

# University of California Cooperative Extension Subtropical Horticulture News

Quarterly Newsletter for Subtropical Horticulture Growers in Riverside & San Diego Counties  
Vol 1, Issue 3



## Note from the Editor:

Hello Subtropical Horticulture Community, it's unfortunate that COVID-19 has caused such a disruption in our everyday lives. My condolences to anyone who has been impacted personally by COVID, I know I have been personally impacted by loss of a family member due to the virus. In general, this has been a difficult year for everyone. Nevertheless, I would like to thank you for joining me for our third edition of our local quarterly newsletter specifically for Subtropical Horticulture stakeholders in Riverside and San Diego Counties.

We just got the word from the university that offices will remain closed until June 30, 2021. We still had a productive summer and fall. Zoom has become our new normal, so many of our UC ANR events have been shifted to online. My Citrus Production Course had been postponed to the summer and online and farm calls went down dramatically. However, here at UC ANR we are trying our best to still be there for our industry, commodities, and growers. We want this newsletter to be valuable for you so *please*, share your feedback and suggestions to help us improve. Don't forget to sign up for the quarterly newsletter, Topics in Subtropics (Please contact Erin Spaniel ([enspaniel@ucanr.edu](mailto:enspaniel@ucanr.edu)) and request to be placed on my email list and join the Topics in Subtropics Blog :<https://ucanr.edu/blogs/blogcore/subscribe.cfm>



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*(Due to office closure, please use email)*

# Mule Deer Management in California Avocado and Citrus Orchards

Sonia Rios



(left) Young male, mule deer. Photo by UC IPM

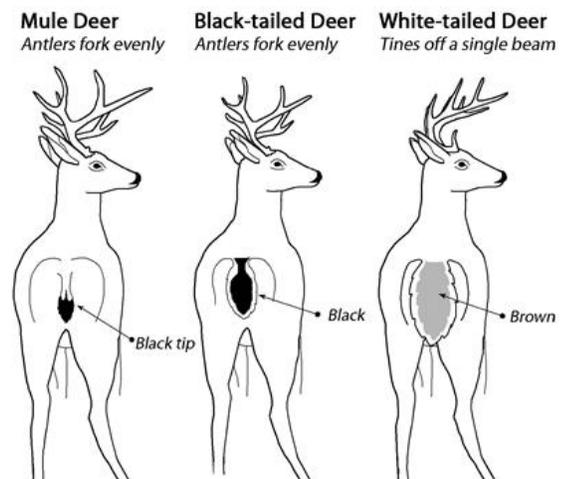
First of all, I would just like for everyone to know that I am not by any means a zoologist or vertebrate specialist. I have been asked by several growers to discuss the subject of deer management in orchards, preferably in avocado orchards. I enjoy writing and learning about vertebrate/mammalian pest control and after doing many hours of literature review, I was able to finally put this article on deer management together!

Many species of wildlife can harm gardens and landscaping. Different animals require different strategies to prevent them from causing damage. Before you can protect your property, it's important to understand which species of wildlife are present and which are responsible for any destruction. Deer are the largest of our avocado pests and can be a serious problem, particularly when young avocado groves are planted next to uncultivated land inhabited by these animals. When planting new orchards in remote areas, especially if in close proximity to woodland terrain, consideration should be given to potential deer problems. California probably has the most diversity of deer in the United States. There are six different species: California mule deer; Rocky Mountain mule deer; feral mule deer; southern mule deer; Columbian black-tailed deer; and, a cross between a black-tailed and a mule deer.

## Biology

The most common species that threaten subtropical tree crops in the southern and central coast are mule deer. There are two subspecies of mule deer in California: Columbian black-tailed deer (*Odocoileus hemionus columbianus*), and California mule deer (*O.h. californicus*). It is named for its ears, which are large like those of the mule. There are believed to be several subspecies, including the black-tailed deer. One of the principal means of distinguishing the closely related black-tailed deer and white-tailed deer is the growth habit of the buck's antlers. In the case of the California mule deer, the antlers fork in an upward growth, whereas the other species' antlers grow in a forward direction. The mule deer's tail is black-tipped (Figure 1). Mule deer antlers are bifurcated; they "fork" as they grow, rather than branching from a single main beam. Each spring, a buck's antlers start to regrow almost immediately after the old antlers are shed. Shedding typically takes place in mid-February, with variations occurring by locale. Although capable of running, mule deer are often seen stotting (also called pronking), with all 4 feet coming down together (Fig. 2.).

