Sacramento Valley Almond Newsletter

UC CE UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources Cooperative Extension

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Almond Management Considerations - Fall 2025

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Postharvest nutrition Use information from your July leaf samples and harvest hull samples, along with 2025 yield, to plan potential fall Boron, Zinc, and Potassium applications. You can also learn more in the *Fall Zinc and Boron Review* in this newsletter. These fall applications, boron in particular, can have an outsized impact on next year's yield. **Boron:** A fall maintenance boron spray can increase yield by hundreds of kernel pounds per acre when hull boron analysis is less than 150 ppm. **Zinc:** A fall spray is the most effective way to provide this nutrient for good shoot growth next spring. Use a high rate (20+ lbs zinc sulfate per acre) in November, or a lower rate (5 lbs/acre) in October. **Potassium** (K) can be effectively applied in-season or in the fall: for a fall application, potassium should be banded or concentrated in micro-irrigation zones. **Nitrogen** (N) applied in the fall, provides the least benefit of the three, and can be reduced or skipped if July nitrogen levels are 2.4% or higher. As an example, given a 2.4% result, the Nickels Soil Lab will still add 10 lbs low biuret nitrogen per acre to their fall foliar spray along with boron and zinc, to "top off the tank". *(This is an example, NOT a fertilizer recommendation)*

Cover crops have numerous benefits including improving water infiltration and soil water holding capacity, providing additional forage for bees in the spring, and providing easier access to the field when the soil is wet. Plant by the end of October and ensure good germination of your cover crop by monitoring soil moisture and irrigating (if using sprinklers) after planting in a dry fall. If cover cropping is not in the cards for you this year, maintaining resident vegetation in the row-middles is free and provides many of the same benefits. Spreading shell is another low-cost approach for improving water infiltration.

Weed survey After the first rain, scout for weeds and develop your weed management strategy for next year. Correct weed identification is critical for effective management plans, so utilize the Weed Research and Information Center Weed ID Tool or email the Almond Board's Field Outreach Team requesting a weed ID booklet.

Winter sanitation Select Sacramento Valley orchards were infested with high navel orangeworm (NOW) levels in 2025. The number one way to get a NOW problem under control or continue an orchard's winning streak against the pest is through sanitation. The historic Sacramento Valley practice has been to count the mummies in 20 trees throughout each orchard. If more than 2 mummy nuts are found per tree, sanitize by shaking or poling nuts to the ground by Feb. 1. If NOW hit you hard in 2025 consider the stricter central/southern San Joaquin Valley standard of no more than 1 mummy/ 5 trees (and no more than 4 intact mummies on ground). Also note if mummy nuts are caused by hull rot, which may indicate a need to reevaluate your irrigation and nitrogen management, and potentially consider a hull rot spray in 2026.

Dormant spur sampling for scale and mite eggs, while also examining green shoots for scab lesions will inform if a dormant spray(s) is a critical investment this winter.

Honeybee planning Get your order in for 2-3 strong (8 frame/hive) honeybee hives per acre for February pollination. Self-fertile varieties should have 0.5-1 hive per acre.

Process harvest samples November is a great time to pull those harvest samples out of the freezer and evaluate them to identify specific pest damage. Grade sheets do not distinguish between different types of insect damage, so harvest samples are an important tool as you calibrate your 2026 pest management program.

Review Schedule the time to review practices, inputs, and results (grade sheets, leaf/hull samples, etc.) orchard by orchard and variety by variety with your management team to plan/budget for the 2026 season.

The Almond Conference (TAC) Say hi to Sacramento Valley UCCE advisors and check out new UC research at the poster session. TAC is Wednesday through Friday December 10-12 in Sacramento.

