

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 mono-typical 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 Mid-west and into the Pacific Northwest and Alaska. Because its seeds need a lengthy period below freezing to germinate, garlic mustard 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, this weed is not eaten by any insects or animals in North America, unlike in its native Europe, where browsing by herbivores and munching by insects keeps it under control. Several butterfly species have become 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. Also, garlic mustard taints the soil with toxins, inhibiting forest tree regeneration. Within 10 years of its arrival in an area, garlic mustard can take over the forest floor.

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, this prolific seeder sets up residence and really takes off. Its seeds germinate nearby and increase the density of the weed's population; seeds then travel and start new colonies in undisturbed sites. GM travels along animal paths, hiking trails, road edges, and streams, and spreads into forests, fields and floodplains.

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 summer, and then die. Garlic mustard is programmed to flower and produce seed, and 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 fertili-



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

zation and seed formation. A single plant can set seed all by itself. GM is a 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 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 spread garlic mustard when their hooves turn over the soil, which brings 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 on a basal rosette are dull green and said to be kidney-shaped (rounded with a heart-shaped base surrounding the leaf stem) and 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.

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, the flowers spread out into a spike. Individual flowers are tiny with four white petals arranged in a cross.



Individual flowers have four white petals arranged in a cross.

Flowering occurs over three or more weeks. Even while the oldest flowers are forming seedpods, the youngest flowers at the tip may still be in bud. The slender, seed-containing capsules 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 may be mistaken for it. Toothworts (*Cardamine* sp.) lack a basal rosette and their leaves are



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

deeply 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 scal-

loped edges and quilted texture. The closest 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 leaves on saxifrage stems are narrow and untoothed, not triangular and toothed. The best way to identify GM is to crush and sniff the leaves. They smell like garlic and mustard.

Text and photos by Susan A. Roth



Left: Garlic mustard seed capsules split open in late summer and fall to reveal slender black seeds. Right: Garlic mustard dies after seeds are set and the dried stalks stand out in the green forest.

Search and Destroy

Look for garlic mustard in the forest, in 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 will be many in following years. Control is not difficult if done before second-year plants set seed. Be mindful of how early GM blooms and how quickly it sets seed and that 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 when the soil is moist any time of year. Grab the short stem under the rosette and pull. Be sure to get the entire taproot because the plant will regrow from a piece of root. Then tamp down the soil to avoid bringing seeds to the surface. If GM



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

has been established for several years, the seedbank is extensive and hand-pulling brings more seed to the surface where it readily germinates. *Even after being pulled from the ground, a second-year GM plant continues to grow, flower and set seed!* Bag and destroy such plants. Do not pull plants once seed stalks ripen from green to brown, as this scatters the seed.

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 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.