

Hemlock Woolly Adelgid Management Options



There has been much recent attention in various media about the Hemlock Woolly Adelgid (*Adelges tsugae* or “HWA” for short), despite the fact that it has been destroying hemlocks in NC’s mountains for at least the last five years. At this point, there are few stands of un-infested hemlocks remaining in NC; those that are will undoubtedly soon be subject to HWA predation. If you have significant stands of infested Eastern Hemlock (*Tsuga canadensis*) or the much rarer endemic species Carolina Hemlock (*Tsuga caroliniana*) on your land, you should be aware that, without some sort of treatment, they will in all likelihood be dead within a few years. Accordingly, we interviewed experts and visited sites to try to provide the best management recommendations possible at this time.

Adelgid Background & Management Options

As you probably know, the adelgid is an introduced pest of Asian origin, thought to have been brought over on infected nursery stock. The insect itself is a nearly microscopic aphid-like creature, which feeds with its sucking/piercing mouthparts at the base of needles. This disrupts nutrient flow in the tree and eventually it starves to death. The pest is easily identifiable on infested trees due to its cotton-like egg sac covering; host trees typically have small white masses on the underside of branches as well as a grayish pallor to their foliage indicating stress and nutrient deficiency. Trees typically die after some three to five years of infestation, although this is dependent on individual circumstances.

Although techniques have been developed for keeping individual trees alive, most of these are feasible only in an urban setting with small numbers of trees. Options include spraying horticultural oil or soap applications, which are environmentally safer than pesticide applications, but which can be difficult with large trees and must be repeated at least annually. The other option involves an application of imidacloprid, a systemic pesticide derived from nicotine--harmless to the tree but deadly to the feeding adelgids. Typically, this is done by one of three methods: soil saturation, which is the least expensive but also least environmentally friendly; soil injection, which is more expensive but better limits pesticide distribution; and trunk injection, which can be quite expensive but may be the only option if the tree is very close to water sources. Although pesticide is certainly a scary word to many, the consensus is that imidacloprid bonds very tightly with organic matter and presents very little danger of soil or water contamination.

Pesticide applications are typically effective for one to three years, and then must be repeated. Unfortunately, the trees, in order to take up the pesticide from the ground, must have a decent amount of rainfall. In the droughts of the past two years, this has been a problem, and may continue to be in the future. The high cost and labor-intensive nature of pesticide application makes this method less feasible for large-scale hemlock preservation.

Finally, there has been a great deal of effort by both the US Forest Service and private individuals to introduce predatory beetles to hemlock stands throughout western NC, in the hope that the beetles would establish viable populations and reduce HWA predation to levels low enough to allow the trees to survive. At this point, the data is inconclusive as to whether this actually happens; in the vast majority of release sites, the beetles have not prevented massive hemlock die-off. Initial beetle releases consisted of *Sasajicymnus tsugae*, an Asian beetle that feeds exclusively during the summer months; a couple of facilities in the area laboratory-rear these beetles and sell them to the general public. However, the HWA produces two generations a year, the most destructive of which is the winter-feeding generation. A more recently-discovered species of beetle, *Laricobius nigrinus*, seems to feed exclusively during the winter months; while still in the early stages of experimentation, it is hoped that the combination of both of these beetles will together produce the effect that one kind of beetle alone doesn’t seem to.

Biological Options for HWA Management

Asian and western North American Hemlock populations have long been subject to predation by the woolly adelgid; however, they are kept healthy by a variety of predatory insects that have co-evolved to subsist on HWA. In this situation, the trees always have a low level of endemic HWA, but the beetles destroy enough of the adelgids to allow the tree to thrive. Unfortunately, Eastern and Carolina Hemlock populations have no such natural defenses. It is unclear whether this same situation can be replicated with eastern hemlock populations, although there are a number of private individuals who are working to bring this about.

One such fellow is Dr. Richard McDonald, also known as “Dr. McBug,” a dedicated predatory-beetle advocate. He has pursued research of the biological control option exclusively and in fact has some objections to widespread and forest-based pesticide application. He is an eloquent spokesman especially for *L. nigrinus*, the winter-feeding beetle for which he makes periodic trips to the Pacific Northwest to collect, for distribution here. Dr. McDonald’s belief is that once both types of beetle (winter and summer-feeding) have established significant populations, HWA will be sufficiently

controlled. For a fee, McDonald will fly out to Oregon for a week or so to collect beetles which he then releases on the fee-payer's property.

