



# almond **FACTS**

JANUARY | FEBRUARY 2015

News, Views & Industry Insights

## Anticipating Key Political Issues for 2015

**Almond Flour Ready for Ingredients Launch**

**Seminar Coverage: Pest Management, Water Outlook and Regulatory Concerns**

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An almond grower's best friend, the honey bee, about to pollinate the crop.  
Photo by Mel Machado, Director, Member Relations.



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## President's Corner

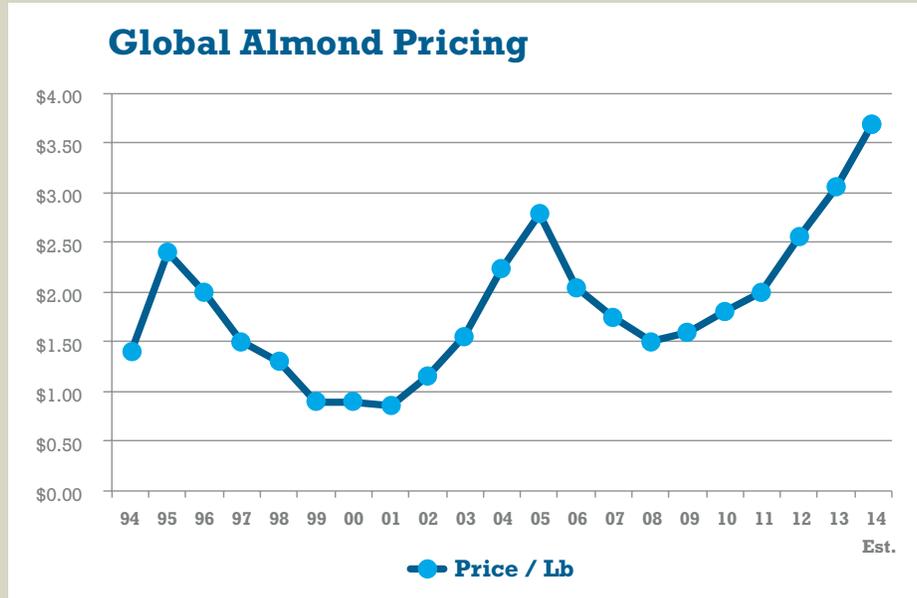
Mark Jansen  
President and CEO

# Almond Prices: A New Normal

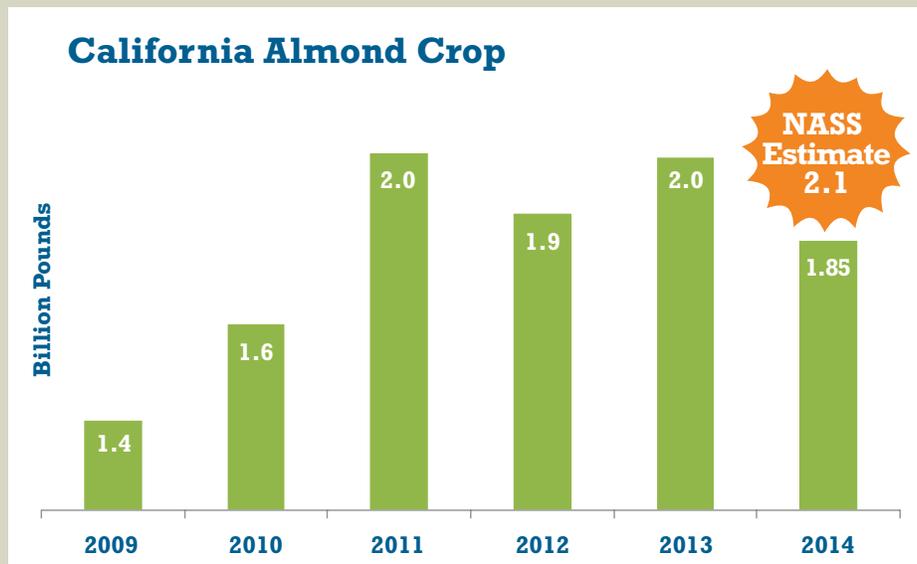
The spectacular and extended rise in almond prices has the industry concerned that we have reached the peak. Many of you have lived through rising and falling prices. You may even recall there has been a five-year pattern to almonds prices. As we enter the fifth year of rising prices, rather than avoid the elephant in the room, it is important the industry understand why this time is different.

The pricing cycles of previous decades were based primarily upon changes in supply. Bad blooms led to high prices, and

increases in bearing acres, coupled with good blooms, led to declining prices. The last five years have been different. Demand has been the primary driver of pricing. While supply expectations influenced prices in the short term, the trend was consistently upward. Even the record 2 billion pound crops of 2011 and 2013 resulted in higher prices. Rising demand for almonds and new forms of almonds, driven by *Blue Diamond* marketing activities, have fully consumed even these large increases in supply. Demand, not supply, has driven prices for most of this decade.

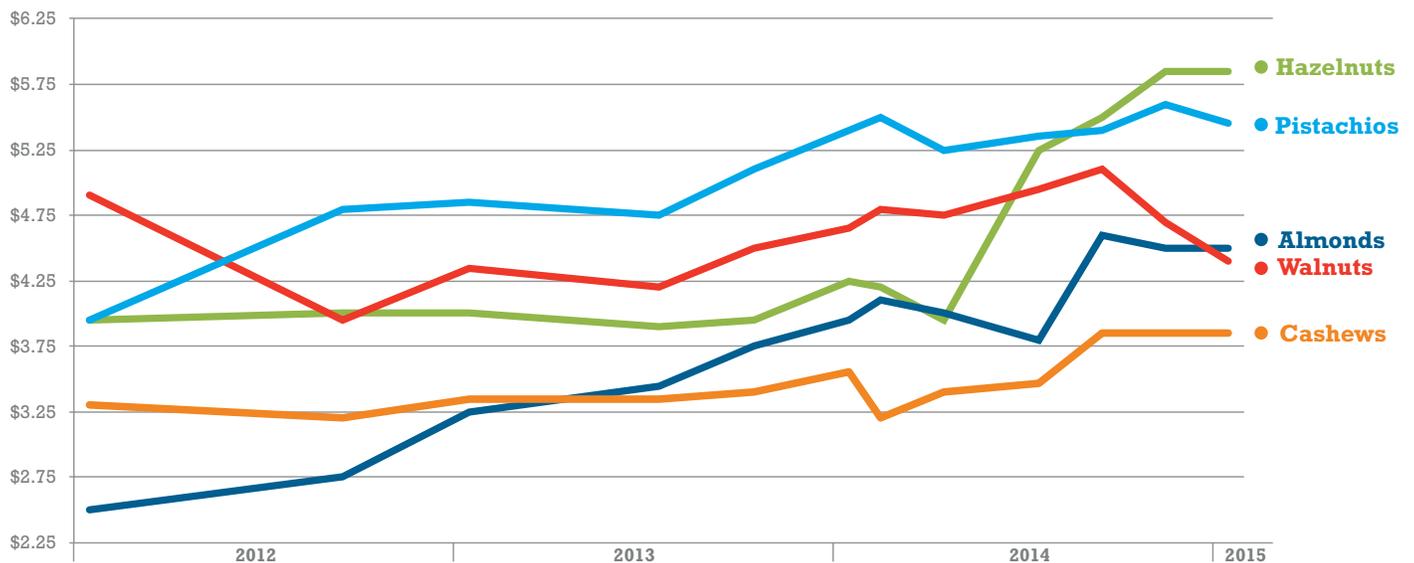


If demand is the key driver of this market, the question is whether almonds are still a value. Three years ago I shared the Warren Buffet quote, "Price is what you pay, value is what you get." In looking at the other tree nuts, almonds are now much more appropriately priced, but they are still a value. As the healthiest, best tasting and most versatile tree nut, almonds have a uniquely strong demand.



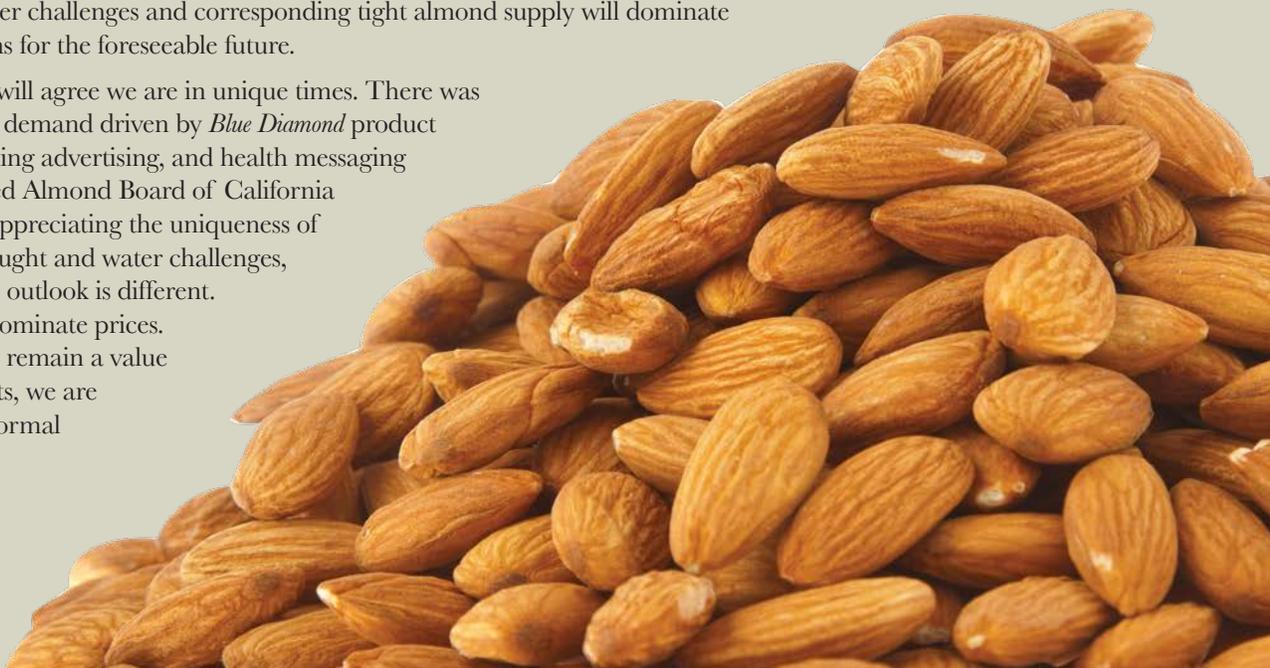
With the 2014 harvest, shortage of supply took over as the primary driver of market pricing. The yield on the 2014 crop was 12 percent below the National Agricultural Statistic Service expectation and was a statistical outlier from any forecasts based upon history. A convincingly good bloom and an apparently good crop in the

