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

Revised November 21, 2019

Mechanical	Manual	Chemical	Integrated Pest Mgmt (IPM)	Notes/Tips
Mowing is not an effective control. Plants will still bolt, flower and set seed, and many additional seed heads may be created by mowing. 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.	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. Second year plants will continue to bolt, flower and set seed even once pulled, unless disposed of properly. All pulled plants must be bagged, removed from the site, and disposed of in the landfill (NOT yard debris/compost). Soil disturbance may cause increased seed germination or seedling flush. Timing: 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. *1st priority: Bolting and flowering 2nd year plants; rosettes may be controlled on a time permitting basis.* Note, *as many as 70% of rosettes may not reach maturity.*	*These should be applied in tandem with practices referred to in the IPM column.* Spring (Apr - May): At a minimum visit each site at least once (2+ visits are recommended) in the spring during the flowering period (typically early April-late May but this can vary due to weather conditions). Apply the suggested foliar spray during bolting or flowering to prevent seeding. Be sure flowers and developing siliques (ie seedpods) have adequate herbicide coverage. Triclopyr amine at 2% rate (or triclopyr amine choline at 1.5% rate), plus 1% site-suitable non-ionic surfactant (e.g. Competitor or Agridex) will minimize damage to competitive grasses and *may* work quickly on preventing seed maturation. Once immature seeds begin to take shape in the seedpods don't rely on herbicide to halt viable seed production. Up until flowering (but no later), 2% glyphosate can be used instead of triclopyr amine. Fall (Sep - Oct): Rosettes can be sprayed in early fall after rain events end summer dormancy but before leaves begin to fall from trees and cover garlic mustard plants. Treatment trials to date suggest using 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 targeted plants are intermixed with mature trees or other desirable vegetation. Rosettes can also be sprayed in late winter, but this is only effective after winter dormancy ends. Garlic mustard often dies back in the winter so you must wait until the great majority of plants have re-sprouted.	Combination of spring herbicide application followed by handpulling is very effective. 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. Revisit sites if possible after initial pull and be prepared to repeat pulling if smaller or later growing plants bolt. 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. Reseed (e.g. native grass such as blue wildrye etc) or replant trees/shrubs to provide competitive cover and/or limit erosion. Installing >5" layer of mulch,	Multiple years are needed to exhaust seed bank, which can last at least 5-10 years. Early detected sites are much easier to manage! 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. Do not move plants, or enter site, once seedpods yellow and mature black seed is present. Prevention is Key! Consider impact of crews – clean boots, clothing, and machinery before moving from areas with garlic mustard plants/seed into uninfested areas!

		Rosette treatments at the height of summer may be least effective due to summer dormancy.	particularly hemlock mulch, may limit seed germination.	

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 and observation is needed.
* 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 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.
* **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 https://tinyurl.com/PNW-GMWG-info.

To join the PNW-GMWG list-serv, please visit https://tinyurl.com/PNW-GMWG-list.

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).