



IOWA NATIVE PLANT SOCIETY

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Biological Control of Garlic Mustard

(Compilation of reports of the "Garlic Mustard Working Group" and the Forest Health Technology Enterprise Team "Fact Sheet")

[Ed's. note – We have included articles about the occurrence and control of garlic mustard in previous issues of the INPS Newsletter. However, because it continues to be such an aggressive invader of Iowa's natural areas, we feel that further updates on current management practices and on-going research on biological control may help us deal with these impacts to our natural areas. Our thanks to Connie Mutel for her efforts to keep us informed!]

Garlic mustard (*Alliaria petiolata* (M. Bieb.) Cavara and Grande) is a member of the mustard family (Brassicaceae) and is native to Europe. It was first recorded in North America on Long Island, New York, in 1868. Garlic mustard is currently one of the most serious invaders of forested areas in southern Canada and the northeastern and midwestern United States. Isolated occurrences are known from western states and populations established in the Pacific Northwest appear to be spreading. Over the past several years, it has rapidly spread from east to west across Iowa.

Garlic mustard is a cool-season, shade tolerant, obligate biennial herb. It is one of the few non-native herbaceous species able to invade and dominate the under story of North American upland and floodplain forests, both in shaded areas and in open woods and savannas, not just into disturbed areas. Garlic mustard invades sites independent of presence or cover of native species, and species-rich sites are more likely to be invaded than species-poor sites. Garlic mustard alters habitat suitability for native insects and thereby birds and mammals.

Garlic mustard seeds germinate in early spring, and seedlings form basal rosettes of leaves the first year. The rosettes continue to grow in winter during snow-free periods when the temperatures are above freezing. In the spring of the second year the rosettes (new adult plants) produce flower stalks, set seed, and subsequently die. Once garlic mustard is established, the management goal is to prevent seed production until the seed bank is depleted, 2-5 years. Cutting of flowering stems at ground level provides the most effective control with minimal side effects, but has a high labor cost. Burning and herbicide (e.g., 2% glyphosate) application provide control but have associated side effects and cannot be implemented on an area-wide basis.

Biological Control Summary

With funding provided by various individuals as well as state and federal agencies, personnel at CABI Biosciences in Switzerland have studied potential insects biocontrol agents since 1998. From a total of over 70 species found feeding on garlic mustard in Europe, 4 weevils were selected as potential biological control agents. Detailed investigations of the two stem-mining weevils, *Ceutorhynchus alliariae* and *C. roberti*, a root-crown feeding weevil, *C. scrobicollis*, and of a seed-feeding weevil, *C. constrictus* showed promise as biological control agents. Before any introductions of these species can be proposed or occur in North America, detailed investigations need to assess the safety of these species, i.e. their host specificity and restriction of feeding and development to the target plant, garlic mustard. This work had largely been funded through a 3-year grant from the

Strategic Environmental Research and Development Program (within DOD), which terminated at the end of 2002. A number of recent taxonomic re-arrangements within the Brassicaceae, as well as difficulties in growing and propagating certain North American plant species in Europe will require testing of problematic species in US quarantine. To allow continuation of efforts towards the development of biological control for garlic mustard, a Garlic Mustard Working Group was formed in the spring of 2002. The USDA Forest Service- Forest Health Technology Enterprise Team is providing coordination and financial support to allow this continuation. *continued page 3*

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Leaves from the President's Notebook

Greetings! In 1998 I became a member of the Iowa Native Plant Society, at the urging of fellow botany graduate student and INPS guru, Bill Norris. Thanks Bill! The wonderful thing about the INPS membership is that it's very affordable, even for a graduate student. After graduating from ISU in 2000 with a M.S. in ecology and evolutionary biology, I was pleased to stay in Iowa and accept a position as biological field station manager for Grinnell College's Conard Environmental Research Area (CERA, pronounced "seerah"). The area is named after Henry Shoemaker Conard (1874-1971), a botany professor at Grinnell from 1906-1944. He wrote several editions of "Plants of Iowa: Grinnell Flora" and was an expert on mosses and water lilies.

My job combines outreach for the Center for Prairie Studies, an interdisciplinary program at Grinnell, with day-to-day management of CERA, a 365-acre oasis of prairie, savanna, and forest in east-central Jasper County. I develop programs to keep people engaged in the preservation and restoration of our natural heritage, often using CERA as my outdoor laboratory and field trip destination. I am also very involved with prairie landscaping on the college campus, plantings in the community, the Poweshiek County Pioneer Cemetery Commission, the Grinnell Area Garden Club, the Grinnell chapter of Trees Forever, monitoring and work days in a variety of local remnants, and have recently begun a project to inventory and map trees in all of Grinnell's parks.

