Identification, Control, and Impact of Garlic Mustard, *Alliaria petiolata*

Fact Sheet FS1212







Cooperative Extension

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Introduction

Garlic mustard, *Alliaria petiolata*, is an aggressive non-native herb in the mustard family (*Brassicaceae*) which has invaded many wooded areas of New Jersey with the exception of the Pinelands. It poses a serious threat to native plant and insect diversity. In addition to disturbed forest lands, garlic mustard affects homeowner woodlots, gardens, flower beds, low tillage farming operations and even lawn areas.

Description and Characteristics

The genus name, *Alliaria*, comes from the garlic or *Allium*-like odor on new foliage when leaves are crushed, an unusual scent for a plant in the mustard family. The aroma usually fades as the foliage ages. The species name, *petiolata*, means that leaves are attached to the stalk by a simple leaf stem (petiole).

Garlic mustard's ability to tolerate shade makes it one of the few non-native species that can easily invade the understories of North American deciduous forests. Dense stands of garlic mustard can divert light, growing space, water and nutrients from herbaceous native plants and woody seedlings that grow in similar conditions.

Life Cycle in New Jersey

In the USA, garlic mustard is typically a biennial. It takes two years to fully mature and set seed. In the first year, the plant forms a low cluster of leaves and spends the winter in that form. If temperatures are above freezing, this basal rosette may continue to grow leaves. It matures rapidly in the second year, produces flower stalks, sets seed, and then dies. The seed pods, called siliques, are long, narrow, four-sided and contain rows of small, black, oblong seeds. The dried stalks and seed pods can continue to hold viable seeds through the summer.

Mature plants can reach a height of 3.5 feet in good growing conditions but flowers can also appear on much shorter stems. Flowers can be self-pollinated or cross-pollinated by insects. Because it is self-fertile, a single plant can populate or repopulate an entire site.

Garlic mustard reproduces only by seeds. The average single plant produces between 600 to over 7,500 seeds for a very vigorous, multi-stemmed plant. Soil disturbance aids in seed production so reproduction is highest in the most disturbed sites. The size of mature garlic mustard populations on a site can vary from year to year depending on when seeds germinate. Most seeds lose viability after the first year but some can remain dormant for 4-6 years or longer.

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Distinctive Features of Garlic Mustard Plants

Correct identification of garlic mustard, before hand-pulling, is important because desirable look-alike plants may be growing at the same time. These include toothworts (*Cardamine* or *Dentaria*), wild anise (*Osmorhiza longistylis*), sweet cicely (*Ozmorhiza claytonii*) and early saxifrage (*Saxifraga virginiensis*).

- Basal rosettes stay green in fall and winter; spring growth starts very early
- Crushed rosettes and new foliage have an odor of garlic
- The white tap root has an S-shaped curve at the top as opposed to the roots of violets which grow straight down
- It is usually the only tall, broad-leafed, four-petaled white woodland plant blooming in early spring.



Ecological impact

In the Northeastern and Mid-Atlantic states, garlic mustard poses a threat to native wildflowers like spring beauty (*Claytonia virginica*), toothworts (*Cardamine* or *Dentaria*), trilliums (*Trillium* spp), hepatica (*Hepatica nobilis*), Dutchman's britches (*Dicentra cucullaria*), bloodroot (*Sanguinaria canadensis*) and wild ginger (*Asarum canadense)*. The loss of plant diversity threatens native insects, including butterflies, because egg-laying sites and food sources may no longer be available.

Research shows that garlic mustard is allelopathic, meaning that it releases chemicals which can inhibit the growth of other plant species. Some researchers believe that these compounds can also hinder beneficial soil fungi (mycorrhizal fungi) which help tree roots take up water and nutrients. In experimental trials, the removal of garlic mustard led to increased diversity of annuals, tree seedlings and other plant species.



Management and Control for Homeowners

The best option for homeowners is to keep garlic mustard from becoming established on your property. This is best done by removing basal rosettes and second year plants before they flower.

Disturbances in wooded areas should be kept to a minimum by reducing overgrazing, foot traffic and erosion. Once a heavy infestation of garlic mustard is established, it will require regular monitoring and removal of new plants for at least five years to eliminate the infestation because of seed longevity.