Post-Harvest Ground Squirrel Management

Clarissa Reyes, Orchard Systems Advisor, Sutter-Yuba, Butte & Placer counties
Roger Baldwin, Professor of Cooperative Extension, University of California, Davis

I've received multiple farm calls regarding extreme ground squirrel infestations in orchards over the past two years. Potential reasons for high ground squirrel populations are an increase in abandoned orchards with no pest control, increased restrictions on tools for ground squirrel control, and an increase in vegetative food sources for rodents after a period of drought. Problems in nut orchards include damage to nuts, tree bark, trunks, scaffold limbs, and underground root systems, chewed irrigation lines, and in the most extreme case I saw this summer, complete crop loss. It can be difficult to control squirrel populations mid-season, when there are lots of nuts as a food source and when some squirrels may be estivating (hibernating due to summer heat), but now that those nuts are out of the picture, here are some post-harvest and dormant season management practices that may help knock squirrels back before next year.

Post-Harvest: Bait with zinc phosphide-treated grain (2.0%)

- Zinc phosphide bait consists of toxin-treated grain and can be a cost-effective method for controlling ground squirrels, especially when populations are high. To be effective, bait must be used at a time of year when ground squirrels are feeding on seeds and will readily accept baits.
- Zinc phosphide is an acute toxin and kills ground squirrels after a single feeding, so it can reduce numbers more quickly than anticoagulant rodenticides, which require multiple feedings.
- Zinc phosphide is applied via broadcast application or spot treatment. It is not generally allowed for use in bait stations, although this may change in the future.
- This bait has a distinctive odor and taste, so squirrels can eat a little and get sick, but not die, and then learn that the bait is bad (become "bait shy").
- If you want to improve chances that they will eat the zinc phosphide bait, you can pre-bait the area. Before broadcasting or spot treating with treated bait, you should prebait with untreated grain 2-3 days prior to the application of zinc phosphide. Check for bait consumption a few days later. If they are taking the pre-bait, apply the zinc phosphide per label specifications. If pre-bait is not readily consumed, a zinc phosphide application is not likely to be effective.
- Most squirrels will die underground and not be visible. Additionally, zinc phosphide has very low to almost no secondary exposure risk to predators or scavengers, making it safer for use than anticoagulant rodenticides from this perspective.
- However, zinc phosphide is acutely toxic and has no antidote. As such, it poses a greater risk of primary exposure to nontarget species than do anticoagulant rodenticides.

Late winter/early spring: Fumigation

- You can fumigate with gas cartridges, aluminum phosphide tablets/pellets, pressurized exhaust machines, and carbon dioxide injection devices.

  - Aluminum phosphide is often cheaper, but a restricted materials permit is required for using aluminum phosphide.
  - If using aluminum phosphide, place the tablets deep into the burrow and then cover the opening with newspaper or some other material before covering the entrance with loose soil. The newspaper acts as a barrier to keep the tablets from getting buried by the soil. If buried, the gas will not evolve from the tablets at a fast enough rate to be effective.
  - Gas cartridges should be lit and inserted into the burrow. All openings where smoke is detected should be buried with loose soil to hold the gases in.
  - Pressurized exhaust machines and carbon dioxide injection devices use a probe to inject the compressed gas into the burrow entrance. Be sure to treat all active burrow entrances unless you know they are connected to another entrance that you are treating. Burrow entrances should be closed while you are injecting carbon dioxide or pressurized exhaust into them.
- Fumigation should happen in early spring (after bloom for almond) when soil moisture is high. This is very important; sufficient soil moisture is required to maximize effectiveness of burrow fumigants, and most do not work in dry soil. For best control, use burrow fumigation about 2-3 weeks after the first ground squirrels emerge from hibernation.
- Do not treat inactive burrow systems.
- After the initial fumigation, recheck burrows and re-fumigate any that have been re-opened.

