Desert FMP

Desert Fire, Mammal and Plant Studies

Seed Harvester Ants and Fire Recovery in Utah Deserts

When she set out to study some of the smallest creatures in the Rush Valley desert in Northwestern Utah, Amy Clark (BS, BYU) began by looking at the big picture – the really big picture. Aerial drone photos, to be exact, which showed her study site bespeckled with circular spaces denuded of vegetation, each one dotted at the center with a tiny earthen mound.

They weren't miniature crop circles. They were the homes of seed harvester ants (*Pogonomyrmex occidentalis*), a common resident of the sagebrush-steppe desert west of Utah Lake. Like other harvester ants, these insects collect edible seeds and plants for their colonies of up to 20,000 workers and have a queen who can live up to 20 years. The mounds are easy to notice among the sagebrush, grasses and forbs of the area. Around them the ants create "yards" … circular areas cleared of vegetation for up to 2 meters in all directions to increase the underground temperature (by preventing shade). They then add carefully chosen pebbles to the cleared area as insulation and to control how precipitation flows across their mound.

Lately these ants have had to live with fire. Rush Valley has seen more than its fair share. The native brush and grasses are not well adapted to wildfire, and are slow to recover following one. Burn after burn, this landscape is being converted into annual grasslands overwhelmed by invasive plants like cheatgrass and halogeten. Aggressive plant invaders make things even more susceptible to repeat fires, pulling flames across gaps that had previously acted as firebreaks.

Managers and scientists have focused on understanding how to rehabilitate these threatened landscapes, interrupting this downward cycle of fire and cheatgrass invasion. Scientists have studied plants, small mammals, soil crusts, and hydrology in the area. Clark, and her advisor at BYU, Sam St. Clair, wanted to know more about how ants affect ecosystem recovery after a fire. Clark wanted to know how a disturbance like fire affects changes in ant populations, and she wanted to see if these changes carry over to the plant population … whether ants help native plants or aid invasive ones.

To begin, Clark laid ant traps in research plots that had been burned with prescribed fire, and set other traps in unburned plots. In the spring of 2014 she began catching ants using these pitfall traps. The small pits were covered to keep out animals and bigger bugs, but to allow wandering ants in to be trapped. She opened the traps for a week at a time when the ants were most active, from April to October.

At the onset of her research she noticed that burned areas appeared to have more ant mounds than the unburned ones. And in fact when she measured, the burned areas did have more ants. Areas that had been burned had an average of 4.5 seed harvester ants per trap over a week's catch, while unburned areas had an average of just 1.5 harvester ants per trap. Traps from the unburned areas did seem to have more

An aerial drone photo of research plots in Rush Valley, pocked with bare ground, patches denuded by the seed harvester ant. Photo courtesy Sam St.Clair.

diversity in ant species, but that is something Clark is still trying to verify.

Seed harvester ants prefer areas cleared of vegetation, Clark said. And normally they have to work hard as a colony to make that happen. It could be that the ants are anxious to move into burned areas because a lot of the clearing work is already done. Burned areas create better environments for colonization. There are fewer obstacles to mound building, softer soil, and less infiltration of water.

Clark used a Trimble GPS, a very accurate technology, to map the different mounds in the plots, and described whether they were newly formed and active. This information allows her to track mound formation and mound death. She'll be able to note changes in the size or shifting of the mounds from year to year.

Clark wanted to know what the ants like to eat. She carefully counted seeds from various plants and put them near ant mounds in containers buried to ground level. These containers were covered with wire mesh large enough to let in ants, but small enough to keep out other hungry critters. What she found was that the ants, like teenagers, tend to go for bigger portions. Ants took larger seeds, and usually preferred native seeds. Cheatgrass seeds were rarely touched – perhaps, Clark postulates, because the hair on the cheatgrass seed made it more cumbersome to carry.

Next Clark offered a salad bar option. She germinated seeds in a greenhouse to an average of 2 inches tall. She transplanted these seedlings to the soil near the ant mounds and observed which plant species the ants took. After one week the ants had removed just 20 percent of cheatgrass seedlings, whereas the Wyoming big sage was 50 percent gone. The ants also removed shrub and forb seedlings before they took grass seedlings. Clark thinks that this was a prioritization effort to maintain their plant line … when you are the size of a jellybean it is easier to clip a tiny sagebrush seedling than to wait and tackle a mature sagebrush plant. Grass is less of a time-sensitive problem. The harvester ants also

A harvester ant mound and "yard" encircled by dishes with seeds as part of the seed preference study. Photo by Amy Clark.

tended to remove native vegetation before the non-native plants.

Managers should know that seed harvester ants, along with small mammals, could have a huge impact on reseeding efforts after a fire. But the changes Clark is seeing in ant populations after fire need observation over time, she said. The number of ants in burned areas is significantly greater than unburned areas, but this may be an initial response. Ants may not be able to sustain their mounds in burned areas that are being overrun by weeds. And ants tend to exacerbate the weed invasion problem by eating native seeds and removing native seedlings before non-natives. But ants also tackle the weed problem by clearing large areas of all vegetation around their mounds, which decreases overall biomass and reduces the seed banks of invasive species.

To Contact Amy Clark with questions or comments, visit our website:

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