Figure 1. Tail markings on the mule deer's tail is black-tipped. Photo by Unknown



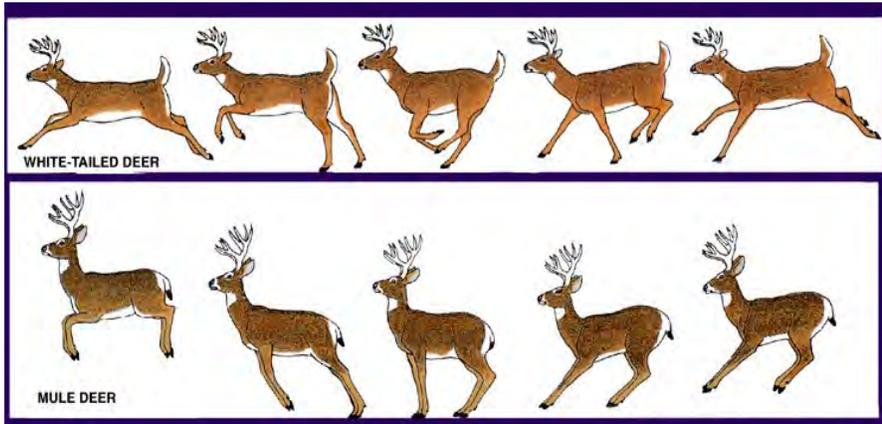


Figure 2. Mule deer are often seen stotting (also called pronking), with all 4 feet coming down together as compared to other species. *Photo by Alexander Kinnear*

## Diet and Behavior

Generally, the California mule deer has a preference for hilly terrain, especially an oak woodland habitat. California mule deer browse most actively near dawn and dusk but will also forage at night in open agricultural areas. Additionally, they usually browse close to lakes or streams providing their water source. From the reference point of water consumption, they may roam 1 to 2 miles, and typically make their beds in grassy areas beneath trees within such a 1-mile distance radius from both water and forage. In summer, California mule deer mainly browse on leaves of small trees, shrubs and herbaceous plants, but also consume many types of berry (including blackberry, huckleberry, salal and thimbleberry). In winter, they may expand their forage to conifers (particularly twigs of Douglas fir, aspen, willow, dogwood, juniper, and sage) (Mayer and Laudenslayer 1988). Year-round, they feed on acorns; grasses are a secondary food source. Mule deer digestive tracts differ from cattle, elk, and other deer species in that they have a smaller rumen in relation to their body size, so they must be more selective in their feeding. Instead of eating large quantities of low-quality feed like grass, deer must select the most nutritious plants and parts of plants. This is why they zone in on young fruit trees, as their leaves are still tender and full of nutrients. Where humans have encroached on historic deer habitat by suburban development or orchards, California mule deer will diversify their diet with fruit trees, with apple and young avocado trees being a favorite (Photo 1).

According to UC IPM (2020), deer populations in some areas of California may be declining for various reasons. However, deer numbers at the suburban-wildland interface, and even within some residential environments, have increased in many localities; perhaps a result of increased food availability from irrigated landscape plantings and because of reduced risk of predation.