Next season: Bait stations with anticoagulant bait (e.g., diphacinone or chlorophacinone 0.005%)

- Bait stations can be effective when squirrels still have limited food availability during late spring/early summer, when there is less green vegetation to feed on, but nut crops have yet to set.
- Place bait stations near runways or burrows and secure them so they cannot be tipped over. If ground squirrels are moving into the crop field from adjacent areas, place bait stations along the perimeter of the field where ground squirrels are invading, one station every 20 to 100 feet depending on ground squirrel density in each area.
- Successful baiting via bait stations usually requires 2 - 4 weeks. Anticoagulant rodenticides are chronic-feed materials, meaning they generally need to be consumed over the course of several days to get a lethal dose. As such, you need to regularly check bait stations to make sure they maintain a constant bait supply. If bait goes missing after only a day or two, more bait stations may be needed.

Notes on zinc phosphide, aluminum phosphide, and anticoagulants: These are restricted chemicals and need to be on a grower's pesticide use permit to use them. They can be added to a grower's private applicator card or a state issued applicator license via your County Ag Commissioner, who will then send the updated permit to the grower or chemical dealer via email.

Also, the mention of products is not a pesticide recommendation, simply the sharing of research results. Consult your PCA and always read the pesticide label; the label is law.

What about trapping?

- Can be effective as a follow up approach to other tools, but is not generally the primary tool for ground squirrel control unless the population size is small or if you are an organic producer.
- Can use kill traps or live traps. Examples of kill traps include body gripping traps, tube traps, and automatic repeating traps. Examples of live traps include single and multi-catch cage-style traps.
- Traps must be checked daily. If using live traps, ground squirrels must be euthanized humanely either via shooting in the head or using a carbon dioxide euthanasia chamber.
- Pre-baiting traps (a period where bait is placed in traps but the traps aren't activated) can increase the effectiveness of a trapping program. Keep pre-baiting until the bait is removed from all or almost all the traps on a regular basis. When that occurs, it is time to set the traps.
- Trapping always takes more traps than you think. Many traps are needed for a trapping program to be successful, but the general number of traps will vary depending on the density of ground squirrels in an orchard.

Additional resources on ground squirrel management: groundsquirrelbmp.com

Irrigation dripline damaged by ground squirrels. (Photo: C. Reyes)

Only one nut left on this almond tree - complete crop loss from ground squirrels by July. (Photo: C. Reyes)

Ground squirrel burrows in background, almond shells on ground as evidence of crop loss in foreground. (Photo: C. Reyes)

Ground squirrel bait station (Photo: R. Baldwin)

Ground squirrel burrows (Photo: C. Reyes)

Oak Root Fungus: Rootstock Considerations in 2025-2026

Luke Milliron, UCCE Farm Advisor, Butte, Glenn and Tehama Counties
Roger Duncan, UCCE Farm Advisor Emeritus, Stanislaus County

If you have an orchard plagued generation after generation by oak root fungus (ORF, *Armillaria mellea*), disease resistance should be at or near the top of your list of rootstock attributes (PDF / comparison tool). Rootstock is the key management tool in a very limited toolbox against this disease (UC IPM / podcast). Rootstocks with plum parentage are the most likely to have some level of ORF resistance. However, the plum in these same rootstocks can lead to incompatibility and in some cases less than desired vigor. Marianna 2624 was California's historic answer to orchards with a history of ORF. However, Marianna 2624 is incompatible with some important standard almond varieties including most critically Nonpareil and Butte. In addition to incompatibility, the rootstock suckers profusely, requiring costly maintenance. Finally, Marianna 2624 confers relatively low vigor on the almond scion, and therefore less yield potential compared to various other plum, peach, and almond hybrid rootstocks used in California almond production. Given these flaws, growers have largely abandoned planting new orchards to this historic standard, and many nurseries no longer provide the rootstock.

Photo: A 13th leaf Nonpareil on Krymsk 86 infected by *Armillaria mellea* (oak root fungus, ORF). The photo was taken by Roger Duncan in 2020 and the tree is still alive as of 2025 (18th leaf).