## Premium Tree Nut Pricing

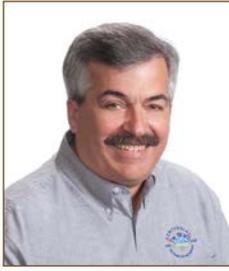


trees translated into a harvest that caught the industry by surprise. The reason? This California drought is unprecedented. Most concerning is that the foreseeable future does not instill confidence in additional supply. I am writing this report in the middle of the driest January on record. Even if we are blessed with rain and snow in February and March, the 2015 crop will once again be small. UC Davis research indicates the greatest drought impact occurs in the year after the drought. If we are water constrained again this summer, we should similarly expect the 2016 crop to be small. The promise of greater groundwater regulation indicates water challenges and corresponding tight almond supply will dominate the industry expectations for the foreseeable future.

I trust almond growers will agree we are in unique times. There was an extraordinary rise in demand driven by *Blue Diamond* product innovation, brand-building advertising, and health messaging from the industry-funded Almond Board of California research programs. In appreciating the uniqueness of California's current drought and water challenges, our future almond yield outlook is different. Tight supply will now dominate prices. Given that almonds still remain a value relative to other tree nuts, we are experiencing the new normal for almond prices.



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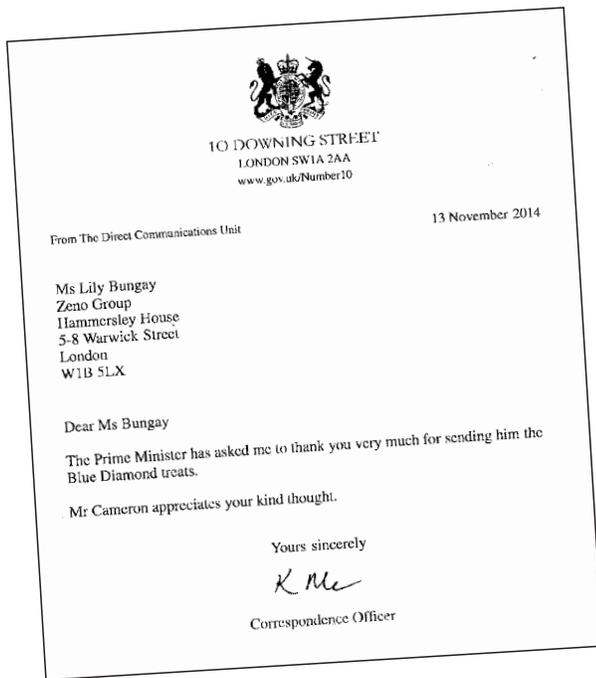
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## British Prime Minister Enjoys *Blue Diamond Almonds*

After the U.K.'s Daily Mail reported that British Prime Minister David Cameron uses almondmilk on his cereal in the morning to stay slim, *Blue Diamond* was sure to send him a basket full of the cooperative's almonds and almond products. His team was kind enough to send a thank you reply direct from Number 10 Downing Street.

## EU Imposes Limitations on Phosphite Levels in Almonds

For California's almond growers, MRL's, or Maximum Residue Levels, have not posed significant impacts on normal pest management decisions. However, MRL's have always been on the minds of Pest Control Advisors as they work to select the best options for managing disease problems and insect populations within their grower's orchards. And a recent decision by European Union (EU) officials has magnified the potential to bring MRL considerations to the forefront for California's almond growers.

The EU recently revised the definition of the residues included under the limits for the fungicide fosetyl-al, known under the trade name, Aliette. While fosetyl-al is not registered for use on bearing almonds, the expanded EU definition includes phosphite-containing products, which are commonly used in the U.S. as foliar fertilizers. Be clear that this decision affects phosphite materials, not phosphate.

Because the U.S. EPA has exempted phosphite containing fungicides from a tolerance and because of the fact that fertilizers are not required to have an MRL, no residue studies have been conducted to set a limit for phosphite containing materials.

Without residue data for tree nuts, the EU has assigned a default MRL of 2 ppm. However, current usage of

phosphite-containing foliar fertilizers by almond, walnut and pistachio growers is likely to result in residues exceeding this limit.

Various trade and grower organizations have expressed concern to EU officials about the trade impacts of their decision. The EU requested that the European Food Safety Authority make a quick risk assessment for phosphite residues in tree nuts and established a temporary MRL of 75 ppm. However, this temporary MRL is set to expire Dec. 31, 2015. EU officials have explained that the limited timeframe of the MRL was to cover the usage of phosphite containing crop inputs during the 2014 growing season. This unfortunately poses some questions on applications of phosphite materials after the 2014 harvest.

Work has been initiated to develop a residue testing program during the 2015 growing season to aid in establishing appropriate MRL's for the EU. However, the work will potentially take several years to complete and for the data to make its way through the EU regulatory system.

At this point in time, the implications of phosphite applications on the 2015 crop are unknown. We will keep you all apprised of any developments as they arise.



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# Snacking on Almonds Reduces Belly Fat and Other Heart Disease Risk Factors

A new study published in the Journal of the American Heart Association found that a daily snack of 1.5 ounces of almonds, instead of a high-carbohydrate muffin for example, eaten as part of an overall healthy diet, improved a number of heart disease risk factors in study participants. In addition to significantly improving LDL (the 'bad' cholesterol) and total cholesterol, snacking on almonds instead of muffins also reduced central adiposity (belly fat), a well-established heart disease risk factor.

Although heart disease remains the number one cause of death in the United States and worldwide, it is estimated that at least 80 percent of premature deaths from cardiovascular disease can be avoided if diet and lifestyle risk factors are controlled. While a significant body of evidence has shown that eating almonds is associated with improved heart health, this is the first and largest controlled feeding study using identical diets with the exception of almonds vs. a calorie-matched snack to investigate and isolate the cardio-protective properties of almonds beyond their contributions to an overall heart-healthy diet. The findings are also the first of their kind to show benefits of eating almonds in reducing abdominal and leg fat. Reducing abdominal fat is particularly beneficial given its connection to metabolic syndrome and increased risk for heart disease.

This study joins nearly two decades of research showing that almonds can help maintain a healthy heart and healthy cholesterol levels, and provides new evidence showing that regularly eating almonds instead of a high-carbohydrate snack may have benefits on body composition. Previous studies showed that regular almond consumption did not lead to significant changes in body weight, indicating that nutrient-rich almonds can be incorporated in weight-maintenance and weight-loss diets.



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## Almond Breeze Returns to UK Airways

Blue Diamond's Almond Breeze consumers in the United Kingdom are once again seeing their favorite non-dairy beverage on television as the "Living a Healthier Lifestyle is a Breeze" campaign showcases its revamped commercial. The campaign, which began airing in December 2014 and will continue into February, has been updated since its original premiere, featuring new voiceover and music.

Whereas the original campaign aimed to introduce Almond Breeze as a new product from California using an American accented voiceover, the new commercial features an English accented voiceover. The change communicates to the audience that this brand is now a staple in the U.K. market.

## Nuts Crack Top Superfood Spot for 2015

A survey of more than 500 registered dietitians conducted by the nutrition trade magazine Today's Dietitian, in conjunction with a leading food, health and wellness public relations agency Pollock Communications, found that nuts and seeds have taken over as the top two superfoods for 2015, surmounting kale and coconut as the trendiest choices. A full 54 percent of respondents identified nuts as the most popular superfood for the New Year.



## Recipe of the Month: Nutty Almond Quiche

Perfect for summer brunch, or serve with a green salad for a light dinner.



### NUTTY ALMOND QUICHE

Prep time: 30 minutes  
Cook time: 1 hour

8 Servings

#### Crust:

1/2 cup Blue Diamond® Honey Roasted Chipotle Almonds, very finely chopped  
1/4 cup buttery spread or butter, melted  
1 (4.25 oz.) box Blue Diamond Honey Mustard Nut Thins®, coarsely crumbled

#### Filling:

1 tablespoon olive oil  
1 cup chopped onion  
1/2 cup chopped red bell pepper  
1 cup shredded Gruyere, Jarlsberg or Swiss cheese  
1 cup Blue Diamond Hint of Honey Almond Breeze®  
3 eggs, beaten  
3/4 teaspoon garlic salt

Preheat oven to 350°F and lightly grease an 8-inch quiche or pie dish.

Stir together almonds, butter and Nut Thins.

Press onto the bottom and sides of an 8-inch quiche or pie dish.

Place a piece of plastic wrap on the crust and press again firmly.

Bake for 15 minutes.

While crust is cooking, heat oil in a medium skillet over medium heat.

Add onion and bell pepper and cook for 10 minutes, stirring occasionally.

Place in cooked pie crust and top with cheese.

Beat together remaining ingredients and pour over cheese and vegetables.

Bake for 45 minutes or until center is set, tenting with foil if top browns too quickly.