Photo 1: A young mule deer buck browsing near an apple orchard in Oak Glen, CA. *Photo by Henry Herrera, Cal Fire*

## Tree Crop Damage

Deer damage is more likely when deer population numbers are high and environmental conditions are stressful, especially during drought. Presence of deer in orchards can be detected by finding hoof prints or droppings (Photo 2.). When deer browse on leaves and tender stems of shrubs and trees, they leave ragged edges on remaining plant parts (Photo 3). Highly palatable young trees like avocado and citrus attract deer and sometimes can sustain severe damage. Avocados are most vulnerable to deer depredation during the first year, about 50% of the problem the second year, and decreases after that. Either the foliage becomes unpalatable to deer or regrowth is so rapid the damage is less obvious. Deer browsing can stunt the growth of newly planted fruit and nut trees and vines, sometimes delaying their fruit production by several years. Also, in mid to late summer, bucks (male deer) will rub their antlers on tree trunks and limbs, fence posts, and other rough surfaces to remove their shedding velvet (the vascular skin that covers antlers while they are growing) as well as eat the bark in some cases (Picture 4). While this is not a problem for larger trees, saplings or small limbs can be badly damaged or destroyed (UC IPM 2020).



Photo 3: Deer damage on young avocados in Pala, CA. *Photo by Greg Kamin, Agua Tibia Ranch*



Photo 2: Presence of deer in orchards can be detected by finding hoof prints or droppings as seen above, photo was taken in an orange orchard in Temecula, CA. *Photo by Sonia Rios, UCCE*



Photo 4: Deer can damage trees throughout the year by grazing on bark, photo above was taken in a grapefruit orchard in Temecula, CA. *Photo by Sonia Rios, UCCE*

## Legal status for California

According to the California Department of Fish and Wildlife (CDFW) (2020), California's native deer are game animals, with regulated seasonal hunting that varies among the state's deer management units. Legal sport harvest of deer requires a hunting license as well as the purchase of deer tags from the CDFW. When verifiable damage is occurring to crops or other resources, the CDFW has authority to issue a depredation permit to allow the lethal removal of deer. Non-lethal methods of preventing or

controlling deer damage are usually recommended first, with lethal control via depredation permit considered as a last resort (UC IPM 2020).

## Management

Agricultural developments also make habitats more desirable to mule deer. However, these same developments often include efforts by those managing agricultural lands to limit wildlife use of the area. Recently, progress has been made in promoting biodiversity in California vineyards and orchards development by increasing use of cover crops (Photo 5) and hedgerows (Hilty and Merenlender, 2002). Establishing buffers of natural vegetation along riparian corridors and leaving those areas unfenced may also be a beneficial practice.

### *Exclusion/Fencing*

Well-built and maintained fencing is the most effective method for preventing deer damage. Fencing may require high initial financial investment but considered over time, may prove to be the most cost-effective approach. The kind of fence you build depends on the cost, terrain, and your needs. In southern California, the terrain may be your biggest challenge. On sloping ground where most avocado trees reside, you may need to build fences 10 or 11 feet high to guard against deer jumping down slope (Ver Cauteren et.al, 2006). Fence gates should be equal to the height of the fence and they must be kept closed to prevent deer from entering the fenced area. Both high-tensile wire and woven mesh, full-height fences are effective. Deer are more likely to crawl under or through a fence than jump over it. Make sure you secure the fence close to the ground and repair any breaks immediately.

Standard electric fences used for livestock have not proven very effective for mule deer control in California. However, the New Zealand-type high voltage electric fence, built specifically for deer with its high-tensile-strength wire and more intense charge, may be effective. Electric fences are significantly less costly to construct than conventional woven wire fences, but they require more routine monitoring and maintenance to ensure they are functioning (UC IPM 2020). Some growers will use temporary fencing such as polypropylene fencing. This can also be effective for limited-term deer exclusion. This type of fencing can be useful in situations where newly-planted fruit trees which need to become established and can be given the chance to grow in a few years to a size that is more resistant to or out-of-reach of deer browsing (usually 5 to 7 feet above the ground). The most common method that I have seen are the individual plant fencing. In many places, protecting individual plants may be more practical and economical than fencing an entire area (Photo 6).

