

Preparing Your Vineyard for Frost

Low temperatures experienced during the winter do not usually damage dormant grapevines in the San Joaquin Valley. However, succulent green shoots are much more sensitive to low temperatures, so spring frost damage is serious concern. Damage from spring frost can vary within and between vineyards. Some factors that determine the extent and severity of frost damage include vineyard location, stage of shoot growth, the minimum temperature reached, and the duration of time that the tissues are at or below critical temperatures (Table 1). A mild frost shortly after budbreak may only damage a few leaf cells, causing necrotic (brown to black) spots (Fig. 1, inset) which will appear to be unevenly distributed throughout the leaf blade or shoot. If enough cells are damaged, the leaves may become distorted, or killed. As frost intensity and duration increases, shoot tips and flower clusters may be killed (Fig. 1). Vines in low lying areas of a vineyard will experience the most damage since cold air will settle and not warm until late morning or later (Fig. 2). Severe frosts will kill entire shoots to the cane. When temperatures are low enough to kill whole shoots, the damage is often uniform throughout the vineyard. Shoots killed by frost will turn a dark brown to black color within a few days of freezing.

On clear nights when frost forms, the coldest air is found near the ground. As night progresses, a cool layer of air continues to build and the shoots nearest the ground are the first to experience damage. Thus, training grapevines to higher heights decreases their susceptibility to frost damage. For example, a Thompson Seedless vineyard trained to a height of three feet will be more susceptible to frost than one trained to a height of four feet.

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Previous research has shown that temperatures during radiative freezes generally increase with height above ground before decreasing again at some height to form an inversion layer. For example, air temperature may be 28°F one foot above ground, but 30°F three feet above ground. At twenty to twenty-five feet above the soil line the temperature will gain another two degrees. The greater the temperature change between the soil line and the inversion layer, the greater the chance of avoiding frost damage. Wind machines can help mix the cold and warm air, increasing the temperature and providing relief for green tissue.

When frost has been predicted, growers should take note of their vineyard's growth stage so a strategy can be developed. Vineyards that are not yet at bud break may not require special attention. However, when green shoots are longer than six inches, soils need to be prepared well in advance of cold weather. Table 1 shows the relative susceptibility of grapevine tissue at different growth stages and critical temperatures.

It's been an honor

Dear San Joaquin Valley grape growers, industry representatives and colleagues:

After 15+ years with UC Cooperative Extension, I have decided that it is time to resign my post as Viticulture Farm Advisor and Co-County Director for Fresno and Madera Counties. As I reflect back on my short time with UCCE, I feel that I have had some of the best opportunities anyone could ask for from a professional career. During my tenure, I have had the privilege of working with the finest grape researchers in the world. Additionally, I'm appreciative of the many farm advisors, specialist and faculty that I've worked with over the years who've helped advance my knowledge outside my area of expertise. My Fresno County UC Cooperative Extension office colleagues have been tremendous—both past and present—and I have thoroughly enjoyed spending time with them.

One of the reasons that I originally took the job in Fresno was the opportunity to work with **San Joaquin Valley raisin, table and wine grape growers**. Over the past 15 years, I have learned a lot about practical farming while still producing the highest quality and quantity that Mother Nature (or regulation) will allow. In the future, I hope to visit with Valley growers/friends and continue our discussion on all things that impact one's ability to farm in California. Thank you for the education; it has been a pleasure serving as your UC Cooperative Extension Viticulture Farm Advisor.

I will be starting a new job in private industry within agriculture that will not take me far, geographically. I will remain in Fresno but will be traveling around the state and hope to meet with some of you when time allows. Although I will not be working for UC Cooperative Extension, it will always be a part of me and I will continue to advocate for the great programs and wonderful people that make it an asset to Californians.

My last day is April 19, 2013. In my absence you can contact the Fresno office and my colleagues will do their best to help you with your issue. Additionally, on page 8 are some online resources focused on viticulture production. UC ANR Cooperative Extension plans to fill my position in the near future. If you are interested in participating in that process, you can contact the Fresno County office for more information.

It has been an honor working with you.

