COOPERATIVE EXTENSION ... UNIVERSITY OF CALIFORNIA

FRUIT AND NUT NOTES

TEHAMA COUNTY **NOVEMBER 2010** Volume 11

1754 Walnut Street, Red Bluff, CA 96080 Phone (530) 527-3101 Email: rpbuchner@ucdavis.edu

Sacramento Valley Regional ALMOND NEWSLETTER

IN THIS ISSUE:

Almond Board Conference in Modesto, Dec. 8-9

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Co.

The Almond Board of California's annual conference is this December 8-9 in Modesto. This is a combination trade show and educational meeting focused solely on almond production. You can hear the latest production research updates from the researchers themselves; talk with them in person in front of their posters; and get Continuing Education credits. You can also see and hear about the latest production technology and materials in the exhibition hall. This meeting is also the place to take the pulse of the industry as growers, processors, manufacturers, and buyers are all there. There is no cost to register or to get in to see all the talks and exhibits.

For more information and to register on-line visit: https://conference.almondboard.com/register.aspx.

Understanding and Applying Information from a Soil Test: Part 3

Allan Fulton, Farm Advisor, Tehama County and Roland D. Meyer, Extension Soils Specialist Emeritus

This article (Part 3) discusses the use of soil tests to evaluate levels of the secondary nutrients calcium (Ca), Magnesium (Mg), and sulfur (S) in orchard soils. These nutrients are considered secondary because while they are essential to crop development, seasonal crop uptake is usually lower than for the primary nutrients N, P, and K but considerably higher than the micronutrients zinc (Zn), iron (Fe), Manganese (Mn), copper (Cu), boron (B), and chloride (Cl).

Calcium and Magnesium

Plant uptake, cation adsorption and desorption in soil, leaching from rainfall and irrigation, and weathering of minerals all contribute to the concentration of water soluble Ca and Mg available to meet tree nutritional needs. Water soluble cations are determined from the saturated paste extract soil test procedure while the exchangeable cations are determined with the ammonium acetate procedure. Also important are the concentrations of exchangeable (non-water soluble) Ca and Mg which help to promote favorable soil structure. Soil chemistry is in a constant state of change attempting to reach equilibrium between the soluble and non-soluble (exchangeable and mineral) phases. The May 2009 newsletter discussed this dynamic process. Calcium and magnesium share similar chemical properties in soils. Both Ca and Mg are double positively charged (divalent) cations in the soil-water phase and on soil cation exchange sites. Calcium is adsorbed to soil exchange sites preferentially and more strongly than Mg. When Ca and Mg are abundant in the soluble phase tree roots absorb these nutrients by mass flow. If Ca and/or Mg are less abundant or limited by soil moisture, uptake occurs more slowly through diffusion.

Table 1 provides ranges of exchangeable Ca and Mg levels that may be observed in soils in the Sacramento Valley. The ranges are expressed in three different reporting units that may be used by agricultural laboratories. The levels of exchangeable Ca and Mg can vary widely in soils and may correlate closely with levels of water soluble Ca and Mg (i.e. when exchangeable levels are high, water soluble levels are also usually high and conversely). The amount of organic matter as well as the type and amount of clay largely determine the cation exchange capacity (CEC) of a soil. The cation exchange capacity can be thought of as a measure of the reservoir of Ca, Mg, K, and other cations adsorbed to the soil in the non-soluble phase that are available to replenish the nutrients taken up in the water soluble phase or may be absorbed directly by nearby roots. Soils which have a large amount of sand with very little clay or organic matter have little CEC or a reservoir to hold cationic nutrients. Adding large amounts of calcium, magnesium and potassium or even anions such as boron, sulfates or nitrates can be easily leached from sandy soils, those having low organic matter content or low CEC.

Table 1. Common ranges in exchangeable calcium (Ca) and magnesium (Mg) in soils in California expressed in three different soil test reporting units.

Element	meq/100 g soil[1]	ppm (mg/kg)[2]	lbs/ac-ft soil[3]
Calcium (Ca)	5 – 50	1000 – 10,000	4000 – 40,000
Magnesium (Mg)	2 - 30	240 - 3600	960 – 14,400

[1]The units of meq/100 g soil imply the determination of exchangeable cations with the ammonium acetate procedure. The units for saturated paste extract determinations are expressed as meq/L.
[2]The units of meq/100 g soil are converted to ppm with the use of the equivalent weight of the cation.
[3]The ppm concentration is multiplied by 4 using the assumption that one acre foot of soil weighs four million pounds and one acre 6 inches weighs two million pounds.

