

# General Treatments for Common Non-native Invasive Species in Forests of Northwest Lower Peninsula Michigan

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*The following recommendations about treatments of non-native invasive species are based on scientific research, bulletins published by agency personnel and university professionals who have specific expertise in non-native invasive species, and my own experiences controlling non-native invasive species as part of research projects and private sector projects in Michigan, Indiana, and Florida. There is obviously always some level of debate amongst professionals in terms of how to approach invasive species management; the text in this document is what I provide to landowners so therefore only represents my professional opinion. The focus of this document is recommendations for non-native invasive species commonly encountered in forest ecosystems of Northwest Lower Peninsula Michigan. This handout is NOT meant to cover all possible non-native invasive species.*

\*Beech bark disease (non-native invasive insect beech scale [*Cryptococcus fagisuga*] interacting with fungi; impacts American beech [*Fagus grandifolia*]), Dutch elm disease (non-native invasive fungus *Ceratocystis ulmi* interacting with native and non-native bark beetles; impacts certain elm species [*Ulmus* spp.]) and emerald ash borer (*Agrilus planipennis*; non-native invasive insect; impacts ash [*Fraxinus* spp.]) – Beech bark disease, Dutch elm disease, and emerald ash borer have and will continue to impact their host trees. Josh Shields recommends the landowner does nothing in this case and simply allow the trees killed by beech bark disease, Dutch elm disease, or emerald ash borer to remain, which will provide standing dead trees as wildlife habitat and eventually provide habitat in the form of down dead wood once the dead standing trees fall. Numerous species of mammals, birds, and herps (amphibians and reptiles) utilize dead standing trees and down dead wood, and leaving such structure in the forest is also beneficial for nutrient cycling in the soil, resulting in a higher level of soil health as compared to areas where such wood is completely removed. The IMPORTANT EXCEPTION to this is to have a salvage harvest of trees that still have merchantable value if the infested trees are harboring insects or fungi that can negatively impact host trees that still appear healthy.

\*Spongy moth (*Lymantria dispar*; formerly known as gypsy moth) – Spongy moth, even though it is a non-native invasive insect (impacts a wide variety of deciduous and coniferous tree species), now behaves more like a native pest so the best strategy is to promote tree health (the strong will usually survive spongy moth outbreaks by re-flushing leaves after being defoliated). Healthy trees in Northern Michigan typically do just fine after spongy moth outbreaks and it is important to remember that many weak trees that die from spongy moth would have likely died from a native pest or disease anyhow. This type of mortality actually results in higher species and structural diversity whereby young trees replace the older, weaker trees that have died. For example, oak (*Quercus* spp.) forests (a preferred forest type for spongy moth) in Northwest Lower Peninsula Michigan are "coming of age" and experiencing "natural" levels of oak decline anyhow so weak trees that die

from spongy moth would have likely died from something native such as the *Armillaria* spp. root rot fungi or the insect two-lined chestnut borer (*Agrilus bilineatus*), not to be confused with the abnormal levels of mortalities in healthy oaks caused by the non-native invasive oak wilt fungus (*Bretziella fagacearum*). It is also important to remember that 2020-2021 is considered a peak in the long-term cycle of spongy moths, so by the end of 2022, populations should be on the downward swing. And part of why spongy moth now behaves like a native pest is because some other organisms are keeping it in check, including biological controls that were released (such as the fungus *Entomophaga maimaiga*), as well as the virus *Nucleopolyhedrosis virus* (NPV).

Some individuals spray a bacterium called *Bt* (*Bacillus thuringiensis*) that has historically been used to control outbreaks of spongy moth. Josh Shields does not recommend this unless the damage from spongy moths is very serious and the goal is to save just a few yard trees. Josh Shields does not advocate the large-scale spraying of *Bt* because it can and does impact native foliage-eating caterpillars, and its application may not matter given how spongy moth currently behaves and given the current age and natural decline of oak forests anyhow.