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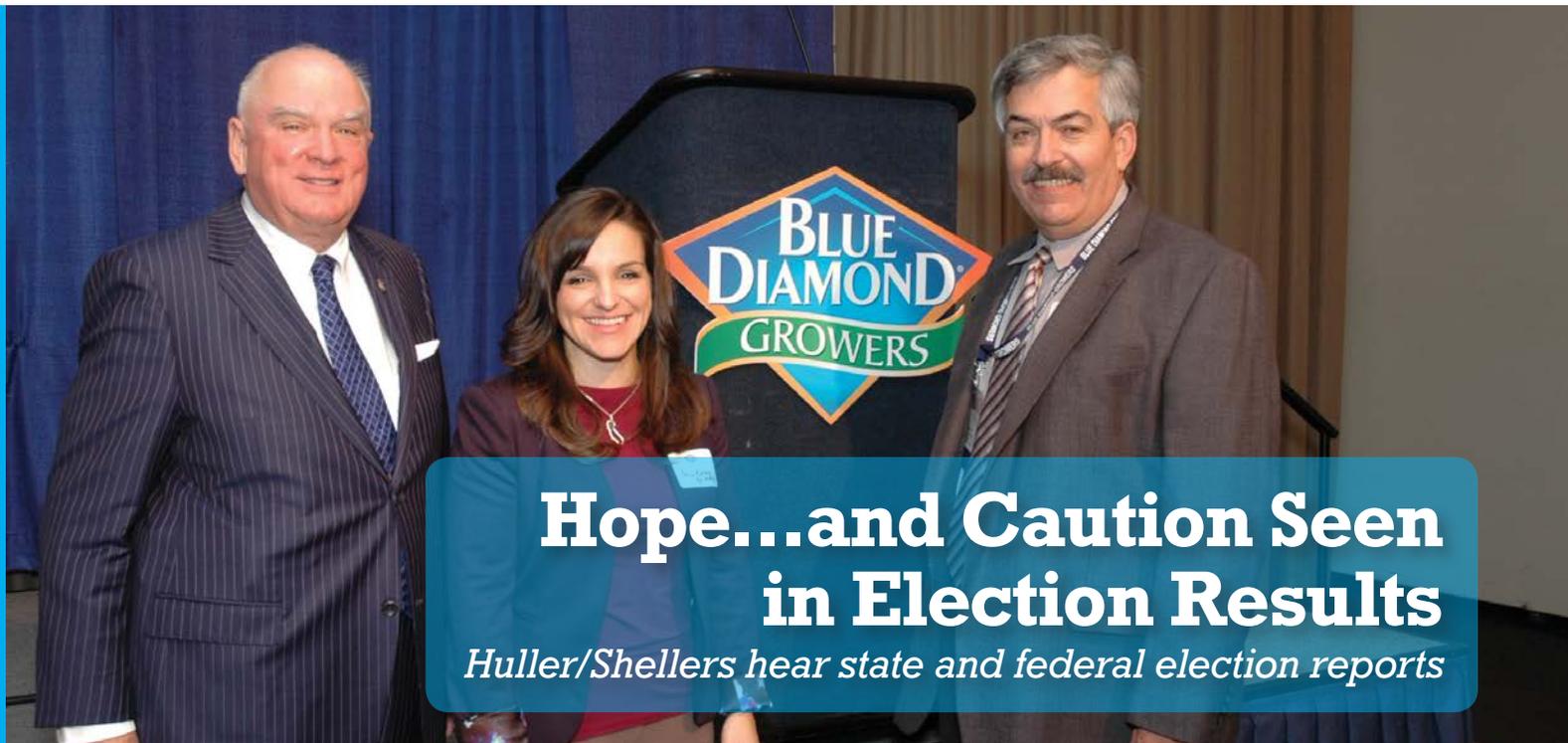
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## Hope...and Caution Seen in Election Results

*Huller/Shellers hear state and federal election reports*

Dismal voter turnouts and voters fleeing the major parties for the "no preference" and "other" labels have characterized recent elections, according to Emily Rooney, president of the Agricultural Council of California. Speaking to more than 50 almond hullers and shellers at the 104th annual meeting of *Blue Diamond Growers* in Sacramento, Rooney noted that while low voter turnout is unfortunate in the macro sense it is generally good for agriculture.



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The Council represents California's farmer-owned cooperatives and their members before the state legislature and regulatory agencies, and participates through a political action committee (PAC) in legislative races important to grower and co-op interests. "Our strategy in the 2014 election was to prevent any one party from achieving a super-majority," Rooney said. "It is not good for one party to have too much control."

The Council's efforts to elect "business-friendly" and "moderate" Democrats (since Democrats are very much in the majority in Sacramento) were highly successful. "We won every state Senate race we participated in," Rooney reported, "and all but one of the candidates we supported in the Assembly races." And their goal of preventing a super majority was successful in both houses.

Rooney explained that the Council's success is based on "building relationships with candidates on behalf of agriculture." The Council works with member co-ops to encourage their growers to get acquainted with their elected representatives, invite the candidates to their farms to inform them about what is involved in producing food for America, and the impact that government policies and regulations have on the viability of agriculture. "Those relationships have a major impact on our ability to get agriculture's message across regarding legislative and regulatory issues," Rooney said.

## State Issues Before Us

Potential red flags in 2015 and beyond, according to Rooney, include:

**Farm labor** — "Every year the United Farm Workers (UFW) brings a bill to increase their control of the farm labor supply or increase liability on farmers. We expect something from this session."

**Minimum wage** — "an effort to increase the minimum wage is expected, although it is felt the governor may not sign it if it passes."

**Groundwater** — legislation to "clean up" the groundwater bill and better clarify its mechanisms for establishing groundwater sustainability agencies at the local level is likely. High- and medium-priority areas in critical overdraft must have local governing agencies in place by 2017 and a groundwater management plan by 2020. Rooney noted that those are "very difficult deadlines to meet." If local bodies do not meet the deadlines the State Water Board is authorized to intervene.

Other issues to watch, according to Rooney: **Farmland preservation** — "the governor is committed to it as a priority." **Water storage** — "It was part of the water bond and the bond is step one in a multi-step process."

[Continued on next page »](#)



## Federal Picture

Julian Heron, attorney with Tuttle, Taylor and Heron in Washington, D.C., has represented the interests and concerns of *Blue Diamond* almond growers and other California cooperatives in Washington, D.C. for decades. He addressed the Huller/Sheller gathering on his interpretation of the 2014 election results at the federal level. "What do the results of the 2014 election mean?" he asked, "The real election is the one in 2016. That is what is on everyone's mind."

As for what may happen in the meantime, Heron explained that with the Republicans achieving a majority in the Senate, legislation will start moving to the President's desk for signature, but vetoes can be expected. One of the first could be the Keystone Pipeline. "If the Keystone Pipeline bill passes and the President vetoes it, and there are enough votes to override the veto, a new dynamic will occur in Washington," Heron explained. "Republicans looking to 2016 will pass bills that the President

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will veto so they can override the veto with enough Democrats helping. This could create a contentious session for the next two years."

Some positive news from the 2014 results reported by Heron include the return of Pat Roberts of Kansas to the Senate Agriculture Committee, which bodes well for agriculture's interests. Similarly, Congressman Mike Conaway of Texas is in line to chair the House Agriculture Committee. The Congressman visited *Blue Diamond* last summer in preparation for taking that seat.

California's Kevin McCarthy of Bakersfield becomes House Majority Leader. He will determine which bills go to the House floor for discussion and vote. If the Speaker retires in two years, McCarthy could be in line for the Speaker's job, which would be good for California.

Important federal issues Heron says to watch include:

**Immigration** — the Republicans realize they need to take the lead on this issue.

**Water** — expect a water bill to pass Congress this year.

**Trade** — the Trans-Pacific Partnership agreement may get done by early this year, which would be good for *Blue Diamond* efforts in Asian markets.

**Food Safety** — FDA's new regulations due next fall are expected to be over-reaching but probably will be dialed back by the Republican Congress.

**EPA** — similarly, EPA's effort to control all waters, real and virtual, in America will likely be reined in by Congress, but the President may veto any such effort.

**USDA** — the Department seems to be on an anti-marketing-order path, starting with national check-off agreements for beef and hardwood timber.

**Tax Reform** — a lot of attention is being directed to this issue. Stay tuned.

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<i>Fifth Leaf</i> Colusa County <b>Arbuckle</b> 2,800 pounds/acre 124 trees per acre	<i>Eighth Leaf</i> Merced County <b>Ballico</b> 3,300 pounds/acre 110 trees per acre	<i>Fifth Leaf</i> Fresno County <b>Fresno</b> 4,100 pounds/acre 124 trees per acre

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# New Almond Flour Products Ready for Global Launch

For food manufacturers looking for a more nutritional alternative to processed flour in their products, *Blue Diamond* Global Ingredients has the solution: almond flour. With all the health benefits of whole almonds, there's no need to sacrifice taste to create healthier, more nutritious versions of go-to recipes that call for flour.



“For *Blue Diamond*, our new almond flour capability opens up a wide range of business opportunities. The new flourmill in the Turlock Plant, is capable of using a variety of raw materials to generate fine granulation flour. We are excited to see almond flour take off,” said Bill Morecraft, General Manager of Global Ingredients at *Blue Diamond*. “Our customers in the US and in markets around the world, have been anxious for almond flour.”

In fact, the Turlock flourmill operates in conjunction with the blanching and natural manufacturing lines already in place in that facility. It utilizes components of the various ingredient products that *Blue Diamond* already produces to churn out the finest granulation of almond flour on the market. Once the product is ready, it is packaged into 25-pound cartons and made available for shipment to customers around the world.



Global Ingredients is working on three different almond flours — two sizes of blanched flour, fine and extra fine, and one extra fine natural almond flour. Fine blanched flour offers nutrition and texture to everyday baking and cooking, and when toasted, turns a rich golden color. Extra fine blanched flour is the finest granulation almond flour available, with a powder-like consistency that is perfect for delicate cookies, breads and cakes. Extra fine natural flour is also exceptionally fine in granulation and is as versatile as blanched flour while maintaining a natural light tan color.



The demand for almond flour is two-fold. Primarily, Morecraft projects that the products will be used primarily for baking uses. With its smooth mouth-feel and rich, buttery flavor, “our baking customers are going to love it!” he said.

