Garlic Mustard
(Alliaria petiolata)

A Major Threat to Wisconsin's Woodlands

Garlic Mustard…

- Displaces native woodland vegetation
- Degrades wildlife habitat
- Displaces rare plants
- Can cause long-term degradation of forests by shading out tree and shrub seedlings

Garlic Mustard, native to Europe, was introduced to North America by early settlers for its supposed medicinal properties and use in cooking. Since it is free from natural enemies of its homeland, garlic mustard has a competitive edge over native vegetation. Garlic mustard invades woodlands displacing native wild flowers and tree seedlings. It spreads rapidly and can dominate the forest floor within ten years. It not only invades disturbed habitats, but readily spreads into high quality forests. Garlic mustard provides habitat and food for few wildlife species. Once canopy closure is complete, most native vegetation is lost.

Identification

Growth: Garlic mustard is a rapidly growing hardy biennial (two-year growth cycle). Its appearance changes dramatically from one year to the next (see pictures). With no controls, garlic mustard becomes so dense that it shades out native wildflowers within a few years of being introduced.

Flowers: White (not yellow), at the end of stems, four petals (mustard family), ¼" wide, only in 2nd year plants.

Seeds: Small, black, 100 plus per plant.

Leaves: Rounded to kidney-shaped (1st year) larger toothed, heart-shaped leaves (2nd years).

Roots: Taproot is slender, white, S-shaped curve at the top of root.

Blooming Period: Late April to early June.

Habitat: Generally requires some shade; found in upland and floodplain forests, savannas, yards, along roadsides, stormwater entry points, along trails, and at the base of large trees. It is less tolerant of acidic soils. The invasion of forests usually begins along the wood's edge.

Odor: Garlic mustard has a distinct odor of garlic when its leaves are crushed (especially during the spring and early summer.

Infested Woods

First Year Plant

Seeds: Germinate in early April.

Leaves: Clusters of 3-4, rounded to kidney-shaped, rise 2-6 inches from the ground, scalloped edges, dark green.

Similar species: Violets (not 4-petaled) and ground ivy, also known as Creeping Charlie (purple flowers).

First Year Plant

Second Year Plant

Height: 1-4 feet tall

Flowers: White (not yellow), four ¼-inch petals, blooms late April to early June, occurs on the end of the main stem and side branches.

Leaves: Heart shaped to triangular, 2-3" across, large teeth, alternate on the stem.

Seed capsules: Appear soon after flowering begins.

Second Year Plant

Seeds: Small, turn black, 100 plus per plant, produced in a single row.

Root: Taproot is slender, white S-shaped curve near the top.

Plants die once seeds are dispersed in July or August.

Life History

Garlic mustard is a biennial that produces hundreds of seeds per plant. In Wisconsin, seeds may germinate the following year, and may remain viable for seven years or more. Seeds germinate in early April. First-year plants appear as basal rosettes in the summer season. They remain green through the following winter, making it possible to check for the presence of this plant in woods throughout the year. Garlic mustard begins vegetative growth very early in the spring, and shoots up a flowering stalk that blooms from late April through early June. Seed capsules begin to form within days after flowering begins. Seeds become viable quickly and are disseminated in July and August when the plant dies.

Distribution and Habitat

Garlic mustard is a problem plant from the Northeast to the Midwest, north to lower Canada and south to the Carolinas, from the east coast west to Utah. In Wisconsin, invasions are most severe in the eastern and southern regions of the state, although scattered populations have been noted statewide.

Garlic mustard grows best in the shade, but will occasionally grow in full sun along roadsides. It generally avoids sunny, hot locations. Look for it along stream banks, forest edges and at the base of trees.

Spread

Garlic mustard spreads by seed carried on the fur of mammals such as deer, horses, and squirrels, by flowing water, and through human movement in pants cuffs, on shoes, via camping equipment, and by vehicles. It is likely that isolated infestations, especially in public places, have been carried in by people visiting from an infested area. Seeds in the soil are easily carried in the soles of most athletic shoes or hiking boots. Birds are likely carriers to places generally inaccessible to other animals or people.

Preventing Further Spread

Prevention is the best way to stop the continued spread of garlic mustard. To prevent further spread:

1. Clean clothing and shoes thoroughly after walking or working in an infested area. (Seeds lodge in cracks of hiking boots and athletic shoes.)
2. Survey your area for garlic mustard plants. Plants can be located any time they are not covered by fallen leaves or snow.
3. When you find an infestation, determine the outer edges of the population and remove plants working from the least infested area to the most infested area.
4. Monitor woodlands carefully and frequently that are not infested. Removing one or two plants (before they go to seed) is much easier than removing man.
5. Alert land managers where there are infestations on public property and seek their support and assistance for control efforts. Alert neighbors. Seek help, if necessary, to control spread. (Use local newspapers, cable access channels, fliers, speak to civic organizations, Scouts, etc.).

