

THE NATURE CONSERVANCY'S RESPONSE TO HWA

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ABSTRACT:

The Nature Conservancy has a dispersed structure. In consequence, its staff have adopted a variety of approaches to responding to the threat to conservation goals posed by the hemlock woolly adelgid. This poster describes this varied response.

KEYWORDS

Hemlock woolly adelgid, The Nature Conservancy, portfolio sites, widespread threats.

WHY THE NATURE CONSERVANCY IS ENGAGED WITH HEMLOCK WOOLLY ADELGID

The mission of The Nature Conservancy (TNC) is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

OVERVIEW OF THE NATURE CONSERVANCY ENGAGEMENT

Nearly 1,340 terrestrial and freshwater ecoregional “portfolio sites¹” in nine forest types are at risk to damage by the hemlock woolly adelgid (HWA), *Adelges tsugae* Annand. About 450 of these sites are in counties already infested by HWA; the remaining 890 portfolio sites are within the range of either eastern or Carolina hemlocks (*Tsuga canadensis* (L.) Carr. and *Tsuga caroliniana* Engelm.), but outside of the currently infested counties (see Figure 1). Some sites under threat have great emotional as well as scientific importance: the Mianus River Gorge in New York, for instance, was the organization’s first preserve.

The Nature Conservancy’s decentralized structure poses a challenge when trying to develop a consistent response to a widespread threat such as that posed by HWA. We find it easier to address more recently-introduced organisms that are still restricted to relatively small areas. Thus, we are actively advocating policies and resources aimed at eradicating the Asian

¹ “Portfolio site” is TNC terminology for a site within an ecoregion determined by our scientific process to be a priority for protecting biological diversity

longhorned beetle, *Anoplophora glabripennis* (Motschulsky), and containing the emerald ash borer, *Agrilus planipennis* (Fairmaire), and *Phytophthora ramorum* (Werres et al.), the pathogen that causes Sudden Oak Death.

A positive aspect of TNC's decentralization is that state chapters may test various approaches to solving a problem. We then replicate those strategies showing most promise.

In the 1990s, TNC changed its focus from small sites which we could protect through purchase or conservation easements to landscape-scale blocks that we have identified as having high biodiversity value (portfolio sites). We now work with public and private partners to improve forest health generally across large forest blocks—each block covering several tens of thousands of acres. We recognize several broad threats that cannot be addressed by our traditional site-based approaches. Among these are invasive species—including insects, pathogens, plants, and aquatic organisms; acid deposition; and global climate change.

We now have staff dedicated to raising awareness and promoting actions intended to minimize the risk from introduced forest insects and diseases. We hope that this project, combined with campaigns to restore fire and other natural disturbance agents to forest management and to improve policies pertaining to acid deposition and global climate change, will together contribute to reducing hemlock trees' vulnerability to introduced insects and other threats.

The hemlock woolly adelgid invasion is extremely challenging. The threat to TNC's mission is undeniably grave: hemlock-dominated ecosystems usually constitute small but distinct segments of the forest matrix we seek to conserve – unique sites that provide habitat for unusual levels of biological diversity and rare species. Hemlock-dominated ecosystems also play a major role in sustaining associated aquatic systems.

Despite our recognition of hemlock-dominated systems' importance, only rarely do hemlock groves or species specifically dependent on hemlock constitute a separate conservation priority. Given TNC's strategy of focusing on threats to identified "conservation targets," this means that the threat to hemlocks can "fall through the cracks." However, even when hemlock stands are specifically identified as targets, TNC staff have sometimes concluded that the biocontrol agent *Pseudoscygnus tsugae* (Sasagi and McClure) offered too little promise to warrant accepting the risk of release.

In determining our response, preserve managers and policy staff have been stymied by several difficulties. First, hemlocks face a myriad of threats; scientists cannot specify the relative importance of HWA in relation to other exotic insects, changing climate, droughts, and soil compaction. Second, few tools are available to control the insect, and they all have significant downsides. Chemical controls are expensive and extremely difficult to deploy in forest systems. Biological control agents have not yet proven effective, and their utilization raises difficult questions about possible non-target impacts. TNC is adapting: we are now more open to dialogue about the benefits as well as the risks posed by biological control in particular circumstances.