Secondarily, consumers who have adopted gluten-free, Paleo or other specialty diets relish in the opportunity to replace processed traditional flours with almond flour. “It’s perfect for everything from coffee cake to cookies, pancake and waffle mixes and as a thickener for sauces or a coating for battered meats and vegetables,” Morecraft explained.

Just how nutritious is almond flour in comparison to other processed flours?

- Almond flour is low on the glycemic index (GI). Low GI foods offer slow digestion and absorption, producing a gradual rise in blood sugar and insulin levels. These types of foods can help maintain weight by controlling appetite and delaying hunger.
- Each quarter-cup serving of almond flour contains 6 grams of power-packed protein, 3.5 grams of fiber and 75 milligrams of calcium. By comparison, a quarter-cup serving of all-purpose flour contains 3 grams of protein, 1 gram of fiber and no calcium, according to the U.S. Department of Agriculture’s Household Foods Fact Sheet.
- Almond flour is high in mono-unsaturated fats, the good fats, at 13 grams per serving and is a top food source of antioxidant Vitamin E.



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# Snack Almonds Kick up the Heat with New Sriracha Flavor

Fans of the bold, complex flavors of Sriracha hot sauce can soon experience that tangy heat on *Blue Diamond Snack Almonds*. The popular chili sauce has exploded out of the condiment category and can be found on everything from beef jerky to potato chips. “Almonds were a logical next step for this new flavor. Our bold line is about to get a whole lot bolder!” said Al Greenlee, Marketing Director for Consumer Products.

Hot sauce production is the 8th fastest growing industry in the United States, according to a report from IBIS World, an industry research firm. IBIS attributes the growth trend to demographic shifts, immigration and the growing popularity of spicier ethnic food in the United States, Canada and Japan.

The Sriracha style of hot sauce, in particular, is booming. CBS has reported that the Southern California-based Huy Fong company, the largest producer of Sriracha hot sauce, has experienced double-digit growth annually. Their popular sauce is based on a traditional hot sauce that the company’s founder modeled after a spicy condiment from his native Vietnam. IBIS points to the sauce’s popularity among Millennial consumers as a big reason for its mainstream success.

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## HEAT SCALE



For *Blue Diamond, Sriracha Snack Almonds* offer the opportunity to introduce heat to the BOLD product line. “Up until now, our BOLD line has featured savory and spicy flavor profiles such as *Wasabi and Soy* or *Jalapeño Smokehouse*. Those flavors feature a unique blend of spices for the consumer to enjoy. But heat is something different. Heat is the sensation in a consumer’s mouth resulting from different components in a seasoning, most commonly resulting from peppers. Our *Sriracha Almonds* exemplify heat,” Greenlee explained.

Heat is just what consumers are looking for, according to market researcher Mintel Innovation. In a poll, 54 percent of consumers preferred hot or spicy sauces, dips and condiments over their tamer counterparts and a majority of respondents indicated hot or spicy to be an “appealing or extremely appealing” flavor. Roasted-red chili is the No. 2 emerging food flavor with chili-pepper right behind at No. 4.

Publix Supermarkets, a chain that operates throughout the Southeast, is the first retailer to offer *Blue Diamond Sriracha Almonds*. Consumers can look for the item in 6-ounce cans starting in March, with 1.5oz tube packages to follow in late Spring.



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## VOCs, Fumigants and Regulatory Concerns



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Growers concerned about new and changing regulations affecting application of VOCs and fumigants to their orchards received expert insights and advice at the *Blue Diamond Growers* annual meeting November 19 in Sacramento.

Sean Runyon, Deputy Agricultural Commissioner for Merced County, presented a detailed overview of the regulatory landscape as practiced in Merced County with reference to limitations that apply throughout the San Joaquin Valley. Pointing out that "this is an overview, not a training session," he provided an update on VOC (volatile organic compounds) restrictions for 2015, an update on fumigant mitigations and permit conditions, anticipated regulations for 2015 and orchard application concerns.

## VOC Regulations

Runyon explained the cause for concern about VOCs is that VOCs and nitrogen oxides react with sunlight to form ozone, which can cause inflammation and irritation of lungs, and result in premature deaths and compromised immune systems. Consequently the Federal Clean Air Act requires the Dept. of Pesticide Regulation (DPR) to develop a State Implementation Plan (SIP). California's SIP requires the DPR to track pesticide VOC emissions by compiling pesticide use reports for areas of the state that do not meet federal ozone standards. There are five such areas in the state, including the San Joaquin Valley. To meet the ozone standard in the critical May through October peak ozone season, DPR seeks to reduce pesticide emissions by specified amounts during that period. In 2008, DPR announced low-emitting fumigation methods and in 2013 implemented restrictions on non-fumigant products in the San Joaquin Valley.

Fumigant and non-fumigant usage in the San Joaquin Valley peaked in 2006 at over 20 tons per day but declined in 2007 below the 18.1 tons/day "trigger" for prohibition of several uses of high-VOC non-fumigant



products and remained there through 2012. However, the trigger was tripped in 2013, which affects grower operations in 2015 and 2016.

## High- versus Low-VOC

In reviewing non-fumigant regulations that became effective in 2013, Runyon noted that certain agricultural chemical products are designated as "high-VOC" or "low-VOC" depending on their emission potential. Pesticide dealers are required to provide product and usage information to purchasers of high-VOC products used in the San Joaquin Valley and growers are required to obtain a pest control adviser's recommendation for some applications.

If the 'trigger' level is exceeded in the San Joaquin Valley, prohibitions will be enacted on several uses of high-VOC non-fumigant products, Runyon stated. He added that low-VOC products are feasible for most uses and that switching to low-VOC products achieves DPR target reductions.

## Included Products

Runyon explained that VOC regulations include products containing abamectin, chlorpyrifos, gibberellins or oxyfluorfen as the primary active ingredient and that are labeled for agricultural uses. All other products are excluded from VOC regulations, he said, adding that DPR publishes a list of specific low-VOC and high-VOC products in an annual emission inventory report that is posted to their website.

From May through October 2014, growers were required to obtain a PCA recommendation if a high-VOC product containing abamectin, chlorpyrifos, gibberellins or oxyfluorfen

was used and it was applied in the San Joaquin Valley during that period to alfalfa, almonds, citrus, cotton, grapes, pistachio or walnuts. Those crops account for more than 90 percent of emissions from the four compounds of concern, Runyon said. "Switching to low-VOC products achieves VOC target emissions," Runyon observed. He added that the restrictions did not, however, prohibit use of the products.

## 2015 Prohibitions

As noted above, Runyon reported that the VOC 'trigger' was tripped in 2013 bringing prohibitions on high-VOC use for 2015 and 2016. When emissions exceed the trigger level, high-VOC use is prohibited for abamectin, chlorpyrifos, gibberellins and oxyfluorfen products in the San Joaquin Valley during May 1 through October 31 for application to alfalfa, almond, citrus, cotton, grape, pistachio and walnut. "All other requirements will remain in effect," he said, "but low-VOC products are not prohibited. Although, as we know, low-VOC products are not always feasible."

A few exceptions apply when high-VOC prohibitions are in effect. With PCA recommendations, high-VOC products can be used for specified applications. Check with your PCA or Ag Commissioner for details. For compliance assistance, refer to the DPR website ([www.cdpr.ca.gov](http://www.cdpr.ca.gov)), click on "Air" under Quick Links, then click on "Volatile Organic Compound Emissions." There are Fact Sheets for dealers, growers and PCAs, and lists of high-VOC and low-VOC products, plus a VOC calculator for calculating VOC emissions from agricultural applications of non-fumigant pesticides.

Continued on next page »

## New Rules for Chloropicrin

Runyon reported that chloropicrin and 1,3-Dichloropropene (Telone) with chloropicrin, and metam sodium/potassium are coming under new rules and permit conditions for 2015. These result from continued complexities with applications resulting from conflicts with labels, regulations and/or permit conditions. His advice is to "plan for fumigations as far in advance as possible."

Interim permit conditions will be incorporated into California labels and will affect 2015 permits. "No permits for chloropicrin will be issued for 2015 until we receive final permit conditions," he said, adding that there are no significant changes regarding 1,3-Dichloropropene, "but 1,3-Dichloropropene with chloropicrin must comply with chloropicrin measures." And, he added, there are no major changes in permit conditions for this year for metam sodium/metan potassium.

## On the Horizon

Runyon signaled a 'proposed regulatory action' to designate chlopyrifos as a California Restricted Material. It may not be

finalized before the end of April, he said, noting that the focus is on mitigation measures for surface water contamination and bystander exposure.

New rules for closed systems are anticipated in "mid- to late-2015," he said. There could be requirements for loading diluted materials, protective eyewear and some stronger warning label wording. Late next year expect some new requirements on personal protective equipment and some regulatory language clean-up.

## Air Blast Spraying Cautions

Runyon offered extensive comment on the risks and fixes for those risks from air blast spraying, saying, "Air blast spraying continues to be the application method that draws the most attention." Listing sensitive sites such as aquatic and residential areas, roads, schools and other crops, he cautioned growers to be especially attentive to avoid litigation, insurance costs, waste and additional regulations.

Visit your County Ag Commissioner's website to learn details of regulations on drift and recommendations on safe spraying practices.

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✓ Seminar coordinator and field supervisor Steve Rothenberg (left) with speaker Franz Niederholzer.



## Effective Pest Management and Bee Protection

"There are three critical objectives in almond spraying: efficacy, efficiency and environment," stated Franz Niederholzer, UC Cooperative Extension farm advisor in Colusa, Sutter and Yuba counties. Speaking to some 150 growers attending a cultural seminar at *Blue Diamond Growers'* annual meeting in Sacramento, Niederholzer emphasized attention to detail at every step in the process when using spray materials to protect an almond crop.

Care taken before entering the orchard will improve a grower's odds of achieving the desired protection of the crop while also protecting the honey bees essential to setting a crop, he said.

"Step back and assess the job," he advised. "Plan your work carefully for maximum effectiveness, bee survival and worker safety."