## Behavioral Change

Deer are creatures of habit and often return to the same area. Take action early to discourage their visits and reduce damage. The use of noise, visual objects, or other frightening devices to keep deer

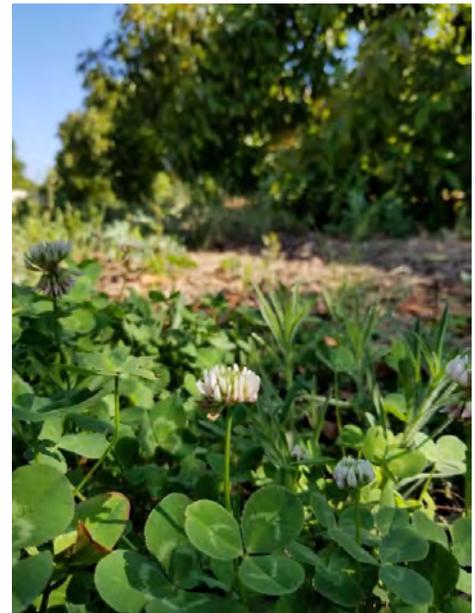


Photo 5: Cover crop in avocados. Promoting biodiversity in California vineyards and orchards by increasing the use of cover crops. *Photo by Thomas Grandperrin*



UC Statewide IPM Project  
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away from young trees is usually effective for only a few days, if at all. In rural, agricultural areas, electronic or mechanical noisemakers that periodically discharge sound (for example, propane cannons and electronic alarms) typically work only for short periods of time, this is also the usual case for birds as well. For smaller farms, motion-activated sprinklers may be effective in some situations for a given period of time. A few southern California growers have reported solving deer damage by using dogs trained to stay within an invisible fence system installed around the periphery of the plantings (UC IPM 2020).

## Repellents

Different chemical repellents are sold for reducing or preventing deer damage to plants, although their effectiveness in most situations is not very good or long lasting nor does it work for antler rub scenarios. Deer repellents are designed to impart objectionable odors or tastes. Studies suggest that repellents containing fermented egg compounds are more effective. Most repellents are not allowed on edible food crops but can sometimes be used during the dormant season or when fruit is not present; check the product label to determine its approved uses. Repellents should be applied before damage occurs and must be reapplied frequently, especially after a rain, heavy dew, or sprinkler irrigation. To be effective, repellents must usually be applied to new foliage as it develops. Some repellents can be injurious to



(Photo by CDFG)

certain tree crops, especially to the new growth. When choosing a deer repellent, ***read the label carefully*** to find out if it's can be used in your orchard. Be sure the repellent is registered for your intended tree crop and season. ***Always follow product label directions.*** For more information regarding deer management, visit the UC IPM website: <http://ipm.ucanr.edu/PMG/PESTNOTES/pn74117.html>

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### ***Africanized Bees: Should We Worry?***

Sonia Rios



Africanized Honey Bee in a hive. Photo: CISR, UC Riverside

Avocado trees will soon be covered in new bloom, this usually occurs during March- May. Avocado flowers are usually pollinated by honey bees and growers will place hives in their orchards. Honey bees have been an integral component of agriculture because they are used to pollinate numerous fruit and vegetable crops.

A few months ago, I was evaluating a research plot in Riverside, the avocado trees were in full bloom and occasionally I would observe a honey bee here and there, zipping by. However, during the middle of my work, there was a honey bee that wouldn't leave me alone, or so I thought it was a normal honey bee. A few seconds later, the bee started to follow me and was getting more aggressive. I started to panic, walked very quickly to my truck, closed the door and locked myself in the truck. The bee had followed me and was on my windshield. It took me a few seconds to realize this was not the common honey bee, but an Africanized bee or hybrid. After about 10 minutes the bee finally left. I causally continued my work and just kept away from that area of the field.



The darker bee on the left is the African Honey Bee and the lighter bee on the right is the European Honey Bee. These are the two bees used to create the hybrid Africanized Honey Bee. *Photo Credit: Available from: <http://nationalatlas.gov/articles/biology/images/beesonhive.gif>*

In 1990, Killer Bees reached southern Texas, appeared in Arizona in 1993, and found their way to California in 1995. They are expected to form colonies in parts of the southern United States. Following colonization, unmanaged bee populations are replaced or mixed with Africanized honey Bee. As of 2008, Africanized bees have colonized all southern California counties, and the southern Central Valley. Though the Africanized honey bee spread has slowed, in time, their range may expand to much of coastal California and the Central Valley (UC IPM 2019). These bees can be expected to thrive in urban, agricultural, and some recreational areas.

