



Eastern Hemlocks in the National Capital Region

Importance

- Eastern hemlocks are evergreen trees native to National Capital Region (NCR) parks.
- They often grow in patches along streamsides and provide cooling shade in winter and spring when other trees have no leaves
- Two non-native insect pests have killed many of the Eastern hemlocks in NCR forests.
- Some trees have survived, but many are being replaced by other tree species that can't shade streams year-round as hemlocks do.

About Eastern Hemlocks

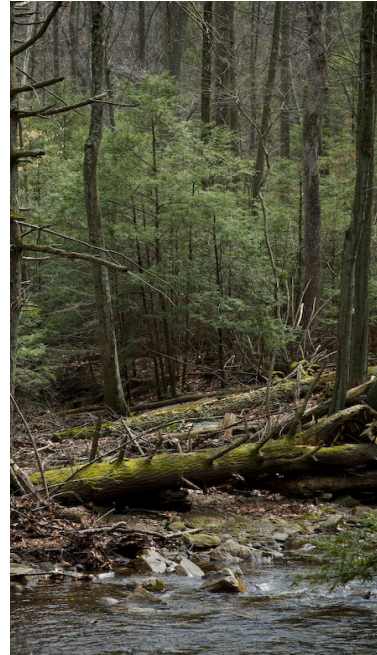
Eastern hemlock (*Tsuga canadensis*) is a long-lived, ever-green tree native to the eastern United States. In the National Capital Region (NCR), naturally occurring stands of Eastern hemlock are usually restricted to stream bottoms and north facing slopes in cool, steep terrain. In stream-side habitats, hemlocks maintain cool water temperatures by shading the water in winter and spring when many other tree species have no leaves.

While Eastern hemlock was never common in the NCR—this is the eastern edge end of their range—it has become increasingly scarce as a result of attacks from two non-native insect pests: hemlock woolly adelgid (*Adelges tsugae*) and elongate hemlock scale (*Fiorinia externa*). These pests have had devastating impacts on hemlocks across much of their range, at a time when warming temperatures have already stressed these cool-climate trees. Yet even where the insects have been established for a decade or more, some trees still survive.

Mapping Hemlocks

In 2015, the NCR Inventory & Monitoring Network (NCRN I&M) set out to document the location of remaining Eastern hemlock stands and to assess tree condition at these sites. In addition, we collected data to illustrate which tree species are replacing Eastern hemlocks in the forests where they are most impacted by non-native pests.

Based on information from parks, regional vegetation maps, and forest-related reports, NCRN I&M staff and interns from University of Maryland, Baltimore County identi-

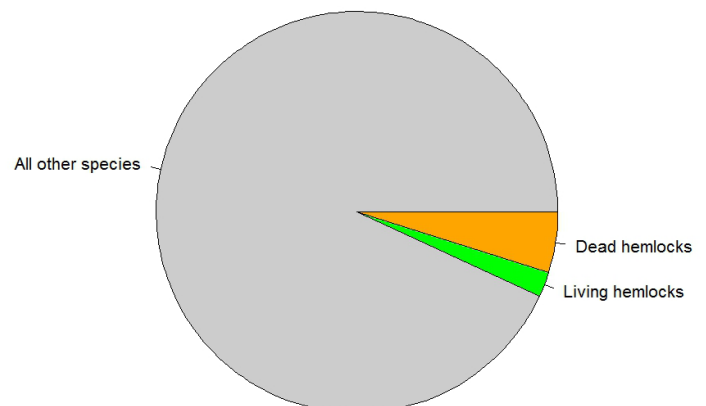


Photos: NPS/Paradis

Left: A patch of Eastern hemlocks along Big Hunting Creek in Catoctin in 2007.
Right: The white fuzz of hemlock woolly adelgid on a hemlock branch.

fied areas where naturally occurring hemlocks were once dominant (so-called “hemlock patches”). Potential hemlock patches were identified at 6 parks: Catoctin Mountain Park, Chesapeake & Ohio Canal National Historical Park, Harpers Ferry National Historical Park, Manassas National Battlefield Park, Monocacy National Battlefield, and Prince William Forest Park. A field team then mapped these patches with global positioning systems.

Figure 1. Hemlocks as a proportion of all standing trees (including living and dead trees) recorded in plots in hemlock patches mapped in Harpers Ferry, Catoctin, and Prince William in 2015.



Hemlock-dominated forest patches at C&O Canal, Manassas, and Monocacy were relatively small. We mapped 3.9 hectares (ha) at C&O Canal, 1.3 ha at Manassas, and 0.6 ha at Monocacy. The patches at Catoctin, Harpers Ferry, and Prince William were larger (47, 8, and 7 ha, respectively). At these parks, we collected vegetation data at randomly located inventory plots to better understand current forest structure and diversity and to predict how these forests may change in the future.

Hemlocks in the Capital Region

Eastern hemlocks were a significant part of the canopy in hemlock patches where we sampled vegetation plots, accounting for ~8% of the basal area present, including both living and dead trees (Figure 1). Basal area is a measure of the volume of wood in a given area based on tree size, as opposed to the number of trees per area.