Many California soils are alkaline (pH above 7.0) with an abundance of Ca and Mg bearing minerals in the soil. Under these conditions, Ca and/or Mg deficiencies are generally uncommon. In contrast, some orchard soils in the Sacramento Valley are acidic (pH 5.0 to 6.5) with a high concentration of hydrogen ions on the cation exchange sites causing growers to have more management questions about Ca and Mg levels in the soil.

Most agricultural laboratories utilize two soil test methods to evaluate soil cations and their relationships. The saturated paste extract procedure is used for salinity evaluation, particularly the Ca, Mg and Na concentrations. Evaluating soil salinity will be a topic in a future article. The ammonium acetate procedure is used to determine the exchangeable Ca, Mg, K (potassium) and Na (sodium) concentrations as well as the base saturation percentages.

In general, field research has shown that plant growth is not affected over a wide range of Ca to Mg ratios, from 6:1 to 1:1. Either the saturated paste extract concentrations (meq/L) or the base saturation percentage (%) can be used to determine the Ca:Mg ratio. Magnesium deficiencies are likely to occur if Ca:Mg ratios are greater than 8:1. Unfavorable plant growth along with poor soil structure may occur when Mg concentrations are greater than twice those of Ca. Blossom end rot and white or pink centers in tomato is an example of a crop in the Sacramento Valley that may develop severe problems resulting from higher magnesium concentrations. Economic benefits from the application of gypsum as the most desired source of Ca to orchard soils when Ca:Mg ratios are in the range of 1:1 to 1:2 is highly unlikely.

Base Saturation is estimated and reported by some but not all agricultural laboratories in California. It is an estimate of the proportions of Ca, Mg, K, Na, and H cations that occupy the cation exchange sites of a soil. Some laboratories also suggest desirable Base Saturation ranges of 60-80 percent for Ca and 10 to 20 percent for Mg. The concept of base saturation and the associated target levels stems from soil testing, and field observations conducted on acidic soils in the Central and Eastern U.S. that date back to the 1940's. Relationships between crop response and specific base saturation percentages of Ca and Mg levels or other cations in soils have not been helpful in improving crop yields or quality. Soil scientists have learned that more general ranges in the base saturation percentages are appropriate for soils. Even though some soils in the Sacramento Valley are acidic like soils in the southeastern and eastern U.S., they consist of different clay minerals that have much higher cation exchange capacities, which can lead to recommendations of extraordinarily high and uneconomical rates of Ca amendments to maintain the "Base Saturation" within the specific desirable ranges often suggested.

Sulfur

Sulfur (S) undergoes numerous transformations in the soil involving biological, chemical, and atmospheric processes, similar to the nitrogen cycle. Plant uptake, mineralization, immobilization, soil anion exchange reactions, volatilization, leaching, oxidation and reduction, and mineral weathering all affect the availability of sulfur to trees. Soil properties such as water content, pH, temperature, and aeration also affect these processes.

Trees absorb sulfur from soil in the water soluble, inorganic form of sulfate (SO_4^{2-}). Usually less than 10 percent of the total S in the soil is in the water soluble SO_4^{2-} form. Sulfate (SO_4^{2-}) taken up by the trees or lost to leaching is replenished by mineralization of organic matter, oxidation of reduced S, and other processes such as weathering of minerals that contain S.

Sulfur (S) containing soil amendments are more often applied to lower the pH of orchard soils above 8.0. Sulfur deficiency has been observed in wheat and other cereals in the Sacramento Valley during late winter-early spring when rainfall is high for several weeks, soils become saturated, sulfur is chemically reduced, and the supply of SO_4^2-S becomes insufficient to meet crop needs. As soon as the soils dry out and warm up for bacteria to convert the sulfur to the SO_4^2-S form, the sulfur deficiency disappears. Sulfur nutrient deficiency is uncommon in orchard crops grown in the Sacramento Valley and other areas of California. Still, S fertility levels are evaluated and reported in soil tests. Water soluble SO_4^{2-} may be measured in the saturated paste extract using a barium chloride turbidimetric method or estimated by subtraction if electrical conductivity (ECe), chloride, bicarbonate, and carbonate have been measured in the saturation paste extract. Alternatively, SO_4^2-S may be measured and reported for a soil sample using a calcium phosphate extraction method. Both of these methods of soil testing have limits in predicting favorable crop responses to sulfur applications in orchards. These methods are subject to the time of sampling because S availability changes in the soil due to mineralization and leaching and is complicated by the fact that several sources of S besides the soil itself (i.e. atmosphere, rain, and foliar applications such as fungicides) can contribute to the needs of trees. As a result, if S tree nutrition is in question, tissue testing should be used for a more positive diagnosis.

