Topics in Subtropics Newsletter

University of California Cooperative Extension

Fresno, Kern, Madera, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara,Tulare,&Ventura Counties

News from the Subtropical Tree Crop Farm Advisors in California

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Editor's Note:

Please let us know if your mailing address has changed, or you would like to add someone else to the mailing list. Call or e-mail the farm advisor in the county where you live. Phone numbers and e-mail addresses can be found in the right column. Please also let us know if there are specific topics that you would like addressed in subtropical crop production. Copies of Topics in Subtropics may also be downloaded from the county Cooperative Extension websites of the Farm Advisors listed.

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An update on the threat of Asian citrus psyllid and Huanglongbing for citrus

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The Asian citrus psyllid, *Diaphorina citri*, is a tiny aphid-sized insect that crossed the border of Mexico and arrived in southern California in 2008. It has the potential to cause great harm to the citrus industry, not because of the direct feeding damage that it does to citrus, but because of its ability to vector the bacterium *Candidatus* Liberibacter asiaticus that causes the disease huanglongbing (HLB), also known as citrus greening disease. HLB is devastating to citrus trees, blocking the vascular system of the plant. This blockage causes leaves to turn yellow, fruit to grow slowly and asymmetrically, the juice turns off-flavor and the tree may die in as little as 5 years. There is currently no cure for the disease, so HLB is a death sentence for citrus trees. In Florida, where both the psyllid and the disease are found, citrus growers are destroying tens of thousands of HLB-infected trees each year to prevent the disease from spreading.

The Asian citrus psyllid can utilize as a host plant all cultivars of citrus and closely related plants in the Rutaceae family such as Indian curry leaves (*Bergera koenigii*), orange jasmine (*Murraya paniculata*) and Chinese box orange (*Severinia buxifolia*). When it feeds, the psyllid injects a toxin that causes young leaf flush to twist and curl or fall off completely. The psyllid is a damaging pest by itself, but we can control the damage it causes to leaves through biological and chemical control methods. For example, there are a number of coccinellid predatory beetles that readily feed on the nymphal stages and a small parasitic wasp called *Tamarixia* that deposits its egg under the nymph and parasitizes it. ACP is also fairly susceptible to a wide range of insecticides including pyrethroids, neonicotinioids and organophosphates. The more serious problem with this pest, is that it is a very efficient vector of HLB.

The psyllid arrived in Florida in 1998 and within 3 years it spread throughout the state of Florida, through natural flight and also by hitchhiking on ornamental orange jasmine plants from nurseries to retail stores to homeowner yards. The Florida governmental agencies did not realize the potential damage that this pest could cause and did not try to stop it. They are now realizing that the ornamental orange jasmine can also be a carrier of the HLB disease pathogen and this plant also helped to spread the disease around the state. Currently, citrus trees in 32 counties in Florida are known to have HLB and both the psyllid and disease have spread from the urban areas into commercial citrus.

From Florida and/or Cuba, the psyllid worked its way into Mexico. It was observed in 2006 by Dave Headrick of Cal Poly San Luis Obispo and Jim Stewart and Bert Quezada of Exeter in the state of Sonora, Mexico when they were visiting citrus orchards in that area in search of citrus peelminer parasitoids. The psyllid spread through Mexico very rapidly. In 2008 it was found in San Diego and Imperial counties and in 2009 in Orange and Los Angeles counties of California. Up to this point, the 99% of California finds have been in citrus trees and *Murraya* bushes in yards of homeowners. In an effort to slow the spread of the psyllid and learn from the Florida experience, the California Department of Food and Agriculture (CDFA) and the Citrus Research Board (CRB) established a Huanglongbing Task Force to study the situation, establish regulations to limit spread of the psyllid and disease, and to

communicate information to the citrus industry and general public. CDFA has set up quarantines 20 miles around psyllid finds, required pesticide treatment of Rutaceae in wholesale nurseries to ensure that the plants arrive in retail stores pre-treated and restricted movement of Rutaceae out of the quarantine areas to limit ACP spread via plant material. Harvested fruit within the quarantine areas must be free of plant material that the psyllid could ride on before being shipped out of the quarantine areas. Finally, citrus and *Murraya* in yards infestedwith ACP and adjacent yards are treated by CDFA with a combination of systemic imidacloprid and the foliar pyrethroid cyfluthrin in an attempt to eradicate the psyllid. The majority of treatments have suppressed psyllids for up to a year. However, the psyllid continues to spread because it is tiny, difficult to detect, and there are many potential avenues for it to arrive in new territories. CDFA is trapping citrus in urban areas and high risk areas such as nurseries and the CRB is trapping all commercial citrus in California in an effort to define areas of infestation.

