

Birds of Hemlock Forests



The eastern hemlock tree, *Tsuga Canadensis*, is an evergreen tree that grows along the east coast of the United States and parts of Canada. It is a keystone species that provides numerous ecosystem services including erosion and temperature control, as well as air and water filtration.

They also provide crucial food, shelter, and habitat for over 96 species of birds, including migratory songbirds, woodpeckers, and birds of prey. These species draw in millions of birdwatchers across the nation, and play important roles in their ecosystem.

Hemlock Woolly Adelgid

HWA is a sapsucking, aphid-like insect native to Japan. First discovered 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 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, leaving skeletal 'grey ghosts' behind.

This insect has already devastated forests and parks in the eastern United States, including the Great Smoky Mountains National Park, where entire stands of hemlock trees have been wiped out. As HWA continues to spread, many of the birds that rely on hemlock trees could disappear from our forests.



Grey ghosts in the Smokies

Migratory Birds

Hemlock trees are an important nesting site and food source for numerous birds, including blue jays, chickadees, grackles, juncos, and goldfinches. While hemlocks may be preferred to other species of tree, many of these birds can continue to maintain their populations without them. However, some species obligate, migratory, and forest interior birds require hemlock stands to survive, and have been shown to decline significantly in stands with high hemlock mortality due to HWA.

Black-Throated Green Warbler



Black-throated green warblers are small songbirds that breed in coniferous and mixed forests in the northern United States and Canada. They are foragers that primarily eat small invertebrates in the forest, such species of hairless caterpillars, beetles, gnats, and spiders. They may also eat berries during migration in the fall, including the berries of poison ivy plants.

These warblers are commonly found in interior forests, and require large areas of mature forest to maintain their population, making them susceptible to habitat fragmentation. Although they are considered to be a least concern species nationwide, they are part of Pennsylvania's list of birds of greatest conservation need. Black-throated green warblers are also considered to be an indicator species in forests, particularly in hemlock stands, as their presence is a sign of a healthy ecosystem.

Black-throated green warblers require eastern hemlock trees for feeding and nesting, and are considered an obligate species in forests in the eastern United States. Infestations of HWA in the warbler's breeding range have led to the decline of local populations, which could negatively impact conservation efforts. While the creation of spruce plantations has been proposed as habitat refuges for warblers, the lack of structural diversity in these sites makes

them less attractive, and the highly scattered, fragmented habitat may be unable to sustain local populations. Without hemlock trees, the black-throated green warbler may become regionally extinct in parts of the northeast, including New York and Pennsylvania.

Blackburnian Warbler

Blackburnian warblers are a species of songbird that breed in mature coniferous and mixed forests along parts of the east coast from southern Canada to North Carolina. These birds, similar to black-throated green warblers, feed mostly on insects including caterpillars, spiders, flies, mayflies, ants, and aphids, but will eat berries during times of migration. These birds may occasionally join mixed flocks led by black-capped chickadees.



These warblers are forest interior birds, meaning that they require large, undisturbed and unfragmented forests to survive and reproduce. In fact, they are rarely found in forests with trees under 60 feet tall. Blackburnian warblers are an indicator species as well as canopy specialists, and are found primarily in the upper third of hemlock trees. This is a form of niche partitioning that helps them to coexist and avoid competition with the other bird species that nest in hemlock stands.

Blackburnian warblers are an obligate species that require hemlock trees for nesting and feeding. Studies have shown that in hemlock stands infected with HWA, these birds have had some of the greatest declines in population of any other breeding birds. Despite being a least concern species nationwide, the Blackburnian warbler is on Pennsylvania's list of Bird Species of Greatest Conservation Concern, and is conserved in some New York sites, including the High Tor Bird Conservation Area. These birds have begun to disappear from some forests in New York and other northeastern states, and if hemlocks continue to disappear, the species could become extinct in much of its breeding range.

Hermit Thrush



Hermit thrushes are somewhat small songbirds typically found in open areas within coniferous and mixed forests, such as trails, pond edges, and meadows. They can be observed at different times of the year across most of North America, and their breeding range includes northern Pennsylvania and nearly all of New York state. Hermit thrushes can be found year-round in central Pennsylvania.

Hermit thrushes occupy the understory of forests, and forage on small insects in the leaf litter on forest floors. Occasionally, these birds also prey on small amphibians and reptiles, and during the winter time, supplement their diet to include berries and other fruit. Like other forest interior birds, this species requires undisturbed forests, and is very sensitive to habitat fragmentation.

Though they do not inhabit the canopy, eastern hemlock trees are used by hermit thrushes for nesting and feeding. Hermit thrushes build their nests on the ground beneath young conifers, including hemlock trees, and the abundance of insects and other invertebrates in hemlock stands makes them attractive. In forests with high hemlock mortality due to HWA infestations, studies have found that hermit thrush populations declined by 34 percent.

