Through the first five months of 2017, Gainesville, Florida, received about 6.7 inches of rainfall — over nine inches below normal. Several cities throughout Florida have experienced similar deficits this year, some even more severe.

During this time many people watched their lawns turn brown, while others tried their best to keep them green. Some people saw their ornamental plants wilt and bake in the sun if left unattended.

Periods of drought like this are concerning for several reasons. Most importantly, water is precious — especially in Florida, where reducing the amount we have while increasing the amount plants need to meet our needs is worrisome. As an entomologist, not only do the effects of drought on natural resources and plant stress come to mind, but I think of how these conditions are affecting insects in our landscapes.

How does drought affect plant-feeding insects?

Insect behavior and physiology is very closely tied to the environment. To a certain extent, as temperatures warm, insect activity increases. Additionally, there has long been the perception that insects feeding on drought-stressed plants are more successful. Although this may be the case for some, it is not a universal rule.

The general logic here is that stressed plants are less able to defend themselves or compensate for feeding damage. Other evidence suggests that drought-stressed plants are more nutritious to plant-feeding pests, which means that insects feeding on them can produce more offspring and develop more quickly.

However, things are not so clean cut. This lack of “cleanliness” makes plant-insect interactions less predictable, but it also means that insects are not going to devour all our plants whenever we have a drought. That’s an upside.

Several folks, including myself, have studied the effects of drought on insect pests over the years, and some general trends have emerged. It turns out that the
effect of drought stress is very dependent on the type of insect, and some commonalities emerge among insect groups.

Through dozens of studies, sap-feeding insects such as aphids, scales, and mealybugs most often benefit from feeding on drought-stressed plants. This means that these insects may develop more quickly, produce more offspring, and survive at higher rates.

On the other hand, chewing pests such as caterpillars and several beetles are typically negatively affected by drought conditions. A third group of insects, borers, show the most consistent relationship with drought stress by primarily targeting drought-stressed woody plants.

**Insects in Turfgrass**

To our benefit or detriment, periods of drought can have a strong effect on turfgrass insect pests. In a previous position, I was conducting research on Japanese beetles, a species of white grub that attacks turfgrasses and ornamental plants. During the first year of the study, we had large beetle populations in our field sites that we could work with. However, that year we had a severe drought and the beetle population virtually disappeared for the next two years. This is because white grubs — scarab beetle larvae — need moist soils to survive and reproduce. Therefore, drought conditions may reduce the abundance and damage associated with white grubs in turfgrass. Contrary to the “benefits” associated with drought conditions, some pests become more difficult to control.

Several subterranean insects prefer moist soils for their development, feeding and reproduction. For example, as soils dry, mole crickets tunnel deeper underground in search for moisture. This can make managing mole crickets more difficult because insecticides do not penetrate the soil to reach mole crickets when soils are dry.

Other research has suggested that mole crickets prefer to fly when the air is moist, which suggests that mole cricket flight activity and movement may be reduced during periods of drought. My lab is conducting research to address questions associated with weather conditions so that we can better predict how these insects change their distribution and behavior during different weather events.

Southern chinch bugs are sap-feeding pests, which means they have a mouthpart resembling a hypodermic needle that they use to tap into plant tissues and feed on sap. As I mentioned previously, sap-feeding insects

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tend to benefit from drought-stressed plants. The southern chinch bug is one of these, and the most damaging insect pest of Florida lawns. Therefore, as periods of drought occur or progress, it is critical to keep an eye on St. Augustinegrass lawns so that populations do not increase beyond control. This can be challenging because chinch bug damage resembles drought stress, which makes active monitoring even more important. Minimizing turf drought stress as much as possible or implementing control measures is critical to manage these pests.

Insects on ornamental plants
Symptoms of drought stress typically appear more quickly in turfgrasses than woody ornamentals. Woody plants are also subjected to this drought stress, but are better equipped to tolerate it because they can survive on the nutrient reserves they have stored away. This makes woody plants very resilient, but also difficult to manage because sometimes we cannot easily observe signs of stress until the stress has been prolonged. Insects, who are much more in tune with the plant's biology and stress level, can respond to this stress before we even realize it has occurred. As a result, we often enter the situation once drought and pests are taking a toll on the plant.

