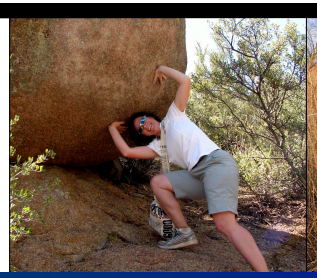
The Lau Lab

Studying the ecology and evolution of species interactions in a changing world



Plant Biology, W.K. Kellogg Biological Station, Michigan State University

What We Do…

We use large, manipulative field experiments, along with greenhouse mesocosm studies and observations of natural plant populations to identify how humans affect the ecology and evolution of plants and the organisms with which they interact. Our research questions span from the purely ecological to evolutionary. Because of the strong role that species interactions play in mediating responses to global change, we try to conduct our research in natural communities.

ECOLOGY

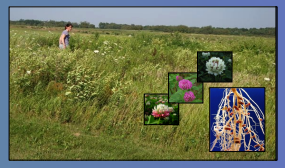
Global warming & biological invasions

Global warming is predicted to facilitate biological invasions, yet few studies have tested this prediction. We use experimental heating arrays in the field to test how warming affects the success of invasive vs. native species.

Plant-microbe interactions in novel environments

Our experimental evolution studies have shown that plant ecological and evolutionary responses to environmental change depend on association with diverse soil microbial communities.

Nitrogen deposition & the evolution of mutualism



By using a 22-year nitrogen addition experiment at the KBS LTER, we have demonstrated that nitrogen deposition has caused the evolution of less cooperative rhizobia that provide fewer growth benefits to their plant hosts.

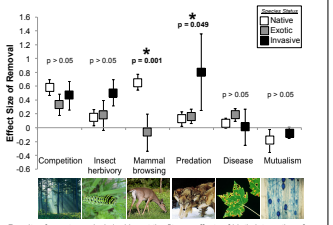
EVOLUTION

Biotic interactions & biological invasions

ELIZABETH SCHULTHEIS, Ph.D. Candidate

Liz uses both field experiments and meta-analyses to test the Enemy Release Hypothesis, one of the key explanations for the success of invasive species.

Biotic interactions do not differ between native, exotic and invasive species and do not explain invasive success



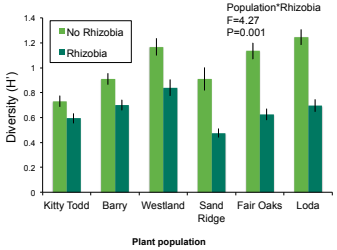
Results of a meta-analysis looking at the fitness effects of biotic interactions for native, exotic, and invasive species. Effect sizes greater than zero indicate species benefitted from the removal of the biotic interaction.

Keystone mutualist, genetic variation & communities

KANE KELLER, Ph.D. Candidate

Kane examines how intraspecific variation in *C. fasciculata* and its resource mutualism with N-Fixing rhizobia influences plant community structure, composition, and diversity.

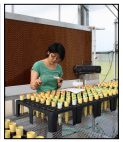
Rhizobia act as a keystone mutualist that reduces diversity. The magnitude of the effect varies depending on the source population of the legume, *Chamaecrista fasciculata*.



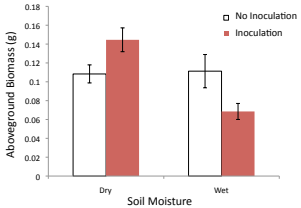
Resource mutualisms & plant adaptation

TOMOMI SUWA, Ph.D. Candidate

Tomomi uses both field and molecular methods to test how resource mutualists contribute to local adaptation to soil moisture and whether symbiosis-related traits are adaptive in wet vs. dry environments.



The effects of rhizobia inoculation on seedling growth depended on soil moisture treatment



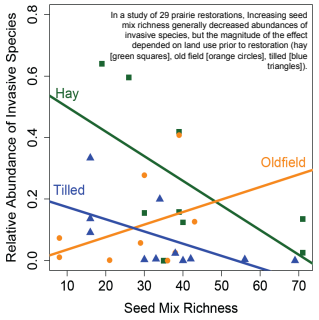
A greenhouse experiment to examine the effects of soil moisture and rhizobium inoculation on *Amphicarpaea bracteata* seedlings

Restoration of diversity & ecosystem services

TYLER BASSETT, Ph.D. Candidate

Tyler's research investigates whether diversity improves ecosystem functioning in grassland restorations and how diversity effects vary across environments.

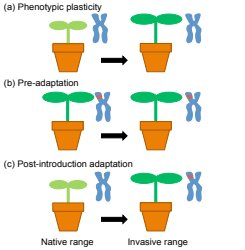
In a study of 29 prairie restorations, increasing seed mix richness generally decreased abundances of invasive species, but the magnitude of the effect depended on land use prior to restoration (hay [green squares], old field [orange circles], tilled [blue triangles]).



Phenotypic plasticity, evolution, & invasions

SUSAN MAGNOLI, Ph.D. Student

Susan tests the roles of phenotypic plasticity, pre-adaptation, and post-introduction evolution in biological invasions.



When an invasive species is introduced to a novel habitat (invasive range), several scenarios can occur for the species to best suit the habitat: (a) the species' phenotype (but not genotype) changes occur; (b) no phenotypic or genotypic change occurs; (c) both the phenotype and genotype change

Genetic variation & biological invasions

CASEY TERHORST, Post-doc

Casey uses empirical and theoretical approaches to investigate how indirect effects influence evolution. Currently, he is testing how genetic variation and biotic interactions influence a plant biological invasion.

Direct and indirect species interactions provide biotic resistance against invasion into a community, but genetic variation in interaction strength allows some genotypes to invade.