At the moment, although portions of southern California are infested with the psyllid, the HLB disease has not been found in California. In Florida, there is good evidence that the disease arrived from Asia through backyard plantings of citrus and the disease remained in those yards, not spreading, until ACP arrived to pick it up and move it around. California could be in a similar situation, with an infected backyard tree acting as a catalyst for spread of the disease. Surveys of backyard and commercial citrus are continually conducted in an effort to find any signs of HLB. CDFA, USDA and the CRB have laboratories that test leaf and psyllid samples for HLB, and to date no disease has been detected.

HLB-infected trees have been found in urban areas of Mexico in the Yucatan peninsula and Belize and in the eastern Mexican states of Jalisco, Nayarit and Sinaloa. The Mexican growers are aware that the disease will likely spread into commercial citrus in the near future. The Belizean Agricultural Health Authority (BAHA), the United States Department of Agriculture – Animal and Plant Health Inspection Service (APHIS), the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food – National Service of Agricultural Health, Safety and Quality through the General Directorate of Plant Health (DGSV), and the Organismo Internacional Regional De Sanidad Agropecuaria (OIRSA) have developed a strategic and operational plan as part of a Tri-National strategy to manage HLB disease and its vector. This plan includes surveys for psyllids and HLB, treatments or biological control to reduce psyllid populations especially along borders of nations, testing of plants and psyllids for HLB and tree removal where infected trees are found.

The best way to keep the disease from finding its way to California is to keep the psyllid populations very low and to plant only California grown certified disease-free citrus trees. Because of the high percentage (60%) of homeowners with citrus in California, the general public is a critical component of the plan for controlling ACP and HLB. The CDFA, USDA, University of California and the Citrus Research Board have launched massive public awareness programs through mailings, internet web sites, television, newspapers and radio to educate the urban population in multiple languages. You can help with this effort by teaching friends and relatives to check their citrus regularly and help them learn to

identify the psyllid and disease utilizing the Citrus Research Board web site www.californiacitrusthreat.org. The web site provides information about who they can call if they think they have found the insect or disease. If they live in a psyllid-infested region, they need to be careful to dry out or double-bag landscape clippings to prevent moving the live psyllids to new areas. Bayer chemical corporation has a citrus formulation of imidacloprid that homeowners can apply themselves to reduce ACP infestations. Most importantly teach friends and relatives the dangers of moving plants and into and around California.

Asian citrus psyllid and the potential threat of HLB is rapidly altering the way the California citrus industry does business. Citrus nurseries are required to apply pesticide treatments prior to shipping plants to retail stores within quarantine zones. Citrus nurserymen are building very expensive screenhouses with fine mesh to protect their trees from infestation by ACP and maintain disease-free plants. Citrus growers in quarantine areas must clean fruit before shipping it to be packed in other regions. The citrus industry with the help of the University of California is developing plans for areawide insecticide treatments of commercial citrus. At the first sign of psyllids, growers will be asked to treat aggressively with systemic neonicotinoid and a foliar ACP effective insecticide. This treatment will likely eliminate the psyllid for many months. Once psyllids become established in a region, then an areawide, continuous management strategy will be implemented. The treatment strategies for various regions of commercial citrus (San Diego, Riverside, Coachella, Ventura and the San Joaquin Valley) are listed on the UC Kearney Ag Center citrus entomology web site: http://ucanr.org/sites/KACCitrusEntomology/Home/Asian_Citrus_Psyllid/Management_420/. The insecticide treatments include systemic imidacloprid, thiamethoxam and foliar treatments of organophosphates (Lorsban, Dimethoate, Imidan), pyrethroids (Baythroid and Danitol), Delegate, Agri-Mek and others. ACP effective insecticides are listed in the Citrus IPM Guidelines www.ipm.ucdavis.edu/EXOTIC/diaphorinacitri.html . The treatment strategy proposed is to hit the psyllid aggressively in the fall and late winter with the broad spectrum foliar insecticides when the population is primarily adults and utilize systemic insecticides and additional foliar insecticides when the nymphal populations appear during periods of flush growth. An areawide approach is critical because the insect is small and difficult to detect visually and yellow trap cards are not effective when flush is present. Thus, it is difficult to determine the boundaries of a psyllid infestation and they are known to fly many miles. The Florida experience demonstrated that delayed, localized action resulted in rapid spread of the psyllid and the disease. Unhappily, none of the registered organic insecticides tested (Pyganic, Neemix, oils, Surround, Ecotrol) show enough efficacy to provide an eradication-level program for organic citrus and so organic citrus production may be lost as the psyllid and disease advance into those orchards.