In lieu of Marianna 2624 on ORF ground, growers have largely shifted to planting with Krymsk 86 (plum x peach) rootstock. This newer rootstock confers superior anchorage, and vigor compared to Marianna 2624. Although Krymsk 86 is not immune to ORF (see photo), and field data on its level of resistance is still limited. However, grower and UC Farm Advisor observations, as well as USDA lab data all indicate that it offers higher survival rates against ORF compared to the historic Sacramento Valley standard Lovell peach rootstock.

Unfortunately, no rootstock is perfect, and Krymsk 86 is no exception. Krymsk 86 is one of the most sensitive rootstocks to nematodes (especially root knot), and salts (Cl, Na, B, etc.). In addition, much like Marianna 2624, K86 doesn't get along with every almond (scion) variety. There's the yellowing Krymsk 86 malady which has appeared periodically in young Monterey trees, often induced by excessive spring rain. More recently, orchards planted with new self-fertile almond varieties Independence and Shasta have shown 'failure to thrive' with Krymsk 86. There is also some early evidence of Krymsk 86 incompatibility symptoms with new self-fertile varieties Lassen and Pyrenees. However, there are other self-fertile varieties that to-date appear to be compatible with Krymsk 86, including Yorizane, Parpareil (new USDA release), and Early Bird.

Which other rootstocks may hold promise? Rootpac R (plum x almond) is purported to have some ORF resistance. However, the relatively low vigor can be a concern, especially if paired with a low vigor scion like Independence. Rootpac R can also have the same issue as "yellowing Krymsk 86" with young Monterey.

Magnus, previously known has Hybrid 17 (peach x plum) is a new Sierra Gold rootstock that is purportedly higher vigor than Krymsk 86. A Butte County grower is early in testing the rootstock in their ORF hot spots, and it is also being tested by Roger Duncan in Stanislaus County. It is too early to know if this rootstock will have some resistance against ORF.

What doesn't work? Following the problems with Independence and Shasta on Krymsk 86, some Sacramento Valley growers have instead planted those same varieties on Viking (interspecific hybrid of peach, almond, apricot, and plum; only 1/8th plum). Very early results from Roger Duncan's trial indicate that Viking may be highly susceptible to ORF. Peach (Lovell, Nemaguard), and peach/almond hybrids (Hansen 536, Bright's Hybrid 5, SG1, etc.) are not ORF resistant.

Bottom line: If you are concerned about ORF, and not willing to deal with Marianna 2624, Krymsk 86 is the alternative we have the most evidence in favor of. The selection of Krymsk 86 then adds the complication of potentially eliminating certain self-fertile varieties from being planted on that ground because of rootstock incompatibility concerns. We will continue to vet Krymsk 86, along with Rootpac R, Magnus, and newer alternatives both for resistance to ORF, as well as for compatibility with an ever-growing list of new self-fertile varieties.

Red Leaf Blotch Finds its way to the Sacramento Valley (2025)

Florent Trouillas, Associate Professor of Cooperative Extension, Plant Pathology, UC Davis
Luke Milliron, UCCE Farm Advisor, Butte, Glenn, and Tehama Counties

Red leaf blotch (RLB), caused by the fungal pathogen *Polystigma amygdalinum*, which was first detected in California in the spring of 2024 has found its way to the Sacramento Valley. This summer the disease was confirmed in Yolo, Sutter, and Butte counties. In late April through mid-May, symptoms of RLB initiate as small, pale, yellowish spots or blotches that affect both sides of the leaves (Fig. 1). As the disease progresses, the blotches grow larger (0.4 to 0.8 in) and turn yellow orange with a reddish-brown center (Fig. 2). At advanced stages of disease development, leaves become necrotic, curl, and drop prematurely. Premature defoliation of trees can occur, thus reducing carbohydrate accumulation going into the next growing season, which can decrease future yields.

The disease overwinters on fallen infected leaves from the previous growing season. Provided spring rains, infection occurs after petal fall when young leaves emerge. Infected leaves don't show symptoms (i.e. remain latent) for 30-45 days before presenting in late-April through mid-May. The Trouillas Lab has recently determined that mixed fungicides (*FRAC groups 3+7; 3+11; 7+11; 7+12) and FRAC 3-triazoles are most effective at controlling RLB. Rotating between modes of action is critical to avoiding disease resistance and keeping these tools effective.

