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**Franz Niederholzer**  
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## Fall Almond Orchard Management Considerations

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### SEPTEMBER

- **Irrigation:** Return water to orchards as soon as possible after shaking. Postharvest irrigation is critical to a good crop potential **next year**. Wherever possible, maintain adequate irrigation to keep leaves on the tree and working to build carbohydrate reserves for next year. The general target stem water potential is -10 to -14 bars (roughly -2 to -4 bars drier than baseline) in the fall. Trees use less water as the days cool and shorten, so less water is needed to maintain adequate orchard moisture as fall progresses.
- **Fall Nutrient Spray:** Once harvest(s) in an orchard are finished and if July leaf sample analysis indicate trees are low on Zn or hull samples show low/moderate B, apply these nutrients through a foliar spray as soon as early October. Healthy leaves are needed for these nutrients to be absorbed into the tree. Research (in peaches) shows a low rate of zinc sulfate (5 lbs/acre) will get zinc into the tree without causing leaf loss. [Fall spray timing](#) ensures these nutrients will be available at bloom next February.
- **Bark canker biology/control training:** [Register](#) for the Sept 29 free online training for bark canker disease and control with UC researchers Drs. Themis Michailides and Florent Trouillas. PCA and CCA CE (1.5 hrs for each) is approved.

### OCTOBER

- **Weed survey:** Scout for weeds in your orchard to target your weed management strategy for next season. For more information about best practices for weed scouting, see [our recent article on post-harvest weed scouting](#). The [Weed Research and Information Center Weed Identification Tool](#) can help you ID the weeds in your orchard.
- **Fall Nutrient Spray:** See September info
- **Irrigation Water Quality:** If irrigation water quality was poor this season, **take soil samples** to assess the build-up of salinity and toxic element(s) such as chloride, boron and sodium. See [video series on soil sampling from the UC Davis Fruit and Nut Center](#) on YouTube. Consult with your CCA regarding fall/winter irrigation practices to help leach salts if elevated levels are found.

- **Cover Crops:** Cover crops can improve orchard soil, reduce runoff, and/or provide additional pollen to bees in the spring. Cover crop planting before the end of October is recommended. For more information about using cover crops in almond orchards, see the [Cover Crops Best Management Practices](#) guide produced by The Almond Board of California, UC ANR and UC Davis.
- **Mulch:** Organic matter (compost, almond shell, etc.) is an alternative to cover crops, helping reduce erosion, improve water penetration and, depending on the material, improving nutrient levels in the soil. [New research from UC Davis](#) reports improved soil potassium levels following shell and/or hull spreading in the fall. (See information on mulching for improved water infiltration, salt management and water storage in the article in this newsletter.)
- **Navel orangeworm** overwinter in mummy nuts. An early survey for mummy nuts can help determine if orchard sanitation (destroying mummies) could be needed. Count mummies in 20 trees per orchard. Make sure all varieties in the orchard are included in the 20 trees. If there are more than 2 mummy nuts per tree, on average across the orchard, plan on sanitizing your orchard by shaking or poling nuts to the ground by February 1 and mowing up by March 1. Double check mummy counts in December/early January to decide if sanitation is needed.
  - If a significant number of your mummy nuts are caused by hull rot, plan on reevaluating your irrigation and nitrogen management practices in the spring of next year to help manage hull rot. For more information about how to identify hull rot in your orchard, see [UC IPM](#).
- **Pruning:** Fall is a good time to prune, shaping young orchards or pruning out damaged branches in your orchard. Avoid pruning immediately before a rainfall event to reduce risk of infection by any number of bark canker diseases (*Cytospora*, *Botryosphaeriaceae* (“Bot”), *Ceratocystis*, and others). Pruning just before rain spreads bark diseases rapidly in the orchard because wind and rain carry disease spores to fresh pruning wounds. Wounds are most vulnerable to infection in the two weeks after pruning. Pruning wounds heal fastest when pruning is done in January. In UC trials, Topsin-M fungicide is the most consistently effective fungicide against bark cankers when applied soon after pruning and before rain.
- **Rodent control:** When [ground squirrels](#) or [gophers](#) are present, fall control can help lower the population ahead of the busy 2023 growing season. Once irrigation (or, better yet, rain) has wet the soil profile and closed soil cracks, aluminum phosphide fumigation becomes more effective in controlling gophers and ground squirrels. Click [HERE](#) to see a gopher trapping video with Dr. Roger Baldwin, UC Extension Specialist.
- **Remove and replant:** Remove dead or badly damaged trees with a backhoe and replant with potted trees in the fall. Put irrigation emitters (drippers or sprinklers) at the trunk, but outside the nursery box, for the first 30 days after planting to directly water the roots in the potted media. Move the emitters 30 days after fall planting (if still irrigating) or before spring irrigation (if rain shuts down irrigation). This step is important and keeps irrigation water from wetting the trunk. The roots should have grown out of the potting media within 30 days of planting.
- **Shot Hole:** If [shot hole fruiting structures](#) are present in leaf lesions in the fall, the likelihood that shot hole will develop in the orchard the following spring is higher. Keep an eye out for shot hole fruiting structures in your orchard after fall rains begin. If fruiting structures are present, apply a foliar zinc sulfate nutritional spray in early November; this will speed up fall leaf drop and reduce inoculum.
- **Rust:** If rust was a problem in your orchard this year, consider a foliar zinc sulfate fertilizer (20 lbs zinc sulfate/acre) spray in late October or early November to accelerate leaf drop and reduce rust carry over to next season.