Sometimes, there is a justification for spraying *Bt* on a few yard trees, especially when those yard trees are very old or recently planted, because they are already under stress in the suburban environment, and because spraying can help reduce the "nuisance" of the caterpillars. However, it is also important to address the stress factors of the tree in a yard situation, especially when there is a drought – Josh Shields recommends the landowner implement practices such as watering during such droughts, giving the tree an extra dose of food through slow-release fertilizers, and avoiding any unnecessary pruning. Late June through the rest of summer is too late to apply *Bt* in this part of Michigan (mid-May to late May/early June is the period), given that spraying is most effective on the young caterpillars as opposed to the caterpillars that have been active for a month or more already. In other words, spraying *Bt* is really only the most effective a couple of weeks after spongy moth caterpillars first hatch from the egg masses, which is mid to late May and early June in Northwest Lower Peninsula Michigan. The landowner can also simply monitor the trees and possibly initiate a process whereby egg masses are removed each year to reduce the number of caterpillars that will hatch during the beginning of the growing season. Following are some informative web pages on spongy moth:

- Michigan Department of Natural Resources (DNR) article from 6/21/2021 - <https://content.govdelivery.com/accounts/MIDNR/bulletins/2e4dd1d>
- Michigan DNR article from 5/12/2021 - [https://www.michigan.gov/dnr/0,4570,7-350-79137\\_79770\\_79780-559297--,00.html](https://www.michigan.gov/dnr/0,4570,7-350-79137_79770_79780-559297--,00.html)
- Michigan State University (MSU) page about scouting and destroying egg masses - [https://www.canr.msu.edu/ipm/invasive\\_species/Gypsy-Moth/surveying-egg-masses](https://www.canr.msu.edu/ipm/invasive_species/Gypsy-Moth/surveying-egg-masses)
- MSU page about how to deal with spongy moth - [https://www.canr.msu.edu/ipm/invasive\\_species/Gypsy-Moth/gypsy-moth-around-home](https://www.canr.msu.edu/ipm/invasive_species/Gypsy-Moth/gypsy-moth-around-home)
- Michigan DNR spongy moth page - <https://www.michigan.gov/invasives/id-report/insects/spongy-moth>
- MSU page about spongy moth and *Bt* - <https://www.canr.msu.edu/news/btk-one-management-option-for-gypsy-moth>
- Spongy moth webinar questions and answers – <https://www.michigan.gov/invasives/-/media/Project/Websites/invasives/Documents/ID-Report-resources/Spongy-moth-webinar-Q-and-A.pdf?rev=11e70c9d7b1f4bf5b42ba759c286ce0a&hash=830FB3030FEC912BAC327D4B5BFB0D0B>
- Michigan DNR article from 5/2/2022 – <https://content.govdelivery.com/accounts/MIDNR/bulletins/315f4be>

\*Hemlock Woolly Adelgid (HWA; *Adelges tsugae*) – HWA (non-native invasive insect; impacts eastern hemlock [*Tsuga canadensis*]) is currently spreading in Michigan. Treatments can be implemented if detected early enough. The landowner should communicate with the local Cooperative Invasive Species Management Area (CISMA; [https://www.michigan.gov/invasives/0,5664,7-324-103844\\_68072---,00.html](https://www.michigan.gov/invasives/0,5664,7-324-103844_68072---,00.html)) for more information. For Manistee County, the landowner should specifically communicate with the Northwest Michigan Invasive Species Network (ISN; <https://www.habitatmatters.org/>). For Mason or Lake County, the landowner should specifically communicate with the North Country CISMA (<https://www.northcountryinvasives.org/>). The landowner should also refer to the Michigan Invasive Species page about HWA at [https://www.michigan.gov/invasives/0,5664,7-324-68002\\_71241-367635--,00.html](https://www.michigan.gov/invasives/0,5664,7-324-68002_71241-367635--,00.html).