In terms of effectiveness, for example, he pointed out that a small amount of active ingredient is added to a large quantity of water. To be effective it must be uniformly dispersed in solution and applied in a manner that produces uniform coverage throughout the tree canopy. This is no small feat. It requires close attention to detail.

### Tank Mixing

Guidelines for what Niederholzer refers to as "tank health" or achieving maximum effectiveness from a spray operation include:

- Start with a clean sprayer, inside and out, including tank, filters, pump and nozzles.
- Spray with clean water.
- Start mixing in the active ingredient *after the tank is 1/4 to 1/2 full* in order to get a uniform mixture.
- Mix with the *agitator on*.
- Follow the label directions, especially regarding steps in the mixing process and compatibility of mixing partners.

- Use a jar test if unsure of the mix. You are risking problems if you put too many things or the wrong combination in the tank.
- Spray as soon as possible after mixing. *Do not let a loaded tank sit.*
- Clean the sprayer inside and out when finished spraying.

Simple, but very important, mixing-order rules to follow are:

- Fix the water if it is alkaline, hard or imperfect. Conditioners go in first.
- Dry pesticides go in the tank next, before other materials such as oil- or water-based emulsions. This is necessary to avoid clumping. The dries must be uniformly dispersed in the tank before other materials go in.
- Water-based pesticides go in next.
- Oil-based and water-based emulsions (ECs) are next.
- Then fertilizers.
- And, finally, adjuvants.
- Agitate thoroughly to get uniform solution for best effect.

Jar test the solution for uniform mixing when in doubt.

### Applying the Material

Niederholzer noted that spraying technology has not changed much since 1955 when air blast sprayers came on the market, but orchards have, which makes careful adjustments in spraying practices essential.

For example, he explained, orchards are much denser. There is less pruning, which makes penetration much harder, and the materials are much less forgiving. Many of the pesticides now in use have to be consumed by the pest, which means the spray has to be delivered to the pest where it is, making effective spraying much more challenging.

Niederholzer advised spraying late in the day or even at night. This offers several important advantages, including increased efficacy, less wind therefore less drift, and there is less traffic on the roads near orchards.

## Setting Up Sprayer

"With the new materials that have to be consumed, getting 50% control is about the best one can expect," Niederholzer said, "and that is with doing everything right."

Therefore it is critical to set up the sprayer for maximum effect. He advises:

- Get the air flow right. The pesticide goes where the air goes. Sufficient air volume is needed to move the spray throughout the target canopy.
- Decide on correct volume. Talk with PCA and read labels.
- Set nozzles to move the spray into the canopy with thorough coverage, especially in the upper 2/3s of the tree where the majority of the crop is.
- Check the calibration for desired spray volume.
- Check targeting with a patternator or similar device to determine spray volume at various heights with most volume in upper part of tree and less lower down. Most of the "miss" typically is on the orchard floor, not to aerial drift, he noted.
- Check coverage by examining leaves at different heights in the tree.
- Make necessary adjustments to achieve desired coverage.

## Ground Speed

Changing ground speed is the most effective way of changing air flow into the canopy, Niederholzer advised. He told of driving at less than two miles per hour to achieve the desired coverage in today's orchards with heavy canopies.

## Protecting Bees

Bees are essential for a crop of almonds, Niederholzer declared, adding that bloom sprays are applied to protect a crop from disease, not to kill insects. Therefore, **the only spray material in the tank at bloom should be fungicide.** That includes **adjuvants**, which **should not be used in fungicide applications during bloom** or when there is high honey bee activity in the field, he urged.

As for adding nutrients and/or insecticides to the mix at bloom, Niederholzer pointed

out, "There are other effective times to spray nutrients and/or insecticides on almonds."

"Also, do not spray when bees are flying," he said. "Spray when the pollen is gone from the flowers, which is late afternoon through early morning." He noted that one spray at bloom may be all that is needed if the weather is dry.

Niederholzer cautioned growers to be **very careful around bees when using chlorothanil (Bravo, etc.), captan, and iprodione (Rovral, etc.).**

For details on protecting honey bees in almond orchards, consult *Honey Bee Best Management Practices for California Almonds*, published by the Almond Board of California.

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# It's A New Era for Surface and Groundwater Management

During the 104th Annual Meeting of *Blue Diamond Growers* held last November in Sacramento, members had a chance to hear an informative presentation from Mike Wade, executive director of the Farm Water Coalition. The Farm Water Coalition is a non-profit educational organization formed in 1989 to provide fact-based information on farm water issues to the public.

Wade reminded the audience that history is often our best predictor of what is to come as the water issues that California farmers, and the state as a whole, are facing are not really new. Wade gave a brief timeline of water use beginning with the Spanish mission era when Padre Fermin Francisco de Lasuen oversaw the construction of a dam and aqueduct system at Mission Santa Barbara that represented the first use of diverted water in California.

Since then, water use in California has been dictated by changes in crop production, population growth and the redirection of water to environmental purposes. "The completion of the Transcontinental Railroad represented a real shift in California agriculture," said Wade. "The farmers that were growing grain in and around Sacramento found that the rates the railroads were charging to ship it back east were too expensive to make it cost-effective. That led to the first crop shift in California where a lot of farmers started growing higher value crops, such as fruits and vegetables that justified the freight to ship to larger population centers in the east."

In the 1940s, the federal Central Valley Project was completed. The project, which was initiated in the 1920s, but didn't come to fruition until after the Depression, was built to address large-scale groundwater overdraft. "The project accomplished its goal as the effects of overdraft were reversed, but we are seeing that same thing happen today due to the lack of reliable surface water delivery."

According to Wade, groundwater was traditionally seen as the "dry year" water supply; but, because of the drought experienced by the state, and increasing regulatory restrictions that rededicate surface water to other uses, groundwater has become an "every year" need to fulfill agriculture's purpose. That reliance has increased, according to Wade, from about 38 percent in an average rainfall year to approximately 53 percent in 2014.

"Governor Brown was correct in a statement he made recently in that we have an 'engineered water supply,'" said Wade. "He's correct in that we need to get over the fact that we no longer have a pristine ecosystem driven, natural water system, and work to manage it accordingly."

It is a new era that will require groundwater and surface water management to go hand in hand. California's drought and



future water management has international repercussions as other nations rely on the crops the state produces for their own food security.

While the Farm Water Coalition does not participate in policy activities, they do keep a close eye on the regulatory changes that will redirect water use in the state. In looking ahead to future issues, Wade touched on the recent passage of Proposition 1 by two-thirds of California voters that included a \$7.5 billion bond package, of which \$2.6 billion is directed towards storage projects. Adding to the discussion is the Sustainable Groundwater Management Act that was just signed by Governor Brown.

"As we see agencies move forward, many of their actions are predicated on our ability to deliver surface water," added Wade. "We have so many competing uses for the same water that all of them add up to a reduction in the reliability of the capacity to deliver surface water, which conversely impacts groundwater. California's agricultural success is built upon on adequate water supplies. It is important that consumers understand those issues."



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## Agricultural Council of California

EMILY ROONEY, President



## Groundwater Forums Reveal Next Steps

With last year's passage of the groundwater law, Ag Council has been taking a leadership role in outreach to the agencies writing the implementation rules. Our staff has now shifted our priorities to help our members understand the law and make improvements where possible in the actual implementation process and remains engaged regarding potential legislation to make changes to the law.

The legislation comprises historic changes to California groundwater law. Ag Council held two Groundwater Forums in December to help members connect with key officials from the California Department of Water Resources and the State Water Resources Control Board to better understand the law's implications.

Ag Council member Campos Brothers Farms hosted the first forum, held on Dec. 4 in Caruthers. Over 100 guests

attended the forum to hear presentations by David Gutierrez, program manager of the Groundwater Sustainability Program at the Department of Water Resources (DWR) and DeeDee D'Adamo, a member of the State Water Resources Control Board. On Dec. 9, Ag Council held its second Groundwater Forum in Sacramento. Steven Moore, member of the State Water Resources Control Board (Board), presented and David Gutierrez joined us once again.

Groundwater represents 40 percent of California's water supply. Citing issues such as wells going dry, lack of groundwater recovery in some areas and subsidence in other areas, Gutierrez said the new groundwater measures "empower local agencies to manage groundwater sustainably." He added that, "DWR's role is to make locals successful." Gutierrez said DWR efforts include the creation

Continued on page 38 »

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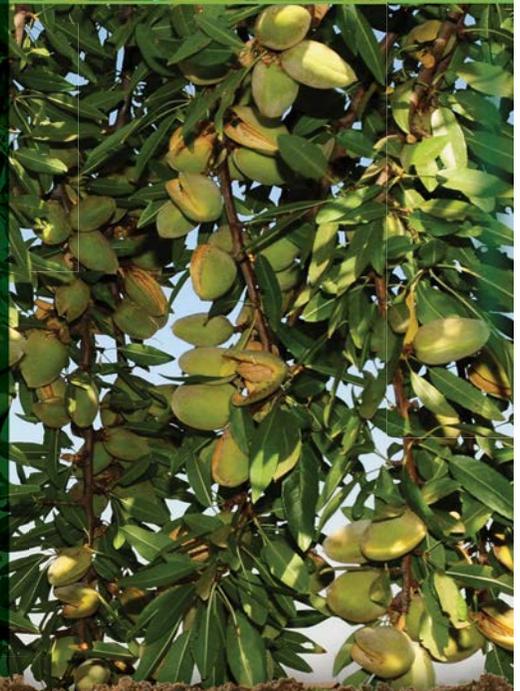
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of technical and planning assistance to locals, in addition to financial assistance.

Gutierrez outlined four phases to implementation of the groundwater package. In phase one, the creation of governance areas — called Groundwater Sustainability Agencies (GSAs) — is mandated by June 30, 2017. Many communities have already started the discussion to move forward on this initial governance requirement.

