

TREATING HEMLOCK TREES FOR PROTECTION FROM HEMLOCK WOOLLY ADELGID



Hemlock woolly adelgid (HWA, for short) was first discovered infesting hemlock forests in Ohio in 2012. Since then, it has become established in many hemlock forests and managed landscapes across the state. More information about HWA in Ohio can be found at OhioDNR.gov/HWA.

Eastern hemlock trees

Accurate identification of your hemlock trees is critical. Eastern hemlock (*Tsuga canadensis*), sometimes called “Canadian hemlock” is a native, evergreen, coniferous trees species. Key identification features include small needles and cones, both about 0.5” in length.

Eastern hemlock forests represent a unique ecosystem in Ohio that supports many plants, aquatic organisms in streams, and terrestrial wildlife. The aesthetic beauty of these forests also makes them popular for recreation and other outdoor activities.

Hemlock woolly adelgid

HWA is a small insect in the order Hemiptera (which also includes scales and aphids) and is native to Asia. After hatching from an egg in the spring, the tiny nymphs attach to the base of the underside of a hemlock needle and do not move after that point.

HWA is most readily visible from late-October through May, when it forms a white, fuzzy, cottony mass over its body about 1/8” in diameter. **HWA will only be found on hemlock trees**, and not broadleaf deciduous trees or other coniferous trees. During the summer months, the cottony masses of HWA are not as visible, and detection can be very difficult.

Feeding by HWA depletes a hemlock tree’s stored nutrients, and leads to needle discoloration, needle loss, branch dieback, and eventual tree

death. In Ohio, it is expected that HWA will cause a slow decline in hemlock health, and trees may survive for 10 years or more before being killed.

If you suspect you have found HWA, contact the ODNR Division of Forestry at OhioHWA@dnr.ohio.gov or 614-265-6694.



Eastern hemlock needles, cones, and bark



White woolly masses of HWA on the underside of a hemlock branch.

Chemical treatments to protect hemlock trees

Before attempting any chemical treatment of hemlock trees, be sure that you have confirmed that they are infested with HWA. Because HWA is a relatively slow killer of hemlock trees, **preemptive chemical treatment prior to infestation by HWA is not warranted**. Commercial pesticide applicators may be hired to

conduct these treatments, but they can also be conducted by landowners.

In yard or landscape settings, contact insecticide sprays for control of HWA may be effective. This fact sheet focuses on the use of systemic insecticides, which are applied to the base of the tree (trunk or soil/roots), and moved through the tree’s vascular system into the twigs and foliage, where it controls the insect. Systemic insecticides are the only practical treatment method in forested settings.

For any pesticide application, read and follow all label directions and use the recommended personal protective equipment.

The two main systemic insecticides used for the control of HWA are imidacloprid and dinotefuran. Imidacloprid has been shown to provide control of HWA for at least 5 years after a single application and dinotefuran should be effective for 2 years. Additionally, dinotefuran is faster-acting, with control being achieved within several weeks after application, while imidacloprid can take up to a year before it begins to provide control. In most cases, this is not a major issue, as infested hemlocks can persist for years before dying due to HWA.

Environmental impacts

It is critical to follow pesticide label instructions to minimize impacts to non-target organisms and the environment. Avoid applying systemic insecticides to surface water or the bark or rooting zone of any flowering plants that may attract pollinators. Eastern hemlocks are wind-pollinated, and not visited by pollinating insects. Do not apply imidacloprid to the soil within 10’ of surface water. More information is available in the University of Georgia publication *Environmental Risks to Arthropods from Imidacloprid Applications for Hemlock Conservation*.

Soil application

Most liquid (soil drench) applications use an imidacloprid 2F product (e.g., Bandit 2F, Mallet 2F, Merit 2F, Xytect 2F). Any 2F imidacloprid product may be used as long as the application site (e.g., forest, woodland) is listed on the label.

If using an imidacloprid 2F product, add 18 oz. of imidacloprid 2F to a container. Fill with water to obtain a final volume of 1 gallon. See the below table for correct dosage per tree, based on the tree's trunk diameter at breast height (DBH), which is 4.5' above ground level. If your measuring tape only has linear inches, you will be measuring the circumference. Divide circumference by 3.14 to get the diameter.

There are also some imidacloprid products specifically for homeowners (e.g., Bayer Bioadvanced Tree & Shrub Insect Control, Bonide Tree & Shrub Insect Control). **If using these products, follow label instructions for proper mixing and dosage.**

It is important to frequently agitate the imidacloprid solution, as it will readily settle to the bottom of the container.

Create a shallow trench within 18" of the tree trunk all the way around the tree to remove the leaf litter or mulch and expose bare soil and fine roots. Measure out the correct amount of solution for the tree and slowly pour onto the soil to avoid splashing and runoff. Replace the leaf litter after application.



Bark spray application

In situations where there is little or no soil, or the soil around the tree is very compacted, preventing a soil drench application, a bark spray application may be appropriate. If using an imidacloprid 2F product, follow the same mixing and dosing guidelines for soil drench application, but pour the solution into a small, handheld pressure sprayer, and spray onto the tree's trunk, all the way around the stem, from ground level up to 5'. Use low-pressure and large droplet size to avoid drift and overspray of solution. Only placing the correct volume of solution for one tree in the sprayer, and spraying until empty, eliminates the need for sprayer calibration, which would be necessary for a sprayer that contains more solution than is needed for a single tree.

a 10% concentration product, the proper tree dosage is one mL of product (undiluted, directly from container) per inch of DBH. If using a 5% product, dosage is two mL per inch of DBH.

Divide the tree's DBH by 3 to determine the number of holes to drill. In the root flares at the base of the trunk, drill holes no more than 1" deep past the outer bark with a sharp 3/8" brad-point drill bit. Tap in plastic ports (e.g., #4 Arborjet Arborlugs) using a hammer and setter tool. The ports should be set to a depth such that the sapwood (whitish in color) is just showing above the port, interior to the outer bark (reddish in color). Fill syringe(s) with chemical and insert into ports and apply moderate pressure to plunger by hand to distribute the chemical among all the ports. Plugs are left in the tree, and will be healed over with new wood within a few years.



Treatment timing

The best uptake of systemic insecticides will occur when trees are actively transpiring, and moving water up from the roots to the foliage. This typically occurs when there is good soil moisture. These conditions often occur in Ohio in the spring and fall. Treatment should not occur during drought or when the soil is saturated or frozen.

Treatment assessment

You should not expect to see an immediate reduction or elimination of HWA after treatment. Assess treatment effectiveness by inspecting for HWA on the new twigs at the tips of the branches 1- to 2-years after treatment. **There is no need to re-treat hemlock trees until they have become infested with HWA again.**

Trunk injection

Direct injection of hemlock trunks with imidacloprid can be done for trees growing close to surface water, where soil and bark applications should not occur. There is no per acre limit of imidacloprid when being applied via trunk injection, so this method is also helpful for treating additional trees if the annual per acre limit of imidacloprid has been reached with soil drench and/or bark spray.

A liquid imidacloprid product specifically formulated for trunk injection (e.g., IMA-jet, Xytect 10%) must be used. If using

DBH	oz	DBH	oz	DBH	oz
2	0.5	14	10	26	24
3	1	15	11	27	25
4	1.5	16	12	28	26
5	2	17	13	29	28
6	2.5	18	14	30	29
7	3.5	19	15	31	30
8	4	20	16	32	32
9	5	21	18	33	33
10	6	22	19	34	34
11	7	23	20	35	36
12	8	24	21	36	37
13	9	25	22	37	38