

Rampant and Most-feared Invasive GARLIC MUSTARD

Murders Crops, Wildflowers, and Forests, Poisons the Land, Kills Butterflies



In the forest, garlic mustard can out-compete native wildflowers and grow into a monotypic stand that severely reduces biodiversity.

The Culprit

This beastly invasive, a mustard-family member, was brought to North America by European settlers as a medicinal and culinary herb. All parts of garlic mustard, sometimes nicknamed GM, emit a strong garlic odor. The first record of its escape from cultivation was in 1868 on Long Island, NY. By now, garlic mustard (*Alliaria petiolata*) is destroying forests and killing butterflies in 34 states, ranging from the Northeast and Mid-Atlantic to the Midwest into the Pacific Northwest and Alaska. Its seeds need a lengthy period below freezing to germinate, so GM is not a problem in the Deep South.

Garlic mustard has displaced native wildflowers such as spring beauty, wild ginger, bloodroot, trillium, and toothworts in vast forested areas. This is because GM grows so vigorously in early spring and fall that it out-competes them. Also, no insects or animals eat this plant in North America, unlike in its native Europe where browsing by herbivores and munching by insects keeps it under control. Within ten years of its arrival in an area, garlic mustard can take over the forest floor. Several native butterfly species are threatened because their wildflower hosts are now rare due to incursion by GM. Other butterflies are endangered because they lay their eggs on GM instead of on their host plants and GM's leaves poison their larvae. Furthermore, taints the soil with toxins, inhibiting wildflowers and forest tree regeneration.

Known Hangouts

Although garlic mustard prefers moist, semi-shady sites in soil that is not highly-acid, it grows almost everywhere in the Blue Ridge. The noxious weed hangs out in both disturbed and undisturbed sites in sun and shade. Once it gains a

foothold in a disturbed area, it sets up residence and really takes off. Its seeds germinate nearby, increasing the density of the weed's population; seeds then travel via water and soil movement along animal paths, hiking trails, road edges, and streams, spreading from there into forests, fields and floodplains to start new colonies in undisturbed sites.

Modus Operandi

Like other members of the mustard family, garlic mustard is a biennial that completes its entire lifecycle in two growing seasons. Its seeds germinate any time from spring to fall. The first-year plants spend the winter as ground-hugging rosettes of evergreen leaves. Second-year plants send up flower stalks in early spring, form seeds in late spring and early summer, then die. Its seeds remain viable for five or so years. No matter how tiny a seedling is, when spring weather says it's time to blossom, that's what it does. Plants only a few inches tall will produce flowers at their stem tips. The flowers are self-fertile – that means they do not need pollen from another plant for fertilization and seed formation. A single plant can set seed all by itself and GM is a very prolific seeder. Estimates vary, but a single plant can produce anywhere from 400 to 7,000 seeds before it expires. Its progeny live on and on and on, with stands



Garlic mustard overwinters as a rosette of heart-shaped evergreen leaves that grow during warm winter days, giving it a head start in spring.

of garlic mustard growing ever larger over the years. GM discourages other plants by growing very early in spring (March and April in the Blue Ridge) and thus shading them out, and by exuding cyanide-containing toxins

into the soil. The toxins kill soil fungi necessary for forest tree growth and regeneration and inhibit wildflowers. Deer encourage garlic mustard when their hooves turn over the soil, bringing seeds to the warm soil surface where they can germinate, and by eating wildflowers and other native plants, thus making room for garlic mustard to spread.

Positive Identification

Garlic mustard is not difficult to identify once you familiarize yourself with it. The leaves form a basal rosette and are dull

green and said to be kidney-shaped – rounded with a heart-shaped base surrounding the leaf stem. They have prominent scalloped edges. The veins in the leaves are quite conspicuous, creating a quilted texture. In early spring, second-year plants send up a single, slender or branching flowering stalk; multiple stalks may develop if the crown was injured. The leaves on the stalk are triangular with toothed edges, an important characteristic for identification.



