

HWA Survey and Treatment Protocol



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Hemlock woolly adelgid (HWA) is a non-native invasive forest pest that infests native Eastern hemlock trees. Once you have identified the presence of HWA on your property, you have three options:

1. Get on the waitlist for at-cost treatment through Muskegon Conservation District. For information and to sign up please visit Muskegon's website linked [here](#) or contact HWA Coordinator Lance McCarty at lance.mccarty@macd.org.
2. Hire a private applicator. Our district forester has compiled a list of certified arborists that have experience treating HWA and service Oceana County. You can find the list on the invasive species management page of the Oceana Conservation District website.
3. Treat your trees yourself. This is most applicable to landowners with a small number of hemlocks on their property, as the treatment process is labor and time intensive. If you decide self-treatment is the right option for you, your first step is to survey your trees. This document will walk you through the survey process, and will include helpful links to treatment demonstrations using different methods.

These instructions complement both HWA treatment data forms found on the invasive species management page of our website. When completing these steps, be sure you are recording all information in one of these datasheets or make your own.

Complete a Hemlock Woolly Adelgid Survey:

Step 1: Gather materials

Recommended materials list:

- [diameter tape measure](#)
- [numbered tags](#) or other way to mark each tree
- roofing nails or similar
- hammer
- device (cell phone or GPS unit) for noting survey GPS points
- means to record your data such as a smartphone, tablet, or notepad

*For smaller properties, you can limit items purchased by using a regular sewing tape measure and calculating diameter by dividing circumference by Pi.

Step 2: Identify your hemlocks

Familiarize yourself with the distinct characteristics used to identify a hemlock tree:

Silhouette: Hemlocks have a vaguely pyramidal shape with a drooping leader at the top and feathery branching texture. Hemlocks can grow to be up to 175 ft tall. As they grow there may be fewer lower branches present.

Foliage: Hemlocks have lacy, feathery foliage. In the late spring and early summer, new hemlock shoots should show up bright, lime green at the ends of twigs. If you do not see new shoots emerge, it could be a sign of an HWA infestation.

Needles: Needles are flat with a shiny deep green top, two parallel white stripes on the underside, and a rounded tip. Needles are typically ~1/2" to 3/4" in length arranged opposite one another on the twig (not whorled around the twig as on a spruce).

Bark: Younger hemlocks will have rough greyish-brownish bark. Mature hemlock bark is rough, scaled, and fissured. It is typically brown in color with a reddish tinge.

Cones: Hemlocks have small, brown cones that grow to be ~3/4" to 1" in length. They have rounded scales and mature in the fall. Immature cones are green with a tapered tip, shaped like a football.



Step 3: Assess tree health

Healthy hemlocks are dark green in color, have plenty of needles near the “fingertips” of their branches, and have enough needles to fully shade the understory around the tree. Use the following metrics to assess tree health:

Live Crown Ratio (LCR): The crown of a tree refers to its foliage and branches. The live crown refers to the part of the crown that has live needles. The Live Crown Ratio is the % of total tree height that supports live needles. For example: if foliated branches reached from the top of the tree all the way to the ground, that tree would have an LCR of 100%, if a tree had no living branches anywhere on the tree it would have an LCR of 0% (dead). A healthy hemlock should have a LCR of close to 100%. A hemlock must have an LCR of >30% to be an acceptable candidate for chemical treatment. Trees with LCRs of <30% are not able to uptake chemical insecticide and therefore will not benefit from treatment.

Crown Density (CD): Crown Density is the % of branches and foliage that blocks light coming through the live crown. For example: A hemlock crown is 100% dense if no light passes through the foliated branches, it is 0% dense if light is clearly visible with no live foliage blocking it.