Due to the perceived lack of good options, TNC's response has followed a pattern: when HWA is first detected in a state, conservation staff take notice and search for solutions that will protect at least some of the hemlocks on their preserves. Often, they consider the

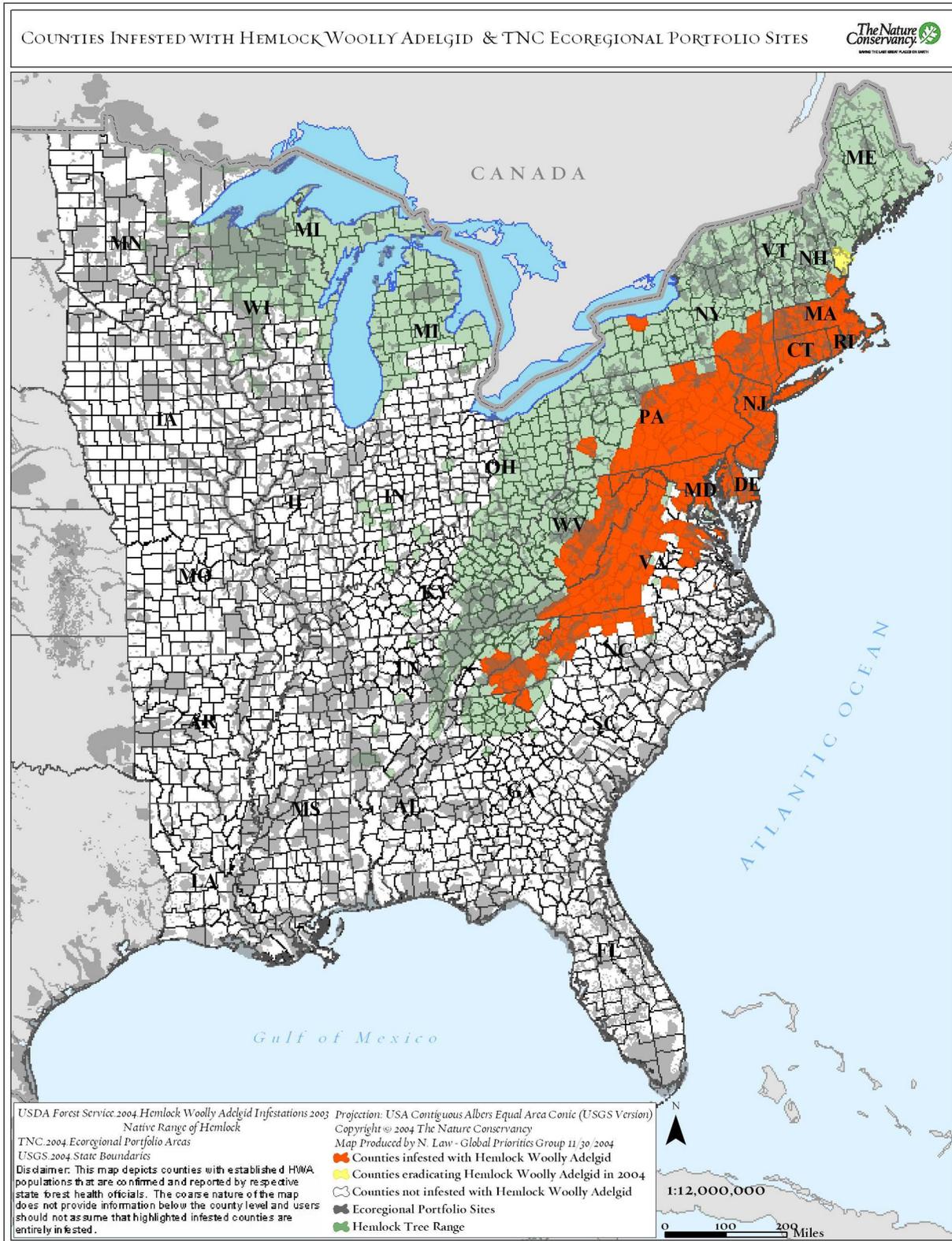


Figure 1. Hemlock range, HWA infestation locations, and portfolio sites of The Nature Conservancy.

extent and spread of the HWA infestations. Some preserves apply a TNC protocol to determine whether release of biological control agents is permitted: some situations allow such releases; others do not. Once HWA is widespread and TNC staff perceive no effective control solutions, they may focus on other threats against which they believe that they have better prospects (several note that, in terms of minimizing ecosystem impacts, ongoing weed control programs have a higher priority in that they reduce invasions by exotic plants).

