Research team name: Natural Enemies

Research team mentors:

Principal Investigator: Scott Mangan, Assistant Professor, WUSTL
Link to research website: http://manganlab.weebly.com/
Prof. Mangan is the head of the team. He will be available for team meetings and individual meetings.

Post-doctoral research associate: Claudia Stein, PhD, WUSTL
Link to research website: see above
Claudia will be mentoring students on a daily basis.

Graduate student: Rachel Becknell, WUSTL
Link to research website: rachelbecknell.com (Not online yet.)
Rachel will be mentoring students that are interested in her project on a daily basis.

Technician: Taylor Rohan, WUSTL
Taylor will be working with all students on a daily basis in the field and in the lab.

Research focus for summer 2017:
Our current research is focused on understanding the ecological and evolutionary importance of plant-soil microbial dynamics. Soil communities are exceptionally diverse and include both mutualistic and pathogenic plant symbionts (soil-borne fungi, bacteria, viruses, etc). Interactions formed between plants and their soil-borne symbionts can serve as a strong force in determining plant community assembly through both positive and negative feedback processes. Using both field and more controlled mesocosm and greenhouse experiments at Tyson, we seek to understand the importance of these feedbacks in determining plant community dynamics, ecosystem functioning, and invasion.
One major part of our work will concentrate on a mesocosm experiment that we established at Tyson. Working in experimental native tallgrass prairie communities, we test the underlying mechanisms of how plant diversity affects ecosystem functioning under drought and no drought conditions. Although the positive correlation between plant diversity and ecosystem function (e.g. productivity, carbon sequestration, nutrient retention) is well documented, much debate centers on the underlying mechanisms that cause this relationship. We focus on the relative importance of plant-soil microbial interactions versus competition.
Rachel's research will be centered around incorporating plant-soil microbial interactions into ecosystem restoration experiments focusing on Missouri's glade and prairie plant communities. Restoration experiments will be performed in prairie and glade remnants in the field and in common gardens at the Tyson Research Center.

Skills/techniques/methods:
Students will take many different measurements on individual plants, such as seed production, plant height, above and belowground biomass, herbivore or pathogen damage and also physiological measurements of plant traits related to water stress. Students will also measure

ecosystem-level responses, such as soil nutrients, soil carbon, and productivity. Interest in plant identification would be beneficial. Especially for the restoration projects students will assist in performing plant community cenuses and get experience with prairie and glade plant species identification. Students will also be involved in the propagation of seedlings and the establishment of the common garden and glade experiments by planting seedlings and taking measurements such as plant height and diameter, soil moisture and pH, and solar radiation. Students will also collect soil samples to perform DNA extractions for later DNA metabarcoding analyses.

Research conditions:
Most of our work will occur next to the research garden at Tyson where we established our mesocosm (big pots) experiment. It gets hot out there as there is no shade. Nevertheless this is a convenient location as it is close to the lab, and we usually do not have to worry much about ticks. However, we do have groundhog activity in our experiment and many bees. Actual lab work will probably make up to 50-60% of the total time, depending on the task.
For Rachel's work a great deal of time (~80%) will be spent in the field establishing the glade restoration experiment and working to establish the common garden experiment. Glade ecosystems become very hot compared to their surrounding environment, so work will be performed in the earlier part of the day to avoid the worst heat. Students will be exposed to ticks while working in the field. Around 20% of the time will be spent working in the greenhouse on seedling propagation and in the lab performing DNA extractions.

Team structure and opportunities for independent research:
We value teamwork as well as independent work. We have tasks that will be tackled by all of us as a team and here we will train all of you (such as soil sampling for nutrient analyses, biomass harvest, weeding and maintenance). However, we will have many opportunities for interested students to develop their own project ideas within the framework of the larger mesocosm experiment or in the framework of Rachel's dissertation project. We are happy to assist with the development of independent projects. Examples of topics students worked on in the past: pollination studies, leaf pathogens, soil carbon sequestration, changes in plant functional traits in response to drought and soil microbes, plant reproduction. We always encourage students to help each other with their projects to facilitate collaborations, to give everybody the opportunity to learn different methods and just because it is more fun to work together!
We will also offer opportunities to mentor high school students, as our team will include TERF students.