Hull Rot Review

Joe Connell, UC Farm Advisor, Butte County

Almond hulls are susceptible to attack by hull rot fungi (*Monilinia fructicola* and *Rhizopus stolonifer*) from the time nuts are mature and green at hull split initiation until the hulls begin to dry. Densely canopied, vigorous, well-watered and fertilized orchards usually have the most severe damage from hull rot. Observations suggest that more open canopies help reduce this disease. Nonpareil is the most susceptible variety commonly planted but Sonora and Winters are also susceptible. Kochi can be affected by severe hull rot.

Beth Teviotdale, Extension Pathologist worked on hull rot in the early 1990s. She demonstrated that hull rot could increase 10-fold with an increase in total water applied, particularly irrigations applied as the nuts are maturing. Rainfall any time during nut maturation also increases hull rot. This was the case in many orchards this year following the rain that occurred in September. Regulated deficit irrigation management at the onset of hull split can greatly reduce the incidence of hull rot. This practice is the most important cultural control.

In Dr. Teviotdale's trials, hull rot also decreased as the amount of applied nitrogen (500, 250, 125, and 0 pounds of N per acre per year) decreased. In addition to this general decrease, there was a major difference in the amount of hull rot between the 125 and 250 pound N treatments. A sharp increase in hull rot occurs somewhere between applications of 125 and 250 pounds of N. This was true in both experimental orchards for two years. So, if you don't want to favor hull rot, avoid excess nitrogen fertilizer. July leaf nitrogen levels should be below 2.6% N.
Hull rot fungi invade hulls and produce a toxin that kills the shoot attached to the fruit. When the shoot dies suddenly, nuts and leaves dry up and remain stuck on the trees well after harvest (Figure 1). This symptom is a good indication of hull rot infection and this loss of fruit wood can reduce productivity in future years. Dr. Teviotdale found that both *Monilinia* and *Rhizopus* fungi responded similarly to irrigation and fertilization.

Early harvest also reduces injury because nuts are removed before much toxin can be transported into the shoot and leaves. There are no fungicides currently registered for hull rot control. Recent work by Dr. Jim Adaskaveg has shown that both *Monilinia* and *Rhizopus* fungi can invade through the outside of green mature hulls (Figure 2) and some of his fungicide work has shown potential for reducing the disease .

Figure 1.

Black spores of *Rhizopus* hull rot are visible between the hull and shell.

Figure 2.

This tan hull rot on the outside of a green hull is often caused by *Monilinia* hull rot but recent work has shown that *Rhizopus* hull rot can also attack the outside of mature green hulls.

Fall Nutrition Management

Bill Krueger, UC Farm Advisor, Glenn County

Post harvest is the time to think about applying certain nutrients such as potassium, zinc and boron which can be deficient in area orchards.

Potassium: Soil application of potassium (K) in the fall is one of the most effective and economical methods of correcting potassium deficiency in orchards under solid set or flood irrigation. [Micro-irrigated orchards are most efficiently fertilized with potassium by injecting potassium through the irrigation system in the spring and early summer.] A mass dose of 1,500 to 2,000 lbs. of potassium sulfate can be banded on the soil surface 4 to five feet away from the tree and will usually correct deficiencies the first year after application and last 3-5 years. If the orchard is cultivated the application should be shanked in to get the material closer to the roots. Optionally, annual maintenance rates of 300 to 500 lbs. of K can be applied annually in the same manner to keep the trees adequately supplied with potassium. The material should be applied annually in the same location as previously to help overcome the soils ability to fix the potassium ions and move the potassium further into the soil. Potassium can be applied to the soil either as potassium sulfate (K_2SO_4-50 % K_2O) or potassium chloride (KCl- 60% K_2O). KCl can be toxic to the tree if it is taken up by the plant or remains in the root zone. It should not be used on weak trees or on soils with a limiting layer such as a claypan, hardpan or high water table which will not allow the chloride to be adequately leached. If KCl is used, it should be applied early enough to allow for adequate leaching (at least 10 inches of rainfall) or the trees should be winter irrigated. If KCl is used, be sure to sure to include a chloride analysis in your summer tissue analysis to be sure that chloride levels are not building in the soil.

