

<b>SURI Research Proposal Application</b>	
<b>Title of Research Proposal:</b>	Biodiversity responses of native insects to garlic mustard invasion
<b>Major:</b>	Biology
<b>Select Session:</b>	1st summer session (3 credits)
<b>Description of Project:</b>	<p><u>Introduction:</u> The past two decades have seen an increase in the study of invasive plants and their negative impact on native plants (Levine et al., 2003). Garlic mustard (<i>Alliaria petiolata</i>) is an invasive plant that can be found throughout much of the North American deciduous forests. Human activity has been the major cause of garlic mustard's spread throughout the forests, as garlic mustard was introduced from Asia in the 1800's (Rowe and Swearingen, 2006). Deer, small animals, and even humans involuntarily carry seeds and deposit them to uninvaded areas. In contrast to native plants, whose population densities are kept in check by insect herbivores, garlic mustard has few enemies in the United States (Haribal and Renwick, 1988). Past studies have shown a decrease in the biodiversity of native plants living in ecosystems where garlic mustard has invaded (Stinson et al., 2007). However, effects of garlic mustard invasion on native herbivores have not been studied in this system. I hypothesize that a less diverse group of insects will be found in forest plots densely populated by garlic mustard compared to uninvaded plots.</p> <p><u>Proposed Research:</u> I propose to study the biodiversity of plants and insects in forest research plots behind VMI that vary in the density of garlic mustard. More specifically, I plan to document the effects of garlic mustard on the natural food web of this forest ecosystem by analyzing the effect of invasion on diversity of native plants and insects within these field plots.</p> <p><u>Methodology:</u> I plan to begin the study by first finding six identical field plots; half of them will contain high population densities of garlic mustard and the other half will be uninvaded. Next, I will develop procedures</p>

	<p>to trap flying and walking insects that reside in these field plots (Shane, 1997). Once the traps are established, they can be placed in the plots and insects collected twice each week. Also, I will characterize native plant diversity in these plots. When the insects are trapped, I can begin the process of identifying and quantifying insects and plants. Afterwards I will analyze my results statistically and prepare the written paper and oral presentation for SURI.</p> <p><u>Significance of Proposed research:</u> Investigating the biodiversity responses of forests to garlic mustard invasion will better help biologists understand how this species may impact native insect herbivores in the temperate forest ecosystem. Insects are a good indicator of plant biodiversity because they are primary consumers of plants in the forest food web. If insects decide not to eat garlic mustard, they might migrate to a new environment in search of more palatable food sources. This could cause population declines in carnivores that depend on these insects. Results from this experiment in conjunction with further studies will allow us to elucidate impacts of the current rapid spread of garlic mustard in North American forests.</p>
<p><b>Bibliography:</b></p>	<p>Haribal, M., and Renwick, J.A.A. 1988. isovitexin 6''-O-beta-D-glucopyranoside: a feeding deterrent to <i>Pieris napi oleracea</i> from <i>Alliaria petiolata</i>. <i>Phytochemistry</i> 47: 1237-1240</p> <p>Levine, J.M., Vila, M. D'Antonio, C.M., Dukes, J.S, Grigulis, K., and Lavelle, S. 2003. Mechanisms underlying the impacts of exotic plant invasions. <i>Proc. R. Soc. Lond. B.</i> 270, 775-781.</p> <p>Rowe, P. and Swearingen, J.P. 2006. Garlic mustard. <a href="http://www.nps.gov/plants/alien/fact/alpe1.htm">http://www.nps.gov/plants/alien/fact/alpe1.htm</a></p> <p>Shane, B. 1997. <i>Buying &amp; Using Insect Traps</i>. <a href="http://www.canr.msu.edu/vanburen/trapsweb.htm">http://www.canr.msu.edu/vanburen/trapsweb.htm</a></p>

<b>Timeline:</b>	<p>Week 1: Locate field plots and design insect traps.</p> <p>Week 2-3: Collect and identify insects and plants and quantify their biodiversity of the plots.</p> <p>Week 4: Analyze data using statistics.</p> <p>Week 5: Prepare oral presentation and paper.</p>
<b>VMI &amp; other facilities to be used:</b>	I will use Maj. Alerding's laboratory in the Science Building in addition to the forest behind VMI to conduct my research.
<b>Detailed Budget:</b>	insect traps \$500
<b>Date &amp; Time of Submission:</b>	2/12/2009 11:10:33 PM