Sincerely,

Stephen



Australia to Host International Table Grape Symposium

In June 2010, UC Cooperative Extension hosted the 6th International Table Grape Symposium; showcasing California's advanced production systems. Approximately 300 participants—including growers, industry representatives and researcher from around the world convened to discuss all aspects of table grape production. In 2013, the **7th International Table Grape Symposium** will be held in Australia and will include vineyard tours prior to the symposium. This will be a great opportunity to see Australia's unique subtropical growing environments and production systems.

SYMPOSIUM

When: November 24-26, 2013

Where: Mildura, Victoria, Australia

PRE-SYMPOSIUM TOURS

Tour 1. When: November 16-20, 2013

Where: Stanthorpe, Queensland, Australia (subtropical)

Tour 2. When: November 23, 2013

Where: Mildura, Victoria, Australia

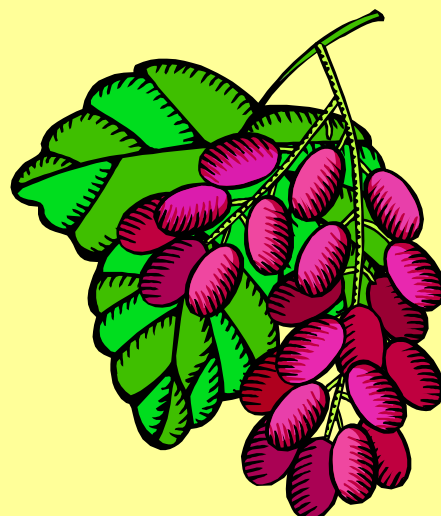
Persons interested in presenting a paper at the 7th International Table Grape Symposium should contact:

David Oag

Telephone +61 7 4681 6147

Mobile +61 (0)427 427 517

david.oag@daff.qld.gov.au



More information can be found here:

Australian Table Grape Association

<http://www.australiangrapes.com.au/news-and-events/events/7th-international-table-grape-symposium-2013>

More information on Mildura, Australia can be found here:

<http://www.visitmildura.com.au/>

To learn more about Australian viticulture, read this review titled "Grape Production in Australia", by David Oag: <http://www.fao.org/docrep/003/x6897e/x6897e04.htm>

Glassy-Winged Sharpshooter Program 2013 Season Begins!

Spring is here and the time has come to begin the Glassy-winged sharpshooter ([GWSS](#)) trapping, surveying, treatment and bio-control program in Fresno County. The treatment strategy will continue as a suppression effort beginning at the perimeter of known GWSS finds in 2012 and moving inward toward the core of the Cities of Fresno and Clovis. The goal is to stop the expansion of this destructive pest through effective treatments and the use of bio-control measures; while reducing the size of the infested area over time. The result will minimize the impact of this pest to ornamental landscapes and as a serious threat to agriculture.

The GWSS causes severe damage by feeding on a wide variety of ornamentals and crop plants. They prefer to feed on stems rather than leaves, using their strong sucking mouthparts to remove fluid and nutrients from plants. As a result of their feeding, they can transmit the bacterium [Xylella fastidiosa](#), the cause of various plant diseases including Pierce's Disease. The disease kills grapevines and there are no effective treatments for it.

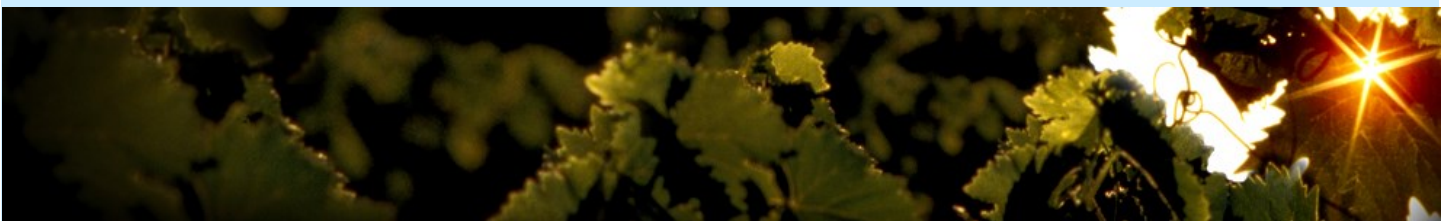
The GWSS adult, a large insect is approximately ½-inch long and is dark brown to black, with lighter underside. The wings are partly transparent with reddish veins. When the adults and nymphs are newly emerged, they are grayish to light brown in appearance. The nymphs do not have fully developed wings.