The disease has existed for many years in Asia and India yet citrus continues to be grown there and China has become one of the leading citrus producers. How can their industries survive in the face of the disease? The answer is that their expectation for the lifespan of trees in HLB infected regions is less than 15 years and the productivity of the trees is much lower than in California. In some areas of China, citrus production has been moved to new areas in order to stay ahead of the psyllid and disease. Florida is

losing citrus rapidly because urban areas and untreated orchards provide continuous sources of psyllids and pathogen. Currently there is much discussion about how severe the disease will be in California. California has a dryer climate than Florida, with less frequent flushing of trees, and fewer alternate ornamental host plants such as orange jasmine. In the San Joaquin Valley, extremes of heat and cold should act to reduce psyllid survival and HLB titer. While this may make the situation less dire for California, it is not likely to stop the pest and disease altogether. Thus, the citrus industry must take a conservative approach to slow the spread of the psyllid to protect against the disease.

Federal, State, and citrus industry funds are being directed not only towards ACP eradication efforts in California, but also towards research programs throughout the nation. Researchers are screening the effectiveness and residuality of insecticides to provide new and different insecticide groups to manage the problem of ACP resistance to insecticides. Research is underway to develop better trapping systems that utilize the insect's attraction to pheromones and color cues. A critical problem with HLB management is that symptoms often don't show in a tree for 6 months to 2 years after infection and an infected tree can be a source of infection for neighboring trees during that time period. Research is underway to detect HLB soon after infection, instead of waiting until symptoms appear, so that infected trees can be removed more promptly. The most critical research efforts underway, are to develop a citrus tree that can withstand the disease and methods to prevent the psyllid from transmitting the bacterium. The current ACP insecticide treatment efforts in California are an effort to limit numbers and spread of ACP to buy time for this research to be accomplished. Once HLB is found, the ACP control efforts will escalate to protect trees from infection and HLB-infected tree removal will be initiated.

Huanglongbing is the most serious disease of citrus worldwide. The citrus industry must do everything it can to educate itself and the general public, reduce ACP numbers and carefully control movement of plant material to limit the introduction of HLB, and fund creative research to solve this very difficult problem.

The Search for Salinity Tolerance in Avocado ; An Update on a Frozen Rootstock Trial

Gary Bender, David Crowley and Mary Lu Arpaia

This is the story of a remarkable avocado rootstock trial that was set up in 2004, lost to the freeze of January 2007, recovered (mostly) and had its first harvest in spring of 2010. But the real story is how some of the rootstocks bore at a really high rate with water that was so saline that almost killed most of our California rootstocks.

As part of Crowley and Arpaia's salinity rootstock trial, in cooperation with farm advisors and several growers, and funded by the California Avocado Commission, this particular trial was planted in 2004 at the Nick Stehly Ranch in Valley Center. The trial had 10 different rootstocks all grafted with Hass scions. Twenty trees of each rootstock were planted in a randomized and replicated block design: the rootstocks were Duke 7, Spencer, Parida, VC 44, VC 207, VC 801, VC 218, PP14 (Uzi), PP 16 (Rio Frio) and PP24 (Steddom). The VC series are rootstocks selected in Israel for tolerance

to salinity, and the PP series are rootstocks selected for root rot tolerance by Dr. John Menge at the Plant Pathology Dept., U.C. Riverside. At the time of planting it was not known how the PP trees would react to salinity.

In Spring 2005 we planted six Hass/Dusa trees into vacant spots in the trial. These trees were left over from a Bender irrigation trial on another part of the ranch.

