). Seedling numbers increased 19-fold at Catoctin Mountain Park and more than doubled at Rock Creek Park since deer management began. While a promising start, this effect requires continued effort over many years to sustain our forests.
- [After a high-intensity fire at Prince William Forest Park, we have seen seedlings start to recover \(https://www.nps.gov/articles/000/fire-and-the-future-of-the-forests-at-prince-william-forest-park.htm\)](https://www.nps.gov/articles/000/fire-and-the-future-of-the-forests-at-prince-william-forest-park.htm). Low-intensity fire doesn't show the same result.
- NCRN staff are working with colleagues in the Northeast Region to support park managers in taking actions [to promote forest regeneration \(https://www.nps.gov/articles/000/managing-resilient-forests-initiative.htm\)](https://www.nps.gov/articles/000/managing-resilient-forests-initiative.htm).



Invasive stiltgrass covers the forest floor along a road edge at Catoctin Mountain Park.

NPS/Thomas Paradis

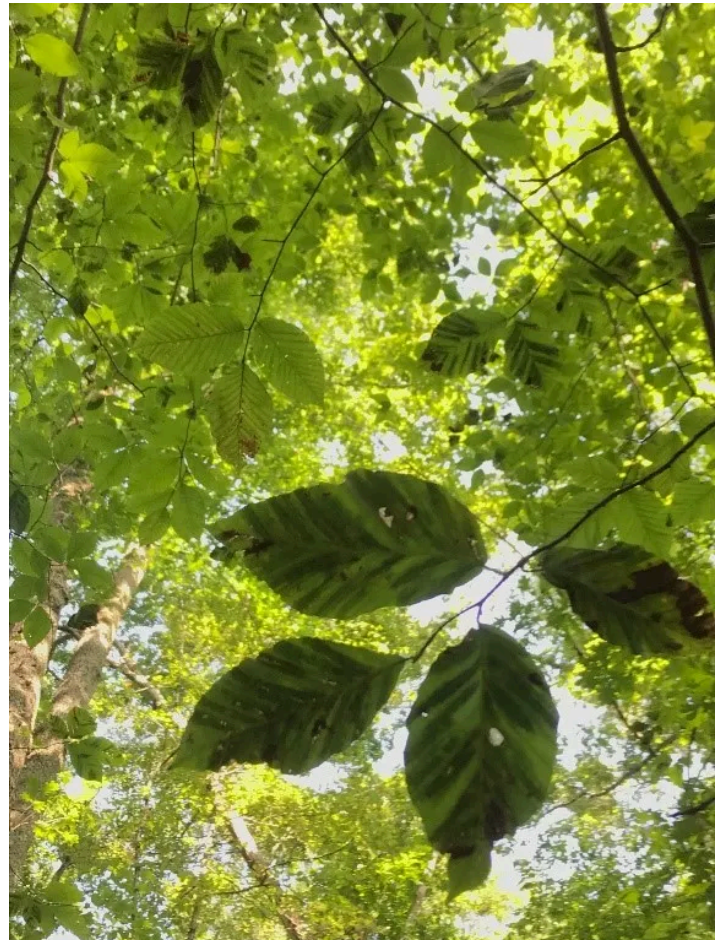
Invasive Plants

More than non-native plants, native plants supply wildlife with the food and physical structure they need. Visitors and neighbors can support healthy wildlife and forests by growing native plants and removing non-native invasive plants from their yards. Invasive plants take advantage of forest stressors including: forest fragmentation, overabundant deer, forest pests, and light gaps caused by forest canopy disturbance.