Individual flowers have four white petals arranged in a cross.

Flowering plants can grow 3 to 5 feet tall in a moist site, although a height of 1 to 1½ feet is most common. Stalks shoot up so fast in spring that second-year garlic mustard plants are usually the tallest plants on the forest floor in May, which makes them easy to spot. A round cluster of flower buds tops the young stalk, but as the stalk elongates, flowers spread into a spike. Individual flowers are tiny with four white petals arranged in a cross.

Flowering occurs over three or more weeks. Even while the oldest flowers are forming siliques (seedpods) the youngest flowers at the tip may still be in bud. The slender, seed-containing pods start out green and mature to straw colored. As they split open in summer and fall, they reveal elongated black seeds. The dried fruiting stalks persist for months and stand out prominently in summer in the green forest.

Mistaken Identity

Several wildflowers that grow in woodlands where garlic mustard often occurs might be mistaken for it. Toothworts (*Cardamine* sp.) lack a basal rosette and their leaves are deeply



Note the prominent veins and scalloped edges on the garlic mustard leaf (left) compared to a violet leaf (right).

cut with toothed edges, unlike GM's kidney- and triangular-shaped leaves. Toothworts' four-petaled, pinkish-white flowers resemble GM's but bloom on shorter, fuller stems in dense clusters.

The leaves of many violets (*Viola* sp.) resemble small rosettes of garlic mustard. However, their heart-shaped leaves lack

the prominent scalloped edges and quilted texture and they are smoother and more shiny. The closest native wildflower look-alike is early saxifrage (*Saxifraga virginica*). It has a basal rosette of fleshy, scallop-edged leaves and a stalk of five-petaled, not four-petaled, flowers. Its dried stalks resemble GM; however, the saxifrage leaf stems are narrow and un-toothed, not triangular and toothed. The best way to identify GM is to crush and sniff the leaves. They are pungent and smell like garlic and mustard.



Left: Garlic mustard seedpods split open in late summer and fall to reveal slender black seeds. **Right:** Garlic mustard seedling swarms germinate in fall and early spring and should be sprayed before spring ephemerals appear.

Search and Destroy

Look for garlic mustard in forests, fields and gardens, and along roadsides. When you find a large patch of garlic mustard -- or even a single plant -- search for scattered individual plants and swarms of seedlings in the vicinity, especially downhill where water might wash seeds. If you find only a few plants, don't be lulled into thinking you don't have a problem. Where there are a few, there likely will be many in following years. Control is not difficult if done before second-year plants set seed. Be mindful of how early GM blossoms and how quickly it sets seed; newly germinated seedlings may not be obvious at first because they may be buried in leaf litter. Repeat searching and destroying may be necessary.

Manual & Mechanical: It is impractical to hand-pull garlic mustard in a heavily-infested area, but it works for scattered plants and small groups. Hand-pull rosettes any time of year when the soil is moist. Grab the stem under the rosette at soil



When hand-pulling GM, be sure to remove the taproot.

level, twist and pull. Be sure to get the entire taproot because the plant will regrow from a piece of root. Tamp down the soil to avoid bringing seeds to the surface. If GM has been established for several years, the seedbank is extensive; hand-pulling may bring more seed to the surface where it readily germinates. If a hand-pulled GM contains green or ripe seedpods, do not

toss it on the ground because seeds may continue to ripen and become viable. Bag and dispose of these in the garbage, taking care not to scatter seeds during bagging.

Foliar Spray: Spot-spray garlic mustard rosettes with a recommended herbicide any time the ground is not frozen. Add surfactant if the product does not contain it. Continue to monitor treated areas for several years for new seedlings and any missed plants.

Biological Control: A root-crown-boring weevil studied at Cornell University may be available in the near future.

For currently approved herbicide recommendations, check the Virginia Department of Forestry chart *Non-Native Invasive Plant Species Control Treatments*, which you can download from the Blue Ridge PRISM website.