Ovenbird

Ovenbirds are warblers which inhabit closed-canopy, mixed forests with breeding grounds east of the Appalachian Mountains. They resemble thrushes, and like these birds, are insectivores that feed on invertebrates in leaf litter on the forest floor. They are also an important species in controlling outbreaks of spruce budworms, a native insect and pest of many coniferous trees.



Ovenbirds require extensive areas of uninterrupted forests, often more than 2,000 acres in diameter with canopies 50 to 70 feet above the ground. They are sensitive to habitat fragmentation, which also increases their vulnerability to nest parasitism from brown-headed cowbirds. As model species, ovenbirds have been used extensively in scientific studies, and have helped researchers understanding the effects of logging and habitat fragmentation on migrating songbirds.

Ovenbirds are ground nesters that build their nests under eastern hemlock trees and other conifers. The dense canopy created by hemlock trees, as well as the abundance and diversity of insects in hemlock stands, make these areas attractive to ovenbirds. In hemlock stands with high mortality due to HWA infestations, populations of ovenbirds have been shown to decline.

Blue-Headed Vireo



Blue-headed vireos are migratory birds with breeding grounds along the east coast of the United States from Maine to northern Georgia. It is the only species of vireo in its range that nests in coniferous forests. Blue-headed vireos feed mostly on insects but may also eat spiders, snails, and small fruits.

These birds are preyed upon by barred owls, crows, and brown-headed cowbirds, which are nest parasites of many songbirds. During the summer, blue-headed vireos also act as seed dispersers for many kinds of fruits and berries. Like other forest interior birds, they are very sensitive to habitat fragmentation, and are the presence of humans.

Blue-headed vireos nest in mature forests with closed canopies and healthy understories. Birds in the northern part of the blue-headed vireo's range prefer to build their nests in hemlock trees, as well as fir and spruce. Though the population of blue-headed vireos has increased since 1970, these birds have declined in hemlock stands affected by HWA, and are considered to be a consistently sensitive species. This has raised concerns over their conservation status, especially in the eastern United States.

Acadian Flycatcher

Acadian flycatchers are insectivorous birds found mostly in the middle levels of mature forests, especially in riparian habitats, such as streams, ravines, and rivers, where hemlock trees often grow. Their breeding range covers much of the eastern and central United States, but they have only begun to expand into the northeast in over the past few decades. Acadian flycatchers can currently be found in most of Pennsylvania, but only rarely in western New York.



Acadian flycatchers prefer undisturbed forests to nest in, making them a useful indicator of the health of forests. For this reason, land managers often assign high conservation priority to these birds. As forest interior birds, Acadian flycatchers are threatened habitat loss and fragmentation, which decrease their reproductive success and makes them more vulnerable to nest parasitism by brown-headed cowbirds.

Acadian flycatchers are strongly associated with hemlock forest in eastern states, and very are sensitive to the removal of these trees. In the northern part of their range, which includes Pennsylvania and parts of New York, these birds only nest in hemlock ravines. While other birds declined in stands with high hemlock mortality due to HWA, Acadian flycatchers were completely absent. This leads researchers to believe that if hemlock trees continue to decline, these birds will begin to withdraw from the northeast.

Woodpeckers

Woodpeckers are also common inhabitants of hemlock forests. While they are often not as reliant on hemlock as the Blackburnian warbler or other migratory birds, these trees provide them with habitat and an abundance of insects for food. Dead or decaying hemlock trees can also be used for cavity nesting.

Yellow-Bellied Sapsucker



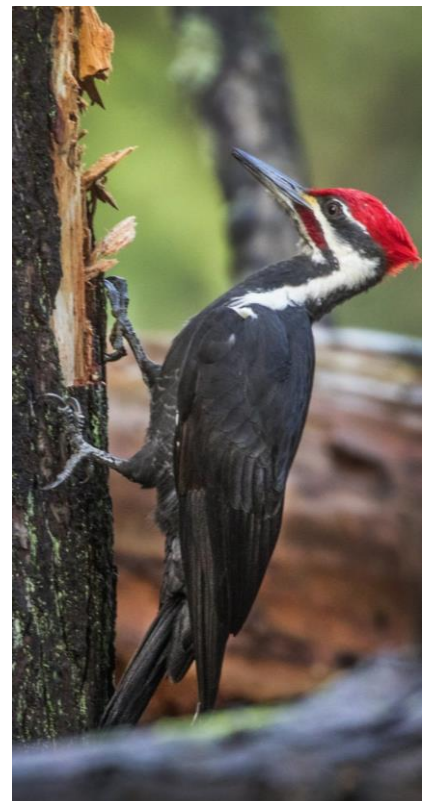
The yellow-bellied sapsucker is a migratory woodpecker with a breeding range in the northeastern United States and Canada. They favor young, mixed forests, and feed mostly on insects like beetles, ants, moths, and dragonflies. Unlike other woodpeckers, they do not require dead trees for feeding, but may use the dead limbs of trees to build their nests in.