\*Oak wilt – Oak wilt is a non-native invasive fungus that impacts oak, particularly those in the “red oak group”. It is important that the landowner monitor for symptoms and signs of this disease on oaks in the “red oak group” (refer to bulletin published by MSU at [https://www.canr.msu.edu/uploads/resources/pdfs/Oak\\_Wilt\\_in\\_Michigans\\_Forest\\_Resource\\_\(E3169\).pdf](https://www.canr.msu.edu/uploads/resources/pdfs/Oak_Wilt_in_Michigans_Forest_Resource_(E3169).pdf)). It is also important to not prune or cut oaks during the highest risk period of April 15<sup>th</sup> to July 15<sup>th</sup>. Oak wilt is a challenging non-native invasive fungus to combat, but there are several control options that may be implemented, including a combination of the following treatments: a) Destruction or covering of wood from symptomatic trees for the entire growing season following the year that oak wilt caused the leaves to shed from the tree along with trenching a five-foot deep trench put in along the boundary of the infection zone (e.g., zone established using a Bruhn model [refer to MSU bulletin referenced previously]) and the removal of all apparently healthy trees within the infection zone; b) Destruction or covering of wood from symptomatic trees for the entire growing season following the year that oak wilt caused the leaves to shed from the tree along with the application of herbicide to apparently healthy trees within the boundary of the infection zone; or c) Destruction or covering of wood from symptomatic trees for the entire growing season following the year that oak wilt caused the leaves to shed from the tree along with the application of fungicide to apparently healthy trees within the boundary of the infection zone. The use of herbicides and fungicides have yielded more mixed results and are considered more experimental than the trenching treatment, at least currently. For more information about oak wilt, the landowner should visit the Michigan DNR webpage on oak wilt at [https://www.michigan.gov/dnr/0,4570,7-350-79136\\_79237\\_81077-370911--,00.html](https://www.michigan.gov/dnr/0,4570,7-350-79136_79237_81077-370911--,00.html) and the Michigan Oak Wilt Coalition webpage at <https://www.michiganoakwilt.org/>.

\*Controlling non-native invasive conifer trees – The landowner may consider controlling the non-native invasive conifer tree Scots pine (*Pinus sylvestris*). Josh Shields recommends that the landowner first consult with professionals to determine if a commercial timber harvest is feasible. If the landowner implements work on their own or hires a contractor to implement non-commercial cutting of non-native invasive conifers, Josh Shields recommends that the landowner cut the trees below the lowest branch whorl (the branches on the lowest branch whorl will grow upward if not destroyed) or use a chainsaw to girdle the trees, making sure to remove any branch whorls below the chainsaw girdles. With chainsaw girdling, the most reliable method is to place a chainsaw girdle around the entire circumference of the tree at a height of approximately 4.5 feet, making the cut approximately one inch deep, then creating another chainsaw girdle approximately six inches above or below the first girdle (that cut should also be approximately one inch deep). The landowner may also peel off the bark in between the two chainsaw girdles to ensure the tree does not heal. Herbicide is not needed for non-native invasive conifer trees since conifers do not sprout from the stump or the roots. Josh Shields also recommends that the landowner cut the non-native invasive conifers when the cones are closed so that seed is not spread during the removal of trunk and branches. If the non-native invasive conifers must be cut when the cones are open and releasing seed, Josh Shields recommends the landowner do not move cones away from the area where the tree was growing.

\*Controlling non-native invasive deciduous trees – The landowner may consider controlling non-native invasive deciduous trees that sprout aggressively from the stump or the roots (e.g., black locust [*Robinia pseudoacacia*] and tree of heaven [*Ailanthus altissima*]). If the landowner does not want to use pesticides, it is important for the landowner to be aware that cutting black locust or tree of heaven without using herbicides has been shown to make the population expand even more aggressively due to the ability of the species to sprout aggressively in response to being cut. For black locust, there are several options, all of which require applying herbicide. Black locust can be most effectively controlled by first using a basal bark application of herbicide (spray the entire circumference of each tree, to a height of 1-2 feet), a cut stump treatment (cut the trees at ground level and apply herbicide to the cut surface), or a hack and squirt treatment (make cuts around the circumference of the standing tree and apply herbicide to the wounds). Because black locust aggressively produces sprouts from the root system, even after an initial treatment is implemented using a basal bark, cut stump, or hack and squirt method, it is critical to monitor for root sprouts the following growing season and treat those sprouts with a foliar herbicide if necessary. For tree of heaven, there are several options, all of which require applying herbicide. The recommended control methods for tree of heaven are to use a basal bark application of herbicide (spray the entire circumference of each tree, to a height of 1-2 feet), or a hack and squirt treatment (make cuts around the circumference of the standing tree and apply herbicide to the wounds). Cutting tree of heaven (even if herbicide is used as a cut stump treatment) is generally not recommended. Because tree of heaven aggressively produces sprouts from the root system, even after an initial treatment is implemented using a basal bark or hack and squirt method, it is critical to monitor for root sprouts the following growing season and treat those sprouts with a foliar herbicide if necessary. For all treatment methods, there are numerous herbicides and mixture rates that can be effective. Following are some helpful links for additional information about controlling black locust and tree of heaven:

- Black locust control, by Michigan Natural Features Inventory (MNFI) – <https://mnfi.anr.msu.edu/invasive-species/BlackLocustBCP.pdf>
- Tree of heaven control, by Pennsylvania State University Extension – <https://extension.psu.edu/tree-of-heaven> and <https://extension.psu.edu/using-hack-and-squirt-herbicide-applications-to-control-unwanted-trees>

If the landowner hires a professional to apply herbicide, that professional must be Certified and Licensed by Michigan Department of Agriculture and Rural Development (MDARD; [https://www.michigan.gov/mdard/0,4610,7-125-1569\\_16988\\_35288-11993--,00.html](https://www.michigan.gov/mdard/0,4610,7-125-1569_16988_35288-11993--,00.html)).

\*Controlling non-native invasive shrubs – The landowner may consider controlling the non-native invasive shrubs (e.g., autumn olive [*Elaeagnus umbellata*], buckthorn [*Rhamnus* and *Frangula* spp.], Asian shrub honeysuckle [*Lonicera* spp.], multiflora rose [*Rosa multiflora*], Japanese barberry [*Berberis thunbergii*], etc.). If the landowner chooses not to use herbicides, fully uprooting the invasive shrubs is the only effective way to control them. If the landowner chooses to use herbicides, Josh Shields recommends that the landowner use a combination of hand pulling, basal bark application of herbicide (spray the entire circumference of each stem on each shrub, to a height of 1-2 feet), and cut stump treatment (cut the shrubs at ground level and apply herbicide to the cut surface of each stem for each shrub). Hand pulling should be used on any shrub where the entire root system can be pulled out of the ground. For shrubs that cannot be hand pulled and that are less than 5 feet tall, use a basal bark treatment. For shrubs more than 5 feet tall, use a cut stump treatment. For both basal bark and cut stump treatments, an effective herbicide mixture is to mix 20% to 30% of an herbicide that contains ester triclopyr as the active ingredient with 70% to 80% approved oil (based on the herbicide label). IMPORTANT –

some brand names with ester triclopyr are NOT approved for use in wetlands so it is important to READ THE PESTICIDE LABEL.

Following are website links to bulletins that contain a more detailed list of treatment options for common non-native invasive shrubs:

- Asian shrub honeysuckles – <https://cdn.shopify.com/s/files/1/0145/8808/4272/files/A3924-03.pdf>
- autumn olive – <https://mnfi.anr.msu.edu/invasive-species/AutumnOliveBCP.pdf>
- common buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Frangula alnus*) – <https://mnfi.anr.msu.edu/invasive-species/CommonBuckthornBCP.pdf>; <https://mnfi.anr.msu.edu/invasive-species/GlossyBuckthornBCP.pdf>
- Japanese barberry – <https://mnfi.anr.msu.edu/invasive-species/JapaneseBarberryBCP.pdf>
- multiflora rose – <https://cdn.shopify.com/s/files/1/0145/8808/4272/files/A3924-20.pdf>

Another, more experimental approach, is to use only a cut stump treatment with ready-to-use triclopyr or ready-to-use glyphosate that contain lower concentrations of active ingredients than what is typically used for invasive shrub treatments. Josh Shields conducted an experiment with this approach and found some success (contact Josh Shields for more information). An ideal time to apply the herbicide is during the autumn, when shrubs are already moving sugars downward into the root systems for the dormant season.

Herbicide application should be avoided during the spring when shrubs are moving sugars upward from the root systems to the twigs, thus counteracting the desired downward movement of herbicide. Because 100% mortality is not a realistic expectation during the first round of treatments, Josh Shields recommends that follow up treatments involve a foliar application (using a foliar herbicide with glyphosate or triclopyr) to kill sprouts from stumps where the shrub did not die, and to kill seedlings that have germinated from the seed bank. If the landowner hires a professional to apply herbicide, that professional must be Certified and Licensed by MDARD ([https://www.michigan.gov/mdard/0,4610,7-125-1569\\_16988\\_35288-11993--,00.html](https://www.michigan.gov/mdard/0,4610,7-125-1569_16988_35288-11993--,00.html)).