Tree 1:
LCR 100%
CD 100%
healthy

Tree 2:
LCR 70%
CD 50%
moderate decline

Tree 3:
LCR 0%
CD 0%
dead

Step 4: Confirm presence of HWA

HWA is visible on the underside of hemlock branches from November to April while they overwinter in their white woolly ovasacks. Look for small, round, white egg masses that resemble a q-tip on the underside of branches at the base of the needle where it meets the branch. This is the only place HWA will secure their egg masses. If you were to pick up one of these egg sacks and squish it, there would be an orange residue left behind. If there are no branches within reach, search the ground for fallen branches to inspect. If you cannot reach a branch on a tree and cannot find a fallen branch to inspect, label the HWA infestation on that particular tree as “out of reach”. It is common practice to assume a tree within 800 ft of another with an infestation has an HWA population whether visible or not, and is most often treated as though it has an infestation. During survey data collection, it is common to record the extent of infestation on each tree. See reference pictures below for HWA and different levels of infestations.

Light:



Moderate:



Heavy:



Step 5: Measure and record diameter at breast height (DBH)

If using a diameter tape measure, simply measure around the circumference of the tree at breast height (roughly 4.5 feet from the ground) and round up to the nearest inch in diameter. If using a regular measuring tape, follow the above steps and use the formula $\text{Circumference}/\pi$ to get the diameter. Round your calculation up to the nearest whole inch. DBH is the metric used to calculate how much chemical is needed for each tree.

If measuring a hemlock on a slope, measure at breast height from the upland side of the tree.

If measuring a hemlock with multiple stems that split lower than breast height, be sure to measure each stem as an individual tree, and then add the totals of each stem diameter together.

Step 6: Record gps points

Using your device, record the latitude and longitude of each tree you assess. Make sure you set a consistent format for your coordinates, whether decimal degrees, degrees minutes seconds, or degrees and decimal minutes.

Step 7: Tag tree

Once you have assessed and recorded all of the above data, you must tag your tree with an individual marker and record the marker number. Treatment teams often use numbered tags, as this is the easiest way to look up DBH and other important information from your data sheet when it comes time to treat. Nail your numbered tags to the North side of each surveyed tree, 1-2 ft up the trunk.

Navigating the datasheets:

PLEASE NOTE: Documentation of treatments is legally required and you must retain these documents for a number of years.

Both self treatment data sheets found on the invasive species management page of our website are designed to help guide you through the survey and treatment process. In addition to your property information and required treatment information, both sheets have columns to record DBH, tag number, and coordinates of each tree. The general data sheet differs from the spray specific data sheet slightly in that it also includes drop down columns to assess the extent of HWA infestation and tree health using live crown ratio percentage, as well as has a built in formula to calculate DBH from circumference and round up. I would suggest using the general data sheet if using a soil drench/injection method and or using a regular tape measure and using the spray data sheet if using a basal bark spray method and or using a diameter specific tape measure.

If you have questions about how to navigate these data sheets, please contact stewardship coordinator Sky Harsch at sky.harsch@macd.org.

Treatment Options:

Treatment season is between May-October, as long as sap is flowing. Treatments should not begin once we have had our first hard front.

There are two main chemicals that you can use for HWA management in Michigan; imidacloprid and dinotefuran. Imidacloprid is a slow-acting, but longer-lasting pesticide. It takes 12 - 18 months to reach the canopy but can provide protection for up to 4 - 7 years. The second pesticide, dinotefuran, is a fast-acting, but short-lasting pesticide. It takes several weeks to reach the canopy, but may only last up to 1 - 2 years. One pesticide is not better than the other, there is a time and place for both pesticides. You can even use these pesticides at the same time, it just depends on the condition of the site. The cost would be dependent on how many hemlocks you have, what size they are, and what chemical and method you use.

MSU Extension has a helpful document detailing different treatment methods available to landowners. Page three of this document lists homeowner accessible chemicals for treatments with brand names you can find at box stores. You can find this document on the invasive species management page of our website. I have attached demonstration videos for each treatment method below, but be aware there are many processes you can use to effectively use these methods and the dosage will vary greatly depending on the chemical, concentration, and equipment you use. **DO NOT USE THESE VIDEOS AS YOUR GUIDE FOR MIX AND APPLICATION RATES.**

PLEASE NOTE: You must comply with all local, state, and federal pesticide laws. Always read chemical labels and abide by maximum application rates. The label is the law.

- [Soil Drench](#)
- [Basal Bark Spray](#)
- [Injection](#)