Zinc: Zinc deficiency is the most common micronutrient deficiency affecting area almond trees. It is often seen in young trees. It can be corrected using a fall foliar spray of zinc sulfate at the rate of 10 to 15 lbs. of zinc sulfate in 50 to 100 gallons of water per acre. This can be applied at the beginning of normal leaf drop in early November and will hasten defoliation and reduce concerns related to trees blowing over or tipping when the first winter storms come.

Boron: Boron can be limiting in certain area almond orchards and is essential for pollen tube germination and fertilization. Hull samples taken at harvest have been shown to be a better indicator of tree boron status than July leaf analysis. Boron is considered to be deficient when hulls levels are less than 80 ppm. Trees with hull levels up to 120 ppm may benefit from a post harvest application. Boron deficiency can be corrected by a soil broadcast application of 50 to 75 pounds of agricultural borax. This will give correction for 3 to 5 years. Boron deficiency is more commonly corrected with a foliar application of .2-.4 pounds of actual boron (1-2 pounds of a 20% boron product) per 100 gallons of water per acre. This can be done from the fall through pink bud in the spring. Fall is a good time because the boron will be rapidly translocated to the flower buds where it will be used next spring. Spraying flowers with boron at full bloom can reduce nut set. These post harvest applications will not result in higher levels in next year's hull samples and will have to be repeated annually.

Excessive rates of foliar boron (3 lbs. per 100 gallons of a 20% material) may actually reduce fruit set and yield.

Why Dormant Spray Almonds?

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Co.

Summary: San Jose scale is the key insect pest in almonds controlled by a dormant or delayed dormant spray. Scale feed directly on twigs and limbs, sucking plant juices and injecting a toxin into the tree as they feed. If beneficial parasitoids are disrupted by sprays during the growing season, scale populations can build up over time (1-3 years) and kill spurs and scaffolds when beneficials are not present in sufficient numbers. Monitor for scale by taking a dormant spur sample anytime between mid-November and mid-January. Details on dormant spur monitoring are available from your local UCCE farm advisor or from the web at: http://ipm.ucdavis.edu/PMG/C003/m003dcdmtspursmpl.html. If the results of the dormant spur sample show a need to control scale, a high rate of oil, alone, sprayed in the dormant or delayed dormant timing will control low to moderate scale populations. A mixture of oil + pesticide (Seize, Centaur, diazinon, Supracide, etc.) is needed to control high levels of scale. The best timing for scale control is in the delayed dormant timing, although full dormant treatments will provide some control. High spray volumes (400 gpa) give better scale control than more standard volumes (100 gpa). Ignoring scale monitoring can risk serious damage to your orchard. Many other pests (peach twig borer, peach silver mites, European red mites, brown almond mites) also controlled by a dormant or delayed dormant spray can be controlled at other times. Delayed dormant sprays of copper or lime sulfur delay scab sporulation on twig lesions in the spring, and so are a key part of an IPM program for scab, but lime sulfur is incompatible with an effective dormant spray for scale control. Unless scab is a problem in your orchard, scale control is the only potential reason to apply a pesticide in almonds before bloom. Pesticide runoff into streams and rivers can occur when a dormant spray is applied ahead of rain. Spray only when needed and time those sprays as far ahead of rain as possible to minimize pesticide runoff.

A dormant or delayed dormant spray is a solid pest management tool for almond growers. Done right, it will control scale, peach twig borer, peach silver mites, Brown almond mites, European red mites, and delay sporulation of almond scab in the spring. Spray coverage is usually excellent because trees are bare, with no leaves to interfere with spray and air movement. This timing is a good one for a pesticide such as diazinon or Supracide that can harm beneficial insects, because beneficial insects are not active at that time and so are not harmed.

However, a dormant or delayed dormant spray using the proper pesticides and labeled rates is expensive, may not be necessary, and may harm the environment through drift or pesticide runoff. A pesticide that is effective on scale at labeled rates plus 2-4 gallons of oil pushes the pesticide bill/acre into the $30-40+/acre range without adding labor, fuel and equipment costs. Pesticide runoff from orchards into streams and rivers can occur in many parts of California, leading to potential damage to aquatic life including salmon, steelhead, and the small fish and insects they eat. All pests targeted in the dormant spray – excepting scale – can be as effectively controlled at other times.

