

Hemlock Woolly Adelgid

Hemlock woolly adelgid, or HWA, is an invasive insect native to Japan. First discovered in the eastern United States in Richmond, VA, in 1950, HWA is now found in 18 states including New York and Pennsylvania, and covers nearly half of the native range of the eastern hemlock tree. HWA feeds on the sap of the hemlock tree, which disrupts the flow of nutrients to twigs and branches and causes the needles to dry, turn grey and fall off. Eventually, the tree's limbs will begin to die back, and if left untreated, the tree could die within 4 to 10 years of infestation.

HWA are hard to detect during most of the year due to their small size. However, during the winter months, HWA forms woolly masses on the underside of hemlock branches. These masses are about $\frac{1}{4}$ the size of a cotton swab, and are found at the base of hemlock needles.



Importance of the Eastern Hemlock Tree

The eastern hemlock tree is the state tree of Pennsylvania, and third most common tree in New York. It is incredibly important ecologically, and is considered to be a foundation species. In addition to improving air and water quality and stabilizing soil along streambanks, hemlock trees create unique environmental conditions that are vital to many species. They form dense canopies that keep animals sheltered during the winter months, and create cool, shaded environments during the summer necessary for the growth of many native plant species. Since few plants are adapted to tolerate the shade and acidic soil conditions created by hemlocks, the presence of these trees also helps to prevent the spread of other invasive plants.

Hemlock forests provide habitat for more than 120 animals, including white-tailed deer, black bears, squirrels and other small mammals, as well as over 90 species of birds. Many of these species are game animals and support the multimillion-dollar hunting and angling industries in New York and Pennsylvania. If the hemlocks disappear from forests, all of these species that rely on them could also disappear.



White-Tailed Deer

Deer rely on hemlock trees for shelter all year round, but especially during the winter months. Hemlock trees hold more snow than any other conifer, allowing deer to bed under them. Deer may also browse on hemlock branches when food is scarce. Without hemlock trees, many deer could perish over the winter.



Birds and Small Game

Hemlock is often planted as cover for ruffed grouse, rabbits, and other small game. Many bird species, including grouse, use hemlock stands as roost areas. The insects that live on hemlock branches provide food for many of these birds.

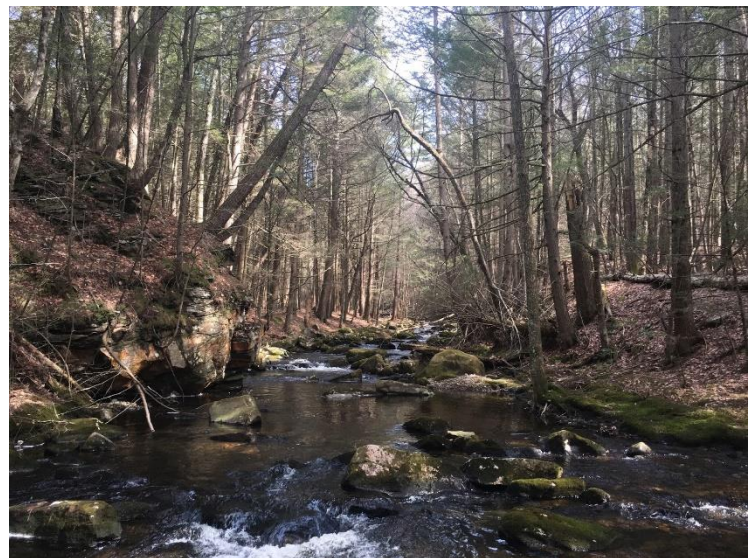
Black Bear

Hemlock forests also provide winter shelter for bears. The cavities in large hemlock trees are used by bears as dens to hibernate. During the spring, mothers and cubs tend to stay close to large hemlock trees, which they can climb to escape from predators, find food, or sleep. Bears have also been known to forage on hemlock trees in the early spring.



Aquatic Ecosystems

The shade and shelter provided by hemlock trees are also important to aquatic ecosystems. The presence of hemlocks along streambanks helps prevent soil erosion, and keeps the water oxygenated, and at a cool, stable temperature. These conditions are important to many species of fish, including trout and other game fish. The trees' branches also help to intercept rain as well as snow, preventing runoff of nutrients and sediments into waterways and improving the water quality downstream. Since hemlock trees do not use and store as much water during the spring and summer as deciduous trees, waterways with hemlocks are less likely to dry out.



