

**Integrated Pest Management (IPM) Guide for Garlic Mustard in the Pacific Northwest**

Revised December 2023

<b>Mechanical</b>	<b>Manual</b>	<b>Chemical</b>	<b>Integrated Pest Mgmt (IPM)</b>	<b>Notes/Tips</b>
<p><u>Mowing is not an effective control.</u> Plants will still bolt, flower and set seed, and many additional seed heads may be created by mowing.</p> <p>Mowing after seeds are present (typically, May-September) will spread garlic mustard. This has been shown to turn small infestations into large infestations very quickly.</p>	<p>Handpulling can be very effective but must be done when soil is moist enough to allow complete root extraction. Pry out the plant by the roots carefully by grasping from root crown to avoid breaking off the stem. A hori hori can be useful to loosen soil around base of plants. May not be practical at larger sites, or in all situations. Roots, especially root crowns, left behind may resprout. Monitor site for regrowth.</p> <p><u>Second year plants will continue to bolt, flower and set seed even once pulled, unless disposed of properly.</u></p> <p>All pulled plants must be bagged, removed from the site, and disposed of in the landfill (NOT yard debris/compost).</p> <p>Soil disturbance may cause increased seed germination or seedling flush.</p> <p><u>Timing:</u> Best time to pull is during flowering when plants are most visible and when root stores have been used for flower production. While rosettes can be dug up any time of year, provided the soil is moist enough, late winter or early spring is most ideal. <i>1<sup>st</sup> priority: Bolting and flowering 2<sup>nd</sup> year plants; rosettes may be controlled on a time permitting basis.</i> Note, <i>as many as 70% of rosettes may not reach maturity.</i></p>	<p><u>Spring (Apr – May):</u> At a minimum visit each site at least once (2+ visits are recommended) in the spring during the flowering period (early April-late May but this can vary due to weather conditions).</p> <p>Apply the suggested foliar spray during bolting or flowering to prevent seeding. <u>Be sure flowers and developing siliques (seedpods) have adequate coverage.</u> Triclopyr amine at 2% rate (or triclopyr amine choline at 1.5-2% rate), plus 1% site-suitable non-ionic surfactant (e.g. Competitor or Agridex) will minimize damage to competitive grasses and <i>may</i> work prevent seed maturation. Once immature seeds begin to form don't rely on herbicide to halt seed production. Up until flowering (but no later), 2% glyphosate can be used instead of triclopyr amine. See back for additional treatment info.</p> <p><u>Fall (Sep - Oct):</u> Rosettes can be sprayed in early fall after rain events and summer dormancy. Application should take place before fallen leaves cover plants. Trials suggest 1% glyphosate OR 1% triclopyr amine, and 1% site-suitable non-ionic surfactant. 0.5-1% imazapyr has also been effective, but may not be appropriate if mature trees or other desirable vegetation are nearby. Escort XP can also be used in the fall at 0.5 to 1 oz/acre but spring follow up is required to prevent seeding.</p> <p>Rosettes can be sprayed in late winter, but are only effective after winter dormancy. Garlic mustard often dies back in the winter so you must wait until the great majority of plants have re-sprouted.</p> <p>Rosette treatments at the height of summer are least effective due to summer dormancy.</p>	<p>Combination of spring herbicide application followed by handpulling is very effective.</p> <p>Spray bolting and flowering plants in early spring (typically early April-mid May). Revisit sprayed sites in late May-early June (once seedpods have started to harden and spraying has become ineffective) to handpull any plants that were missed or bolted after spraying. Pulled plants should be bagged and removed from the site and disposed of in the trash.</p> <p>Revisit sites if possible after initial pull and be prepared to repeat pulling if smaller or later growing plants bolt.</p> <p>Fall rosette treatments can also be added to this IPM method as directed in 'Chemical' section of this document. This approach has the potential to reduce spring workloads and may be beneficial to desirable native plant recruitment.</p> <p>Reseed (e.g. native grass such as blue wildrye etc) or replant trees/shrubs to provide competitive cover and/or limit erosion. Installing &gt;5" layer of mulch, particularly hemlock mulch, may limit seed germination.</p>	<p>Multiple years are needed to exhaust seed bank, which can last at least 5-10 years. Early detected sites are much easier to manage!</p> <p>Control before the plant goes to seed! Once seedpods are no longer milky, even sprayed plants will continue to set seed. TIP: Be sure to spray seedpods during late treatment applications using the 2% triclopyr amine solution described OR handpull and properly dispose of plants before seed matures.</p> <p>Do not move plants, or enter site, once seedpods yellow and mature black seed is present.</p> <p><u>Prevention is Key!</u> Consider impact of crews – clean boots, clothing, and machinery before moving from areas with garlic mustard plants/seed into uninfested areas!</p>