If the state were fully colonized by Africanized honey bees, reduced numbers of beekeepers and colonies would lower honey and wax production (\$42 million) as well as pollination rental income (\$122 million). More significantly, the annual value added by honey bee pollination of agricultural crops in California in 2005 exceeded \$3.9 billion; reductions in managed bee colonies have resulted in substantially increased costs and decreased yields in many fruit, nut, vegetable, and seed crops.

All honey bees readily defend their nests, and an attack usually means that the victim is too close to the nest. While European races of bees may attack a nest intruder with a few bees (usually no more than 10-20 bees), African bees may attack the same intruder with hundreds of bees. Further, African bees generally defend a larger radius around their nest and usually require lower levels of stimuli to initiate an attack (Winston 1996). Because of these characteristics, African bees are capable of killing large mammals, including man.

A final behavioral curiosity of African bees concerns nest usurpation (or colony takeover) of European colonies. Small African swarms containing a queen often land on the outside infrastructure of a European colony (a wall, beekeeper-managed hive, etc.). As time passes, the worker bees in the



African swarm begin to exchange food/pheromones with the European workers from the colony. This gradually ensures the adoption of the African bees into the European colony. Somewhere during this process, the European queen is lost (perhaps killed by the African bees, her fate remains uncertain at this point) and the African queen is introduced into the colony, thus becoming the reigning matriarch (Orley 1977). European bees do not display this behavior but often fall victim to it, thus creating an African colony from a

preexisting European one. Because Africanized offspring, including queens, develop faster than European offspring, a queen having an African genotype is more likely to emerge earlier than a queen with a European genotype (Orley 1985). The first queen to emerge kills her queen sisters that have not yet emerged from their cells.

According to França et. al 1996, if an attack occurs, remembering a few simple recommendations will increase one's chances of minimizing the effects and severity of the attack. If attacked, a victim should run away from the area using his shirt to cover his head and especially airways. Running through tall grass or small trees will help to disrupt the attacking bees. The victim should not stand and swat at the bees. The bees are defending their nest, and the victim needs to get away from that nest as quickly as possible. It is important that the victim get cover in a bee-proof vehicle or structure if either is available. One should not jump into the water or hide in bushes. The bees can remain defensive and in the area for some period of time, thus increasing the risk to the victim. If stung, the victim should remove the stinger quickly by scraping it rather than by pulling it. One should see a doctor immediately if breathing is affected.

For more information regarding Africanized Bees:  
<http://ipm.ucanr.edu/PMG/PESTNOTES/pn7449.html>

Bee Alert: Africanized Honey Bee Facts  
(UC ANR Publication) (PDF)

Africanized Honey Bee  
Center of Invasive Species Research (CISR), UC Riverside (Website)

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## South American Palm Weevil: Update

Sonia Rios & Tracy Ellis



Adult South American Palm Weevil. (Photo Credit: Mark Hoddle)

The South American Palm Weevils (SAPW) have made their way north from Mexico and are having a destructive impact on canary island palms in the San Diego region – a multi-million dollar industry in Southern California’s landscape. As of 2019, this pest has been killing palms at a faster rate than ever before and moving northward. The SAPW threatens the iconic aesthetics of public and private properties and will be a costly management expense for public authorities as well as private home and business owners due to the difficulty of removing dead and dying palm trees (Hoddle 2017).

COVID-19 has placed a lot of things to the back burner, we have been distracted with many other serious issues. However, just because we are in quarantine doesn’t mean we forget that invasive pests are still out and about. As California starts opening up again slowly, we must turn our focus back onto the issues that were important pre-pandemic, the SAPW. The beetle inflicts serious physical damage to the fronds, crown, and hearts of palm trees, as well as weakening palms immune system to leave them susceptible to other fungal and wilt diseases. An untreated palm infested by palm weevils will ultimately die while serving as a nesting site to spread the beetle to other palms in the area. Fast



detection and removal of SAPW infestations is key because even moderately infested palms act as nurseries for weevil larvae and spread damage.