Beginning February 25, homeowners were asked permission to treat properties, as well as the soil beneath "backyard citrus" (a known prime overwintering host), for the GWSS. Treatment began on March 4, 2013 with the application of a systemic insecticide to the soil directly beneath certain host plants, or sprayed onto the foliage of the plants on properties where the GWSS had been found last season and/or at the edge of determined quarantine boundaries.

Trapping with yellow sticky panels will commence on May 1, 2013. As done in previous years, traps will be placed in nurseries, commercial citrus orchards and in towns throughout Fresno County. In addition, traps will now be placed in Fresno around the perimeter of the city, the eastern edge of Clovis and surrounding the Sunnyside area at a density of 15 traps per square mile. The 2013 strategy is for a higher concentration of detection traps to be placed at the edge of the quarantine boundary instead of traps being placed throughout the city. Bio-control efforts will continue through the release of a very tiny wasp that is a parasitoid of GWSS eggs. Areas identified as "good candidates" for bio-control efforts will occur through consultation with the California Department of Food and Agriculture and the Fresno County Department of Agriculture's Entomologist.

Each Fresno County Department of Agriculture employee has been issued an identification badge and directed to wear it while on duty. Residents and growers are encouraged to ask for official identification badges carried by permanent and seasonal staff employees.

If you think that you have found GWSS or have questions about our trapping, surveying, host treatments or parasitoid release efforts, please call the **Fresno County Department of Agriculture at (559) 600-7510**. You may also bring a suspect insect to the Department's Entomologist located at 1730 S. Maple Avenue in Fresno, Monday thru Friday, between the hours of 8:00am and 5:00pm for identification.



California Crush Report

California's 2012 crush totaled a record high 4,387,086 tons, up 13 percent from the 2011 crush of 3,874,158 tons, and 1 percent larger than the previous record high 2005 crush. Red wine varieties accounted for the largest share of all grapes crushed, at 2,292,201 tons, up 19 percent from 2011. The 2012 white wine variety crush totaled 1,725,689 tons, up 21 percent from 2011. Tons crushed of raisin type varieties totaled 270,085, down 28 percent from 2011, and tons crushed of table type varieties totaled 99,111, down 36 percent from 2011.

The 2012 average price of all varieties reached a record high of \$737.61, up 25 percent from 2011. Average prices for the 2012 crop by type were as follows: red wine grapes, \$883.62, up 25 percent from 2011; white wine grapes, \$625.30, up 15 percent from 2011; raisin grapes, \$318.62, up 20 percent; and table grapes, \$272.21, up 24 percent.

In 2012, Chardonnay accounted for the largest percentage of the total crush volume with 16.8 percent. Cabernet Sauvignon accounted for the second leading percentage of crush with 11.3 percent of the total crush. The next eight highest percentages of grapes crushed included wine and raisin grape varieties. Thompson Seedless, the leading raisin grape variety crushed for 2012, held 5.3 percent of the total.

District 13, (Madera, Fresno, Alpine, Mono, Inyo Counties; and Kings and Tulare Counties north of Nevada Avenue (Avenue 192)), had the largest share of the State's crush, at 1,462,119 tons. The average price per ton in District 13 was \$369.40.

Grapes produced in District 4 (Napa County) received the highest average price of \$3,564.54 per ton, up 5 percent from 2011. District 3 (Sonoma and Marin counties) received the second highest return of \$2,182.57, up 5 percent from 2011.

The 2012 Chardonnay price of \$848.90 was up 13 percent from 2011, and the Cabernet Sauvignon price of \$1,385.36 was up 20 percent from 2011. The 2012 average price for Zinfandel was \$715.29, up 28 percent from 2011, while the Merlot average price was up 16 percent from 2011 at \$802.31 per ton.

