

Pest Management – Invasive Plant Control

Garlic Mustard (*Alliaria petiolata*)

Conservation Practice Job Sheet

MN-797



Garlic mustard (Alliaria petiolata)
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GARLIC MUSTARD

Garlic mustard (*Alliaria petiolata*) has a history similar to common tansy. It was brought from northern Europe in the mid 19th century as a medicinal and culinary herb that has escaped into the forests causing loss of native plants and habitat. The photos above show how invasive this plant can be.

In Minnesota, garlic mustard has invaded moist forests and woodlands in 25 counties, mostly in the southeast and central areas of the state. It was put on the invasive species list in 1999.

DESCRIPTION

Garlic mustard is a cool season biennial herb, forming a rosette of 3-4 scalloped, reniform leaves in the first year that stay green all year round and in the second year, stems of alternate,

sharply-toothed, triangular or deltoid leaves that emit a strong garlic or onion odor when young. Immature plants resemble several native species such as violets, white avens, bittercress and species of the Saxifrage family. The plants are more easily identified in the second year by the garlic odor of the leaves, early blooming of the 4-petaled, white flowers of these 1-3 foot tall plants, and a single, white “S” curved root where the stem meets the root ball. The garlic odor dissipates as the plants age.

In the second year, all surviving plants of any size produce flowers. After flowering, seedheads form atop a single stem, rarely multiple stems, in linear, 4-angled pods called a ‘siliques’. The seeds are ballistically expelled from the siliques 3-4 feet from the mature plant. Plants in drier conditions produce fewer seeds than those in

mesic or wet conditions. Seed production is inversely dependent on population density, the smaller the density the more seeds produced per plant, while plants in larger densities produce fewer seeds per plant; however total seed production is much greater with increasing density. Seeds remain viable for about 5 years in the soil.

The plant spreads by an advancing front and through satellite populations. Garlic mustard can self-pollinate or cross-pollinate. A single plant can reproduce to form a colony. Expelled seeds falling a few feet away advance the colonized area. Young plants emerge in the very early spring before native plants break dormancy thus suppressing native communities. Satellite populations begin when seeds are disbursed by animals either carried on the body or buried by rodents, or transported by mammals, humans or vehicles along roadsides and trails.

HABITAT

This persistent, rapidly expanding plant invades edges of partly-shaded, disturbed areas under deciduous woodlands, forests, riparian areas, savannahs, and alongside hedges, roads, railroad beds and trails. Floodplains are particularly susceptible. Most infestations begin at open edges and the plant then spreads to the interior of open moist woodlands and riparian areas, even in previously undisturbed habitats.

Garlic mustard can survive on any soil texture and calcareous soils, but not on strongly acidic soils such as peats or mucks. Although preferring moist areas, it can survive in sunny, dry conditions where the soils have been disturbed.

ECOLOGICAL THREAT

A population of garlic mustard can double in four years and within 10 years of infestation; it can overtake native herbaceous cover reducing biological diversity. The roots of garlic mustard may have an allelopathic effect on native herbaceous plants suppressing both germination and growth. It is also theorized that garlic mustard harms mycorrhizal activity important in

the survival of many native terrestrial plant species.

The plant does not provide any wildlife benefits. Large herbivores avoid eating garlic mustard unless no other forage is available. Since garlic mustard is related to native mustards, several butterfly species lay eggs on the plants; however the larvae die before maturing because the foliage is poisonous to them. Milk is tainted with a bad taste if cows eat garlic mustard rosettes.

CONTROL METHODS

Garlic mustard infestations are managed through prescribed burning, manual and mechanical techniques and herbicides. Ideally the plant is eradicated with the goal of preventing seed production and depleting the seed bank over time. All methods of weed control must be repeated 3 – 4 years or more for optimal effectiveness. If not completely controlled, just one garlic mustard plant can re-start a new infestation.

Biological control

Research is on-going to develop biological controls for garlic mustard. Several possibilities are under investigation.

Prescribed Burning

Prescribed burning is used in large areas with significant garlic mustard densities where hand pulling or cutting is not efficient. To eliminate an infestation completely, burning must take place annually for 3 – 4 years at minimum to deplete the seed bank. The burn should take place before the majority of plants mature beyond the rosette stage to prevent plants from forming seeds.

A mid-intensity, early spring fire, before native plants emerge, is ideal since spring fires destroy the future seed bank. Fall burning during the rosette stage can be very effective when leaf litter provides adequate fuel and native plants are dormant. Supplemental control measures can be applied until snowfall covers the ground.

