

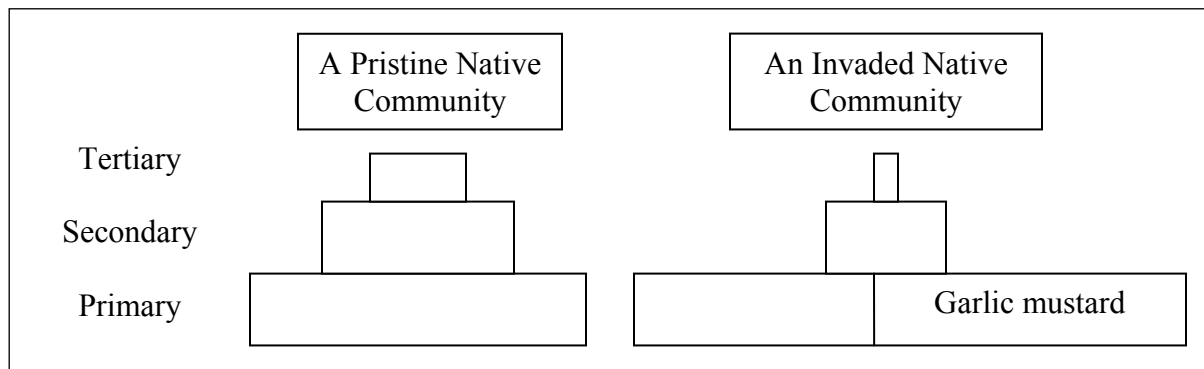
Do Invasive Species Change the Biomass of Dependant Trophic Levels in Communities?

Invasive species are the second greatest threat to global biodiversity and can reduce the diversity of the native plant communities. It is not well established, however, how invasions could change the trophic structure of their invaded territories in terms of biomass. If invasive plant species reduce native plant biomass it is expected that the higher trophic levels that depend on native plants will be reduced in biomass and community function will be inhibited (Tallamy 2004). Garlic mustard, an invasive species that threatens woodland understories, has been shown to have few predators in its invaded range (Blossey et al. 2001). A garlic mustard invasion may result in a great amount of plant biomass that locally adapted herbivores do not consume. If there are fewer palatable plants for native herbivores, both the diversity of native specialists will decline and the overall biomass of higher trophic levels will decline as well. The question I will address in my research in the summer of 2007 is: how are secondary (herbivore) and tertiary (predator) communities changed in total biomass when the composition of the primary community is altered by an invasive species?

To answer this question I will conduct a natural experiment surveying community composition in areas with similar habitats that are invaded or uninvaded by garlic mustard. At two Missouri Department of Conservation parks and Tyson Research Center, I will choose two kinds of 1 hectare sites for comparison: sites with established cores of garlic mustard and sites that are pristine. At each site, within the hectare I will establish four pairs of 15 m<sup>2</sup> replicate survey plots. Each pair of replicates will be as similar in habitat structure (slope, aspect).

Each of these 32 plots will be surveyed for primary, secondary and tertiary community richness and biomass at three points during the summer (mid-May, mid-June, and mid-July). I will use standard field techniques for calculating species richness and evenness and measuring

biomass (Green 1979). In the primary plant community I will survey plots for the number and kind of species present and I will collect specimens to measure biomass (dry weight). At the secondary level of the community which consists of mostly insects, I will use pitfall traps, sweep nets and sticky traps to quantify species richness. At the tertiary level, I will use cover boards to census small vertebrate amphibians and live traps to track small mammals. I will also survey birds with timed observations.



I will use a paired t-test statistical analysis to analyze this data. As exhibited by the figure above, I expect to find that an invasion of garlic mustard alters the diversity and biomass the trophic level it invades as well as that of the secondary and tertiary trophic levels. If garlic mustard displaces local species and is inedible to local herbivores, I expect to find a decline in herbivore diversity, especially among specialists, and biomass. As a result of this decline I expect the tertiary community that feeds on herbivores to suffer in terms of diversity and biomass as well. If invasions in the primary community do lessen the total biomass of higher trophic levels, as I expect that they do, invasive species might be a greater threat to native communities than was once thought.

Works Cited

Blossey, B., V. Nuzzo, H. Hines, and E. Gerber. 2001. Developing Biological Control of *Alliaria petiolata* (M. Bieb.) Cavara and Grande (Garlic Mustard). *Nat. Areas J.* 21: 357-367.

Green, Rodger H. 1976. *Sampling Design and Statistical Analysis for Environmental Biologists.* John Wiley & Sons.

Tallamy, Douglas W. 2004. Do Alien Plants Reduce Insect Biomass? *Conservation Biology* 18: 1689-1692.

Proposed Budget

	Cost
Supplies (cover boards, live traps, sticky traps)	\$300
Transportation to and from research sites	\$200
Student stipend	\$2,000