

The beauty beneath us

by Kathleen Schaeffer

When one thinks of science, the images that may come to mind are individuals in white lab coats mixing chemicals in a room filled with expensive machines, or maybe even of astronauts taking their first walk on a moon mission. It is likely, that one of the last things a person would picture as a scientific activity, is digging around in the dirt. But soil science is so much more than just playing in the dirt. Even the word “dirt” is often religiously avoided by soil scientists because it fails to emphasize the unique functions and importance of the intricate world beneath us. Soils are connected to countless biological processes, from the plants that we depend on for food and fodder, to the air that we breathe, they are a substrate of life. Studying soil can not only offer tips on how to improve those begonias that are wilting away in your back yard, but can better inform land management decisions, especially in conservation and restoration practices.

Historically the northern Chihuahuan desert was comprised of perennial grasslands. The introduction of European cattle, and the subsequent heavy grazing, diminished the extent of grasslands to the point where shrub species like Creosote bush (*Larrea tridentata*) and honey mesquite (*Prosopis glandulosa*) began to encroach upon the grasses. As a result, the Chihuahuan desert is now primarily made up of shrublands dominated by these species (Figure 1). This has often been considered a negative land transition by land managers, as it has reduced the amount of grasses available, ultimately limiting the resources that grasses provide to wildlife and locally grazed cattle. To counteract this shrub encroachment, there are ongoing efforts to bring back the grasslands.

In the 1980's, the New Mexico Bureau of Land Management (BLM) began efforts to restore grasslands by removing shrubs with aerially applied herbicide. Around 2005, the BLM launched a broad scale restoration initiative with the aim of restoring lands in the northern part of the Chihuahuan desert that have undergone disturbance by woody plant encroachment. This large-scale program was dubbed “Restore New Mexico”, and since then has grown into a multi-faceted study with several different agencies and stakeholders invested. In 2006, the USDA-ARS Jornada Experimental Range (JER) joined forces with the BLM, to rigorously monitor the landscape level effects that these shrub removal treatments have had on these desert ecosystems.

In 2017, I was accepted as a PhD student at the University of Texas at El Paso. My mentor Dr. Jennie McLaren and I joined the JER and the BLM on their than most recent project proposal of the Restore New Mexico Initiative, with the goal of adding a belowground perspective to the study. Our primary interest is how the shrubs and their subsequent removal, have affected soil carbon and other soil properties that can be used as indicators for how ecosystems function. It is very important that we understand what might happen to soil carbon as the landscape is actively altered from shrublands, into novel ecosystems that have undergone shrub removal treatments. Accounting for the soil carbon levels within these two landscape scenarios can help better inform land managers about the possible costs and benefits of these treatments, as the need to mitigate the ongoing increase of atmospheric CO₂ grows. Getting a better census of soil carbon and other

soil properties in these desert regions will not only add to the current deficit of desert ecosystem knowledge but will allow us to take a look at the fine-scale processes that may be affected during shrub removal treatments. Furthermore, we are exploring whether we can use soil characteristics to help us predict which areas have a higher likelihood of grass recovery after treatments, allowing managers to target these areas for treatments.

This research project has been a life-changing opportunity for me, not only because it has expanded my education and love for science, but it has allowed me to see the unique beauty of the Chihuahuan Desert up close, and why well-rounded monitoring of management in this region matters. But overall, I have found that there is truly a world of wonder living beneath our cloud-wisped bright desert skies. From the hardy yet lovable cacti, to the stout-hearted horned toad lizard that digs his toes into the warm living earth, the Chihuahuan desert is special, and worth the exploration.