The entire Grape Crush Report is available online at www.nass.usda.gov/ca



Vineyard Frost *(Continued from page 1)*

If a significant frost event occurs and all the green shoots are killed, secondary or tertiary buds will push within one to two weeks. However, secondary and tertiary buds will not be as fruitful as the primary buds and growers can expect substantial losses. Vineyards that have experienced significant frost damage should be irrigated regularly in order to develop a full canopy and prepare them for the following season. Vineyards with substantial frost damage should not be neglected.

Table 1. Frost damage to various growth stages of grape.

Growth Stage	Critical Temperature*
Buds—tight, closed	25-27°F
Buds with wool (eraser stage)	< 26°F
Budbreak—green tissue showing	< 30°F
Shoots < 6" in length	< 31°F
Shoots > 6" in length	< 32°

*Critical temperatures are based on research under controlled environments. Vineyard characteristics (location, cultivar, etc.) may increase or decrease susceptibility to frost damage. These values should only be used as a point of reference when developing a frost protection program.

Soil Characteristics

In order to minimize damage caused by frost, vineyard soils should be prepared for maximum heat absorption during the day and release at night. Optimal conditions include soils that are free of vegetation, firm in texture, and moist. Moist dark soils improve their ability to absorb heat during the day and radiate it at night as ambient temperatures drop. Soil texture will also have an impact on heat absorption. Vineyards planted to sandy soils are more prone to frost damage because they retain less water. Additional water may be needed if winter precipitation has not been adequate to maintain soil moisture. Prior to a predicted frost, the goal should be a uniformly distributed irrigation that allows for maximum heat absorption. Table 2 shows the benefits of a bare, firm moist soil in contrast to less optimal vineyard floor conditions. Soils that have been recently cultivated or disked do not retain heat well because they are dry and have numerous air pockets and thus should be irrigated soon after cultivation. Native vegetation or cover crops that insulate soils from absorbing heat should be mowed, disked, and irrigated, unless significant precipitation makes irrigation unnecessary. Irrigation during a frost event can be beneficial. On nights that low temperatures



Figure 1. Thompson Seedless leaf (inset) displaying individual cell damage. Frost damage to Thompson Seedless shoots and flower clusters.

Continued on Page 7

Vineyard Frost (Continued from page 6)

are expected pumps should be turned on early enough that the entire vineyard is covered with water. In some vineyards, it may not be feasible to saturate the whole vineyard. In such cases, focus efforts on the most susceptible areas (low lying) portions where cold air tends to drain. Doing so will improve the chances of protection.

Vineyards that are drip irrigated should not have their row middles cultivated. Drip irrigation should be turned on to wet as much soil as possible. Growers will have to be especially vigilant to the weather forecast in order to start irrigating well in advance of the frost event. Cover crops or native vegetation should be mowed prior to budbreak and regularly thereafter until the risk of frost has passed (typically mid-April). Row middles should not be cultivated unless a significant rain event has been predicted. Doing so could result in significant losses if frost should occur. It only takes a single frost event (one night at freezing or below) to experience a complete loss.



Figure 2. Orange arrows showing the downward slope of a Rubired vineyard where severe frost damage occurred.

Table 2. Comparisons between optimal soil conditions for frost.

Soil Characteristics	Vegetation	Temperature Benefit	
Bare, firm, moist	None	Warmest	Optimal
Moist	Shredded cover crop	0.5 °F	↓
Moist	Low growing cover crop	1-3 °F colder	↓
Dry, firm	Freshly disked	2 °F colder	↓
Dry to moist	High cover crop	2 °F colder	Least optimal