If the fire is not hot enough, the burned area presents the perfect disturbed habitat for garlic mustard invasions and surviving root crowns will

send up flowers stalks and form seeds. Since population density will be low, each plant will produce an abundance of seeds and the disturbance will result in a high rate of seedling survival possibly resulting in an infestation greater than was present.

Mechanical or Manual Control

Mechanical or manual methods for controlling garlic mustard include weeding and cutting. Use these techniques for small areas where labor and time are sufficiently available. The ideal target is to remove seeds and seedheads (siliques). Garlic mustard does not spread by roots or stolons. Ideally, remove flower stalks just as flowers begin to develop for maximum effectiveness. Viable seeds may be formed after the flower stalks are cut so completely remove and destroy all flowers, siliques and seeds present.

Manual control

In moist soils pulling on the plants removes them entirely. Like dandelions, a new plant can emerge from broken roots, so the entire root must be removed. This technique causes significant soil disturbance, encourages seed sprouting from the seed bank and may impact nearby desirable plants through soil compaction or accidental destruction.

A variation of this technique is to remove just the flowers and seedheads. The site will need to be scouted multiple times during the growing season for repeat treatments if flowers or seedheads reform. This method is useful if labor or time is short per outing but multiple outings are possible. This method reduces soil and desirable plant damage.

Mechanical control

Another technique is cutting the stem at ground level with a weedeater, scythe, or other cutting tools. This method is used during the second year of growth at the time the flower stalk is elongating and is more successful where the plants are already in stress such as during droughts or in drier areas. Like burning, mechanical removal needs to be repeated for a number of years until the seed bank is depleted.

If mechanical or manual control methods are used, prevent the spread of seeds by changing outer clothing and footwear and thoroughly cleaning equipment and vehicles before moving off site.

Chemical control

An herbaceous plant like garlic mustard can be effectively controlled with the proper application of herbicides. Glyphosate applied to rosettes at a concentration of 1-3% or an amine formulation of 2,4-D is effective when applied to rosettes in the late fall or early spring. For plants in the rosette stage, triclopyr at a 1% a.i. concentration in solution with water is effective.

Bentazon is effective on dense stands of rosettes in mid-summer and causes less damage to native herbaceous and grass species. Apply bentazon at 0.5 to 1 pound per acre during the active growing season of rosettes; it is not effective beyond the rosette stage. This herbicide is water soluble but it is rapidly broken down and has little impact on germinating seeds of native plants.

Plants covered by leaf litter must be uncovered for the chemical treatments to work. Missed plants can repopulate and re-infest an area quickly. If applying near desirable plants, use paint brushes or wicks so only the target species is treated. Pre-emergent herbicides for seed bank control do not exist.

Important Note

Mention of specific pesticide products in this document does not constitute an endorsement. These products are mentioned specifically in control literature used to create this document.

Follow all label instructions when applying pesticides including ‘grazing and re-entry level restrictions’ and application site restrictions (Is the product labeled for “the application site” you are considering?)

By law, herbicides may only be applied as per label instructions. If the plant to be controlled or

eradicated is not listed on the label, it is illegal to use the product on that plant.

Most products listed in this series of invasive plant control job sheets are not acutely toxic but have high potentials to move off-site via leaching or runoff under certain conditions. Off-site movement potential can be minimized by following the instructions in the “foliar treatment” and “cut-stem” portions of these job sheets. Specifically, avoid over-spraying or application to the point where products are reaching or dripping onto the ground.

Keep in mind that glyphosate is a broad spectrum herbicide and kills anything it touches. Triclopyr kills broadleaf and woody plants and is a safer choice for prairies and grasslands. Be very careful when using herbicides in wetlands.

POST-TREATMENT MANAGEMENT

Garlic mustard invades bare soils, disturbed areas and floodplains; usually starting at an edge or opening. Preventing seeds from spreading into such opportunistic habitats is the best management technique especially in protecting natural floodplains.

Destroying the rosettes, flowers, siliques and seeds will have the greatest impact on reducing garlic mustard population growth rates. The size of the seed bank is related to the population age; thus timely treatment is important to stopping the spread of this plant. Drayton and Primack wrote about garlic mustard “A population with a history is more likely to have a future.” They also note that the most sensitive stage for controlling spreading is the transition from seed to rosette.

Ensuring healthy native species habitats, restoring bare soils and disturbed areas as quickly as possible and protecting floodplains will help control the spread of garlic mustard. Vigorous scouting and prompt removal of small populations are necessary to protect our native moist woodlands and riparian areas.

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