How do you know if scale is a problem in your orchard? Take a dormant spur sample. Detailed instructions on how to take a dormant spur sample are available from your local UCCE office or from the UC IPM website at: http://ipm.ucdavis.edu/PMG/C003/m003dcdmtspursmpl.html. Use of certain pesticides – particularly pyrethroids (Asana, Brigade, Warrior, Baythroid, etc.) – can harm beneficial insects that help control scale and contribute to buildup of scale in an orchard. If you use pyrethroids in your hull split spray or for peach twig borer control in dormant or spring, a dormant spur sample is especially important. Don't let scale sneak up on you!

If a dormant spur sample shows a scale problem, what can be done? A high volume (400 gpa), delayed dormant ground application gives the best scale control. A lower spray volume (100 gpa) or the dormant spray timing does give some scale control. Low to moderate populations of scale are effectively controlled by high rates of oil (4 gallons/acre), alone. Adding a pesticide labeled for scale control (diazinon, Seize, Centaur, Supracide, etc.) plus oil will control high levels of scale. Oil + labeled pesticide provide two modes of action in the same tank and is a good resistance management practice. Getting spray solution into scaffold and trunk bark cracks is essential to effective, long term control. High spray volumes (400 gallons/acre) give better scale control than lower volumes (100 gallons per acre). Expensive, yes, but high volume works best for pre-bloom scale control.

But how can peach twig borer, peach silver mites, and European red/Brown almond mites be controlled if a dormant spray is not applied? There are several, effective options. Peach twig borer control at bloom with bee-safe pesticides (Intrepid, Dimilin, B.t., etc.) tank mixed with fungicides is a research-proven practice. Peach silver mites can be controlled by sulfur or one of many miticides – check the label -- in the spring. Brown almond mites and European red mites are usually not a significant pest in almond and often are good to have in the orchard as they are a food source for beneficial mites in the spring before web-spinning spider mites appear.

A dormant or delayed dormant spray of copper plus oil or lime sulfur can be part of an integrated scab management program. Check the pesticide labels and consult with your PCA before combining scale and scab control pesticides in the same tank or making separate applications close in time.

Looking Back at 2010 Leaf Diseases

Carolyn DeBuse, UC Farm Advisor, Solano/Yolo Counties and Joe Connell, UC Farm Advisor, Butte County

Autumn is a good time to review the diseases and pests that caused problems this year and to make plans for next year. This year had the potential for a higher incidence of leaf diseases in almond orchards all over the Sacramento Valley. The long wet spring promoted the growth and spread of fungi if they weren't controlled. The five major leaf diseases are Shot Hole, Scab, Leaf Blight, Alternaria Leaf Spot, and Rust. A quick comparison of the disease can be seen in the table below. Infected trees with any of these diseases may prematurely defoliate which weakens the trees and can reduce yield.

Looking at the table you can see there are similarities and differences in the timing of disease monitoring. In the fall, monitor for evidence of spore structures of Shot Hole, these are the black dots in the center of the leaf and twig lesions. If these structures are found in the fall, more spores will overwinter on the tree. This can increase disease pressure after petal fall next spring as the trees begin to leaf out. Similarly, assess the incidence of Leaf Blight and Rust in the orchard and plan for protective sprays next spring if the weather promotes the disease. In early spring, monitor for Shot Hole and Scab and protect the trees as necessary but wait until late spring and early summer to monitor and treat for Alternaria. Recent research on Scab has shown that copper dormant sprays will delay the sporulation on overwintering twig lesions for about a month. Since spores are often produced in mid-April, delaying sporulation until mid-May may be late enough to miss spring rains thus avoiding a scab outbreak.

For more information on treatment timing and fungicide efficacy go to http://ipm/PDF/PMG/fungicideefficacytiming.pdf page 19-21.

Tehama County Fruit & Nut Notes & Sacramento Valley Regional

ALMOND NEWSLETTER

SAVE THE DATES:

Tehama Irrigation Meeting - December 17, 2010
Tehama Walnut Day - January 21, 2011
Tehama Prune Day - February 4, 2011

******* Watch for upcoming announcements *******

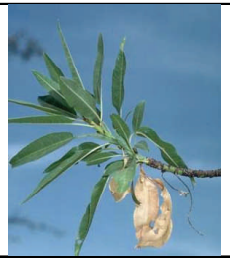
Richard P. Buchner
UC Farm Advisor -Orchard Crops, Tehama County Director

Prepared by Cindy McClain
Office Manager/Ag Secretary

Cooperative Extension
University of California
1754Walnut Street
Red Bluff, CA 96080
"52"

PRSRT STD
US POSTAGE
Paid
Red Bluff
Permit No. 112

Table. A comparison of the five major leaf diseases in almonds.