TNC's Eastern New York chapter, which is inside the northern reach of HWA, adopted in early 2001 a new protocol that requires supportive answers to nine questions before the Chapter can support release of biocontrol agents. These questions include:

- Establishing the level of threat posed by HWA as distinct from threats posed by other exotic insects, climate change, etc.
- Establishing the potential non-target results of a release.
- Establishing that the benefit will outweigh the costs when neither the efficacy of the biocontrol agent nor its possible non-target effects can be determined when the biocontrol agent is thought unlikely to do more than slow the spread of HWA.
- Having on hand sufficient resources to monitor the spread and impact of both HWA and the biocontrol agent.

In contrast, TNC staff at the southern edge of the HWA infestation in North and South Carolina are actively reaching out to partners and asking TNC's Government Relations staff to help promote effective responses by federal agencies (Figure 2). TNC staff in the Carolinas adopted a Conservation Action Plan for the Southern Blue Ridge in June 2003 that includes, among its action items:

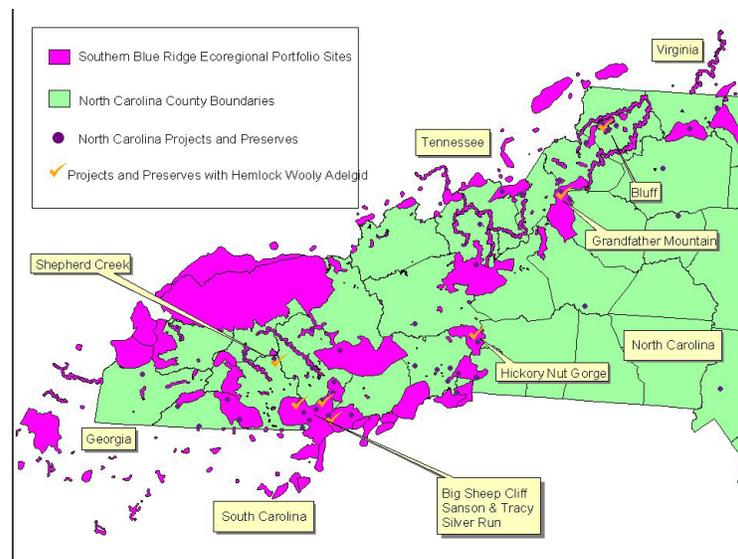


Figure 2. Areas in North Carolina and adjacent areas of TNC concern for HWA.

- Develop a landscape-wide strategy and protocols for treatments and biocontrol agent releases.
- Accelerate mass rearing of agents and research on release techniques.
- Amend any language in TNC easement agreements that hamper release of biocontrol agents.
- Provide assistance in setting priorities for releases.

TNC staff from the eastern states that work on invasive species will meet in April to explore ways to improve our effectiveness; HWA is a focus of the meeting.

In areas that are not yet experiencing infestations, such as Tennessee and Ohio, the staff is in a “watchful waiting” mode. TNC’s forest ecologist in Ohio is closely following scientific developments in such areas as biocontrol agents’ efficacy and recommendations for forest management practices to restore forest health generally. She is open to the idea of working with partners to conserve genetic material for use in later restoration projects.

At the national level, TNC staff continue searching for useful measures to promote them. In the meantime, we seek to apply to more recently introduced forest pests the lesson from the unfortunate HWA experience; authorities should eradicate such organisms promptly before they spread to threaten important conservation goals.

A SAMPLE OF TNC PORTFOLIO SITES VULNERABLE TO HWA

New England The Berkshire-Taconic landscape reserve on the Connecticut-Massachusetts-New York border is 155,000 acres. It provides habitat for more than 150 rare species. TNC staff’s greatest worry is the cumulative impacts of HWA, hemlock looper *Lambdina fuscicollis* (Guenee), and elongate hemlock scale, *Fiorinia externa* (Ferris). TNC staff were disappointed that release of *Pseudoscymnus tsugae* in the Mianus River Gorge of New York reduced HWA populations, but damage by the hemlock looper increased. TNC will prevent exotic plants from invading areas with newly opened canopies through the well-established “Weed it Now” program.

New York The Mianus River Gorge Preserve was TNC’s first project and is a Natural History Landmark. The Mianus River is an AA trout stream. The preserve is unusual in that much of its old-growth forest is hemlock. The Mianus River Gorge Preserve is now managed by a separate non-profit consortium. This consortium approved release of *Pseudoscymnus tsugae*, but the results were apparently unsatisfactory.

