Alliaria petiolata (M. Bieb.) Cavara & Grande

Garlic mustard


Photo courtesy of Kelly Kearns
Washington State Noxious Weed Control Board

Family: Brassicaceae
Range: Reported in Alaska, British Columbia, Washington, Oregon, Idaho, Utah, Colorado, North Dakota, Nebraska, Kansas, and Oklahoma.
Habitat: Forest understory, parklands, rights-of-way, and riparian areas/floodplains.
Origin: Native to Eurasia and northern Africa. It was introduced into the U.S. as a food and medical plant, and also for erosion control. Apparently escaped from cultivation.
Impacts: Garlic mustard is shade tolerant and can move into stable forest understory where it rapidly outcompetes native vegetation. Once established, it can form near-monotypic stands, decreasing species diversity and function. It is considered potentially allelopathic, producing several phytotoxins that either directly affect growth of adjacent plants or interfere with mycorrhizal associations needed for normal root growth.
Western states listed as Noxious Weed: Oregon, Washington

Garlic mustard is a biennial or short-lived perennial to 3 ft tall. The basal leaves are kidney-shaped, while stem leaves are more triangular in outline. Both leaf types are alternate, petiolate, and toothed along the margin. First-year plants form a rosette, while second-year plants will bloom and set seed. All foliage produces a garlicky odor when crushed. The main taproot is distinctively S-shaped just under the soil surface.

Stems often branch near the top and bear individual flowers that alternate up the stem in a raceme pattern. Flowers bear 4 white petals, about ¼ inch long, and have 6 stamens. Seed pods are slender, 2.5-inch long siliques that split longitudinally into two sections at maturity. Garlic mustard reproduces exclusively by seed which typically fall to the ground below the parent plant. Flowers can produce up to 8,000 seeds per plant. Seeds can remain viable in the soil for 5 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Garlic mustard can be dug to remove individual plants or small stands. Remove as much root as possible, being careful to not break the root as these fragments can resprout. Hand pulling is an effective strategy on loose or coarse soil, but difficult to accomplish on heavy soil without substantial root fragmentation. When the plants have bolted in the second growing season, the stem may be easily grasped and pulled. Hand digging is often impractical for well-established or extensive infestations. Mowing can reduce or eliminate seed production. Plants should be cut as low as practical to limit growth of flowering stalks from below the cut. Cutting stems too soon or too infrequently will have little effect on control, while cutting too late will result in lower seedpods ripening and dispersing seed during the mowing process. Cultivation of first-year plants or before flowering of second-year plants can be effective. Mulching with plastic or fabric sheets may also suppress seed germination and plant growth.
Cultural	Garlic mustard is not known to be toxic to animals and, in fact, it is edible for humans. Grazing before flowering may reduce seeding, but could also negatively impact growth of native species that may be preferentially grazed at invaded sites. In general, most animals do not find garlic mustard to be palatable and it imparts an unpleasant odor to the taste of milk. Prescribed burning of large infestations for 2 consecutive years can provide effective rosette control. If fires are not hot enough, however, garlic mustard plants may not be killed and seedlings may be more likely to

	establish on the bare ground resulting from burning. In parks and other managed areas, healthy turf can be a useful tool for discouraging garlic mustard seed germination.
Biological	There are no biological control agents currently available to aid in the control of garlic mustard. However, six species have been identified that may be candidates for biological control agents in the eastern US: *Ceutorhynchus alliariae* and *C. roberti*, stem-mining weevils that attack rosettes and bolting plants; *C. constrictus*, a seed-feeding weevil; *C. scrobicollis*, a rosette-feeding weevil; *Phyllotreta ochripes*, a root/crown mining flea beetle; and *Ophiomyia alliariae*, a leaf- and shoot-mining fly.

CHEMICAL CONTROL

The following specific use information is based on published papers and reports by researchers and land managers. Other trade names may be available, and other compounds may also be labeled for this weed. Directions for use may vary between brands; see label before use. Most herbicide applications will require multiple applications over several years to fully control garlic mustard. Herbicides are listed by mode of action and then alphabetically. The order of herbicide listing is not reflective of the order of efficacy or preference.

GROWTH REGULATORS	
2,4-D Several names	**Rate:** Broadcast foliar treatment: 1 pt product/acre (0.48 lb a.e./acre). Spot treatment: 1% v/v solution **Timing:** Postemergence to rapidly growing plants before flowering. **Remarks:** Apply 2,4-D alone or mixed with dicamba (*Banvel* or *Clarity*). Some reports have shown that 2,4-D is not particularly effective for the control of garlic mustard.
Triclopyr *Garlon 4 Ultra*	**Rate:** 8 oz product/acre (3 oz a.i./acre). Spot treatment: 1.25 to 2.5% v/v solution (*Garlon 4 Ultra*) **Timing:** Postemergence to garlic mustard foliage in spring when plants are in the rosette stage. **Remarks:** Triclopyr is selective on broadleaf species.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Broadcast foliar treatment: 2 to 4 pt product (*Roundup ProMax*)/acre (1.1 to 2.25 lb a.e./acre). Spot treatment: 1 to 3% v/v solution **Timing:** Postemergence to rosettes in late fall or early spring when plants are in the rosette stage. **Remarks:** Glyphosate is a nonselective herbicide with no soil activity. Application in winter may cause less injury to native perennial plants, but may increase spring germination of garlic mustard seed.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Imazapic *Plateau*	**Rate:** 4 to 6 oz product/acre (1 to 1.5 oz a.i./acre) **Timing:** Postemergence to garlic mustard foliage in fall or early spring. **Remarks:** Use 2 lb methylated seed oil/acre to improve herbicide uptake. Imazapic is not registered for use in California.
Metsulfuron *Escort*	**Rate:** 0.5 to 1 oz product/acre (0.3 to 0.6 oz a.i./acre) **Timing:** Postemergence to garlic mustard foliage in fall or early spring. **Remarks:** Use 0.25% v/v non-ionic surfactant to improve herbicide uptake. Metsulfuron is not registered for use in California.
Sulfometuron *Oust* and others	**Rate:** 0.5 oz product/acre (0.38 oz a.i./acre) **Timing:** Postemergence to garlic mustard foliage in fall or early spring. **Remarks:** Use 0.25% v/v non-ionic surfactant to improve herbicide uptake.
Sulfosulfuron *Outrider*	**Rate:** 2 oz product/acre (1.5 oz a.i./acre) **Timing:** Postemergence to garlic mustard foliage in fall or early spring. **Remarks:** Use 0.25% v/v non-ionic surfactant to improve herbicide uptake.

RECOMMENDED CITATION: DiTomaso, J.M., G.B. Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.