**Disclaimer:** This document is a basic guide and assumes no liability toward product efficacy, loss of non-targeted plants, or personal safety issues. Always follow label instructions, wear proper safety gear, and avoid herbicide drift. If in doubt as to control practices, consult a licensed herbicide contractor.

## **Important Notes:**

- \* Prevent new infestations!! Always clean equipment and footwear before and after entering a site. Consider limiting contractor work in affected areas.
- \* *Always read the entire label before using any herbicide. Wear proper safety gear, and mix and pour herbicides carefully in a safe environment.*
- \* A site-appropriate non-ionic surfactant and indicator dye will help with efficacy and control.
- \* Aquatic formulations of herbicides AND surfactants must be used near open water and riparian areas.
- \* Glyphosate-based products, such as Roundup and Rodeo are non-selective -- they will kill **all** green plants!
- \* If using one of the listed chemicals, spray to wet entire plant, including flowers and seedpods. Unsprayed seedpods may continue to set mature seed.
- \* There have been some casual observations that suggest that Vastlan (i.e. triclopyr amine choline) may not be as effective at halting seedpod maturation as Garlon 3A / Element 3A (i.e. triclopyr amine) during “late season” applications. More research is needed, but increasing Vastlan to 2% helps burndown..
- \* Treatment trials are ongoing that incorporate an ammonium-sulfate based conditioner to improve penetration and efficacy; may be useful for hard water.
- \* There are currently treatment trials testing a site-appropriate pre-emergent (e.g. indazaflam) in combination with other IPM methods. This method needs more exploration, but could be useful at certain sites that do not have natural native plant recruitment (e.g. roadside patches). Timing: fall and late winter applications.
- \* A new treatment mix (triclopyr amine, aminopyralid and metsulfuron methyl - a sulfonyleurea that adds a new mode of action) has shown good results. This mix includes Garlon 3A and Opensight or Garlon 3A, Milestone and Escort XP. Refer to labels for recommended rates. Adding Opensight (or Milestone and Escort XP) provides some residual control (higher rates will provide more). You can use Opensight at 6.6oz/ac rate if you are applying it to less than half of the treatment area (same limitation as Milestone when you use it at a rate over 7 oz/acre to 14 oz/acre) . Opensight can be broadcast at 3.3oz/acre. Escort XP’s label recommends using 0.5 to 1 oz/acre to control Garlic mustard. Ensure the products you select are appropriate for the site you are applying in.
- \* **REMEMBER: Garlic mustard can set seed even after being pulled! Dispose of plants in the trash—Do Not Compost, or place in yard debris.**
- \* It may be helpful to mark bags as “Noxious—Do Not Compost,” if worried about disposed plants being redirected to green waste stream.
- \* Limit invasive seed germination by improving competitive plant cover. Reseed sites with suitable native grasses or replant with trees and shrubs.
- \* Gravel trucked in from other sites may contain invasive weed seeds – please monitor right of ways/storage facilities throughout the year.

To access additional PNW-Garlic Mustard Working Group materials, please visit: [4countycwma.org/priority-weed-coordination/garlic-mustard-working-group](https://4countycwma.org/priority-weed-coordination/garlic-mustard-working-group)

To be added to the PNW Garlic Mustard Working Group listserv, please email Courtney Gattuso at the Western Invasives, [weeds@cascadepacific.org](mailto:weeds@cascadepacific.org).

*Adapted from Western Invasives Network IPM Matrix. Contact your local weed specialist for more information. For questions regarding information in this matrix, please contact Michelle Delepine (503-238-4775 x115, or [michelle@wmswcd.org](mailto:michelle@wmswcd.org)).*