## NOVEMBER

- **Dormant Sampling for Scale and Scab:** Between mid-November and mid-January, collect 100 spurs from 35-50 randomly selected trees in each orchard. Check for scale and mite eggs using a hand lens (OK) or dissecting microscope (best/easiest on your eyes). Check green shots for scab lesions. UC IPM has a helpful on-line [guide to spur monitoring](#).
- **Potassium:** If planning on making a fall potassium application, November is a good time to do it, either by banding or targeted broadcast (under sprinklers) dry fertilizer. Check leaf and soil Cl<sup>-</sup> levels if planning to use KCl (muriate of potash; MOP) to avoid too much (toxic) Cl in the rootzone. More information on fall potassium application is available [on-line](#).
- **Remove and replant:** Same as October.
- **Rodent control:** Same as October.
- **Pruning:** Same as October.
- **Mulch:** Same as October.
- **Harvest Samples:** Check the nut samples collected at harvest and stored in your freezer. The results of these sample evaluations can help with pest management strategy for next year. Use this [guide to Harvest Damage Evaluation for Almonds](#) to help with your evaluation process.
- **Bees:** Plan ahead for February by ordering 2-3 strong honey bee hives per acre for traditional (multiple variety) orchards, and 0.5-1 hive per acre in self-fertile orchards. Make sure you have a written contract with your beekeeper that outlines the expectations of each party. See our article on [Honeybees, Colony Strength, and Beekeeper Challenges](#) for best practices for using honeybees in your orchard.

## DECEMBER

- **Mummy recounts.** Now that leaves are off the trees and mummies are easier to see, recheck your mummy count and update your plan for knocking and destroying mummies by February 1<sup>st</sup>.
  - Crack out mummies to find out the percent NOW infestation (nuts with NOW per nuts cracked out). Experienced PCAs have their own target number of mummies/orchard to check, but, to date, UC doesn't have a research-based protocol to recommend. Percent infestation plus the number of mummies in the orchard provides an estimate of the resident population in the orchard (how much NOW pressure is in the orchard). Good information to start the season.

**Dormant spray.** If spur samples show treatable levels of scale, prepare to spray in early-mid January (delayed dormant). If scab treatment is needed and the primary target of a dormant spray using chlorothalonil (Bravo), the label states it must be used before bud break (dormant, not delayed dormant). Copper and oil, targeting scab, can be used during delayed dormant and so fit in with the best timing for scale control. Consult with your PCA regarding materials, rates and timings that best fit your orchard conditions.