- [Invasive plants are pervasive and spreading](https://irma.nps.gov/DataStore/Reference/Profile/2284723) (<https://irma.nps.gov/DataStore/Reference/Profile/2284723>).
- In forests, [invasive shrubs are increasing faster than invasive herbs, trees, or vines](https://irma.nps.gov/DataStore/Reference/Profile/2284723) (<https://irma.nps.gov/DataStore/Reference/Profile/2284723>). Ticks benefit from this increasing shrub cover, and given added risk to human health from tick-borne diseases, invasive shrubs are a high management priority.
- Do all invasive plants hinder the growth of tree seedlings? A [study on invasive stiltgrass at Catoctin Mountain Park](https://www.nps.gov/articles/000/stiltgrass-and-tree-seedling-recovery.htm) (<https://www.nps.gov/articles/000/stiltgrass-and-tree-seedling-recovery.htm>) found more tree seedlings in patches of stiltgrass than in open areas. This plant may offer seedlings protection from deer browsing, since they can hide amongst plants deer don't like to eat.
- [Invasive plants change habitat structure, which has a cascading impact on invertebrate communities](https://irma.nps.gov/DataStore/Reference/Profile/2293797) (<https://irma.nps.gov/DataStore/Reference/Profile/2293797>).

Forest Pests

- [Beech leaf disease](https://www.nps.gov/articles/000/pests-and-pathogens.htm) (<https://www.nps.gov/articles/000/pests-and-pathogens.htm>), was first found in Prince William Forest Park in 2021 and has since been found in C&O Canal in 2023. Potential forest impacts could be dramatic and dire since beech are the most common tree species in the region.
- As of 2023, [emerald ash borer \(EAB\)](https://www.nps.gov/articles/000/ash-tree-update-2022.htm) (<https://www.nps.gov/articles/000/ash-tree-update-2022.htm>) has killed more than 80% of the white, green, and pumpkin ash trees that were present in NCR parks in 2014.
- Since arriving in 2021, [spotted lanternfly](https://www.nps.gov/articles/000/slf-in-perpective.htm) (<https://www.nps.gov/articles/000/slf-in-perpective.htm>) has been observed throughout NCR parks. It is unlikely to cause as much mortality as emerald ash borer, because it feeds on a wide range of plants and is rarely lethal on its own.
- [Hemlock woolly adelgid and elongate hemlock scale](https://irma.nps.gov/DataStore/Reference/Profile/2224947) (<https://irma.nps.gov/DataStore/Reference/Profile/2224947>) have killed many eastern hemlock trees. Parks (like Prince William Forest) preserve their hemlock patches with regular insecticide treatment. Hemlocks grow along streams, providing shade for brook trout that rely on cold water for survival. An NCRN census of hemlocks in 2015 found 112 standing hemlock trees, 34 of which were alive. 38% of living hemlock trees were infected with the adelgid or the scale.
- American chestnut trees were devastated by [chestnut blight fungus](https://irma.nps.gov/DataStore/Reference/Profile/2227548) (<https://irma.nps.gov/DataStore/Reference/Profile/2227548>) in the early 1900s. In 2014, we surveyed surviving American



Beech leaf disease.
NPS/Brolis

chestnuts in all parks except Antietam and Manassas. We documented 234 trees. Most were small and showed no signs of flowers or fruit.

- A [summary of forest pests through 2023](https://www.nps.gov/articles/000/pests-and-pathogens.htm) (<https://www.nps.gov/articles/000/pests-and-pathogens.htm>) describes current and upcoming threats to NCR parks.

