



PHOTOS: JEN WEIMER

Hemlock woolly adelgids produce white, wool-like wax to protect themselves and their eggs. Inset: *Laricobius nigrinus* predatory beetle being released for HWA biocontrol.

RETHINKING HEMLOCK MANAGEMENT

BY JEN WEIMER

Hemlock woolly adelgid (HWA) is hardly a new threat, but a new approach to managing it is taking root in the Adirondacks. In New York's Lake George region, a shift from eradication to targeted resilience management is reshaping the response to HWA. There, a collaborative effort is demonstrating how new solutions can emerge when landowners, scientists, and foresters work together across an entire landscape.

HWA is a tiny, aphid-like invasive insect native to East Asia that attacks eastern and Carolina hemlock trees. First discovered in the eastern United States near Richmond, Virginia, in the 1950s, the insect spread steadily through the Appalachian region before moving northward into New England and the Adirondacks. In the Northeast, the pest has become one of the most serious forest health threats facing eastern hemlock.

Unlike many native insects, HWA has few effective natural predators in North America. As infestations build, the adelgids feed on stored nutrients at the base of hemlock needles, weakening trees over several years. Infested trees often show thinning crowns, needle loss, branch dieback, and eventual mortality. In southern states, heavily infested trees may die within just a few years, while in colder northern climates decline is a bit slower. Mortality is becoming more common in the Northeast however, especially when HWA is coupled with drought, elongate hemlock scale, fungal pathogens, or spongy moth and hemlock looper outbreaks.

The adelgid has a two-generation life cycle. Both generations reproduce asexually, meaning all individuals are female and capable of producing eggs without mating. The overwintering generation, known as the sistens generation, settles at the base of hemlock needles in late summer and enters a dormant period during the hottest months. As temperatures cool in autumn, the insects resume feeding through winter and early spring, when they become most visible because of the distinctive white, wool-like wax they produce to protect themselves and their eggs.

In spring, sistens adults lay egg masses within these white woolly coverings. The eggs hatch into tiny mobile crawlers that disperse by wind, birds, mammals, or human activity.

These crawlers, known as the progrediens generation, mature quickly and lay another round of eggs in late spring and early summer. There is also a winged adult of this generation that flies to spruce hosts in its native range, but the required spruce species are absent in North America, so those fail to reproduce here.

New York's Lake George region contains exceptionally dense and ecologically important eastern hemlock stands, with some areas composed of 60–70% hemlock. These forests play a major role in protecting water quality in Lake George, one of New York's few Class AA drinking water sources, while also supporting wildlife habitat, tourism, scenic beauty, and shoreline stability.

The first HWA infestation in the Lake George watershed was discovered in 2017, and six acres were initially treated with insecticides in an attempted eradication effort. A second outbreak was reported in 2020 by a camper using New York's invasive species reporting database, iMapInvasives. Again, there was a major effort to survey and eradicate it. This is when Tammara Van Ryn, who at the time was the Adirondack Park Invasive Plant Program Manager, realized they were not going to stop it and decided it was time to switch strategies. This led to the formation of the Lake George Hemlock Coalition – a collaboration of multiple organizations and agencies fighting to save hemlock in the Adirondacks. Each partner contributes different expertise, from surveys to treatments, and public outreach. "It's a very diverse group with lots of knowledge," says Lyme Adirondack Forest Company General Manager Eric Ross. "We've learned a ton just by being part of the coalition."

Lake George Hemlock Coalition Partners

Adirondack Park Invasive Plant Program of
The Nature Conservancy
East Shore Schroon Lake Association
Lake Champlain Lake George Regional Planning Board
Lake George Association
Lake George Land Conservancy
Lake George Park Commission
Lyme Adirondack Forest Company
NYS Department of Environmental Conservation
NYS Hemlock Initiative of Cornell University
Warren County Soil and Water Conservation District
Washington County Soil and Water Conservation District



LYME ADIRONDACK FOREST COMPANY

Bullhead Pond, near Indian Lake in the Adirondacks, acts as a buffer. Hemlock is the fourth-most-abundant tree species across LAFCO's ownership.

Using GIS analysis, coalition members identified 16 ecological, recreational, and cultural criteria to prioritize treatment areas. These include old-growth hemlock stands, bird habitat, scenic viewsheds, campgrounds, municipal water supplies, and conservation lands. The resulting plan identifies approximately 18,000 acres of "priority hemlock areas," representing about 25% of the watershed's hemlock forests. According to Van Ryn, who is now the coalition's coordinator, the goal is to maintain "reservoirs" of healthy hemlocks across the landscape while biological controls become more established.

Within the identified treatment areas, the coalition is using an integrated pest management approach to manage HWA. Grant funding supports field crews from the New York State Hemlock Initiative at Cornell University (NYSHI), who conduct surveys, release biocontrol, and do chemical treatments, monitoring, and outreach. One of the newest practical field innovations surveyors are utilizing is powerful high-lumen headlamps for detecting HWA high in tree canopies. The white woolly masses reflect light and become much more visible in the canopy during surveys. "You can actually see the white pretty far up with the high-power headlamp," says Van Ryn.