## Management Practices for Improved Water Capture

*Clarissa Reyes, North Sacramento Valley Orchard System Staff Research Associate*

UC researchers are conducting trials observing soil water dynamics for improved water use efficiency and conservation in orchard crops. In the middle of a drought, there are several management practices that may improve the retention of limited water resources.

### Groundwater recharge:

Capturing surplus surface water and “banking” it as groundwater through the off-season irrigation of almond orchards has the potential to help offset groundwater overdrafts in some California water districts.

In experiments in the Central Valley, city stormwater runoff was captured and used to flood irrigate almond orchards with a total of 24 inches of water. Results showed that more than 90% of the water applied to sandy soil and 80% of the water applied to loamy soil percolated past the root zones, with no detriment to tree water status, canopy development, or yield. Additionally, groundwater recharge did not negatively affect new root production, but rather tended to extend root lifespan.

Based on these data, winter irrigation is not likely to have negative impacts on almond orchards in moderately drained to well-drained soils. However, the opportunity to flood almond orchards during the dormant season will only be feasible during years when excess surface water is available, and bloom in mid-February presents a limited window of time to do so. Also, to help prevent unintended tree injury or loss, growers need to carefully consider rootstock, soil type, and other factors that affect water percolation when adopting a strategy for groundwater recharge in almond orchards. Additional resources include a [guide from the Almond Board](#), a [map from UC Davis researchers showing suitability](#) of groundwater recharge based on soil characteristics, and a [Growing the Valley Podcast episode](#) on groundwater recharge.

### Winter cover crops:

Winter cover crops offer many potential benefits to an orchard. They can increase soil microbial diversity, increase nutrient cycling, capture solar radiation, improve water infiltration and rainfall capture, and reduce overwintering navel orangeworm populations on the orchard floor in almond orchards. Winter cover crops are not without their cons however, including the need for soil moisture to establish a stand in the fall, and the risk of a colder orchard in the event of a freeze during bloom in February.

### Application of organic matter

#### *Dairy manure*

Soil organic matter is known to improve soil structure, and therefore influences the movement and storage of water within the soil. Organic matter amendments such as composted manure, which is readily available throughout California, can be used in orchards to enhance water use efficiency.

A recent study in a Modesto almond orchard has shown that composted dairy manure applied as mulch in the fall and wetted by irrigation during the growing season to allow for incorporation, was effective at enhancing soil water retention, improving soil organic carbon, and reducing tree water stress (measured by stem water potential). The use of organic matter amendments will typically have the greatest effect on soil water retention on coarse-textured, sandy soils with low initial soil organic matter content. Additionally, in California orchards, organic matter amendments are applied during tree dormancy to maximize the exclusion period between amendment application and harvest to minimize food safety risk.

### *Almond hulls/shells*

In ongoing experiments, surface-applied hull/shell amendment creates a "mulching effect" on the soil surface, which can increase water infiltration rate, reduce evaporation, moderate daily temperature, maintain higher soil moisture in the uppermost soil layer, and create better conditions for increased root growth near the soil surface. In one local almond orchard, hull/shell amendment maintained higher soil water content in the top 0-4 inches of soil and lower tree water stress between weekly irrigation events when compared to bare ground. Hulls/shells can be delivered for free by local processors because processors want to remove the materials from their facilities promptly during harvest.

### **Reduced or no-tillage**

Tillage has variable effects on water movement and retention based on permeability at the surface where soil is disturbed, overall soil texture and structure, and a potentially impermeable hardpan at depths where tilling does not occur. Reduced tillage has been proven to reduce soil erosion, and when no-till practices are implemented along with cover crops, they provide an enhanced ability to improve water infiltration and increase soil organic matter in the topsoil.

