

Garlic Mustard *Alliaria Petiolata*

NATURAL HISTORY

Garlic mustard is a biennial herb of the mustard family (Brassicaceae). This family also contains cauliflower, broccoli, and kale. It was brought to the United States by early settlers most likely from the British Isles, Belgium and the Netherlands. It was historically eaten as a potherb, particularly in winter and early spring when few greens were available. It's Vitamin A and Vitamin C content is substantially higher than in commercially grown fruits and vegetables. In its native Europe, Garlic Mustard grows in hedges, fencerows in open woods and is associated with calcareous soils.

In North America, Garlic Mustard is most common in deciduous forest and also occurs in the partial shade characteristic of oak savanna, forest edges, hedgerows. Garlic Mustard is disturbance adapted, and is frequent in sites subjected to continued or repeated disturbance, such as floodplains, roadsides, hiking trails, railroads, and abandoned farmland.

LIFE CYCLE

Because Garlic Mustard is self fertile, a single individual is sufficient to populate or repopulate a site.

Garlic Mustard is an obligate biennial, completing its life cycle within a two-year period. First year seedlings germinate in February and March. Unlike some forest crucifers that fail to germinate under leaf cover, *Garlic Mustard* seeds germinate in both light and dark. By June, seedlings develop into a basal rosette only a few inches tall with leaves that are round, scalloped-edged and dark green, with a garlic odor. Immature plants can be confused with other rosette-forming species, especially violets (*Viola* sp.) and golden ragwort (*Senecio aureus*).

By mid-fall rosettes average 2-5 inches in diameter and are dark green to purplish in color. The leaves store energy in the large white, taproot, with a distinctive "s" curve just below the root crown. The leaves and roots overwinter as a basal rosette which continue to grow during snow-free periods when temperatures are above freezing.

In the second year, plants become reproductively mature, then die. Flower stalks begin to elongate in March or April, growing at the rate of ½ inch per day. Flowers open in April and May and are numerous, small, and white, with 4 petals that form a cross. Flowers remain open for 2 -3 days, but nectar production and insect visitation occur primarily on the first day of flowering. Pollinators include medium and small sized solitary bees, medium sized flies, and rarely a honey bee or bumblebee. Garlic Mustard flowers can be self-or cross-pollinated. Because Garlic Mustard is self fertile, a single individual is sufficient to populate a site.

The fruits are slender capsules termed siliques that contain a single row of oblong black seeds. Seeds ripen and disperse between mid-June and late September. The seed capsules are explosively dehiscent, meaning that when they are dry they explode like popcorn and eject the seeds up to a few meters from the plant. Plants with large rosettes produce flowers earlier and

for a longer time period, and consequently produce significantly more seeds than plants with small rosettes. Plants in drier communities tend to produce fewer seeds than plants in wet communities, and isolated plants produce more seeds than plants growing in high densities. Garlic mustard seeds can remain viable in the soil seed bank for up to five years.

Garlic Mustard spreads exclusively by seed which become widely dispersed primarily by human activity. Seed stick to boots, clothing, hair, mower blades, and vehicle tires mowing, in automobiles. Birds, rodents and whitetail deer are also likely seed dispersers in woodland habitats and seeds can float so they are widely dispersed in floodwaters.

ECOLOGICAL IMPACT: Garlic Mustard can totally dominate a forest floor within 5-7 years of its introduction.

Garlic Mustard displaces many native wildflowers. It grows during early spring and late fall when native species are dormant so it can shade out native wildflowers and tree seedlings before they have a chance to grow. In dense populations, the first-year leaves may block virtually all sunlight from reaching the ground. Moreover, it has no known natural enemies in North America, outside of the occasional slug and snail browse. In Europe, Garlic Mustard is fed upon by 69 species of insects.

Garlic Mustard damages local insect populations. Adults of several native butterfly species lay eggs on garlic mustard, but many or all of the larvae die before completing development. Thus, garlic mustard serves as a population sink for these species.

Garlic Mustard may also inhibit mycorrhizal activity in native plants. Like other members of the Brassicaceae, Garlic Mustard is nonmycorrhizal, while some 75% of native groundlayer plants are mycorrhizal. Mycorrhizae colonize root systems and are critical for nutrient and water uptake.

CONTROL METHODS The best and most effective control method for *Garlic Mustard* is to prevent its initial establishment.

Garlic mustard is frequently overlooked at low density levels, but a small population can explode in favorable years. In a site that is largely Garlic Mustard free, enjoy a leisurely walk in the spring and fall, pulling out all Garlic Mustard plants as you go. Flowering plants are easier to locate, and should be removed before seeds are released. Basal rosettes are less noticeable, but may be removed at any time. Pay particular attention to potential entry points, along the forest perimeter, parking lot edges, trails, riverbanks, floodplains, streamsides, and at the bases of large trees.

For sites already infested with Garlic Mustard, a consistent effort over multiple years is required to reclaim the area. The goal is to prevent seed production until the seed bank is depleted, potentially 2-5 years. Focus first on controlling small populations of Garlic Mustard in high quality natural areas. It is best to resist the urge to wade into the middle of the worst patch you can find. Such sites can scarcely get worse, and remember that people are one of the primary sources for carrying the seeds to new sites, so you may do more harm than good if you spread

the plant to new areas via seeds on your shoes and clothes.

A better plan is to survey the area and begin working to eliminate the outlying, young colonies first and then work your way in toward the heavier density areas. Garlic Mustard spreads through establishment of multiple small populations. The general pattern of spread is a ragged advancing front, supplemented by establishment of satellite populations. After a few years, the front coalesces with the satellite populations to form an extensive area of garlic mustard.

When removing garlic mustard there's a couple of things to keep in mind. First, make sure to remove the root. The root stores the energy of the plant, and if it is left in the soil, the plant can manufacture a second wave of leaves and flowers. Second, if the plant has begun to elongate its flowering stalk, you need to make sure the roots dry out completely after you pull it. If you leave the plant on the ground, it will soon re-root and continue its growth cycle. If you can not pull all of the Garlic Mustard, you can also cut flowering stems at ground level with a weed whip to prevent seed release. Some native species, such as Trillium, are severely impacted if cut but most other species are not substantially damaged.

The best time to cut Garlic Mustard is when plant is just finishing flowering and the seed pods are still green. The plant has expended all of its stored energy and nearly finished its life cycle. At this time, cutting should kill the plant. Plants cut earlier in the flowering period may have sufficient resources to produce additional flowerstem. Cut flower stems may form viable seed so they should be removed from the site. Whatever the control method, keep in mind that it must be continued annually until the seedbank is exhausted.

Burning can be a great aid in controlling Garlic Mustard, since it is evergreen. A properly timed burn can set back or kill rosettes. Because a fire exposes the soil, it can also speed germination of Garlic Mustard seeds already in the soil. Just because a site has been burned, don't assume that Garlic Mustard has been eliminated. While fire can maintain Garlic Mustard at low abundance, it does not eliminate this plant.

References

The Nature Conservancy Element Species Abstract

http://www.uwgb.edu/biodiversity/herbarium/invasive_species/allpet01.htm