Photo: (L) a collapsed palm due to SAPW damage, (R) a healthy palm tree. *Photo Credit, Tracy Ellis*

### **Current Status**

Since July of 2019 there has been no area-wide trapping, so we are not so sure how far north the beetle has flown since last summer when a SAPW was caught with a CDFA trap in San Marcos and spurred on the outreach meetings late last summer. The devastation is now apparent all along Hotel Circle on Route 8 for all the tourists to see. There are a few dead palms reported as far north as Pacific Beach along the coast. The Mission Hills neighborhood just south of Route 8, Chicano Park, Presidio Park, Downtown, Old Town and Greenwood Cemetery are all very hard hit.

Date palm growers should be on high alert for this pest, as date palms are a prospective host to the SAPW, although no ornamental *Phoenix dactylifera* have been found to succumb locally in San Diego.

Please report infested palms, please fill out the form below:

[https://script.google.com/macros/s/AKfycbwKATkoSnbgiQIF7xfsAgGXV8Qw6jHJxH\\_67LVrG6SF\\_H54QBc/exec](https://script.google.com/macros/s/AKfycbwKATkoSnbgiQIF7xfsAgGXV8Qw6jHJxH_67LVrG6SF_H54QBc/exec)

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## University of California Avocado Farm Advisors Receive UC Thelma Hansen Grant to Study High Density Plantings of ‘GEM’ Avocado

Sonia Rios



*Photo by Index Fresh*

University of California Subtropical Horticulture Farm Advisors, Sonia Rios, Ben Faber, and Gary Bender received a \$50,000 grant to conduct a 5-year study on a ‘GEM’ high density trial. Collaborators include Tim Spann, a representative from the California Avocado Commission (CAC) and Anil Shrestha from California State University, Fresno. With the help of CAC, the research trial will be planted at Pine Tree Ranch in Santa Paula in early 2021.

The GEM avocado came about as a result of the University of California Riverside’s (UCR) avocado-breeding program. A particularly promising seedling, called ‘3-29-5’, was selected from a Californian test orchard and named after one of the selectors, Gray E. Martin (initials GEM). The first 3-29-5 trees were top-worked in 1992 at University of California South Coast Research Station. In 2002, a US Plant patent application for 3-29-5 was filed, and from 2003 applications were filed for international Plant Breeders Rights (PBR). Westfalia Technological Services are the exclusive licensee to develop and market 3-29-5 internationally outside the United States.

The GEM is a high yield per acre variety that allows for efficient harvesting. GEM’s flesh has a unique buttery/nutty flavor and smooth texture. The green skin turns blackish-purple when ripe. The fruit hangs on the tree much longer than Hass without compromising fruit quality, so it allows growers to offer fruit of excellent quality during late seasons when limited fruit is available. GEM grows on smaller trees than Hass and is a more consistent producer, since it tends to be less alternate-bearing than Hass.



Photo: *Sylvie Kremer-Köhne, Westfalia*

Even though the GEM variety technically isn’t a new variety, it has recently sparked the interest of California avocado growers. There is still so much we need to learn about how this variety adjusts to California. To learn more about the GEM, UC ANR Subtropical Horticulture Specialist, Mary Lu Arpaia tells the history of the GEM: <https://vimeo.com/177043009>

For other information regarding the GEM avocado being grown in California, please click on the links below:

<https://abc30.com/food/researchers-look-at-new-avocado-that-could-be-grown-in-the-valley/5465937/>  
<https://vimeo.com/channels/1117526/177039176>  
<https://vimeo.com/channels/1117526/177045003>

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Sonia Rios



Photo Credit: AgAlert

***In Memory of Dr. Travis Bean  
February 11, 1977 – May 2020***

We unexpectedly lost Dr. Travis Bean towards the end of May. He struggled with chronic illnesses, such as an autoimmune disease amongst other ailments. His cause of death is still unknown and many of his colleagues are still grieving the disbelief of his passing.