It is my sincere pleasure to serve the Iowa Native Plant Society over the next two years. INPS has grown leaps and bounds since its establishment in 1996 and I look forward to facilitating even more opportunities for its members. A few things I'd like us to consider include:

- Expanding opportunities for learning plant taxonomy; offering more workshops on a variety of taxa
- Increasing our role in educating the public about invasive species, and supporting changes in public policy; involvement with the Midwest Invasive Species Network
- Continuing to provide grants for land acquisition, research, and education
- Providing more opportunities to engage people of all ages in restoration activities in our state parks, preserves, communities, and on private lands

I look forward to hearing from members on these topics and any others. Please feel free to contact me at work (641-269-4717), mottll@grinnell.edu, or at home (641-236-0372).

Larissa Mottl

continued from page 1

The current funding through the FS is intended to allow completion of the host range testing in Europe with species that can be grown in Europe. Arrangements have been made to utilize a recently opened quarantine facility in Minneapolis, MN for additional tests with problematic test plants, i.e. those that grow poorly or do not flower in Switzerland. Personnel from MN visited CABI Bioscience Switzerland in spring 2003 to become familiar with handling of the selected biocontrol agents and host specificity test methods. The initial primary focus of work in quarantine will be placed on the most promising insect, the root-crown feeding weevil *C. scrobicollis*. This insect mines the stems and roots causing extensive damage to the plant.

In mid June 2003, Dr. Bernd Blossey and Victoria Nuzzo, Natural Area Consultants, held a garlic mustard monitoring workshop at Fermilab in Batavia, Illinois. Participants from private, local, state, and federal agencies were introduced to the standardized protocol developed to monitor garlic mustard. This protocol is intended to follow the populations of target plant and its biocontrol agents over time using permanent plots. Long-term monitoring plots already have been established for several years in NY (2) and IL (2) (B. Blossey and V. Nuzzo) and recently plots have been established using the same protocols in IN, MN, MI, WI, VT, NH. The collection of baseline data before control agents are released is essential to allow an accurate assessment of the impact after release. An early start of the monitoring is particularly important for a species such as garlic mustard that shows dramatic annual fluctuations in the size of its populations, which are, at least in part due to its biennial life cycle. Data record forms and instructions are available at www.invasiveplants.net.

Testing at the University of Minnesota

Three hundred *Ceutorhynchus scrobicollis* adults were received in mid-November, 2003, from the CABI facility in Delemont, Switzerland. The weevils arrived in excellent shape and were placed under quarantine conditions in the High Containment Security Facility on the University of Minnesota campus.

In mid December 2003, sequential no-choice and single choice host range studies were conducted with mating pairs of *C. scrobicollis* (Gerber et al., 2003) on the plant species, *Anemone canadensis* and *Carex laxiflora*. Six valid replications of the sequential no-choice test and 12 valid replications of the single choice test were completed for both plant species. No feeding or oviposition was observed on either *Anemone canadensis* or *Carex laxiflora* plants.

Test plant species currently cultivated for *C. scrobicollis* host range screening at the University of Minnesota include hog peanut (*Amphicarpaea bracteata*), yellow trout lily (*Erythronium americanum*), cut-leaved toothwort (*Dentaria laciniata*) and northern blue monkshood (*Aconitum noveboracense*). The additional species to complete the provisional TAG list host range screening will be collected this spring (2004). These plants include: *Arabis Canadensis*, *Cardamine bulbosa*, *Cardamine pennsylvanica*, *Dentaria angustata* and *Ranunculus septentrionalis*. We currently have cooperators in Indiana, Michigan, Minnesota and Wisconsin that will collect these plants species once they are visible and available in the field (April and May).

To date, 50 plus, newly emerged *C. scrobicollis* weevils have been collected from garlic mustard plants on which the original weevils were placed. This indicates that *C. scrobicollis* may complete their life cycle in quarantine conditions. The *C. scrobicollis* adults are now in an aestivation period. Currently, we are determining the best method to manipulate the length of aestivation required by *C. scrobicollis* prior to oviposition. We plan to conduct additional host range tests on native non-target plant species later this spring, as soon as *C. scrobicollis* resumes oviposition.

The co-operators in the biological control project at the University of Minnesota are Dr. David Ragsdale, Dr. Roger Becker, Dr. Elizabeth Katovich, Mr. Brian McCornack, University of Minnesota and Dr. Luke Skinner, Minnesota Department of Natural Resources. Dr. Richard Reardon of the Forest Health Technology Enterprise Team, USDA Forest Service, assisted in getting Forest Service funding for the project.