Phase two includes the development and adoption of Groundwater Sustainability Plans (GSPs). The deadline for GSPs in high and medium priority groundwater basins in critical overdraft is Jan. 31, 2020. GSPs for high and medium priority basins not considered to be in critical overdraft must be developed and adopted by Jan. 21, 2022.

Phase three is the early implementation of the GSPs beginning in 2020 for areas in critical overdraft and 2022 for other areas. Phase four, sustainable groundwater management, begins in the year 2040.

The state water bond, Proposition 1, included \$100 million for sustainable groundwater management agencies. In addition, GSAs have been provided broad fee, compliance and enforcement authorities. GSAs can choose to assess fees, monitor groundwater pumping and levy fines for violations, among other actions.

In outlining next steps, Gutierrez said DWR is completing a Draft Strategic Plan and is working on outreach plans to ensure public input. In addition, a Groundwater Information Center was developed with further information available (<http://www.water.ca.gov/groundwater/>).

D’Adamo discussed how our state groundwater resources are under stress and she added that the Board, like DWR, believes groundwater should be locally managed.

D’Adamo outlined what many call the state “backstop,” which is state intervention triggered by a specific failure to act by locals. Under the groundwater law, the Board can designate a basin or sub-basin as “probationary” if:

- By June 30, 2017 a GSA is not designated for the entire basin
- By Jan. 31, 2020, no GSP is developed or the GSP is inadequate for basins in critical overdraft
- By Jan. 31, 2022, in other basins, no GSP is developed or the GSP is inadequate and the basin is in long-term overdraft
- By Jan. 31, 2025, DWR or the Board determines a GSP is inadequate and there are significant depletions of interconnected surface waters

The ag community is concerned about the scope of intervention that will potentially be imposed by the Board. This issue was raised at both Groundwater Forums. At the Dec. 9 Groundwater Forum, Moore said it is “not appropriate for the state to come in and manage groundwater basins,” adding it is “temporary, if needed.”

According to Moore, the Board’s view is that enforcement is needed because the state wants to prevent those who are not following the rules from gaining an economic advantage. Moore said the Board is “not interested in micromanaging the process.” D’Adamo added, “The Board is only stepping-in where there’s an undesirable result. The Board has a lot on its plate and does not want to get involved unless necessary.”

Now that this historic legislation has passed, Ag Council is working to make sure key state officials understand the rights and protections needed to sustain our agricultural community.

# Almonds

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## The Bee Box

CHRISTI HEINTZ  
& TARA MCCALL



« Apply fungicides in the late afternoon, evening, or at night when bees and pollen are not present. Photo by Christi Heintz

THE BEE BOX

Bees in almonds – not something you worried too much about many years ago. A mere 10 years ago, honey bee colony rental fees in almonds were about \$75 per colony. With growers paying an average of \$168 in 2014 and facing \$185 per colony in 2015, according to the California State Beekeepers Association 2014 Pollination Survey, honey bees and pollination weather are top-of-mind subjects for the almond grower. With decent pollination weather that includes ample opportunities for sufficient bee-flight hours, your trees will set a good crop. But if the Central Valley sees rain, dense fog and cold temperatures for an extended period during the February-March pollination season, worry sets in. During these times any break in the weather has to allow maximum pollination potential by the approximately 32 billion honey bees poised to do the job.

What can we do to make sure bees exhibit the health and vitality necessary to do their work in the almond orchards? Fortunately we now have a comprehensive guide. The Almond Board of California, in partnership with several California beekeepers, Paramount Farming Company, the California Department of Pesticide Regulation, EPA, the University of California Extension and Project Apis m.,

recently released “Honey Bee Best Management Practices for California Almonds.” These Best Management Practices (or BMPs) are based upon the many years of experience of these partners and the latest scientific research available.

Project Apis m. has been funding Dr. Reed Johnson, Ohio State University, in an on-going study of the impact of fungicides and insect growth regulators (IGRs) on the various life stages of the honey bee. Dr. Johnson has documented compromised bee development and reduced survival rates for honey bees when exposed to IGRs, including diflubenzuron (Dimilin 2L). He is also looking at the potential negative effects of methoxyfenozide (Intrepid 2F) and chlorantraniliprole (Altacor) on bee development. In addition to this study, there have been many observations that bee activity ceases for up to 24 hours after the spraying of fungicides due to the repellent odor effect. This research has been key to the development of these BMPs.

The first BMP of the comprehensive guide addresses communication. Good communication between beekeeper and grower is essential. The communication chain might also include a bee broker, a farm manager, the County Agricultural Commissioner, Pest Control Advisors (PCAs)



and pesticide applicators. Highlights of the communication chain focus on setting specific, detailed agreements with each party including expectations to be discussed prior to almond bloom, placement of colonies and inspections. Registering hives, requesting optional notifications from the County Agricultural Commissioner, and reporting pesticide applications and incidents are all part of the checklist.

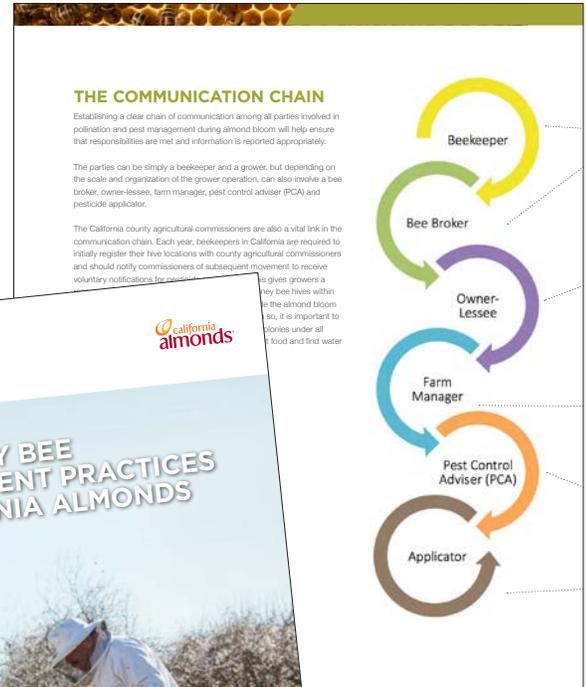
The BMP Guide provides a graphic representation of the distribution of hives in an orchard for uniform bee activity within an orchard. To assist in colony strength evaluations, an online course is suggested, as are several hints a grower can use to determine just how well pollination is progressing.

Following communication, another key area of the BMP Guide focuses on protecting honey bees at bloom. When almonds are in bloom, the balance between protecting the honey bees from potentially harmful pest control materials and protecting crops from pests and diseases must be maintained. While often not resulting in a direct kill to honey bees, daytime applications of fungicides just might keep bees from working your flowers for a day or so and are known to impact developing brood, resulting in decreased emergence of replacement bees. Though not a label violation at this time, tank mixing insecticides with fungicides can be deadly to bees and also to developing larvae. In addition, some combinations of fungicides and insecticides result in a spray more toxic to honey bees than either compound alone via synergism of the chemistries.

Protect honey bees during bloom by:

- Avoiding pesticides whose labels contain the cautions “toxic to bees” or “extended residual toxicity”
- Avoiding tank mixing insecticides with fungicides

✚ The Almond Board has published a comprehensive BMP Guide.



⚡ The communication chain is vital to ensuring honey bees stay healthy in your orchard.

- Avoiding application of any pesticide during bloom
- Applying fungicides in the late afternoon, evening or at night when bees and pollen are not present
- Removing or covering water sources during spraying, or providing clean water sources for bees after completion of spraying
- Keeping sprays from coming in direct contact with hives

Proper timing of bee removal from orchards is also important in protecting honey bee health.

The guidelines suggest removal of the honey bees “when 90 percent of the flowers on the latest-blooming variety are at petal fall.” After this point in time, fertilization of the flower is not taking place, bee activity in the orchard diminishes and remaining bee flights are concentrating mainly on nectar

Continued on next page »

« Following BMPs for honey bees result in better pollination. Photo by Christi Heintz



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foraging. Bees will likely begin to search more widely for pollen sources, flying up to three to four miles away. The chances of pesticide-related harm from other crops increases at this time.

Communicating with your beekeeper about the progress of bloom, timing of petal fall and hive removal serves as the beginning of a healthier pollination season the next year. Bees do well on almond pollen and many beekeepers use this time to split and build colonies through the season. The more colonies a beekeeper has going into winter, the more likely you will get the colonies you need for your almonds next year.

The BMP Guide includes two Quick Guides which are laminated sheets designed for field use. The first, the “Honey Bee BMPs Quick Guide for Almonds,” is a 10-step checklist overview of the more extensive guide.

The second Quick Guide is the “Applicator/Driver Honey Bee BMPs Quick Guide for Almonds,” for pesticide applicators. This guide is in English and Spanish and is designed for placement in a truck, tractor or field rig. Both Quick Guides cover elements that will help you achieve maximum pollination by protecting your investment in honey bee colony rentals.

Contact the Almond Board of California or ask your *Blue Diamond* field representative for copies of “Honey Bee Best Management Practices for California Almonds.” An online version of the publication can be found at [www.almonds.com/BeeBMPs](http://www.almonds.com/BeeBMPs). Don't forget to follow the progress of bloom on Blue Diamond's website [www.bluediamondgrowers.com/bloom-harvest-report](http://www.bluediamondgrowers.com/bloom-harvest-report).



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## Time To Consider

DAVID DOLL

I hope you all had a wonderful holiday season and a great start to the New Year. Although we like to think this is a "quiet" time of year, I often find operations busy trying to wrap up many of the dormant season activities in preparation for bloom.

### Delayed Dormant Pest Control

The dormant period provides an opportunity to control various insects and diseases. If increased scale and mite populations are seen on a sampling of spurs or were observed in 2014, a treatment may be warranted. Low to moderate populations of these pests can be controlled by an application of 6 to 8 gallons of dormant oil, while moderate to high populations will need a combination of oil and an insecticide. If tree defoliation occurred in 2014 from fungal scab, the addition of either copper or chlorothalonil will reduce scale and mite populations, and will delay or prevent the disease from occurring in 2015. Please note that chlorothalonil and oil are phytotoxic to flowers and green tissues. If peach twig borer has been observed, the addition of *Bacillus thuringiensis* (Bt) as well as many other insecticides may be used for control in combination with the

oil. More information on these pests and control can be found at [ucipm.ucdavis.edu](http://ucipm.ucdavis.edu).