The trees were grown with highly saline irrigation water with an average EC of 2.5 and chloride levels of approximately 300 ppm. Needless to say, most of these trees suffered greatly with severe tip-burn and some of the trees almost died. But some looked better than others and we were waiting for the first harvest. In Spring 2006 some the trees set fruit and we expected the first harvest to be in 2007. **But then disaster struck!**

In January 2007 we had a serious freeze in San Diego County. Nick Stehly called us to let us know that he recorded a temperature of 18° F in our plot. All of the trees looked like they had died and we gave up on this plot and went on to other trials.

But the irrigators didn't give up! They kept pruning the dead wood out of the trees that did not die and gradually brought most of the trees back to life. But the trees were still being irrigated with the saline water, except for one important difference.

The Stehly family liked to swim in the reservoir about three times during each summer. So they would fill the small reservoir at the end of the ranch that supplied our trial, with Metropolitan Water District water with an EC of 0.7 – 0.9. After swimming they used this water for an irrigation of the trial. Amazingly, this "leaching" irrigation was apparently enough to keep the trees growing without too much tip-burn, and the irrigator reported to Nick in January, 2010 that we had enough fruit for a harvest.

The first harvest was completed in March, 2010. The data for mean pounds of fruit per tree is presented in Figure 1. The number of surviving trees after the freeze of 2007 is presented in Table 1.

Figure 1. Mean weight (wt) of Hass avocados per surviving tree according to rootstock.

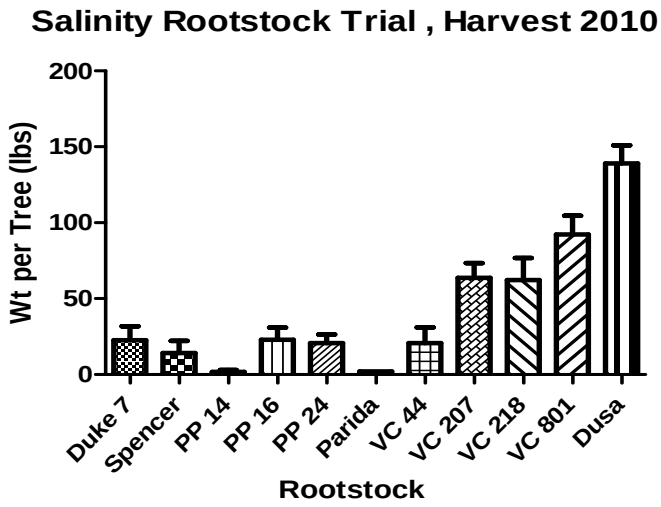

Table 1. Number of surviving avocado trees according to rootstock three years after the 2007 freeze.

Rootstock	Surviving Trees	# of Trees Planted
Duke 7	11	20
Spencer	9	20
PP 14	2	20
PP 16	7	20
PP 24	16	20
Parida	1	20
VC 44	9	20
VC 207	20	20

VC 218	16	20
VC 801	19	20
Dusa	6	6

The mean wt of Hass avocados for the VC 801 rootstock was 92.2 lbs, and the mean wt for the Dusa rootstock was 139 lb. If this is compared to the San Diego County average yield of 7000 lbs per acre (about 70 lbs per tree), it would indicate that we might be making progress in finding some better rootstocks for use with some of our saline irrigation waters. However, as we all know, you can't base any conclusions on one year of yield data. We need to have at least three years of yield data to even begin to draw any conclusions.

Our hats are off to the irrigators at the Stehly Ranch, and to the Stehly family for their cooperation (and their reservoir/swimming pool). You never know what might show up in some of these older rootstock trials.

Activator Spray Adjuvant Selection: Crop Spraying

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties and Rhonda Smith, UC Farm Advisor, Sonoma Co.

Agricultural spray adjuvants are materials added to the spray tank when loading the sprayer. They include products classified as activator adjuvants and marketed as wetters/spreaders, stickers, humectants, and/or penetrators. Activator adjuvants are marketed to improve the performance of pesticides and foliar fertilizers.

Activator adjuvants can have a place in tree (and vine) crop sprays, but matching the material to the job can be tricky. A bad match can lead to minor or major losses to the grower. Minor losses can result from excess spreading and pesticide runoff from the target plant. Phytotoxicity can cause major damage.