Sample Plot Survey in New York

Field sites in eastern North America have been surveyed, and two stem mining weevils, a stem mining fly, a scale insect, two fungi, and aphids were found attacking garlic mustard. However, their attack was of little consequence to plant growth or reproduction. Plots were established in the state of New York to collect baseline data on garlic mustard and its natural enemies before any introduction of control agents. A standardized protocol was developed to measure (1) garlic mustard abundance, (2) abundance and impact of biological control agents, and (3) changes in native plant communities and associated fauna. This protocol is sophisticated enough to allow statistical analysis, yet simple enough to allow widespread use by natural areas managers.

Technical and financial assistance will continue for host range testing and monitoring in the permanent plots, developing rearing techniques for promising biological control species, and the release of promising species.

FIND AND FIGHT GARLIC MUSTARD THIS WINTER

by Connie Mutel

Early discovery and treatment are the weapons of choice to use against garlic mustard. This very aggressive invader remains green and active throughout the winter. Thus it's vulnerable to winter treatment with glyphosate. Unless covered by tree leaves, garlic mustard's roundish serrated leaves are easily spotted on winter's brown forest floor. They can be sprayed without harming dormant natives. Use 1.5 to 2% glyphosate; read the label for proper application procedures. Apply the glyphosate any time that temperatures are above freezing. Mid- to late-winter or early spring are ideal, but field experience has shown that spraying can be done any time temperatures are above freezing. Patience is required: Winter spraying means that plants will take longer to die, sometimes months. Be sure to return in the spring and early summer, to spray or pull any surviving stragglers.

This fall, when other outside chores lessen, start your garlic mustard patrol. Spray any sites you find, and mark them so you can return to treat stragglers. Finding small infestations of this extremely damaging plant, and treating them immediately, will save tremendous efforts later on.

FUNDING FOR PRAIRIE RESEARCH

offered by Prairie Biotic Research, Inc.

Prairie Biotic Research, Inc. is a Wisconsin nonprofit established in 2000. Our purpose is to foster biotic research in prairies. One of the ways we do this is through a Small Grants Program that funds grants up to \$1000 for the study of any grassland taxa in the USA. We are especially eager to support independent researchers (individuals lacking institutional support), but anyone may apply. From 2002 to 2004, we awarded 12 grants to researchers in seven states to study insects, plants, mammals, reptiles and spiders. Half of these grants supported graduate student research.

In 2005, we expect to fund four grants of up to \$1,000 each. We also have additional geographically restricted funds for research in southeastern Wisconsin and for research in Iowa.

To Apply for a Grant: To apply for a grant, contact Michael Anderson at Prairie Biotic Research, Inc., PO Box 5424, Madison, WI 53705, or prairiebioticresearch@hotmail.com after October 15, 2004, for a Grant Application Form. Proposals must be received by January 15, 2005.

Our Supporters: We've received gifts in support of the 2005 Small Grants Program from: H. Baldwin; G. & T. Balogh; BioLogic Environmental Consulting, LLC; C. Blamire; A. Blattner; K. & B. Bowman; K. Christoffel; R. Christoffel; T. Felden; C. Gimse-Owen & R. Owen; D. & H. Hagar; the Jerome and Dorothy Holz Family Foundation; G. Johnson; P. Kellogg; the Legg Mason Blattner Charitable Trust; M. Lockwood; the Reva and David Logan Foundation; the Fred Maytag Family Foundation; C. & R. Mutel; U. Petersen; J. & R. Sime; L. Van Slyke; G. Teschendorf; T. & E. Wedel; and the West Bend Mutual Charitable Trust.

To Become A Supporter: Please make a donation to support our Small Grants Program. Any amount is welcome. PBR is run entirely by volunteers and we maintain no offices so our overhead is very low. You may specify that your entire tax-deductible donation be given to researchers through our Small Grants Program. You may also specify: a geographical region in which the research is to be done; research in one of three taxa (plants, invertebrates or vertebrates); graduate student research; or our endowment fund to support our Small Grants Program.

THANK YOU, from the Board and Scientific Advisors of Prairie Biotic Research, Inc., Michael Anderson, Rebecca Christoffel, Douglas LeDoux, Eric Metzler, Ursula Petersen, Dennis Schlicht, Scott Swengel, David Voegtlin, Andrew Williams and Daniel Young

SOUTHERN IOWA OAK SAVANNA ALLIANCE

Landowners in Decatur County have joined together to form the Southern Iowa Oak Savanna Alliance. The purpose of this organization is to protect, restore and maintain savanna in southern Iowa. In Decatur County alone there are thousands of acres of highly restorable savanna. The Alliance is being sponsored by the US Fish and Wildlife Service and the Southern Iowa RC&D. Anyone interested in participating is invited to our next meeting at 7 PM on Thursday, November 18 at the Leon Community Center in Leon, IA.