The nearby Shawangunk Mountains are part of a ridge system that extends through New Jersey to Harrisburg, Pennsylvania. The 90,000-acre Shawangunk bioserve is a “Last Great Place”—a major landscape rich in biological diversity. There are more than 35 natural communities; the hemlock forests dominate just 5,000 acres. When New York State proposed introducing *Pseudoscymnus tsugae* in the area, the reserve’s management (which includes TNC and nine other organizations) could not reach agreement, so it remained neutral on the release, which occurred at one nearby site in 2002. As a result, in part, of this quandary, the Director of Conservation Science for the Eastern New York Chapter developed the more demanding decision protocol for

assessing possible releases of biocontrol agents described briefly elsewhere on this poster. As of late 2004, HWA distribution along Shawangunk ridge is still patchy.

New Jersey In 1999, a TNC intern assessed the HWA invasion at all TNC preserves in the state. At that time, 11 of the 40 stands evaluated were experiencing severe defoliation (80 per cent or more), while eight stands were experiencing mild defoliation (less than 19 percent). One stand was described as “healthy.” Five years later, TNC staff report that HWA has destroyed or seriously degraded over half of the 26,000 acres of hemlock in New Jersey. The State continues to rear and release *Pseudoscymnus tsugae*, although its effects are uncertain.

Pennsylvania In an effort to protect important ecosystem functions, in spring 2005 TNC staff will begin planting other evergreen trees in the West Branch Preserve in Clinton County. Candidates for planting include eastern white pine *Pinus strobus* (L.), red spruce *Picea rubens* (Sarg.), and even Norway spruce *Picea abies* (L.) (Karst)—which can be removed later if better alternatives become available.

Virginia HWA is affecting every portfolio site at which hemlocks occur. Introduced forest insects and diseases—including HWA—have been identified as the greatest threat in the Alleghany Highlands project area. One preserve, Bottom Creek Gorge, was established to protect the Roanoke River headwaters; it contains the second-highest waterfall and the largest Carolina hemlock in Virginia. The stream provides critical habitat for four species of narrowly endemic fish as well as to the widespread but still rare native brook trout.

West Virginia: TNC’s preserve at Ice Mountain protects a site called, in 1845, “one of the greatest natural curiosities of (then) Virginia”. The microclimate—created in part by the dense hemlock canopy along the deep rock crevasses which retain ice well into summer—provides habitat for regionally rare, typically boreal plants and uncommon tiger beetles. The preserve approved release of *Pseudoscymnus tsugae* by the West Virginia Department of Agriculture in 2002 and 2004. In addition, USFS researcher Brad Onken injected five trees in the immediate vicinity of the ice vents with imidicloprid in May 2003.

North Carolina and South Carolina: In North Carolina, HWA already is present in five TNC-owned preserves and another five preserves established by easement agreements with partners. HWA threatens at least five portfolio sites.

One—the Blue Wall/Southern Blue Ridge Escarpment—stretches from the Pacolet River north of Spartansburg, South Carolina, west to the Chattooga watershed in Georgia, and from the upper Piedmont of SC to the escarpment ridges of North Carolina. This region harbors more than 300 occurrences of rare species and natural communities. The Blue Wall Escarpment is “a biological hotspot within a hotspot”- the wider Southern Blue Ridge ecoregion. Four Conservation Targets in this region have a strong hemlock component: Gorge Species Assemblage, Carolina Hemlock Bluff, Escarpment Forest Matrix, and Headwater River Systems.

At Grandfather Mountain, a private park with which TNC has both ownership and easement agreements, staff are treating infected hemlocks in the back country with stem injection of Imicide.

Ohio: The Ohio Chapter led TNC planning for conservation of important examples of the Western Allegheny Plateau Ecoregion – an area covering more than 40,000 square miles stretching across portions of Kentucky, New York, Ohio, Pennsylvania, and West Virginia. HWA is not yet present in Ohio, but it threatens six large forest blocks in the West Virginia portion of the ecoregion and five in Ohio. Some extremely rare species are associated with hemlock large patch communities within the overall forest matrix. The federally listed Indiana bat has been found to establish maternity roosts inside dead hemlocks standing in dense hemlock groves (Britzke et al. 2003).

REFERENCE

Britzke, E.R., M.J. Harvey, and S.C. Loeb. 2003. Indian bat, *Myotis sodalist*, maternity roosts in the Southern United States. *Southeastern Naturalist* 2(2):235-242.