Sea Level Rise

- [Relative sea level in Washington DC has been increasing](https://www.nps.gov/articles/000/sea-level-rise-in-the-dc-area.htm) (<https://www.nps.gov/articles/000/sea-level-rise-in-the-dc-area.htm>) since 1924 at an annual rate of 3.43 mm per year, with higher rates recorded in recent decades. This could lead to [more frequent and severe flooding in low-lying areas](https://www.nps.gov/articles/000/sealevelrise-climateimpact.htm) (<https://www.nps.gov/articles/000/sealevelrise-climateimpact.htm>).
- [Flooding can change the vegetation and wildlife able to survive in freshwater tidal marshes](https://irma.nps.gov/DataStore/Reference/Profile/2224225) (<https://irma.nps.gov/DataStore/Reference/Profile/2224225>) of the Potomac and Anacostia Rivers. Transformation of high marsh into low marsh could benefit spawning fish, but also reduce the ability of the marsh to trap sediment.
- Early findings from marsh elevation monitoring in national parks of the mid-Atlantic and northeast suggest that some wetlands are more resilient to climate change. Data from the freshwater tidal marshes of [Dyke Marsh](https://www.nps.gov/articles/000/marsh-health-at-dyke-marsh-george-washington-memorial-parkway.htm) (<https://www.nps.gov/articles/000/marsh-health-at-dyke-marsh-george-washington-memorial-parkway.htm>) in George Washington Memorial Parkway (based on monitoring from 2006-2019) and [Kenilworth Marsh and Kingman Lake](https://www.nps.gov/articles/000/long-term-monitoring-reveals-changes-and-resilience-at-kenilworth-marsh-and-kingman-lake.htm) (<https://www.nps.gov/articles/000/long-term-monitoring-reveals-changes-and-resilience-at-kenilworth-marsh-and-kingman-lake.htm>) in National Capital Parks-East (based on monitoring from 2002-2019) show signs of these marshes' resiliency and the challenges to come in the face of sea level rise.



Spotted Salamander (*Ambystoma maculatum*)

NPS / C. Shafer

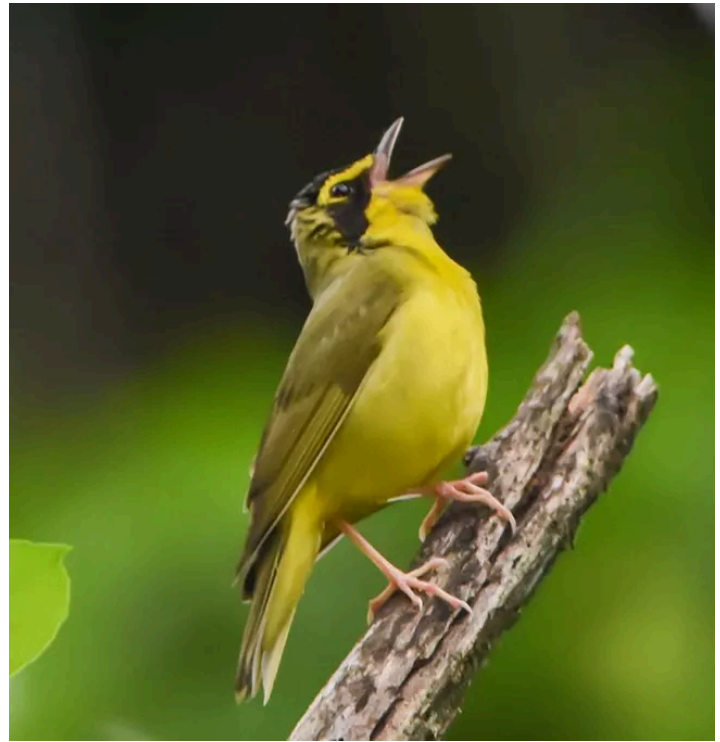
Amphibians

- [Amphibian populations are fairly stable](https://www.nps.gov/articles/000/amphibian-monitoring-update-2023.htm) (<https://www.nps.gov/articles/000/amphibian-monitoring-update-2023.htm>). Over 15 years of data collection, no species experienced severe decline or unexpected growth.
- [Wetlands that are larger and closer together have more species](https://www.nps.gov/articles/amphibian-diversity-habitat-connectivity.htm) (<https://www.nps.gov/articles/amphibian-diversity-habitat-connectivity.htm>). The biggest factor for species richness is the hydroperiod (ability of a wetland to retain water during the breeding season).
- Longer, hotter summers and urban development can impair habitat and water quality. [Parks can protect amphibian habitat by: 1\) increasing hydroperiods, 2\) keeping wetlands connected, 3\) limiting roads near wetlands](https://www.nps.gov/articles/000/amphibian-monitoring-update-2023.htm) (<https://www.nps.gov/articles/000/amphibian-monitoring-update-2023.htm>).