Research is continuing to determine the optimal number of fungicide applications, but at least 2 to 3 applications will be required between petal fall (early March), 2-3 weeks post petal fall (mid- to late March) and 5-6 weeks post petal fall (mid- to late April) for effective management. These timings overlap with management timings for shot hole, scab and rust and should be implemented as part of the orchard's IPM program. **Fungicides applied during bloom and after symptoms are visible in late April to mid-May are NOT effective in managing RLB**.

Cultural practices, focused on eliminating the primary inoculum of infected fallen leaves, can also help mitigate the disease. These consist of removing leaf litter or applying urea to accelerate its decomposition. It is also important to prevent the transport of infected leaf debris by cleaning equipment before it moves between fields. Cultural strategies are only effective when applied over a wide area, with neighbors working together in a regional effort.

If you suspect that you have this new disease in your almond orchard, please contact your local UC Cooperative Extension farm advisor.

Additional disease details and photos are provided by the Almond Board.

**Mention of a fungicide is not a pesticide recommendation. Merely the sharing of research results. Consult your PCA and the pesticide label. The label is law.*

Figure 1. In late April through mid-May, symptoms of RLB initiate as small, pale, yellowish spots or blotches that affect both sides of the leaves. (Photos from early May).

Figure 2. Advanced symptoms of red leaf blotch as the disease progresses in June and July include larger, yellow-orange blotches (1 to 2 cm) that turn reddish-brown in their center. At advanced stages of disease development, leaves become necrotic, curl, and drop prematurely.

(Picture credits: Alejandro Hernandez and Florent Trouillas).

Fall Zinc and Boron Review.2025

Franz Niederholzer, UCCE Advisor, Colusa and Sutter/Yuba Counties

Bloom is the most important time of year for adequate boron (B) and zinc (Zn) levels in almonds. Zinc is essential to many processes such as cell division, protein synthesis, and auxin synthesis in growing points (flowers and shoots), and bloom is the time of the most growing points in a tree. Boron is essential for cell wall synthesis and division. Boron fertilization has improved fruit or nut set compared to deficient plants in research in many tree crops, but only if applied in time to get B into buds at bloom. Both Zn and B can be absorbed into leaves and translocated within almond trees.

Check leaf symptoms, summer leaf analysis, or harvest hull analysis results to see if Zn and/or B fertilization is needed. Zinc deficiency produces “little leaf” symptoms with trees showing summer leaf levels of 15 ppm Zn or less considered deficient. Trees with hull B levels below 80 ppm B at harvest are deficient, but almond yield may benefit from B application if hull levels are below 150 ppm B. Do not fertilize with B if hull levels are 300 ppm B or greater, as excessive B is toxic to plants.

A fall spray is a cost-effective way to get Zn or B into buds for the following year’s bloom. The return on investment for a fall B spray can be significant. Yield increases of 200-400 kernel pounds per acre have been measured from a foliar application the previous fall at Nickels Soil Lab of 0.6 lbs. of actual B (the equivalent of 3 lbs. Solubor®/acre applied in 400 gallons/acre). A fall Zn spray should increase leaf Zn the following year and eliminate Zn deficiency symptoms while

reducing the risk of phytotoxicity compared to spraying between petal fall and harvest. The following are tips that may help maximize the benefit from a fall Zn and/or B spray.