### Protecting the Crop from Bloom and Spring Diseases

Almond blossoms and newly emerged leaves are sensitive to several different diseases. These diseases include brown rot, shot-hole, anthracnose, jacket rot/green fruit rot and leaf blight. All are more severe in wet weather when long periods of leaf-wetness occur. Although we tend to focus on diseases at bloom, infections can occur in mild and wet conditions after bloom. Dew may also create conditions conducive for disease.

To prevent these diseases from occurring, most make use of fungicides. Fungicides work best as protectants, and need to be applied prior to infection. Coverage from a fungicide spray will last around two weeks, unless significant rainfall occurs. In dry weather, a single application at full bloom or petal fall will usually be effective (i.e. full bloom 'Aldrich,' petal fall 'Nonpareil'). If applying prior to a rain event, applications will need a few hours to dry to prevent "run-off." In rainy weather, follow-up sprays will be needed every 7-10 days. Some varieties — such as 'Butte' and 'Carmel' — are more susceptible to disease and may require a spray even in dry weather, while others, such as 'Nonpareil,' are quite tolerant and may not need a bloom spray. Orchard history, weather and your comfort level should be the guidance in determining your bloom and springtime disease control strategy.

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« Mummies infected with bacterial spot are the source of disease inoculum the following spring.

Included are the updated efficacy ratings and timings of various fungicides for bloom time diseases. Remember to rotate chemistries to avoid back-to-back applications of the same mode of action or FRAC group. There is a lot of information regarding bloom spray timings and diseases at [www.thealmonddoctor.com](http://www.thealmonddoctor.com) and [www.ucipm.ucdavis.edu](http://www.ucipm.ucdavis.edu).

## Bacterial Spot Control for Affected Orchards

This is a new disease to orchards in California. Predominantly found in the northern San Joaquin Valley and severely affecting 'Fritz,' this bacterial disease kills nuts leading to crop loss. Symptoms appear similar to leaf footed plant bug, but gumming is amber in color, which when scraped away, reveals a 1/4-inch lesion. Leaves can also be infected.

The bacteria overwinters in infected mummies and will spread to the new crop when warm, rainy weather occurs. Recent research has demonstrated that delayed dormant copper and mancozeb applications can reduce in-season infection rates. In season treatments with low doses of copper and mancozeb were most effective when timed around warm rain events. A recent study has shown a delayed dormant (copper-mancozeb) and a single in-season treatment (copper alone or copper+mancozeb) in mid-March timed before a warm rain event provided excellent control. Keep in mind

that almond trees are sensitive to high rates of copper. More information can be found here: <http://thealmonddoctor.com/2015/01/01/bacterial-spot-of-almond-management/>

## Be Careful with Bees

There has been a lot of concern about honeybee health related to fungicide and insecticide applications within orchards. More is being learned every year about the impacts of pest management practices on hive health. Recently, The Almond Board of California released an excellent resource titled "Honey Bee Best Management Practices for California Almonds ([http:// Almonds.com/BeeBMPs](http://Almonds.com/BeeBMPs))." This resource provides an overview of the research conducted and the recommendations generated from the results and conclusions.

The following is a brief overview of these practices that are associated with insect and disease control around bloom:

- Read the pesticide label carefully - including surfactants - and avoid any chemicals that indicate toxicity to bees.
- Avoid applying or tank mixing any insecticides during bloom until the effects on bees are known. Treatments for peach twig borer should be considered prior to bee move-in or after hive removal (i.e. delayed dormant, "May" spray);
- Avoid the fungicides iprodione, captan or ziram. These fungicides negatively impact bee hive health;

[Continued on next page »](#)

- Apply fungicides later in the afternoon or evening when bees and pollen are less present. It is also important to not spray too late that the fungicide does not have a chance to dry before the next foraging day;
- Addition of adjuvants is not needed unless specified by the fungicide label. These compounds may harm bees by increasing fungicide activity;
- Cover or remove the bees' water source and avoid spraying the hive directly with any pesticides.
- More information can be found at [www.Almonds.com/BeeBMPs](http://www.Almonds.com/BeeBMPs).

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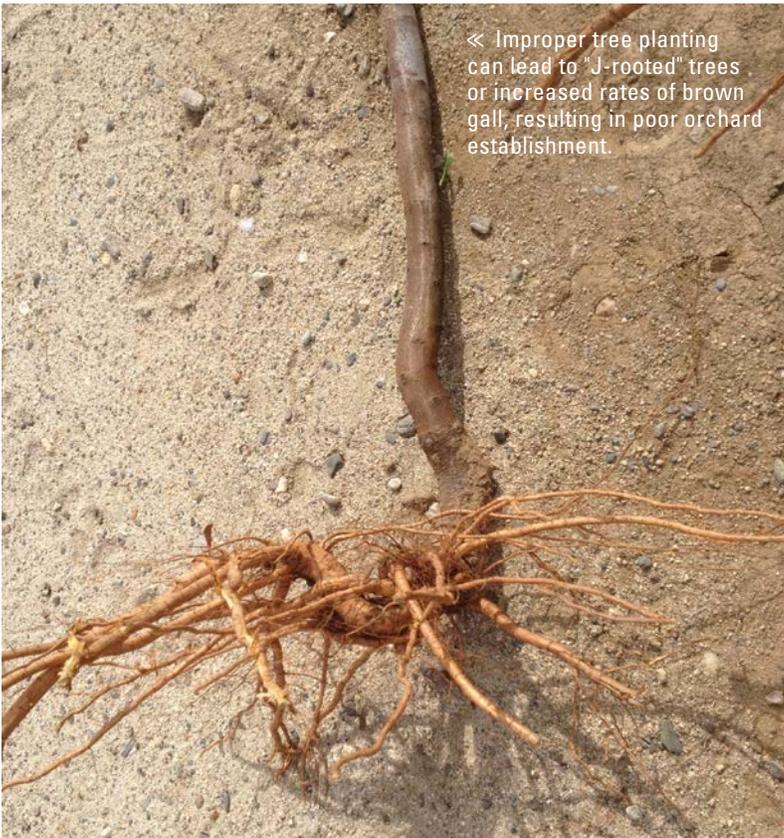
The Longstreths - Escalon, California

## Proper Tree Planting

When planting a new orchard, it is important to take the proper precautions to avoid tree loss. I have seen more orchards ruined by poor planting than by any other problem. Trees should be planted as soon as possible after arrival from the nursery. Prior to delivery, make sure the field is prepared, which includes ensuring that soil fumigants have completely dissipated, soil clods are broken down and workable, and large amounts of organic material (e.g. grass clippings, compost) are not present in the planting areas. Berms are recommended for most soils to prevent crown infections by *Phytophthora*. Berms may not be needed in soils with high infiltration rates. If planned, berms should be pulled prior to tree planting. Do not pull berms as an after-thought: soil covering the graft union will increase the risk of *Phytophthora*.

To prevent root drying, keep the roots moist and cover with a tarp when being transported within the field. Do not prune tree roots unless they are broken. Although the efficacy is variable, tree roots should be treated with Galltrol or similar product to prevent infection by crown gall. This is done by making a suspension of the provided bacteria with water and either dipping the tree roots into the suspension or spraying the suspension onto the tree's roots.

When planting, dig a large enough hole to fit the entire root system without bending or wrapping. Forcing trees into planting holes causes "J-rooting," increasing the chance of crown gall and tree loss. Holes should be dug at the time of planting if possible, but if not, as close to the timing of planting to prevent "glazing" of the soil by the sun. If the holes are dug with an auger or prior to the planting day, slice the sides of the hole with a shovel to break any crust that may have formed. Plant the tree high enough so that the nursery soil line is just above the current soil line. Backfill the soil and compact gently around the tree's base to remove air pockets. Tank the tree in with 4 to 5 gallons of water to help settle the soil. Trees should be headed at 32- to 36-inches, staked and side branches



« Improper tree planting can lead to "J-rooted" trees or increased rates of brown gall, resulting in poor orchard establishment.

pruned. Fertilizers should not be applied until there is 4- to 6-inches of new growth. More information can be found at: <http://thealmonddoctor.com/2010/12/27/proper-almond-tree-planting/>.

## Pre-Emergent Herbicides

This is a good time to apply any pre-emergent herbicides. Orchard weeds need to be surveyed to determine any specific challenges. The pre-emergent product and burn-down partner selected should provide control for the whole spectrum of weeds within the orchard. Most pre-emergent products need to be "watered-in" with either an irrigation or rainfall in order to have efficacy. If applying a pre-emergent product after the trees become active (around early February) it may be of benefit to reduce the rate of pre-emergent to the lower end of the label rate to reduce the risk of crop injury. This is of more concern with low cation exchange capacity soils. More information on herbicide selection and orchard preparation can be found at: <http://thealmonddoctor.com/2014/01/27/dormant-weed-control-tree-nut-crops-2014/> and <http://thealmonddoctor.com/2013/12/14/pre-emergent-herbicide-use-perennial-crop-orchards/>.