Birds

- NCRN bird populations are fairly stable. Bird community trends were stable in 12 parks, increased in 4 parks, and decreased in 1 park.

- Since 2007, we've observed 157 species in 11 NCRN parks, 22 of which are high priority for conservation. We observed the highest number of forest bird species at Chesapeake and Ohio Canal.
- A recent article examines [how six interior forest breeding birds are doing in NCRN parks](https://www.nps.gov/articles/000/ncr-forest-interior-birds.htm) (<https://www.nps.gov/articles/000/ncr-forest-interior-birds.htm>).
- NCRN parks provide critical breeding habitat for birds. [Forest birds fare worse at forest edges and in more urban parks](https://irma.nps.gov/DataStore/Reference/Profile/2236102) (<https://irma.nps.gov/DataStore/Reference/Profile/2236102>).
- Since the beginning of grassland bird monitoring, we've observed 7 grassland-dependent species that we had not seen in forests. Grassland habitats are declining in the eastern United States due to natural succession to forests, fire suppression, and fewer open agricultural fields.
- A recent analysis of two focal grassland birds—the eastern meadowlark and the grasshopper sparrow—at four battlefield national parks, showed that [how grasslands are managed effects the survival and reproduction of birds in those places](https://www.nps.gov/articles/000/battling-to-save-battlefield-birds.htm). (<https://www.nps.gov/articles/000/battling-to-save-battlefield-birds.htm>)



Kentucky warbler.
D. Tallamy

Stream Biota

- NCRN streams are usually home to aquatic species that are less sensitive to changes in water quality. Urban development and other land use impair water quality and stream structure.
- More sensitive species have been observed in streams with good water quality. [At Prince William Forest Park, we observed sensitive macroinvertebrates](https://irma.nps.gov/DataStore/Reference/Profile/2204823) (<https://irma.nps.gov/DataStore/Reference/Profile/2204823>) including mayflies, stoneflies, and caddisflies.
- [Freshwater sponges were observed](https://www.nps.gov/articles/freshwater-sponges.htm) (<https://www.nps.gov/articles/freshwater-sponges.htm>) at five parks.
- [Herring and American eel populations are in decline](https://www.nps.gov/articles/eels-in-the-potomac.htm) (<https://www.nps.gov/articles/eels-in-the-potomac.htm>). They face great difficulty migrating and reproducing because of dams and other barriers.



Vernal pool.

NPS

Stream Water

- Winter road salting is one of many factors that is increasing water conductivity in streams. Conductivity shows the level of dissolved material in streams. [High levels cause harm to fish and aquatic invertebrates](https://irma.nps.gov/DataStore/Reference/Profile/2233434) (<https://irma.nps.gov/DataStore/Reference/Profile/2233434>) who can't survive in increasingly salty water. In the larger DC area, our monitoring data shows the otherwise unseen [downstream effects of pollution](https://www.washingtonpost.com/science/road-salt-environment-lakes/2021/12/31/2c7a333a-6651-11ec-96f3-b8d3be309b6e_story.html) (https://www.washingtonpost.com/science/road-salt-environment-lakes/2021/12/31/2c7a333a-6651-11ec-96f3-b8d3be309b6e_story.html) from many sources.
- Streams in Rock Creek Park and Antietam National Battlefield have [high concentrations of phosphorus and nitrogen](https://irma.nps.gov/DataStore/Reference/Profile/2210069) (<https://irma.nps.gov/DataStore/Reference/Profile/2210069>). This can cause algae to grow faster than ecosystems can handle.
- We recorded very [low summer-time levels of dissolved oxygen at Young's Branch](https://irma.nps.gov/DataStore/Reference/Profile/2287442) (<https://irma.nps.gov/DataStore/Reference/Profile/2287442>) (the main watershed in Manassas National Battlefield). In the summer, low water levels allow for higher water temperatures and lower oxygen levels that stress aquatic life. In some years, the stream completely dries up. Aquatic life that can't withstand drying or can't repopulate quickly once the stream is flowing again, will be severely harmed.
- Brook trout rely on coldwater streams at Catoctin Mountain Park. Based on our modeling, we expect to have no coldwater streams within the next 50 years in NCRN parks. This means that brook trout will no longer be a part of our aquatic ecosystems. [Check out this map of coldwater refugia](http://ice.ecosheds.org/nps-ner/) (<http://ice.ecosheds.org/nps-ner/>) (and [learn how to use it](https://www.climate-refugia.org/coldwater-refugia) (<https://www.climate-refugia.org/coldwater-refugia>)).