Mechanical Control for Homeowners

Removing garlic mustard by hand is not difficult if done when the soil is moist. Pull out all the roots or at least the top half where a new plant could re-sprout on live root buds. Flowering plants can be cut to the ground to prevent seed production but plant parts should be bagged and removed. Plants could still re-sprout after cutting. When using a weed line trimmer, care should be taken not to cut native plants growing near garlic mustard and to keep soil disturbance to a minimum.

Chemical Control for Homeowners

A non-specific systemic herbicide, like glyphosate, can be used to control garlic mustard but repeated applications will be necessary for several years as seedling emergence may continue. The herbicide can be applied at any time of the year, including winter for over-wintering rosettes, if temperature and weather conditions are in the range recommended on the label. However, spraying in early spring, or late fall, when

other plants are dormant, reduces the risk of destroying desirable plants. Spray should cover the leaves but not to the point of dripping to the ground. Using a spray shield to prevent drift and to protect other plants is recommended. Wear protective clothing. Read and follow all directions on the product label.

Biological Control Under Consideration

In Europe, garlic mustard is kept under control by many native biological enemies. Biological control using the weed's natural insect enemies is under consideration in New Jersey but still needs to undergo testing.

Five weevils (*Ceutorhynchus* spp) and one flea beetle (*Phyllotreta ochripes*) have been under investigation as possible biocontrols for garlic mustard. The weevils include two stem-feeders, two seed-feeders, and a root-crown feeder. Most of the damage is done by larvae inside the plant so observation is not usually possible. When under heavy attack by one or more of the weevil species, garlic mustard plants become shorter, less robust, have tip dieback and produce fewer flowers and seed pods. The flea beetle adults feed on leaves and the larvae are root miners.

One weevil, *C. scrobicollis*, is currently being evaluated in the University of Minnesota's quarantine facilities. New Jersey plans to start a mass breeding program at the Phillip Alampi Beneficial Insect Laboratory in Trenton as soon as the insects are released from quarantine. Four garlic mustard test sites have already been established in Cumberland, Monmouth, Mercer, and Hunterdon Counties.

References:

USDA National Plant Library, Species Profile/ Garlic Mustard. 2011: invasivespeciesinfo.gov/plants/garlicmustard.shtml

The Bugwood Network. BugwoodWiki. wiki.bugwood.org/Alliaria_petiolata

BugwoodWiki. Internet 2010. wiki.bugwood.org/Archive:BCIPEUS/Alliaria_petiolata

Mayer, M., W. Hudson, G. Robbins. Internet. 2010 Annual Report on Garlic Mustard, Alliaria petiolata, an Alien Invader of NJ's Deciduous Forests. NJ Department of Agriculture: nj.gov/agriculture/divisions/pi/pdf/garlicmustard.pdf

Swearingen, J., B. Slattery, K Reshtiloff, and S. Zwicker. 2010. Plant Invaders of Mid-Atlantic Natural Areas, 4th ed. National Park Service and U.S. Fish and Wildlife Service. Washington, DC. 168pp.

Rowe, P. and J.M. Swearingen. Internet, 2009. Garlic Mustard Alliaria petiolata (Bieb) Cavara & Grande. PCA Alien Plant Working Group – Garlic Mustard (*Alliaria petiolata*). nps.gov/plants/alien/fact/alpe1.htm

New Jersey Department of Environmental Protection, Division of Science, Research and Technology, NJ Non-Native Plants, "Garlic Mustard Fact Sheet" October 2008: nj.gov/dep/njisc/Factsheets/garlic_m.pdf

NJ Department of Agriculture Biological Control of Plant Pests. nj.gov/agriculture/divisions/pi/prog/biological.html#9

USDA NRCS Plants Database (*Alliaria petiolata*). plants.usda.gov/java/nameSearch?keywordquery=Alliaria+petiolata&mode=sciname&submit.x=4&submit.y=13

Blossey, B, V.Nuzzo. Internet. 2008. (Garlic Mustard Monitoring Protocol). invasiveplants.net/monitor/gm_monitor.aspx

Organizations

Plant Conservation Alliance: nps.gov/plants

New Jersey Invasive Species Strike Team: njisst.org

Mid-Atlantic Invasive Plant Council: maipc.org

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