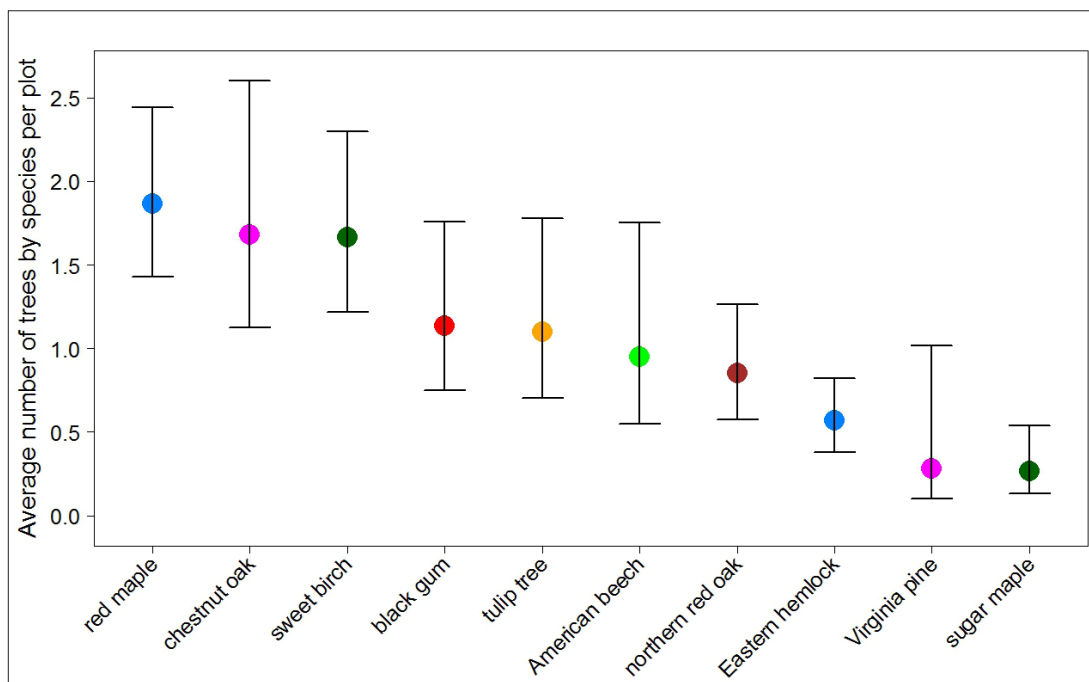
The plot data were used to determine the condition of hemlocks and to document all tree species of tree, sapling, and seedling size. In the 60 plots sampled, we recorded 112 standing hemlock trees, 34 of which were alive. Among the living hemlock trees, 38% were infected with the adelgid or the scale.

The other tree species that commonly occurred in hemlock patches varied substantially by park (under Further Reading, see resource briefs summarizing our findings at Catoctin, Harpers Ferry, and Prince William). Summarized at the regional scale, the most common trees found in the plots included red maple (*Acer rubrum*), sweet birch (*Betula lenta*), American beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), chestnut oak (*Quercus prinus*), and northern red oak (*Quercus rubra*). Even though hemlocks accounted for much of the basal area in these forest patches, it was only the 8th most common tree species (Figure 2). As hemlocks continue to decline, the other species shown in Figure 2 may take the place of hemlocks in the forest canopy. However, since few of these species are evergreen, the new canopy will be unable to replace some of the functions of hemlocks in this forest (e.g. the cooling shade hemlocks provided in winter and spring).

Survivors at Prince William Forest Park

Overall, the loss of hemlock trees in the NCR has been profound. Yet, in one small area of Prince William Forest Park, hemlocks remain unscathed. In 2015, prior to any preventative treatments by park staff, hemlocks in that area showed no signs of infection by the adelgid or scale.

Figure 2. Tree species present in hemlock plots sampled in Catoctin, Harpers Ferry, and Prince William in 2015.



References

Data from the NCRN Hemlock Inventory Project is available at: <https://irma.nps.gov/DataStore/Reference/Profile/2224947>. A geospatial dataset contains locations of mapped hemlock patches, sampled plots, and individual live and dead trees at Catoctin, C&O Canal, Harpers Ferry, Manassas, Monocacy, and Prince William. In the hemlock patches mapped, data was gathered on infection status of all hemlocks and all tree species present of tree, sapling, and seedling size.

Further Reading

Matthews, E. and M. Nortrup, 2017. NCRN Resource Brief: Eastern Hemlocks in Catoctin Mountain Park. <https://irma.nps.gov/DataStore/Reference/Profile/2241027>

Matthews, E. and M. Nortrup, 2017. NCRN Resource Brief: Eastern Hemlocks in Harpers Ferry National Historical Park. <https://irma.nps.gov/DataStore/Reference/Profile/2241030>

Matthews, E. and M. Nortrup, 2017. NCRN Resource Brief: Eastern Hemlocks in Prince William Forest Park. <https://irma.nps.gov/DataStore/Reference/Profile/2241035>