

Notes: Presentation by Jeff Evans¹, Dartmouth College Biology Department.
Title: What's the Big Problem with Garlic Mustard ?²
Date of talk: May 18, 2011³
Sponsor: Biodiversity Committee of the Hanover Conservation Commission⁴

Vicki Smith: Welcome – and, a bit about the biodiversity committee.

Barbara McIlroy:

- The purpose of this meeting and follow-up is to:
 - Educate the general public and land stewards about this plant, so we can spot it, report it and begin to control it. We simply need more eyes on the ground.
 - Begin to build neighborhood 'ownership' of this problem and help in its control, using more coordinated measures than in the past.
 - Begin to push back on the populations of this plant, and to prevent its further spread.
- Introduce Jeff Evans, with background

Evans noted that Charles Elton, considered the father of modern ecology studies, was the first to research the behavior and patterns of invasive plants and animals in a classic text published in 1958⁵. Invasive species cause problems because they have arrived here without the natural predators that keep them in check in their homeland – insects, diseases, etc.

A species is considered invasive only if it is:

- Non-native
- Shown to have naturalized
- Proven to disrupt diversity of native species

The Ecology of Garlic Mustard (*Alliaria petiolata*):

- The plant is a biennial. Few (less than 50%) of the first-year seedlings will become established.
- The higher the density of seedlings, the lower the survival rate of these seedlings.
- The plant is cold-hardy, so that the first year rosette will remain green late in the fall and still be present in early spring. Photosynthesis is possible on warm winter days.
- An uprooted plant has sufficient energy in the stem and root to flower and produce seed.
- Cut plants will send up multiple stems, and probably produce more seeds than original plant.
- The plant has the ability to disrupt the action of mycorrhizal fungi, thus having a direct effect on the survival of hardwood seedlings (and possibly other herbaceous plants)⁶.
- Seeds mature in late summer (July/August), and can be viable for as long as 12 years (although most are not viable for that long).
- It does extremely well in rich moist soil, but can survive in a wide range of habitats.
- The plant quickly fills the forest space where deer have browsed excessively, other disturbances (such as log landings in forestry operation), and is often associated with disturbance caused by non-native earthworms.

¹ Speaker Jeff Evans is a population ecologist who specializes in the biology and control of invasive plants. He earned his Ph.D. from Michigan State University in 2009 studying the demography of the invasive weed garlic mustard with Dr. Doug Landis and Dr. Doug Schemske. The focus of Jeff's research is the development of population models that can be used to tailor optimal control strategies for invasive species. Jeff is currently a Howard Hughes Medical Institute Postdoctoral Fellow in the Life Sciences at Dartmouth College, in Hanover, NH, where he teaches and continues to study invasive species ecology.

² The talk will be available on video on demand on CATV (GIVE WEB address here).

³ Approximately 35 attendees, including representatives from the towns of Hanover, Orford, Woodstock, Thetford, Charlestown, Weathersfield, Lebanon, Lyme, Hartford and West Windsor. (plus students in conservation group from other states)

⁴ This committee was established in 2011, and has membership from the Conservation Commission, the Hanover Garden Club, the Sustainable Hanover Committee, the Hanover Conservation Council, the Upper Valley Land Trust, and members of the public. All are welcome to participate. To learn when it next meets or to obtain minutes, contact Vicki Smith at town offices – (Vicki.Smith@hanovernh.org, PHONE?)

⁵ Elton, Charles S. The Ecology of Invasions by Animals and Plants, 1958

⁶ See: *Invasive Plant Suppresses the Growth of Native Tree Seedlings by Disrupting Belowground Mutualisms* by Kristina Stinson et al. (2006) <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1440938/>

- The plant survives well where there is little species richness. The richer the site, the more resistant the site to this plant (although garlic mustard can still get established on biologically rich sites—witness NEWFS refuge in Plainfield NH).
- The plant probably won't establish well in all sites where it appears (soils, water, light, existing vegetation, nutrients, other reasons).
- It survives in sun or shade, making it an adaptable in competition for resources, and a particular threat to forests..

Control Strategy for Garlic Mustard, derived from ecology of plant:

- **Plan to do the work in mid-May**, when the plant is likely to be flowering. It is much easier to spot when the plant is flowering. Further, the seeds will not be mature at this time, and few will escape.
- **Only pull the second year plants**, as few of the first year plants will survive
- **Pull out entire plant**, including root if possible.
- **Dispose of plants in plastic bags**, take to landfill. Any leftovers may sprout.
- **Start at the outer edges of the colony**, and begin to push back to the colony's core. Look for those single plant outliers and satellite populations and remove them before they can go to seed.
- **Plan to return on annual basis**, as seeds are viable from 5-12 years. There should be some sign of decline after 3 years of control.
- **Be on the lookout at disturbed sites**. Garlic mustard is opportunistic, often arrives on equipment or hay used on construction sites. Road crews can help spread it.
- **For large infestations**, herbicides work best if applied on a warm day in late fall or early spring --- that way there will be less collateral damage to native plants nearby. A 2% solution of Roundup (glyphosate) has proved effective. Not recommended if there are lots of other good plants nearby.

Where are we with biocontrols for Garlic Mustard?

Evans noted that the *galerucella* beetles have proved effective against the spread of purple loosestrife. But sometimes there are unexpected side effects from the introduction of predator: for example, a fly predator of the spotted knapweed (*Centurea maculosa*) seedhead was extremely successful in controlling the plant, but led to an unexpected rise in population of deer mice who found these flies tasty, thus raising the threat of Hanta virus. Since research for biocotrols of garlic mustard started in 1998, several beetles and weevils have looked promising as host-specific agents. Using his population models, Evans believes that a combination of two weevils, one a predator of the stems and leaf petioles (*Ceutorhynchus alleieriae*), the other a predator of root crowns of overwintering rosettes (*Ceutorhynchus scrobicollis*) may have the ability to reduce the population growth rate of this plant, causing decline in the plant density. These two insects seem to be host-specific, and are now being tested in this country⁷.

How to answer the question: WHY concentrate now on THIS plant?

This is the important question that Larry Litten posed, just at the end of the meeting. In thinking about the answer, we can observe that Hanover has many invasive plants such as of glossy buckthorn and shrub honeysuckle, that have been slowly spreading for more than 30 years. Many of these plants were introduced as 'wildlife food' and promoted by august organizations such as the Audubon Society and the Soil Conservation Service (now known as the Natural Resources Conservation Service NRCS, a division of the Department of Agriculture). It may take another 30 years to reduce those early escapees. But garlic mustard is here, currently in relatively few locations and has not been here very long. AND, it is spreading very quickly. It is harmful to forest health and much of the forest in Hanover is of very healthy – especially that forest not near the town center (we really NEED that updated map of the AT, with cross section of invasives to illustrate this point). Stewardship organizations, such as The Nature Conservancy, have a motto: *Early Detection, Rapid Response*. Perhaps this is the correct strategy for dealing with new invasives; otherwise, considerable effort will be needed to control it later on.

Notes: BDMcIlroy. 6/2011

⁷ These insects are now in quarantine at the secure USDA facility in MN. They have passed the first set of tests on native mustard family plants from east and central US, and are now under further testing against native mustards from west coast.