Good Visibility Day
Visual Range: 253 miles

Bad Visibility Day
Visual Range: 12 miles

Air Quality

- Recent weather patterns show that [temperatures are rising year after year](https://irma.nps.gov/DataStore/SavedSearch/Profile/3823) (<https://irma.nps.gov/DataStore/SavedSearch/Profile/3823>).
- Ozone levels are declining.
- [Sulfur and nitrogen deposition rates have improved dramatically](https://www.nps.gov/subjects/air/park-conditions-trends.htm) (<https://www.nps.gov/subjects/air/park-conditions-trends.htm>) over the past 20 years. Although air pollutant levels are decreasing, they are still regularly above EPA standards and are a stressor to vegetation and wildlife. High levels of acid deposition cause soil acidification, especially in northern parks.
- [Visibility is poor at National Mall and Memorial Parks](https://www.nps.gov/subjects/air/park-conditions-trends.htm) (<https://www.nps.gov/subjects/air/park-conditions-trends.htm>). In 2021, the estimated visual range was between 41 and 114 miles. Without pollution, estimated visual range would be between 80 and 158 miles.

Supporting Information

Showing results 1-10 of 74

Narrow By Location: 0

Narrow By Office: 0

Per Page: 10

Sort: Recently Updated

Project Profile: Managing Resilient Eastern Forests

(https://www.nps.gov/articles/000/ira-projectprofile-managing-resilient-eastern_forests.htm)

Locations: Allegheny Portage Railroad National Historic Site, Antietam National Battlefield, Appomattox Court House National Historical Park, Bluestone National Scenic River, Booker T Washington National Monument, **more »**

(https://www.nps.gov/articles/000/ira-projectprofile-managing-resilient-eastern_forests.htm)



The National Park Service will improve the ecological health of eastern forests in 38 parks using an array of management techniques. The NPS has selected forest ecosystems of high ecological and cultural value across multiple parks from Virginia to Maine that are at greatest risk of forest loss due to chronic and interacting stressors.

Carolina or Black-Capped Chickadee? Sometimes It's a Hard Call

(<https://www.nps.gov/articles/000/chickadees.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, **more »**



(<https://www.nps.gov/articles/000/chickadees.htm>)

Chickadees are some of the most common birds in the National Capital Region. Both Carolina chickadees and black-capped chickadees can be found in NCR parks. Learn more about these birds and how they're sometimes hard to tell apart.

Springing Up — Dryad's Saddle

(<https://www.nps.gov/articles/000/dryads-saddle.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, **more »**



(<https://www.nps.gov/articles/000/dryads-saddle.htm>)

Dryad's saddle is a large and unique fungi species that can be found across the National Capital Region. Learn more about where they can be found and how to recognize them.