This article describes ingredients and functions of activator adjuvants commonly sprayed on tree and vine crops. Suggestions regarding activator adjuvant selection are offered. Growers must make their own activator adjuvant use decisions based on experience, particular needs, and risk tolerance.

Do I need to add an activator adjuvant?

Read and follow the specific instructions on the label. If the pesticide or foliar fertilizer label indicates the product should be used with certain types or brand of adjuvant(s), that's what you need to use.

Do I want to add an activator adjuvant?

If the label includes phrases such as "use of an adjuvant may improve results" or "complete coverage is needed for best results" then you may want to look into selecting and using an appropriate activator adjuvant.

Before proceeding with use of an activator adjuvant, first look at your existing spray program. Are you already doing the best spray job you can? Good spray coverage begins with proper sprayer calibration and set up. Is your sprayer calibration dialed in for different stages of canopy development? Optimum sprayer set up – gallons of spray per acre, ground speed, fan output, and nozzle selection/arrangement-- changes from dormant to bloom to early growing season to preharvest sprays. Adjusting your sprayer to best match orchard and vineyard conditions at each general stage in canopy development is the foundation of an

effective, efficient spray program. An activator adjuvant will not make up for excessive tractor speed, poor nozzle arrangement and/or worn nozzles. Your money is best spent first dialing in your sprayer(s) for the whole season, before considering an extra material in the tank (that is not required on the label).

If you have your sprayer(s) dialed in for each orchard and stage of growth, now is the time to say "OK, I want to think about a little extra boost to my spray job".

Which activator adjuvant properties do I want?

First, know the properties of the pesticide you will use. Does it work on the plant surface or inside the plant? This is a key point in selecting adjuvants. Here is a quick review of the main classifications and characteristics of activator adjuvants as they currently appear in the field. **Note:** Certain products can provide more than one adjuvant property – that can be beneficial in the field. For example, non-ionic surfactants can work as surfactants and penetrators, depending on use rate.

Wetters/spreaders: These materials contain surfactants that decrease the contact angle and increase the spreading of the spray droplet on the target. High rates of wetters/spreaders may also increase penetration of pesticide into the target tissue (leaves or fruit), potentially causing phytotoxicity. Excessive spreading of pesticide spray solution and runoff from the target may result when using a new or higher rate of spreader -- especially when using silicon "super-spreaders". Test new combinations of spreader material(s) and spray volume before regular use. Spray volume per acre or adjuvant use rate will probably have to be reduced if a labeled rate of adjuvant provides excessive spreading.

To check for excessive spreading, place a length of black plastic sheeting under several trees or vines in a row. Secure the plastic with spikes, wire staples, and/or weights. Spray the new adjuvant and pesticide combination using your current sprayer set up. Reenter the field right after spraying, wearing appropriate PPE (Personal Protective Equipment), and evaluate coverage. If material is pooling at the lower portion of leaves and/or fruit, excessive spreading is occurring. Check to see if pooling is occurring only in a certain area(s) of the canopy or throughout the canopy. If more spray solution is landing on the black plastic tarp under the trees/vines than between them, then runoff is occurring. [Some ground deposit should be expected from standard airblast sprayer use.]

Compare the results of your adjuvant test with a similar application of your current pesticide/adjuvant combination on another portion of the row. If there is no pooling or runoff with the new adjuvant in the tank, you can use the adjuvant with confidence. A lack of pooling or run off with the new adjuvant also might mean that your old sprayer setup and tank mix didn't deliver adequate coverage.

If the test with the new adjuvant showed pooling on leaves and/or runoff on the ground, you have several choices. 1) You can reduce spray volume per acre by replacing some or all nozzles with smaller nozzle sizes on the sprayer in an effort to reduce overspreading. If you saw overspreading on some portions of the canopy, but not others, reduce nozzle size only on the part of the spray boom that targets the over-sprayed part of the canopy. Recheck spray coverage if nozzling changes were made. 2) Reduce the adjuvant rate and recheck coverage/spreading. 3) You can just go back to your established program

without the new adjuvant.