In the spring, yellow-bellied sapsuckers drill holes into the trunks of trees to feed on sap, hence their namesake. They prefer trees with high sugar concentrations, including eastern hemlock trees. These birds also seem to be attracted to hemlock trunks, where they excavate cavities in dead or decayed wood to build their nests.

Pileated Woodpecker

Pileated woodpeckers are the largest American woodpecker, with the exception of the possibly extinct Ivory billed woodpecker. They are found year-round in the eastern United States, including New York and Pennsylvania, and along the Pacific Coast. Pileated woodpeckers nest close to streams in mature coniferous or deciduous forests, and feed on insects within dead trees and fallen logs. They may also eat wild fruits and nuts.

Pileated woodpeckers are common predators of wood-boring beetles like the hemlock borer, a secondary pest of eastern hemlock trees that may attack trees that have already been weakened by HWA. These birds are also considered to a keystone species since its nesting and excavating activities hemlocks and other trees provide habitat for other species.



Birds of Prey

Raptors like hawks and owls use branches of hemlock trees as hunting perches, and they may be attracted to hemlock forests due to the abundance of small mammals and other birds which act as their prey. Some of these birds may also nest in hemlock trees.

Northern Goshawk



Northern goshawks are found year-round in New York and much of Pennsylvania. They nest in mature, continuous, old-growth forests with mostly closed canopy, and prefer sites where trees like birch, maple, and hemlock are dominant. Goshawks conduct most of their hunting in riparian and somewhat open habitats, where they can dive to ambush their prey.

Northern goshawks are very territorial and, tend to stay in their nesting area for their entire life. They eat mainly birds, reptiles, and small mammals including snowshoe hares, squirrels, and cottontail rabbits, which use hemlock stands for shelter and cover. Occasionally, great horned owls and eagles prey upon goshawk nestlings.

Red-Shouldered Hawk

Red-shouldered hawks have a relatively small breeding range that covers the northeastern United States as well as some parts of Michigan and Wisconsin, but can be found year-round in most states east of the Rocky Mountains. They can be found in mature mixed forests and swamps, and prefer areas with some dead trees which they can perch in.



Red-shouldered hawks hunt in riparian areas, conifer swamps, and wetlands. They eat mainly small mammals, including rabbits and squirrels, as well as reptiles, amphibians, and small birds. Branches from hemlock trees are frequently selected by these hawks to build their nests.

Long-Eared Owl



Long-eared owls are found year-round in New York and Pennsylvania, and their breeding range extends into the New England States. They forage in shrublands, grasslands, and open forests, and may roost in dense stands of coniferous trees. Long-eared owls hunt only at night, and eat mostly small mammals including rats, shrews, mice, and rabbits. They are preyed upon by many other raptors, including great-horned owls red-shouldered hawks, and northern goshawks.

Hemlock trees provide these birds with cover and protection from wind, cold, and precipitation, especially during the winter. The dense foliage of the hemlock canopy also helps the owls to camouflage themselves. Long-eared owls are threatened in Pennsylvania, and are currently decreasing in population in the United States.

Saw-whet Owl

Northern saw-whet owls are the smallest raptors in North America. They are year-round residents of Pennsylvania and New York, though most individuals migrate south in the fall. They prefer mature, somewhat open forests with coniferous trees to roost in, and hunt small mammals such as mice, voles, and bats. During migration, they may also eat small birds and even insects. Great-horned owls are known to prey upon saw-whet owls.



Saw-whet owls breed in hemlock forests, and use them for roosting and shelter during the winter months. The population of these owls is decreasing in the United States, and they are a threatened species in some parts of the Appalachian region due in part to the loss of suitable habitat from HWA infestations.

What Can We Do?

As hemlock trees are diminished by HWA, many of these birds could become scarce, or even extinct, in parts of their range. What would our forests look like, and sound like, without them?



HWA is destructive, and can wipe out entire stands of hemlock trees in a relatively short period of time, which can be devastating to the ecosystem and the species that live there.

However, infestations are treatable.

Insecticides and 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. While it may be too late to save hemlocks in the Smokies, there is still hope of managing this insect in forests New York and Pennsylvania, including the Adirondaks, Cook Forest, and the Allegheny National Forest.

But 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, about $\frac{1}{4}$ the size of cotton swabs, 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.



HWA ovisacs (left) and lookalikes, including a spider sac (middle) and spittle bugs (right)

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>