\*Garlic mustard (*Alliaria petiolata*) – The landowner may consider controlling the non-native invasive herbaceous plant garlic mustard. For garlic mustard, hand pulling (do not hand pull while the plants are producing seed that can be spread as the hand pulling is being implemented) can be effective with enough time and labor. Using foliar herbicides is also effective. Applying foliar herbicides in the spring should be avoided when there are native spring ephemeral plants present amongst the garlic mustard population. Garlic mustard can be treated with foliar herbicide during the autumn, when it is still green but native plants have senesced for the dormant season. More information about controlling garlic mustard can be found in an MNFI bulletin about garlic mustard at <https://mnfi.anr.msu.edu/invasive-species/GarlicMustardBCP.pdf>. If the landowner hires a professional to apply herbicide, that professional must be Certified and Licensed by MDARD ([https://www.michigan.gov/mdard/0,4610,7-125-1569\\_16988\\_35288-11993--,00.html](https://www.michigan.gov/mdard/0,4610,7-125-1569_16988_35288-11993--,00.html)). This same approach of hand pulling, herbicide treatment, or a combination of the two, can be used on many non-native invasive herbaceous plants in addition to garlic mustard.

\*Phragmites (*Phragmites australis*) – The landowner may consider controlling the non-native invasive grass Phragmites. The most effective treatment for Phragmites is herbicide (typically the active ingredients glyphosate or imazapyr). Cutting and flooding the Phragmites has also shown to be effective. For more detailed information about controlling Phragmites, the landowner should refer to a booklet published by Michigan DNR, EGLE, Department of Transportation, and Office of the Great Lakes, at <https://www.michigan.gov/egle/-/media/Project/Websites/invasives/Documents/Response/Status/egle-ais-guide-phragmites.pdf>. Given how challenging it is to control Phragmites, it is strongly recommended that the landowner hire a professional to implement the treatment. The landowner should communicate with the local CISMA ([https://www.michigan.gov/invasives/0,5664,7-324-103844\\_68072---,00.html](https://www.michigan.gov/invasives/0,5664,7-324-103844_68072---,00.html)) for more information

and inquire about the possibility of a CISMA strike team implementing treatments given that Phragmites is considered a high-priority invasive species. For Manistee County, the landowner should specifically communicate with the Northwest Michigan Invasive Species Network (ISN; <https://www.habitatmatters.org/>). For Mason or Lake County, the landowner should specifically communicate with the North Country CISMA (<https://www.northcountryinvasives.org/>).

\*Knotweed (*Polygonum* spp.) – The landowner may consider controlling the non-native invasive subshrub knotweed (e.g., Bohemian knotweed [*Polygonum x bohemicum*], Japanese knotweed [*Polygonum cuspidatum*]). The landowner SHOULD NOT cut knotweed and move the material as fragments can re-root and aggressively start a new population. Herbicides can be applied using injection or foliar applications (or a combination of both). Cut stump treatments can also be used so long as the material being cut is dried, destroyed, and not allowed to re-root. For more detailed information about controlling knotweed, the landowner should refer to the MNFI bulletin at <https://mnfi.anr.msu.edu/invasive-species/JapaneseKnotweedBCP.pdf>. Given how challenging it is to control knotweed, it is strongly recommended that the landowner hire a professional to implement the treatment. The landowner should communicate with the local CISMA ([https://www.michigan.gov/invasives/0,5664,7-324-103844\\_68072---,00.html](https://www.michigan.gov/invasives/0,5664,7-324-103844_68072---,00.html)) for more information and inquire about the possibility of a CISMA strike team implementing treatments given that knotweed is considered a high-priority invasive species. For Manistee County, the landowner should specifically communicate with the ISN (<https://www.habitatmatters.org/>). For Mason or Lake County, the landowner should specifically communicate with the North Country CISMA (<https://www.northcountryinvasives.org/>).