When applicable, basal bark sprays or injections of imidacloprid and dinotefuran are used to treat HWA, although consideration is being given to soil drench applications as

a potentially more efficient and equally effective option. In addition, releases of biocontrol agents are ongoing as part of a statewide effort. NYSHI has been releasing HWA predators in the state since the 1990's. It started with a tiny ladybird beetle, *Sasajiscymnus tsugae*, which is native to Japan but did not establish well in the coldest regions of the northeast. In 2008 the initiative switched to releasing *Laricobius nigrinus*, which is a tooth-necked fungus beetle native to western North America that feeds on the overwintering generation of HWA. In 2012 another *Laricobius* species (*osakensis*), native to Japan, was also released. Establishment of these beetles has been greater than the ladybird beetle but remains limited across the state. Starting in 2015, two species of silver flies – *Leucotaraxis argenticollis* and *L. piniperda* – were released. These species feed on the spring/summer generation of HWA. *L. argenticollis* was determined to be established in the state for the first time in 2025 and may help to provide additional control as they feed on different generations of HWA than *Laricobius* species. In New York, the biocontrol strategy is also shifting from small, scattered releases to concentrated releases: "Last year they changed their tactics," Van Ryn explains, "we've got 2,000 flies to put out, we're going to put them all in the same place."

Silviculture is also beginning to play a larger role in managing HWA. Research by the US Forest Service has shown that opening dense stands and increasing sunlight exposure can improve hemlock vigor and lessen adelgid impacts. For Lyme Adirondack Forest Company (LAFCO), the largest private landowner in New York, these findings compliment a broader strategy of building forest resilience. Because chemical treatment is impractical across such a large ownership, LAFCO is focusing on prevention and silvicultural management. "We're not going to be able to go out and spray tens of thousands of acres, so we have to think differently," says Ross. Foresters are exploring ways to maintain vigorous hemlock stands across a variety of age classes and site conditions while adapting harvesting practices around crawler season (mid-March – late July). Stands near known infestations are surveyed and invasive species best management practices – including equipment cleaning and contractor education – are incorporated into daily operations.

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Technology is also playing a major role in management decisions. High-resolution lidar has transformed LAFCO's ability to identify and map hemlock stands, plan access routes, reduce erosion risks, and prioritize monitoring efforts. Ross describes the technology as a "game changer," providing precision in identifying hemlock locations across the landscape. "If they want to know where my hemlock is, I can tell them exactly where it is."

Hemlock is the fourth most abundant tree species across LAFCO's ownership, and their inventory data showed hemlock basal area increasing from 8.8% in 2006 to 11.5% in 2021. Local paper mills rely on hemlock as part of their fiber supply, and LAFCO provides 15,000-20,000 tons of hemlock per year to those facilities. Managing roughly 235,000 acres, most of it within Adirondack Park, LAFCO is supporting monitoring, research, and outreach efforts while promoting a long-term, landscape-level response to the invasive pest.

LAFCO joined the Coalition in part to reach audiences often overlooked in invasive species outreach, including loggers, contractors, hunters, anglers, and recreationists who spend significant time in the woods. Through its timber harvesting operations and recreational leases, the company works with dozens of contractors and thousands of land users who can serve



NEW YORK STATE HEMLOCK INITIATIVE AT CORNELL UNIVERSITY

Technician conducting a basal bark application of imidacloprid to an eastern hemlock tree.

as an extensive network of observers. “The more people that know what they’re looking for, the more we’re going to find it,” says Ross.

Van Ryn agrees that having more people who know what to look for is important and this remains a key component of the coalition’s response. Landowners, recreationists, foresters, and loggers are encouraged to monitor hemlocks for signs of infestation regularly, especially during winter months when the white wool is easiest to spot. The easiest way to identify HWA is by looking for the small white cottony masses attached to the undersides of hemlock twigs at the base of the needles. Infestations often begin in branches overhanging water or along forest edges – where birds often perch – but can spread throughout the crown over time.

For private landowners, Van Ryn’s message is clear: “Please do not go out and cut down all of your hemlock.” Instead, selectively protect important trees, consult foresters, and maintain hemlock presence on the landscape whenever possible. “It’s cheaper to treat a tree now than it is going to be to deal with a hazard tree later,” Van Ryn explains. Unlike management responses to pests such as emerald ash borer, the widespread removal of hemlock would permanently damage northern forest ecosystems because no other tree species fully replaces the ecological functions of eastern hemlock.

The Lake George Hemlock Coalition represents a shift in how invasive forest pests are managed. By uniting landowners, scientists, foresters, municipalities, and conservation groups around a common goal, the coalition has built a coordinated defense against HWA that extends across the Lake George watershed rather than stopping at property lines. Its work combines traditional forest stewardship and integrated pest management with new technologies, strategic planning, and regional cooperation to slow the spread of HWA and preserve hemlock-dominated ecosystems for future generations. NL

GIS Data Layers for Lake George Priority Hemlock Mapping

- Accessibility (for treatment)
- Aspect/Snow Retention
- Climate Resilience
- Conservation Status
- Percent Hemlock in Subwatershed
- Proximity to 8 Major Stream Corridors
- Proximity to Drinking Water Sources/Reservoirs
- Proximity to Hemlock Dependent (birds)
- Proximity to Old Growth Stands
- Proximity to Public Use (recreational significance)
- Proximity to Rare Species
- Proximity to Roads/Infrastructure/Campground
- Proximity to Water
- Soil Erodibility
- Steep Slopes
- Viewshed/Visibility

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