Dr. McDonald's claims have been questioned by some in the forestry community. The first releases of beetles on his test site were in 2004, and many of the trees he released beetles on have since died. Although some of the trees on his test site are quite green now, they are still heavily infested with adelgid and it remains to be seen whether they will thrive in the long term. It is encouraging that the winter-feeding beetle, *L. nigrinus*, has established and spread on his test site, moving about a quarter-mile a year. However, in the absence of a control population of untreated wild hemlocks, which is difficult to establish given site differences of moisture regime, nutrient availability, and exposure, these results must be viewed as currently inconclusive. More importantly, it is difficult to determine whether the vigorous new growth on the trees is the result of HWA control, or simply the trees "re-flushing," that is, producing new growth using energy reserves, after being defoliated by adelgid. Re-flushing is a typical response to adelgid predation by healthy trees, and may cause a heavily infested and very stressed hemlock to appear healthy (for a season) even after two to three years of attack. In Dr. McDonald's favor, some sort of biological control, by near-unanimous agreement, is the only feasible long-term control strategy if the Eastern Hemlock is to avoid functional extinction.

Local arborist Will Blozan, featured in *The New Yorker* magazine as well as our regional newsweekly, *The Mountain Xpress*, is a passionate advocate for the hemlock and president of the Eastern Native Tree Society, as well as the founder of a tree care service called Appalachian Arborists which has done extensive work treating hemlocks. Mr. Blozan's position is that, although the biological control option is essential in the long run, for many large wild hemlocks it's already too late for salvation by beetle. They must receive treatment as soon as possible, in order to give them a fighting chance to survive until that hypothetical date when the beetles become effective. Mr. Blozan regards pesticide application as an emergency stopgap measure only intended to allow some groves of hemlock to survive until an effective biological control can be established—not as a preferred long-term option.

At this point, given the number of beetle releases to date, and the relative lack of success in preserving stands of hemlocks, it seems that the burden of proof rests upon the biological control optimists. Hopefully, the coming months will provide more and better information about the viability of biological control, especially with the evaluation of Dr. McDonald's test sites, and the possibility of "bracketing" both generations of HWA with beetles that feed year round. We hope that this new strategy will increase the effectiveness of the biological control option.

The Vanishing Hemlock

The hemlock is significant for a number of reasons, chief among them the fact that it's irreplaceable in our Southern Appalachian ecosystems. There is simply no other shade-tolerant evergreen that will fulfill the hemlock's vital ecosystem functions. These include the year-round regulation of temperatures in mountain streams—hemlocks keep them cool in the summer and ice-free in the winter, which allows the existence of temperature-sensitive trout species such as our native Brook Trout as well as a host of other rare or endemic aquatic organisms such as the Elk-Toe Mussel. A number of resident and migratory neo-tropical songbirds also depend on the hemlock for nesting sites, some almost exclusively. When the American Chestnut was functionally extirpated by the chestnut blight, it was an unprecedented loss of a vitally important mast tree, a loss that is still evident in Oak-Hickory and Chestnut Oak forests which have moved in to fill the same ecological niche, but which are still-evolving communities. These mast trees have similar site requirements and also produce nuts—while they are not as dependable a source of mast as the Chestnut, nor are they as useful as timber, they have occupied the same physical space. Hemlock extinction would leave no such tree or trees to fill the gaps left behind.

This is why it's vitally important to support efforts to save the hemlock. If you have significant hemlock stands on your property and have the resources to treat them, it would be a worthwhile investment. Mr. Blozan recommends a strategy of identifying the most strategically placed and oldest groves of trees (especially critical watershed-protecting trees), as well as ones that might serve as seed banks for repopulation, and treating them with pesticide while the beetle question is resolved. While Appalachian Arborists has expertise in this area, there are also a number of other companies in the area that will serve a similar function. While the effectiveness of beetles is still in question, we know definitively that it is possible to save important trees with chemical treatment, if they are reached quickly enough. One option being evaluated now is the possibility of treating larger hemlocks with pesticide while releasing beetles onto the surrounding younger trees, to serve as an insectary. According to Mr. Blozan, there is no current research substantiating the purported negative effects of concurrent pesticide applications on predator beetles. It is hoped that as the pesticide wears off on the older trees, established populations of both kinds of beetle would be able to take over the role of adelgid control.

For more information, or if you do choose to treat your hemlocks, by whatever method, please be in touch with SAHC's Stewardship Director Hanni Muerdter.