What's the "best" course of action? That depends on your farming operation. Reducing spray volume per acre means more ground covered per full spray tank – a potential time and cost savings. If spraying is done during the heat of the day in hot, dry climate, spray water evaporation is a major issue and it may be best to keep the higher spray volume and reduce the spreader rate or eliminate it entirely. Checking coverage and overspreading allows you to make the best decision possible; avoid damage and, hopefully, save money. All farming operations are different. Make the choice that best fits your farm.

Stickers: These adjuvants can increase the retention time of the pesticide on the leaf and reduce rain wash off. They may limit movement of systemic pesticides into the plant, and are probably most beneficial when used with protectant materials (cover sprays). Do you overhead irrigate? Is there rain on the horizon? If you answer yes to either one of these questions, you may benefit from using a sticker.

Humectants: Under low humidity conditions humectants can help reduce spray droplet evaporation before and after deposition on the plant. This is especially valuable when small droplets and/or materials that must be absorbed into the plant (systemic pesticides, PGRs, nutrients, etc.) are used in the summer under high temperature and low relative humidity conditions.

Penetrators: Frequently used with herbicides, these products include oils (petroleum, vegetable, or modified vegetable oils) and non-ionic surfactants used at higher rates. In crop sprays, penetrators can be used to increase absorption of systemic pesticides (for example, oil with Agri-Mek) as well as translaminar materials. Penetrator adjuvants should be used with caution or avoided entirely with surface active pesticides such as cover sprays or else phyto may result. Finally, some penetrators can increase the rain-fastness of some pesticides.

Which adjuvant material should I select?

Use a product intended for crop spraying. Many activator adjuvants were developed and intended for use with herbicides. Products that are advertised for use with plant growth regulators should have a higher chance of crop safety compared with those that don't. This is still no guarantee of a phyto-free application.

Ask for help from your PCA or the adjuvant manufacturer's sales rep. How much do they know about the particular activator adjuvant in the spray mix you are planning? Can they show you the kind of information on a single product similar to what you can find at: http://www.ast-us.com? (This website is intended as an example, not an endorsement of the web pages it contains including specific adjuvants.)

Will the adjuvant I selected work in the spray I'm planning?

If you choose to use an adjuvant that is not specifically listed on the pesticide or foliar fertilizer label, jar test (a simple compatibility test –pilot scale test to ensure that materials are all compatible)the planned spray solution first. Use the same spray water source. Include all leaf feeds, other adjuvants, and pesticide(s) that you plan to put in the spray tank. Do this before tank mixing these materials.

A lot of time and money rides on effective pesticide application. Do your homework before the spray tank is filled and you will be well on your way to solid results.

United States Department of Agriculture
NRCS Natural Resources Conservation Service

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Conservation Programs Deadline Set For 2011 Funding

DAVIS, Calif., Sept. 13, 2010—The USDA Natural Resources Conservation Service (NRCS) in California has set the application deadline for Fiscal Year 2011 Farm Bill conservation programs funding as November 12, 2010.

The deadline includes all California Environmental Quality Incentives Program (EQIP) and Wildlife Habitat Incentives Program (WHIP) priorities, except the EQIP Organic Initiative. The EQIP Organic Initiative sign up deadline will be provided at a later date.

NRCS's EQIP program priorities eligible for this sign up include, but are not limited to:

- Water Quality – Animal Feeding Operations (AFO)
- Water Conservation / Drought Response
- Wildlife Habitat Improvements
- California Air Quality
- Grazing Lands Management
- Forest Lands Management

To date in 2010, California NRCS has obligated over $74 million in EQIP funds for over 5,600 contracts and 821,000 acres statewide. However, the number of applications received this past year far exceeds the amount of funding available.

NRCS is anticipating similar funding for 2011. Farmers and ranchers are encouraged to start their application process as soon as possible to ensure consideration for this funding cycle.

NRCS invites agricultural, forestry and livestock producers to apply before the November 12, 2010, deadline, by visiting a local NRCS office or USDA Service Center. Driving directions and contact information for the Service Centers are available on the Web at www.ca.nrcs.usda.gov/contact/.

NRCS is celebrating its 75th year of "Helping People Help the Land." Since its inception in 1935, NRCS has worked in partnership with private landowners and a variety of local, state and federal conservation partners to deliver conservation based on specific, local needs.

– NRCS –

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Topics in Subtropics

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