He earned BS and MS degrees from the University of Arizona, followed by a PhD in Ecology and Rangeland Management, also from the University of Arizona, in 2014. Travis had been working for the University of California Cooperative Extension as a Weed Science Specialist since August 2014. Travis had made a significant contribution to science and demonstrated a substantial contribution to Cooperative Extension. Even when ill, he never complained, and most people couldn't even tell he had been battling several illnesses behind the scenes.

With perseverance, Travis's performance had been exemplary and a model for extension specialists around the UC System. Travis worked with the general public, growers, natural resource managers, ranchers, commodity groups, nonprofits and other government agencies. He provided evidence of numerous extension presentations covering topics such as the management of invasive weeds, proper weed identification, weed phenology, calibration of herbicide application equipment and weed management in commodities such as citrus, avocados, and melons.



He was also considered an expert and was widely interviewed about invasive plant management and restoration and wildfire prevention and recovery. Travis was active on many university committees on campus and off. He chaired the statewide UCANR Weed Workgroup and co-chaired the Desert and Ecological Restoration

Workgroups until 2018. Travis was on the Research Advisory Committee for the UCANR Desert REC in Holtville and was chair of the South Coast REC in Irvine. In 2018, he served on the board directors for the California Weed science Society as Secretary. Travis was also very active in the Western Society of Weed Science.

When not working, which was very unusual because Travis enjoyed his work so much, you could find him out in nature, brewing his own beer, or eating the most exotic entrée at a restaurant! He had great potential for a productive career in the Department of Botany and Plant Sciences at UC Riverside. Unfortunately, his life was short, and he will be extremely missed by everyone at the University.

*I personally had the opportunity to work with Travis on many research trials and publications throughout the years. He was my colleague and my friend. The short-time I had spent with Travis, was always a positive experience and I will never forget everything he had taught me and I thank him for that.*

*When I first met Travis in 2014, he very quiet and reserved, however after getting the opportunity to really get to know him as Travis and not Dr. Travis Bean, UC Weed specialist, I was given a rare glimpse of the person that not many people get see or know. It hurts and saddens me to know that I will never hear from him, receive a text, or see him again, but I know he is whole again and finally at peace. My heart breaks for his family, especially his mother, Debbie as they were very close and communicated almost on a daily basis. He had other offers to work for different universities, but chose UC Riverside/CE, we're glad he did!*



Sonia

## ANNOUNCEMENTS

### California Weed Science Society (CWSS)

Monday, January 25 – Friday, February 26, 2021

The CWSS Board has decided in the best interest of the Society and its Members to transfer our annual site conference from the previously planned location in Santa Barbara to an online event for January 2021. Because of this change, the 73rd annual conference will undoubtedly be different than normal; however, we know our members value the information provided and we look forward to your continued support of the conference and California weed management community. They are moving forward with a great online program, which will include continuing education credits at a reduced registration cost. Look for more information in the coming days regarding the different opportunities for you and your company to participate in the meeting.



Weed infestation in a Coachella date palm orchard. *Photo by Sonia Rios, UCCE*

Registration link: <https://www.cwss.org/2021-annual-conference-registration/>

View Agenda: [https://www.cwss.org/wp-content/uploads/2020/11/Program-Agenda-2021\\_updated-111820.pdf](https://www.cwss.org/wp-content/uploads/2020/11/Program-Agenda-2021_updated-111820.pdf)

*I will be co-chairing the Trees and Vines section at the conference and Ben Faber, UCCE Subtropical Horticulture will be giving us a glimpse of the challenges in Avocado Weed Management.*

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## 2021 Avocado Grower Seminar Series

The planning committee is currently making some last-minute adjustments to next year's schedule, which will be online soon. We hope by next August we can have our traditional field day in person.

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## 2021 Avocado Production Course Webinar



Due to COVID-19, I had to postpone my Citrus Production Course, which pushed back the Avocado Production class which is traditionally done in the fall and eventually I had cancelled entirely for 2020. However, my plans are to bring the class back in **late March 2021** as an online course. Please keep an eye out for further announcements! As things get back on track, we hope to continue with both commodity course, Avocado class in the spring and the Citrus class in fall.

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