Online Viticulture Resources

Vine Lines (archived): <http://ucanr.edu/vinelines-subscription>

Viticulture Blog: <http://ucanr.edu/sjv-viticulture>

UC IPM: <http://ucipm.ucdavis.edu/>

UC Davis, Department of Viticulture and Enology: www.agecon.ucdavis.edu/

UC Integrated Viticulture: <http://iv.ucdavis.edu/>

UC Weed Research and Information Center: <http://wric.ucdavis.edu/>

UC Davis Department of Ag and Resource Economics: <http://ucipm.ucdavis.edu/>

UC Publications: <http://ucipm.ucdavis.edu/>

UC Fruit and Nut Center: <http://fruitandnuts.ucdavis.edu/datastore>

Postharvest Technology Center: <http://postharvest.ucdavis.edu>

UC Davis Biometeorology Program: <http://biomet.ucdavis.edu/#IS>

Foundation Plant Services: <http://fpms.ucdavis.edu/>

National Grape Registry: <http://ngr.ucdavis.edu>

Westside Drift Mitigation Information

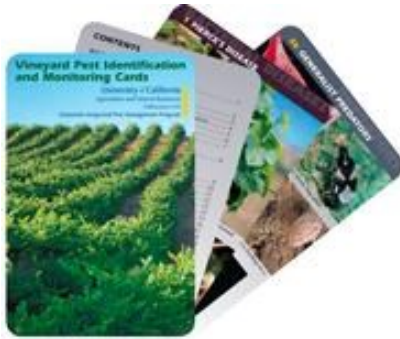
Fresno County's Westside Drift Mitigation Conditions for herbicides have been in effect since January 15 and go through April 30; the additional aircraft application conditions of no aerial application that began February 1 through April 30 are now in effect. The additional aircraft conditions may be waived by the Agricultural Commissioner on a case-by-case basis by contacting the local district in which the application is to occur. The Township, Ranges, and Sections affected are located west of the Fresno Slough. If there are any questions regarding the condition requirements, please contact your local district office or the Pesticide Division at (559) 600-7510.

Publications from the University of California

VINEYARD PEST IDENTIFICATION CARDS

Keep your vineyard healthy by staying on top of pest activity with this pack of 50 sturdy, pocket-size laminated cards. This is the perfect quick reference to identifying and monitoring vineyard diseases and pests.

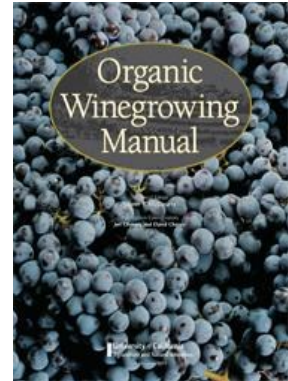
Twenty-seven common insects and mites, 8 diseases, 6 beneficial insects, and a variety of other disorders, weeds, and invertebrate pests are covered in 244 photos. These 50 information-rich cards will help growers,



and vineyard managers identify and manage most common problems.

ORGANIC WINEGROWING MANUAL

Interest in California organic wine grape production inspired this publication that provides a full-color guide with information on soil management, including soil considerations when selecting a vineyard site, developing organic soil and fertility programs and selecting cover crops.



An extensive section covering weed, disease, insect, mite, and vertebrate pest management options for organic grape production is covered. The chapter on organic certification contains an overview of considerations for evaluating and selecting a certifier.

ORDER FORM				
Publication	Number	Qty.	Price	Subtotal
Vinyard Pest Identification	3532		\$ 25.00	
Organic Winegrowing Manual	3511		\$ 35.00	

Shipping - USA Only	
Merchandise Total	Shipping Charge
\$1 - 29.99	\$6.00
\$30 - 39.99	\$8.00
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\$50 - 79.99	\$10.00
\$80 - 99.99	\$12.00
\$100 +	\$15.00

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Wireless Wine Fermentation Network Completed at UC Davis Winery

In another advance for innovative winemaking, students and faculty at the University of California, Davis, are now processing wine with the world's first wireless fermentation system, thanks to a recently completed \$3.5 million network designed, built and donated to the university by Silicon Valley semiconductor executive T.J. Rodgers.