- **Materials:** Zinc sulfate is a good, cost-effective source of zinc in postharvest applications. Other sources work but are more expensive. Most B sources (polyborate, boric acid, etc.), if a similar rate of actual B is applied, are effective foliar fertilizers. See the tank mixing section below regarding different B fertilizers and zinc.
- **Zn Rates:** A moderate rate of Zn, for example, 5 lb. zinc sulfate ($ZnSO_4$)/acre, applied in October, is as effective as higher rates applied in November when natural leaf drop begins. The 5 lb. $ZnSO_4$/acre rate in October will not remove leaves, allowing for continued carbohydrate production and storage for use next growing season. To get defoliation in addition to fertilization, use higher rates – for example, 20 lbs $ZnSO_4$/acre – once natural leaf drop has begun. In my experience, defoliation with zinc fertilizer sprays requires moisture in the orchard – either from rain or irrigation.
- **B Rates:** Generally, 1-2 lbs Solubor®/acre in 100 gallons per acre is recommended as a fall spray. Excess B can be toxic. Consult an experienced PCA/CCA when selecting a B rate. If the canopy is healthy and green, B sprays should be absorbed into November, even when tank mixed with a high rate of $ZnSO_4$. **Note:** Almonds export 0.2-0.3 lb. B in a 1000 lb. per acre kernel yield crop (in kernels, shell and hulls), so a good almond crop will remove the equivalent of 2 lbs. Solubor®/acre from the orchard and hull B levels next harvest shouldn't change as a result of a B spray this fall.
- **Tank mixing:** To reduce application costs, Zn and B can be tank mixed. When using polyborate B fertilizer (Solubor®, Borosol®, etc.) certain steps should be taken. Acidify the spray solution to pH 5 before adding zinc using an organic acid-based material (for example, Mixwell™ or Tri-Fol®) and not a phosphate buffer (will precipitate with zinc). Then add B. If the solution pH climbs above 5, a light brown haze (precipitation) forms in the tank and lower boron levels in the flowers the following spring can result. Add more acid to eliminate the haze. If a boric acid product is used, acidification is not needed.
- **Soil applied B and/or Zn:** Postharvest soil applied B will not increase flower B levels the next spring, but it should increase hull B by next harvest. Adequate B at bloom is the goal, but both a fall foliar spray and spring-summer soil application(s) may be required if the orchard is deficient. If an orchard is B deficient (<80 ppm hull B) an in-season soil application of 2-4 lbs actual B (10-20 lb Solubor) per acre is recommended. Multiple applications instead of a single large dose should deliver best results.
- **Canopy Health**: Boron is readily absorbed by leaves, not wood, so foliar application in an orchard with extensive postharvest defoliation is not recommended. A pink bud B spray maybe be a better B fertilizer delivery option.
- **Aerial application**: University of California research has not tested aerial B applications in almond. If considering aerial applications, the safe recommendation is to keep spray tank B concentrations similar those in ground rigs – 0.4 B/100 gallons = 2 lbs Solubor/100 gallons. Higher concentrations risk reducing yield, so proceed with caution.

Orchard Boron Status	Hull Boron (at harvest)
Deficient	<80 ppm
Adequate	80-150 ppm
Toxic	>300 ppm

Zinc is deficient < 15 ppm in July leaf sample. If there is an in-season zinc spray it could result in falsely high zinc levels, even if samples are washed.

Nutrients can damage trees if effective and safe rates, materials, and/or application practices are not used. None of the information above constitutes a fertilizer recommendation, merely the sharing of educational resources. Consult with your Certified Crop Advisor (CCA) in developing your fertilizer plan.

Late Fall, 2025 and Winter, 2026 Grower Meetings

This list is incomplete (more dates will be added) and more information on the meetings listed here will be available as the dates get closer. Please save the date(s) for programs of interest.

Program	Date	Location
Groundwater Management & Recharge Meeting	Nov 20 (AM)	Yuba City
3rd Thursday: Sacramento Valley Tree Crop IPM Review	Nov 20 (PM)	Yuba City
Almond Board of California Annual Conference	Dec 10-12	Sacramento
North Valley Nut Conference	Jan 14	Chico
Yuba/Sutter Spray Safe	Jan 14	Yuba City
North Sac Valley Prune Day	Feb 26	Red Bluff
Sutter-Yuba Walnut Day	March 4	Yuba City
North Sac Valley Walnut Day	March 5	Red Bluff

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