**Technical description:**

The goal of this project is to move beyond the clear message from previous studies—that individual-level associational effects exist and are *expected* to influence population-level processes—to instead evaluate whether and how AE *do* influence those processes. The researchers will use a combination of mathematical models and empirical work to address whether and how associational effects influence the outcome of plant interspecific competition (coexistence and/or relative abundance) in an old-field system, using *Solanum carolinense* (Carolina horsenettle) and *Solidago altissima* (goldenrod) as focal species. The project will address two questions empirically: 1) What is the spatial scale of AE in this system. To answer this question, the researchers will apply an agricultural experimental approach (Nelder fan designs) to a natural system, thereby developing a tool that may be used in other systems as well. 2) How do AE from multiple species combine? This field experiment will include monocultures, bicultures, and tricultures at two different densities. The researchers will use spatially implicit and spatially explicit modeling approaches to address how plant spatial structure and the form of frequency dependence alter predicted effects of AE on plant populations. In a first-ever case study, the researchers will parameterize models using data from the empirical studies to test how effects of AE scale up to the population level. Overall, this project will quantify directly for the first time how much AE influence plant competition and provide a general framework for understanding how different forms of AE influence population-level processes across different types of consumer-resource systems. Results of this work will provide a framework for determining whether AE alter the outcome of plant competition in natural communities, and suggest how best to manipulate AE in agriculture. Because AE are relevant to a wide range of consumer-resource interactions, the theory developed in this project will also contribute to our general understanding of predator-mediated competition and natural selection.