Rodgers, a wine lover and winery owner, is founder, president and CEO of San Jose-based Cypress Semiconductor Corp. Now in its third generation of refinement, the initial assembly of custom-designed stainless steel fermentors was installed just in time for the winery's first crush in 2010. Since then, Rodgers and his crew of engineers and computer experts from Cypress Semiconductor have continued to fine-tune the innovative fermentation system to meet the needs of the campus's two-year-old Teaching and Research Winery, known for its environmental and technical sophistication. "UC Davis is the foremost center for enology and viticulture in the world," Rodgers said. "Our goal was to provide it with the most advanced winemaking equipment in the world."

In December 2010, the 34,000-square-foot Teaching and Research Winery received official LEED Platinum certification — the highest environmental rating awarded by the U.S. Green Building Council. It is the first winery in the world to attain this level of certification. At the time of the winery's completion, it was the highest scoring of any university LEED projects. The new wireless fermentation network, now with 152 fermentors, puts the UC Davis winery in a class of its own technologically, as well.

"This radically new fermentation system is unlike anything available at the moment to commercial or research wineries," said Professor Roger Boulton, the Stephen Sinclair Scott Endowed Chair in Enology at UC Davis. "It equips us, for the first time, to perform reproducible fermentations with precise temperature control and uniform mixing, which is critically important for consistently producing quality wines," Boulton said.

The 200-liter fermentors — now referred to as "TJs" in the UC Davis winery — are individually equipped with automated temperature control, an automated system for pumping juice over grape skins when making red wines, and a sensor that monitors fermentation progress in degrees Brix — a measurement of sugar content. Data from each fermentor is transmitted wirelessly to a nearby computer control room at a programmable ratio of up to once per minute and automatically graphed on a large monitor in the control room.

Rodgers' \$3.5 million investment in equipment and engineering is the most significant gift to the Teaching and Research Winery since its construction. And it is a gift that has left faculty and staff in UC Davis' Department of Viticulture and Enology still shaking their heads.

"We are incredibly grateful to T.J. Rodgers and the Cypress Semiconductor team," Boulton said. "These fermentors that we now are using for teaching and research will one day become an essential component of every commercial winery." He noted that Rodgers' extraordinary gift for the winery epitomizes the broad-based private support that made the campus's new winery, brewery and food-processing facility a reality. The building was constructed entirely through private contributions from more than 150 individuals, alumni, corporations and foundations.

CALENDAR OF EVENTS

Local Meetings and Events

UC Grape Day

August 13, 2013

8:00 a.m. - 12:00 p.m.

Kearney Agricultural Center

Parlier, CA

559-646-6500

U.C. Davis University Extension Meetings (800) 752-0881

Out of State Compliance: Legal Requirements for Shipping out of State

April 26, 2013

9:00 a.m. — 4:00 p.m.

Da Vinci Building, 1632 Da Vinci Ct.

Davis, CA

Section: 124VIT203

Introduction to Wine Analysis

May 18, 2013

9:00 a.m. — 6:00 p.m.

1127 North Robert Mondavi Institute for Wine and
Food

Old David Rd. Davis, CA

Advance Tasting Seminar

August 3, 2013

9:00 a.m. — 4:00 p.m.

Da Vinci Building, 1632 Da Vinci Ct.

Davis, CA

Section: 131VIT216



7th International Table Grape Symposium

Attention table grape growers and attendees of the 6th International Table Grape Symposium, I am pleased to announce the **7th International Table Grape Symposium** will be held in Australia in early November 2013.

Persons interested in attending or presenting a paper at the symposium should contact: David Oag
+61 427427517
david.oag@deedi.qld.gov.au

More information can be found here:

<http://www.australiangrapes.com.au/news-and-events/events/7th-international-table-grape-symposium-2013>

Additional Web News

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Vine Lines

San Joaquin Valley Viticulture Issues

Vine Lines is produced by UC Cooperative Extension Farm Advisor Stephen J. Vasquez. Contact me for further article information, or to be added to the e-mail list.

1720 South Maple Ave.
Fresno, CA 93702
Hours: 8:00—5:00 M-F
(559) 600-7285
Visit us online at
<http://cefresno.ucdavis.edu>



Our programs are open to all potential participants. Please contact the Fresno County UCCE office, (two weeks prior to the “scheduled” activity), at 559-600-7285, if you have any barriers to participation requiring any special accommodations.

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