I will be happy to answer any questions or give you further information. Please feel free to get in touch.
Sibylla Brown <timbrhl@GRM.NET>

Iowa Nature Store

A new feature on the DNR website is the "Iowa Nature Store" where you can purchase educational materials and shirts with various outdoor-theme logos. The items in the educational material section are:

Frogs and Salamanders of Iowa
Lizards and Turtles of Iowa
Iowa Wildlife Viewing Guide
Iowa Fish and Fishing
Iowa Portrait of the Land

Profits will go to state park improvements and other conservation programs.

The clickable link to the Iowa Nature Store appears just below the photo mosaic in the top center of the DNR homepage. The DNR homepage is at: <http://www.iowadnr.com/>

This year's \$5 Non-game support certificate is also now available from the Iowa DNR, a beautiful print of a sharp-tailed grouse photographed by Roger Hill.

The Grasses of Iowa

A new resource for identifying Iowa grasses is available on-line. Grasses of Iowa is an on-going project under the supervision of Dr. Lynn Clark, of the Ecology, Evolution, and Organismal Biology Department at Iowa State University. The Fred Maytag Family Foundation funded this project. The major components of the website are:

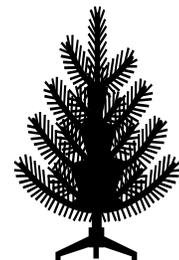
- A guide to Iowa grass species indexed by both common and scientific names including images and descriptions of all species. Presently all species pages have images, and approximately 20% of the pages have descriptions
- Interactive identification keys, one technical and one non-technical (in progress)
- A database of herbarium specimens (in progress)
- A section on ornamental grasses
- A section on weedy and invasive grasses
- Printable lists of Iowa grass species, cross-referenced to previously used scientific names

The project also includes an update of Dr. Richard Pohl's 1966 publication, *The Grasses of Iowa*, to be finished in the near future. More work remains to be done on the website. Comments are welcome; please send them to Anna Gardner, gardner@iastate.edu. The address of the website is: <http://www.eeob.iastate.edu/research/iowagrasses/>

The 5th Annual Loess Hills Christmas Event

Cut a free Christmas tree and help restore Loess Hills prairie in the bargain. The Zahrts invite you to bring your saw and come enjoy a "Loess Hills Christmas in the Hills", at Country Homestead B&B, one mile north of Turin, **Saturday afternoon, December 11, 2004** from 12:30 p.m. - 4:30 p.m.

Restoration is underway at Country Homestead-to remove the invading trees and recover, protect, and reconstruct the native prairie. Contact David Zahrt (712)353-6772 email -zahrt@country-homestead.com, for more information.



2005 Upcoming Events

"America's Lost Landscape: The Tallgrass Prairie"

Haven't yet seen? Here's another chance...

Free prairie film showing: The Iowa Natural Heritage Foundation, University of Northern Iowa and Iowa Public Television invite you to a special showing of a new feature-length film on tallgrass prairies (like those that once dominated Iowa's landscape) at 7 p.m. on Monday, Dec. 6. "America's Lost Landscape: The Tallgrass Prairie" was produced for public television by UNI professor Daryl Smith and New Light Media's David O'Shields. This free showing, sponsored by Pioneer Hi-Bred, is held at IPTV's Maytag Auditorium in Johnston. Seating is limited, so you must RSVP to 800-782-9522 by Dec. 1 if you plan to attend. Get details at <http://www.inhf.org/Invitation.pdf>

IPN Central Region Annual Winter Meeting.

January 29, Ankeny DMACC Campus. This year's presentations include Sibylla Brown (savanna restoration), Carl Kurtz and Tom Rosburg (intro and advanced prairie plant id). Chris Bair will have a display about his "landscape history" software. The silent auction will help the Iowa Natural Heritage Foundation purchase a large addition to Marietta Prairie in Marshall Co. Donations welcome! Doors open at noon, for more info contact Trish Patrick (515-291-6401).

Prescribed Fire Conference, Ames Quality Inn, Feb 8-10, 2005. Registration forms will be available soon, contact Inger Lamb.

Iowa Prairie Conference, Cedar Rapids Indian Creek Nature Center, July 22-23. Contact Jean Wiedenheft, 319.362.0664 or jvwnature@aol.com. Call for proposals announcement to follow this message.

Season's Greetings

INPS MEMBERSHIP/CHANGE OF ADDRESS FORM AND SURVEY

Send with your 2005 dues of \$10.00 to Diana Horton, 720 Sandusky Drive, Iowa City, IA 52240

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The INPS mailing list is never distributed to other organizations or companies. Dues are payable on a calendar year basis from January 1 to December 31. Use this form changes of address.

INPS Website: <http://www.public.iastate.edu/~herbarium/inps/inps/home.htm>

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Message: subscribe (your email address)

NEWSLETTER

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c/o Deb Lewis

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