Freshwater Jellyfish

(<https://www.nps.gov/articles/000/freshwater-jellyfish.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, **more »**



<https://www.nps.gov/articles/000/freshwater-jellyfish.htm>

Preliminary results of recent macroinvertebrate monitoring in the National Capital Region (NCR) using environmental DNA revealed that freshwater jellyfish are present in all NCR parks. Learn more about these unique organisms, and the role they may play in our freshwater streams.

Inventory & Monitoring Partnerships Aim to Improve Park Forest Health from Coast to Coast

https://www.nps.gov/articles/000/imd_forest-partnerships.htm

Locations: Acadia National Park, Allegheny Portage Railroad National Historic Site, Antietam National Battlefield, Appalachian National Scenic Trail, Appomattox Court House National Historical Park, **more »**

Offices: Eastern Rivers and Mountains Inventory & Monitoring Network, Greater Yellowstone Inventory & Monitoring Network, Inventory and Monitoring Division, Mid-Atlantic Inventory & Monitoring Network, National Capital Inventory & Monitoring Network, **more »**



https://www.nps.gov/articles/000/imd_forest-partnerships.htm

From coast to coast, the NPS Inventory and Monitoring Division is helping park managers improve the health and function of forest ecosystems. From promoting resilient forests in the Northeast, to conserving whitebark pine in the West, to protecting Hawaiian forest birds from avian malaria, scientific partnerships are helping parks to share information, leverage funding sources, and work together for outcomes that extend beyond what any park could accomplish on its own.

Oaks of the National Capital Region

<https://www.nps.gov/articles/000/oaks.htm>

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, **more »**



<https://www.nps.gov/articles/000/oaks.htm>

Out of the 50 oak species native to the eastern United States, 20 are native to the National Capital Region (NCR). Learn more about these oak species and where they can be found across NCR parks.

National Capital Region Conifers

(<https://www.nps.gov/articles/000/conifers.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, Congaree National Park, George Washington Memorial Parkway, **more »**



(<https://www.nps.gov/articles/000/conifers.htm>)

A comprehensive look at the conifers found in the National Capital Region (NCR). Learn more about where these species can be found and what makes each kind unique.

Birch Family Natives of the National Capital Region

(<https://www.nps.gov/articles/000/birches-of-the-ncr.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, **more »**



(<https://www.nps.gov/articles/000/birches-of-the-ncr.htm>)

Out of the 150 birch species found across the globe, 9 are native to the National Capital Region (NCR). Learn more about these birch species and what makes them unique.

Native Grapes

(<https://www.nps.gov/articles/native-grapes.htm>)

Locations: Anacostia Park, Antietam National Battlefield, Baltimore-Washington Parkway, Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, **more »**



(<https://www.nps.gov/articles/native-grapes.htm>)

Seven species of grapes are native to the National Capital Region. Learn how to tell them apart, where they grow, and how they benefit birds, bugs, and beasts alike.

Freshwater Salinization: Saltier Rivers Are a Growing Concern

(<https://www.nps.gov/articles/000/salinity.htm>)

Locations: Antietam National Battlefield, Catoctin Mountain Park, George Washington Memorial Parkway, Harpers Ferry National Historical Park, Manassas National Battlefield Park, **more »**



(<https://www.nps.gov/articles/000/salinity.htm>)

Freshwater salinization is a growing threat to aquatic life in streams of the National Capital Region. Learn more about the factors influencing salinization and the actions parks can take to help reduce salt pollution.

Tags: ncrn (<https://www.nps.gov/media/article-search.htm?q=NCRN>)

 TAGS

antietam national battlefield

catoctin mountain park

chesapeake & ohio canal national historical park

george washington memorial parkway

harpers ferry national historical park

manassas national battlefield park

monocacy national battlefield

national capital parks-east

prince william forest park

rock creek park

ncrn

monitoring

water quality

science

vegetation

vegetation and soils

climate

climate change

climate change effects

streams

stream monitoring

streams monitoring

resilience

contaminants

marsh

landbirds

grassland

grassland birds

landbird community monitoring

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air quality

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beech leaf disease

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