Continued on next page »

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# ALMOND: FUNGICIDE EFFICACY

Fungicide	Resistance risk (FRAC) <sup>1</sup>	Brown rot	Jack-et rot	Anthraco-nose	Shot hole	Scab <sup>3</sup>	Rust <sup>3</sup>	Leaf blight	Alternaria leaf spot 3	PM-like <sup>5</sup>	Hull rot <sup>16</sup>
Bumper/Tilt <sup>4</sup>	high (3)	++++	+/-	++++	++	++	+++	ND	++	+++	++
Indar	high (3)	++++	+/-	+++	++	++	NL	ND	+	ND	----
Inspire Super <sup>4</sup>	high (3/9)	++++	++++	ND	+++	+++	+++	ND	+++	ND	+++
Luna Sensation	medium (7/11) <sup>3,7</sup>	++++	++++	++++	++++	++++	++++	ND	++++	+++	+++
Pristine	medium (7/11) <sup>3,7</sup>	++++	++++	++++	++++	++++	+++	ND	+++	+++	+++
Merivon*	medium (7/11) <sup>3,7</sup>	++++	++++	++++	++++	++++	+++	ND	++++	++++	+++
Quash <sup>4</sup>	high (3)	++++	++	++++	+++	+++	++++	ND	++++	+++	+++
Luna Experience	medium (3/7) <sup>3</sup>	++++	+++	++++	+++	++++	++++	ND	++++	+++	+++
Quadris Top	medium (3/11) <sup>3</sup>	++++	+++	++++	+++	++++	++++	ND	+++	+++	+++
Quilt Xcel	medium (3/11) <sup>3</sup>	++++	+++	++++	+++	++++	++++	ND	+++	+++	+++
Rovral + oil <sup>8</sup>	low (2)	++++	++++	----	+++	+/-	++	ND	+++ <sup>9</sup>	ND	----
Scala <sup>3</sup>	high (9) <sup>3, 7</sup>	++++	++++	ND	++	----	ND	ND	+	----	----
Tebuzol (Elite**)	high (3)	++++	+/-	+++	++	++	+++	ND	+	ND	++
Topsin-M/T-Methyl/ Incog-nito <sup>2</sup>	high (1) <sup>2, 7</sup>	++++	++++	----	----	+++ <sup>8</sup>	+	+++ <sup>6</sup>	----	++	----
Vanguard	high (9) <sup>3, 7</sup>	++++	++++	ND	++	----	ND	ND	+ <sup>9</sup>	----	----
Fontelis	high (7) <sup>4</sup>	++++	++++	++	++++	+++	+++	ND	+++	ND	----
Abound <sup>4</sup>	high (11) <sup>3,7</sup>	+++	----	++++	+++	++++	++++	+++	+++ <sup>10</sup>	+++	+++
Elevate	high (17) <sup>7</sup>	+++	++++	----	+	ND	ND	ND	ND	ND	----
Protexio*	high (17) <sup>7</sup>	+++	++++	----	+	ND	ND	ND	ND	ND	----
Gem <sup>4</sup>	high (11) <sup>3, 7</sup>	+++	----	++++	+++	++++	++++	+++	+++ <sup>10</sup>	+++	+++
Laredo	high (3)	+++	----	++	++	----	+	+++	----	+++	----
Rovral/Iprodione/Nevado	low (2)	+++	+++	----	+++	----	----	ND	+++ <sup>9</sup>	----	----
Bravo/Chloro-thalonil/Echo/ Equus <sup>11,12</sup>	low (M5)	++	NL	+++	+++	+++ <sup>15</sup>	++++	NL	NL	----	----
Captan <sup>4,12</sup>	low (M4)	++	++	+++	+++	++	----	+++ <sup>6</sup>	+	----	----
CaptEvate**	low (M4/17)	+++	+++	+++	+++	+++	----	+++	+	----	----
Ph-D	medium (19)	++	+++	----	++	+++	+++	ND	++++	ND	++
Syllit*	Medium (M7)	+	----	ND	+++	++++	ND	ND	+	ND	----
Rally <sup>13</sup>	high (3)	+++	----	++	+/-	----	+	+++	----	+++	----
Ziram	low (M3)	++	+	+++	+++	+++	----	++	+	----	----
Copper <sup>14</sup>	low (M1)	+/-	+/-	----	+	+ <sup>15</sup>	----	----	ND	----	----
Copper + oil <sup>14</sup>	low (M1)	ND	ND	----	+	+++ <sup>15</sup>	----	----	ND	----	----
Lime sulfur <sup>12</sup>	low (M2)	+/-	NL	----	+/-	+ <sup>15</sup>	++	NL	NL	----	----
Sulfur <sup>4,12</sup>	low (M2)	+/-	+/-	----	----	++	++	----	----	+++	----
PlantShield*** <sup>17</sup>	low	----	----	----	----	----	----	----	----	----	----

TIME TO CONSIDER

**Rating:** +++++ = excellent and consistent, +++ = good and reliable, ++ = moderate and variable, + = limited and/or erratic, +/- = minimal and often ineffective, ---- = ineffective, NL = not on label, and ND = no data

\* **Registration pending in California**

\*\* **Not registered, label withdrawn or inactive**

\*\*\* Section 24C (special local needs) registration approved in California for silver leaf disease of almond.

<sup>1</sup> Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see <http://www.frac.info/>). Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode of action Group numbers 1, 4, 9, 11, or 17 before rotating to a fungicide with a different mode of action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode of action Group number.

<sup>2</sup> Strains of the brown rot fungi *Monilinia laxa* and *M. fructicola* resistant to Topsin-M and T-Methyl have been found in some California almond orchards. MBC-resistant strains of the jacket rot fungus, *Botrytis cinerea* and powdery mildew fungi, have been reported in California on crops, other than almond and stone fruits and may have the potential to develop in almonds with overuse of fungicides with similar chemistry. MBC-resistant strains of the scab fungus, *Cladosporium carpophilum*, have been found in California.

## ALMOND: FUNGICIDE EFFICACY, *CONTINUED*

- <sup>3</sup> Field resistance of *Alternaria* sp. and *Cladosporium carpophilum* to QoI and SDHI fungicides has been detected in almond orchards. AP-resistant populations of *Monilinia* spp. have been found on other stone fruit crops in California.
- <sup>4</sup> Of the materials listed, only sulfur, Abound, Gem, and some of the DMI fungicides (FRAC Group No. 3) are registered for use in late spring and early summer when treatment is recommended.
- <sup>5</sup> PM-like refers to a powdery mildew-like disease on almond fruit that is managed with fungicides. Recent information suggests an *Acromonium* species is involved.
- <sup>6</sup> Excellent control obtained when combinations of Topsin-M or T-Methyl and Captan are used.
- <sup>7</sup> To reduce the risk of resistance development start treatments with a fungicide with a multi-site mode of action; rotate or mix fungicides with different mode of action FRAC numbers for subsequent applications, use labeled rates (preferably the upper range), and limit the total number of applications/season.
- <sup>8</sup> Oils recommended include "light" summer oil, 1-2% volume/volume.
- <sup>9</sup> Not registered for use later than 5 weeks after petal fall.
- <sup>10</sup> Efficacy reduced at high temperatures and relative humidity; experimental for *Alternaria*.
- <sup>11</sup> Bravo Ultrex, Bravo WeatherStik, Echo Ultimate, and Chlorothalonil are currently registered.
- <sup>12</sup> Do not use in combination with or shortly before or after oil treatment.
- <sup>13</sup> Efficacy is better in concentrate (80-100 gal/acre) than in dilute sprays.
- <sup>14</sup> The low rates necessary to avoid phytotoxicity in spring reduce the efficacy of copper.
- <sup>15</sup> "Burns out" scab twig lesions when applied at delayed dormant. (Chlorothalonil can be applied with dormant oil during tree dormancy).
- <sup>16</sup> Hull rot ratings are for the disease caused by *Rhizopus stolonifer*. Ratings for the disease caused by *Monilinia* spp. will be provided in the future.
- <sup>17</sup> Active ingredient, *Trichoderma harzianum* Rifai strain KRL-AG2, provides control of Silver leaf disease.

## ALMOND: TREATMENT TIMING

**Note: Not all indicated timings may be necessary for disease control.**

Disease	Dormant	Bloom			Spring <sup>1</sup>		Summer	
		Pink bud	Full bloom	Petal fall	2 weeks	5 weeks	May	June
Alternaria	----	----	----	----	----	++	+++	+++
Anthraxnose <sup>2</sup>	----	++	+++	+++	+++	+++	+++	++
Brown rot	----	++	+++	+	----	----	----	----
Green fruit rot	----	----	+++	----	----	----	----	----
Hull rot <sup>7</sup>	----	----	----	----	----	----	----	+++
Leaf blight	----	----	+++	++	+	----	----	----
Scab <sup>3</sup>	++	---	---	++	+++	+++	+	---
Shot hole <sup>4</sup>	+5	+	++	+++	+++	++	----	----
Rust	----	----	----	----	----	+++	+++	+6

**Rating:** +++ = most effective, ++ = moderately effective, + = least effective, and ---- = ineffective

- <sup>1</sup> Two and five weeks after petal fall are general timings to represent early postbloom and the latest time that most fungicides can be applied. The exact timing is not critical but depends on the occurrence of rainfall.
- <sup>2</sup> If anthracnose was damaging in previous years and temperatures are moderate (63°F or higher) during bloom, make the first application at pink bud. Otherwise treatment can begin at or shortly after petal fall. In all cases, application should be repeated at 7- to 10-day intervals when rains occur during periods of moderate temperatures. Treatment should, if possible, precede any late spring and early summer rains. Rotate fungicides, using different fungicide classes, as a resistance management strategy.
- <sup>3</sup> Early treatments (during bloom) have minimal effect on scab; the 5-week treatment usually is most effective. Treatments after 5 weeks are useful in northern areas where late spring and early summer rains occur. Dormant treatment with liquid lime sulfur improves efficacy of spring control programs.
- <sup>4</sup> If pathogen spores were found during fall leaf monitoring, apply a shot hole fungicide during bloom, preferably at petal fall or when young leaves first appear. Re-apply when spores are found on new leaves or if heavy, persistent spring rains occur. If pathogen spores were not present the previous fall, shot hole control may be delayed until spores are seen on new leaves in spring.
- <sup>5</sup> Dormant copper treatment seldom reduces shot hole infection but may be useful in severely affected orchards and must be followed by a good spring program.
- <sup>6</sup> Treatment in June is important only if late spring and early summer rains occur.
- <sup>7</sup> Make application at 1-5% hull split to manage hull rot caused by *Rhizopus stolonifer*.

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