Soil water content and movement are inherently linked to soil type and texture, so the effects of these practices will vary based on location and other management factors. Growers are encouraged to try any of these practices on a portion of their fields and to track soil moisture and stem water potential with a pressure chamber (pressure bomb) to see if this makes a difference for their trees.



## **2022 Almond Season IPM Reflections**

*Sudan Gyawaly, Sacramento Valley IPM Advisor*

*Luke Milliron, UCCE Orchards Advisor Butte, Glenn, and Tehama Counties*

We spoke with several Sacramento Valley PCAs to develop a retrospective on the 2022 almond IPM season. The 2022 almond season had a rough start for many growers in the Sacramento Valley because of frost. Frost in late February set the tone for almond production this year. Serious frost damage resulted in reduced crop size in many orchards in the region due to inadequate nut load. Moreover, the increased cost of orchard inputs (plant protection material, fertilizer, and fuel) and concern about low nut prices caused many growers to seek cheaper alternatives for some of their regular IPM activities or forgo them altogether.

**Disease.** The dry 2021-2022 winter did not warrant bloom fungicide applications in many orchards. Many growers skipped summer fungicide application for rust because of cost, but unexpected summer rains paired with this lapse in fungicide resulted in rust infestations and serious leaf drops in some orchards. PCAs we talked with said that orchards sprayed with a fungicide in April ahead of rains mid-month showed much less rust in June than orchards not sprayed in April. Orchards with extensive defoliation will achieve less carbohydrate accumulation in 2022 and may face the consequences in 2023, potentially even reduced yield.

**Plant bug:** This season had mild to average plant bug pressure. However, there were cases of elevated plant bug damage (8-10% damage compared to less than a percent damage in previous years) because of less investment in costly management. Although some ranches with high plant bug pressure sprayed, many orchards let them go without the spray, resulting in severe damage.

**Spider mites.** Overall it was a mild spider mite pressure season. Many PCAs believe spider mites are becoming increasingly hard to manage, with some orchards receiving as many as four applications for spider mites. PCAs are concerned about Pacific mite becoming more prevalent, though confirmation

through monitoring is needed. Water stress due to less water applied and poor irrigation water quality were likely responsible for a high level of mite infestation in select orchards.

**Navel orangeworm (NOW).** It was a bad NOW year, according to most PCAs we interviewed. PCAs attributed high infestation to reduced investment in management due to low crop size. Some PCAs believe this is the worst NOW damage in 20 years and reported NOW damage percentage in the double digits. In the orchards where the NOW populations were monitored, the peak flights were recorded around June 25 compared to the end of June or the first week of July in previous years. Because harvest started at the usual time, hull split nuts were exposed to female moths for over two weeks resulting in higher damage. We will know more about the NOW situation as harvest winds down, but this year might prove to be a perfect storm for NOW damage in the Sac Valley. The possible scenario for this NOW storm involves a compromise in sanitation practices last winter due to poor pricing leading to an increased population going into bloom. Moreover, the freeze-reduced crop size reduced control efforts, and the low nut numbers resulted in higher infestation rates and more pressure over larger areas.

### **Free CE units! UC IPM Air Blast Sprayer on-line calibration course.**

UC IPM is offering their excellent on-line course on airblast sprayer calibration for FREE this year. (It was offered for a fee in 2021.) There are 2.5 hours of CE available with this course (0.5 hr Laws and Regs, 2.0 hours of “Other”). The course is available for credit for 2022 if taken by December 30. Enroll in the course at: <http://ipm.ucanr.edu/training/>.

### **Time for a hard look**

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

Current tree crop economics are tougher now than at any time in the last 20 years. The outlook is not encouraging. Costs are way up and may not ease anytime soon. Net acreage is up, sustaining market volume and soft pricing. Labor is hard to find, and expensive if found, while labor-saving solutions often require major capital investments. Water, if you can get it, will most probably cost more over time. More water per acre will be needed for good crop health and production if average temperatures continue to rise. The way forward to a better future is not clear. All is not lost (despite how this paragraph reads) but forging ahead with the same practices and expecting a natural return to better times is looking like a long shot.