Again, among insect pests, sap-feeders are most likely to benefit during periods of drought. This includes groups like scale insects, aphids, whiteflies, and mealybugs. Current research in my lab is investigating the effects of temperature and drought on urban trees in Florida and the east coast. Over the next three years, we will be manipulating the level of drought stress in these trees and measuring its effect on plant-feeding pests. Our goal is to better understand this relationship so that we can develop IPM strategies that increase tree health and reduce pests that attack them, especially during stressful periods.

How can we mitigate these effects?
Ultimately, mitigating the effects of drought or heat comes down to proper preventive cultural practices. Plants must be set up for success from the beginning if they are expected to survive during stressful times. In most cases, if the right plants are being used for the site and they are being maintained appropriately, plants should be able to tolerate or compensate for insect feeding.

The recent Florida drought is an excellent example of how cultural practices can set up a
landscape for failure or success. Individuals who resisted the need to irrigate their lawns may have ended up battling other issues like southern chinch bugs. Although these forces are often out of our control, lawns that were dense, green, and vigorous prior to the drought most likely encountered fewer additional challenges.

An important note for landscape management — and perhaps in life — don’t overcompensate. Although too little water is bad, too much water can be equally so. Not only can disease come into play with too much moisture, but insects may also respond. For example, bark beetles are attracted to drought-stressed and over-watered trees. A research project that I worked on found that over 80 percent of water-logged nursery trees were attacked by bark beetles, while less than 15 percent of unstressed trees were attacked. This is because water-logged trees release ethanol in response to this stress, which attracts wood-boring beetles. Therefore, it is critical to maintain a balance with cultural practices.

Scientists predict that periods of drought will become more frequent and severe in coming decades. To address the challenges associated with drought stress and future landscape management needs, UF/IFAS is conducting several research studies to identify more drought-tolerant turfgrasses and IPM tactics for maximizing urban landscape plant health. In addition, my lab is evaluating multiple new turfgrass genotypes for resistance to southern chinch bug, which could provide an additional tool for reducing damaging chinch bug populations that result from plant stress.

If drought conditions persist, consider the stress levels of turf and ornamental plants in your landscapes, and keep an eye out for the insects that may respond to that stress. If the rainy season brings much needed precipitation, track the irrigation and management of these plants to ensure they are healthy and able to tolerate or defend against pests. These efforts and results depend on active monitoring for plant stress and pests, while using appropriate cultural practices to promote the system’s overall health.

‘Roach Hunter’

Lyle J. Buss

WHEN I THINK OF INSECTS that are found in buildings, some things that come to mind are ants, termites and cockroaches. But what about wasps? Usually I think of wasps living outside, although in Florida lots of different critters may wander into homes. But here is a wasp that is mainly found indoors, and it’s not a bad bug, either. This is *Evaria appendigaster*. Its common name is easier to pronounce — it is a type of ensign wasp. It gets its name from its relatively small abdomen, which is attached to the thorax by a thin segment that enables it to be waved around like a flag, or ensign.

The interesting thing about ensign wasps is that they attack cockroach egg cases, or oothecae. That makes them a beneficial insect in most people’s opinion. This particular species is black with clear wings and is about ¼ inch long, which makes it one of the larger species in the ensign wasp family. Its long legs make it look even larger, and at first glance, some people mistake it for a spider.

Ensign wasps parasitize cockroach oothecae, and since this is one of the larger species, it needs a big ootheca in which to develop. Its favorite host is the American cockroach, *Periplaneta americana*. Another host is the Australian cockroach, *P. australasiae*, which also commonly invades homes and garages in the Southeast. The female wasp lays a single egg in a roach ootheca, and the larva will eventually kill all of the roach eggs as it grows. Unfortunately, this wasp species is too big to utilize the oothecae of German and brown-banded roaches.

This wasp probably originated in Asia and has been transferred around the world along with the roaches. It is commonly found in urban areas and in buildings, but it doesn’t seem to occur outdoors in natural environments. Homeowners don’t need to be worried about these wasps, as they don’t sting or bite people or pets. However, if many of these wasps are being found, it may indicate that there are a lot of large roaches present.

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