Control Methods

Any control method selected must be repeated for several years until the garlic mustard seed bank is depleted. Vulnerable areas, especially woodlands, should be monitored annually in the spring to detect new invasions early and/or to prevent re-occurrence. More research is needed to determine longevity and the most effective control techniques.

Hand Pulling: For smaller infestations or where large groups of people are involved, hand pulling garlic mustard can be effective. Tamp the soil down after pulling to limit further seed germination. If plants are pulled before budding begins, they may be scattered about the area to dry. Do not put pulled plants in piles where roots may stay moist and development can continue. Once flowering has begun, all plants must be bagged. Garlic mustard can set seed just days after flowering begins, even after it is pulled! Pulled plants may be put in plastic bags or large paper bags used for composting. (Do not compost garlic mustard! Few compost piles produce enough heat throughout to destroy all garlic mustard seeds.) Bagged plants should be disposed of by burning, burying deeply in an area that will not be disturbed, or landfilling. (Do not burn plastic bags!) Call the Bureau of Endangered Resources (608-266-7012) if you have difficulty getting permission to landfill garlic mustard. Let garlic mustard collected in paper bags dry thoroughly before burning, leaving the top of the bag open. Poking holes in the sides to allow air to circulate will speed the drying process. Protect bags from rain.

Cutting: Research has had conflicting results thus far. Some sources indicate that cutting garlic mustard plants as near to the soil surface as possible just after the flower stalks have elongated but before the flowers have opened has been very effective in killing garlic mustard plants, preventing seed production, and avoiding soil disturbance. Others say that garlic mustard resprouted several times when they used this technique, making it more labor intensive. Additional research is needed to establish adequate data.

Herbicides: Do not use herbicides unless absolutely necessary. For toxicology information on pesticides, check the Web site: http://ace.orst.edu/cgi-bin/mfs/01/. Severe infestations can be controlled by applying a 1 to 2% solution of Roundup or Touchdown (glyphosate) to the foliage of individual plants and dense patches in October or early spring. At these times most native plants are dormant, but garlic mustard is green and vulnerable. Glyphosate is a nonselective herbicide that will kill or injure all green nontarget plants if it comes into contact with them. Use caution during application, and spray so that herbicide neither drips from the garlic mustard leaves nor drifts onto adjacent desired vegetation. Other herbicides that control mustards are expected to also control garlic mustard. This includes 2,4-D, triclorpyr (Garlon) and the combination of these products (sold as Crossbow). Herbicide use is safest for native plants if done during their dormant season. Read and follow all label directions.

Biological Control: Scientists are conducting research on biological control of garlic mustard, but at this time, biological control agents are not available in the U.S. to suppress this weed.

Websites

http://tncweeds.ucdavis.edu/esadocs/allipeti.html -- An extensive summary of information about garlic mustard. The Nature Conservancy also has information on many other invasive plants.

http://dnr.wi.gov/invasives/fact/garlic.htm - A summary of garlic mustard information from the Wisconsin DNR, with links to other sites.

http://www.nps.gov/plants/alien/fact/alpe1.htm -- Plant Conservation Alliance Alien Plant Working Group. Good overview of information on garlic mustard.

http://www.invasiveplants.net -- Cornell's page on garlic mustard biocontrol.

http://www.botany.wisc.edu/wisflora - Photos and information on all Wisconsin plants.

Printed Material

WI Manual of Control Recommendations for Ecologically Invasive Plants – Available from the Bureau of Endangered Resources, WDNR, Box 7921, Madison, WI 53707, or (608) 266-7012, or kelly.kearns@dnr.state.wi.us.

Invasive Plants of the Upper Midwest, An Illustrated Guide to Their Identification and Control. Author: Elizabeth J. Czarapata. University of Wisconsin Press, 1930 Monroe St., Madison, WI 53711. Copyright 2005.

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Waushara: 920-787-0416
Winnebago: 920-232-1970
Wood: 715-421-8440

Additional garlic mustard bulletins are available from your county Extension office.

The information in this brochure was compiled by Paul Hartman, Brown County UW-Extension, and Sharon Morrisey, Milwaukee County UW-Extension, as part of the Environmental Committee Work Group, a part of the UW-Extension Urban Horticulture Team. (Updated with current websites in June 2006.)

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The rosette photo was contributed by Laurie Weiss, Milwaukee county UW-Extension. All other photos were contributed by Elizabeth J. Czarapata, author of Invasive Plants of the Upper Midwest.