	Shot Hole *Wilsonomyces carpophilus*	**Scab** *Cladosporium carpophilum*	**Leaf Blight** *Seimatosporium lichenicola*	**Alternaria Leaf Spot** *Alternaria alternata*	**Rust** *Tanzchelia discolor*
Affected part	leaves, twigs, flowers, fruit	leaves, twigs, fruit	leaves & buds	leaves	leaves & occasionally young twigs
photo					
Leaf Symptoms	Yellow leaf lesions rimed with red tinge, later a tan center that drops out; black spores present indicate disease is primed for an epidemic outbreak	Leaf lesions begin as yellow dots then turn soft grey	Individual leaves yellow and drop or die attached to shoots or spurs in hot weather	Leaf lesions are large brown spots (0.5-0.75 in.) spots turn black when spores are present	Yellow spots appear on the top surface of the leaf, reddish rust colored spots are on the lower surface of the leaf containing spores
Overwinter	spores on wood and bud surface or in twig lesions	twig lesions	on dead leaf petioles	on buds and shoots	On infected leaf litter and possibly infected twigs
Conditions that promote growth and spread	Spread by rain; promoted by prolonged periods of wetness; rain, or sprinkler irrigation that wets leaves	Spread by rain; growth promoted by long wet springs or irrigation that wets leaves	Spread by rain; wet spring promotes fungal growth	Needs summer heat; begins development in June and July; high humidity and dew promote growth	Conditions of high humidity promote growth; rain and water spread the spores; excessive nitrogen increases disease susceptibility
Monitoring	**Fall & Spring:** look for spore forming structures on leaves and twigs	**Late Spring or Early Summer**: look for leaf lesions	**Previous Summer**: look for symptoms	**April-June**: look for leaf lesions	**Fall**: assess amount of rust infections; history of rust in orchard
Treatment timing	If seen in fall, put a petal fall spray on next spring If seen in spring, spray as soon as possible	Usually controlled along with Shot Hole, but if it is a wet spring then treat 2-5 weeks after petal fall, later if rain continues	Treat during full bloom through early spring	If disease pressure is present, begin treating mid-April	If history of rust in orchard or heavy amount in previous season, treat 4-5 weeks after petal fall; if severe treat 2-3 times.
Prevention	Fall foliar fertilization with Zinc Sulfate will promote early leaf fall	Dormant or delayed dormant copper+oil or liquid lime sulfur		Reduce open and spreading canopies; prune to encourage upright tight canopies, reduce humidity and dew	Fall foliar fertilization with Zinc Sulfate will promote early leaf fall, do not over fertilize with nitrogen

Almond Pollination with Blue Orchard Bees: Topics for Industry & Management

workshop presented by
USDA-ARS Bee Biology & Systematics Laboratory, Logan Utah
& University of California Cooperative Extension

December 7, 2010
UCCE Stanislaus County
3800 Cornucopia Way, # A
Modesto, CA 95358

8:45-9:00 Registration & Sign-in

9:00-9:10 Welcome & Introduction
Carolyn Pickel & Sara Goldman Smith, University of California

9:10-9:25 Quality Rating of Alfalfa Leafcutting Bees for Sale
Miles Wendell, Pollinator Provider, Prairie Pollination Company

9:25-9:40 Summary of CA Permits for Importing Blue Orchard Bees
Kevin Hoffman, Primary State Entomologist, CA Dept. Food & Agriculture

9:40-10:00 Open Panel Questioning

10:00-10:15 Break

10:15-10:30
Summer Development of Blue Orchard Bees Varies According to Their Source of Origin
Theresa Pitts-Singer, USDA ARS Bee Biology & Systematics Lab

10:30-10:45
Developmental Mismatches from Interbreeding CA & Northern Blue Orchard Bees
Glen Trostle, USDA ARS Bee Biology & Systematics Lab

10:45-11:00
Supplementing Bloom to Extend Foraging Season for Blue Orchard Bee Reproduction
Jim Cane, USDA ARS Bee Biology & Systematics Lab

11:00-11:15 Open Panel Discussions
11:15-11:30 Open Forum for Informal Introductions & Announcements
11:30-1:00 Networking, Socializing, & Tour of Pollinator Habitat Demonstration Site
Habitat partners include Xerces, NRCS, RCD, UCCE Stanislaus

The Xerces Society for Invertebrate Conservation

Questions? Contact Sara Goldman Smith, 530 751-6378 srgoldman@ucdavis.edu