Research at the James: ***Microbial response to changing climate and the constraints of local adaptation***

Nameer Baker University of California Irvine

Climate change has the potential to impact the entire biosphere, including microbial species, which occupy land, air, and water. On land, microscopic organism that live in the soil such as bacteria, viruses, fungi, and protozoa, can affect soil composition and productivity, which is essentially the subterranean foundation of the terrestrial world. To determine potential effects of climate change on microbial communities and their role in carbon cycling, doctoral candidate, Nameer Baker, initiated a plant litter transplant experiment across a climate gradient. Grass litter from the Irvine Ranch Conservancy's Loma Ridge site in north-east Orange County was collected and transplanted in litterbags across 5 sites: a grassland site, a desert site, and three forest sites. The forest sites are on or nearby the James Reserve. These sites were chosen because they vary significantly in annual climatic parameters such as average annual temperature and precipitation. The transect across sites will enable a comparison of the effects of the warming earth on microorganism across an array of climactic regimes.

Nameer deploys two sets of bags of litter, "microbial cages" that act to exclude foreign local microbes and prevent transplanted microbes from escaping. One set of litterbags is deployed with only grassland litter, while the second set contains grassland litter that has also been inoculated with litter local to the site to which each litterbag is transported. What might we predict will happen to the microbial conditions at each location? First, in warm and moist conditions, microorganism may be more active and decompose litter much faster than in cooler, dry environments. Next, microbial communities will be quick to adapt to the conditions where they were transplanted, especially when inoculated with local litter and they could become genetically distinct. Finally, the species within microbial communities may not be able to evolve quickly, their community function may shift, especially if litterbag communities are inoculated with local microbial communities.

The results of this study should provide us insights into how climate change might affect soil microbial communities and how this in turn might impact soil dynamics. This research also highlights how the James Reserve is an ideal location for studies that compare communities across the steep and varied ecotones that exist along its western facing slopes.