

Green Infrastructure Impacts on Carbon Cycling: Evaluating Changes in Soil Microbial Composition and Function

Ross, Isabel (School: Cienega High School)

This project aimed to identify how the implementation of green infrastructure (GI) water harvesting systems impacts the carbon cycle by studying shifts in microbial composition and function. Soils contain the largest supply of carbon in the world, meaning that changes in soil function may impact the amount of greenhouse gases in the atmosphere. To conduct this study, a GI system was created in a residential area in Tucson, Arizona. The microbes and functions present in the soil were identified by sequencing a 16S rRNA gene marker and using a program called FAPROTAX. I used this previously collected data to conduct my research. I conducted a literature review to link the identified microbes to functions they have been proven to perform. I focused on two functions involved in the breakdown of cell walls and exoskeletons, making them key for decomposition: chitinolysis and cellulolysis. I found that both functions have higher abundances in all GI systems compared to the control. This demonstrates that GI water harvesting treatments do impact soil microbial composition and function. This is important because it suggests that GI does alter the carbon cycle, which could have possible impacts on climate change, as carbon is a major greenhouse gas. In addition, GI systems may increase the availability of key nutrients by releasing locked compounds stored behind strong cell walls, exoskeletons, and cellulose. Increases in bioavailable compounds can lead to greater access by other organisms such as soil invertebrates and plants, supporting growth and increased diversity.

Awards Won:

University of Arizona: Renewal Tuition Scholarship