Given all the above, this off-season should be a good time to take a particularly hard look at your operation. Every farm is different, so solutions and especially decisions must come from inside the operation. However, basic guidelines for finding the best way “out of the woods” follow four simple steps; stop, think, observe, and plan.

Stop. Block out some time on the late fall/winter calendar to think, observe and plan. If time is not set aside, the final planning may be incomplete or not done at all.

Think about the current state of the operation. Use the most recent [UC Davis Cost of Production studies](#) to build a spreadsheet, entering past and/or projected costs and income for each orchard. Consider production history along with soil salinity and irrigation water quality trends when evaluating the production potential of an orchard.

**Observe.** Talk with neighbors, friends, PCAs, industry members, your local UC farm advisor, bankers, and others to see what they think about the future. Read up on world energy and trade trends. Compare what is heard and read to the reality of your situation. Attend industry meetings. The following steps are just examples. The North Valley Nut Conference will be held on January 19, 2023, in Chico. Check the [Events page](#) ([sacvalleyorchards.com](http://sacvalleyorchards.com)) for upcoming meetings. Read about world trends in energy and fertilizer (examples include the [Midwest](#) and [California](#)). Be a healthy skeptic but look around.

**Plan** for several futures (costs, water, production, prices) as nothing is certain. Prepare to move into 2023 with flexible practices but a solid, realistic goal. With the current world and local conditions unimaginable just a few years ago, it may be necessary to make previously unthinkable decisions. Go big? Sell out? Lease? Shift crops? Limit personal spending? Invest in technology? All options should be on the table. This is a difficult process, but one that should lead to a better outcome than just plowing ahead.

Best wishes to all as the holidays approach.

Upcoming Orchard Meetings	
Th January 19	North Valley Nut Conference - Silver Dollar Fairgrounds
Wed February 22	South Valley Prune Meeting – Sutter Co Ag Building
Th February 23	North Valley Prune Meeting - Red Bluff Elks Lodge
Th March 2	Tehama Walnut Meeting - Red Bluff Elks Lodge
Many more meeting dates to come! Details will be at <a href="http://www.sacvalleyorchards.com">www.sacvalleyorchards.com</a>	

### New IPM Advisor Introduction

Sudan Gyawaly, *UCCE Area Integrated Pest Management Advisor Butte, Sutter-Yuba, Glenn, Colusa, and Tehama Counties*

I joined UCCE as an Area IPM Advisor based in Butte County in July and am very excited about this opportunity. I will oversee Butte, Sutter-Yuba, Glenn, Colusa, and Tehama counties and look forward to working with the growers in the region. I was born and raised in Nepal, a south Asian country, where I completed an undergraduate degree in Agriculture. I worked in rural areas of Nepal for a couple of years, providing sustainable vegetable production and pest management training to growers before moving to the United States in 2009 for graduate studies.

I have an academic background in pest management and have an M.S. and a Ph.D. degree in entomology from West Virginia University and Virginia Tech, respectively. Most recently, I worked as an Associate Specialist at UCCE Stanislaus County, where I worked on various tree nuts pests,



including walnut husk fly, navel orangeworm, and Pacific flatheaded borer. Before that, I was a post-doc at North Carolina Agricultural and Technical State University in Greensboro, NC. At Greensboro, I researched pest management on vegetables and fruit trees on small farms.

I am currently learning about the crops and pests in the region by meeting and talking with growers and other stakeholders. I plan to develop a need based applied IPM research and extension program for orchard crops. I will design and deliver IPM information using various extension tools, including personal consultations, print publications, public presentations, and field days.

I can be reached by phone at 530-538-7201 or by email at [sgyawaly@ucanr.edu](mailto:sgyawaly@ucanr.edu).



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