Brook Trout

Brook trout are sometimes referred to as 'hemlock trout' for their preference of the cool, deep water under hemlock trees. Since these fish are very sensitive to warmer water, the loss of hemlock trees can lead to a decline in brook trout. As top predators and important recreational species, as well as the state fish of Pennsylvania, the loss of brook trout could have serious consequences for ecosystems and local economies.



Brown Trout

Though they do not require the water to be as cool or clean as brook trout, brown trout are also frequently found much more frequently in hemlock streams than deciduous ones. Up to three times more brook trout and brown trout are found in streams lined by hemlocks as compared to deciduous streams. This may be because hemlock streams tend to have a greater abundance and diversity of insects and other invertebrates, which are a food source for trout. Other insectivorous fish have also been found in hemlock streams in high proportions.



Impact of HWA on Hemlock Forest

HWA infestations can destroy forests. Heavily infested hemlocks may die in less than a decade, leaving pale, skeletal trees dubbed "grey ghosts" behind. Less severe infestations are also dangerous, as they can weaken the trees, leaving them susceptible to disease and other issues. The death of hemlocks, especially in old growth forests, can be devastating to the ecosystem and to the species that live there.



"Grey ghosts" in Pisgah National Forest, North Carolina

Some parks in the eastern U.S. have already experienced the loss of hemlock trees from HWA. More than 800 acres of old-growth hemlock forest are found in the Great Smoky Mountains National Park, or the Smokies. This is more than any other national park in the United States. An additional 90,000 acres of the park contains younger hemlock trees. First found in 2002, HWA has now spread throughout these hemlock forests, killing many of the trees. Although pesticides can be used to treat infestations, they are only able to reach about 15% of the hemlock trees, leaving the rest to slowly die off.



Grey ghosts in the Smokies

While it may be too late to act in some areas of the Smokies where entire hemlock stands have been wiped out, there is still hope of managing HWA in other forests. In the past decade, HWA has spread to Allegheny National Forest and Cook Forest in Pennsylvania, as well as the Adirondacks in New York. Continued treatment of infested trees and monitoring for new infestations can help to slow the spread of the insect and protect hemlock trees, as well as all of the species that rely on them.

What Can We Do?

Consider your favorite hunting and fishing spots. What would these sites look like without hemlock trees? How would the loss of this tree affect the species there?

An HWA infestation does not have to be a death sentence for hemlock trees. Insecticides, as well as biological controls, are being used by national parks and forest managers in many states to successfully treat trees and protect those that are at risk of future infestations. However, hemlock trees must be consistently surveyed to determine where the insect has spread and to assess which trees are the highest priority. Early detection of HWA is vital to save the tree. While you are out in the forest, please keep an eye out for HWA, and help protect hemlock forests for future generations to enjoy!



Identifying HWA

Anyone can survey for HWA! From November to April, HWA is visible as woolly masses on the underside of hemlock branches. Spider sacs, spittle bugs, and pine sap are sometimes mistaken for HWA, but while these are generally found in only one spot of a branch, HWA is spread over the entire branch, specifically at the base of needles.



Spittle bugs (left) and spider egg sac (right) on hemlock

Reporting

If you suspect you have found HWA, report your findings! Contact the NYSDEC or the DCNR. In your report, make sure to include detailed information about the site so that it can be easily found again. GPS coordinates and photographs are also encouraged.

- NYSDEC HWA Survey Form: https://www.dec.ny.gov/docs/lands_forests_pdf/hwasurvey.pdf
- DCNR Bureau of Forestry: <https://www.dcnr.pa.gov/about/Pages/Forestry.aspx>

Alternatively, you may use the iMapInvasives app or website to record your findings in New York or Pennsylvania.

- PA homepage: www.paimapinvasives.org
- NY homepage: www.nyimapinvasives.org

For more information about HWA and other invasive species in New York and Pennsylvania, visit:

- <https://www.dec.ny.gov/animals/265.html>
- <https://www.dcnr.pa.gov/Conservation/ForestsAndTrees/InsectsAndDiseases/Pages/default.a>