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## Advisor Farewell

*Allan Fulton, Irrigation/Water Advisor*

Allan Fulton retired as Irrigation and Water Resources Advisor in Tehama, Glenn, Colusa, and Shasta Counties on June 29, 2020. Allan worked for UC Cooperative Extension in Tehama, Glenn, Colusa, Shasta, and Kings Counties for 32 years. He has worked in both orchard and field crops focusing on water management tools and practices to achieve competitive production and efficient use of water and nutrients. He has also worked to support local efforts to achieve sustainable groundwater management. In retirement, Allan is helping new UC irrigation scientists establish their field research programs while wrapping up a couple unfinished projects of his own. He plans to spend more time with family and have an opportunity to travel.

## Fall Walnut Orchard Management Considerations

*Katherine Jarvis-Shean, UCCE Orchard Advisor, Sacramento, Solano and Yolo Counties*

### Pre-harvest

- ✓ Monitor for **navel orangeworm** (NOW) to determine risk of damage. Walnuts that have made it through the season intact are most susceptible to damage when husks open. However, if this husk split timing does not overlap with female flight and egg laying, damage is unlikely. Third and fourth flight peaks come close together, often with overlap between generations. Treatment decisions thus need to take into account trap counts and husk split in each block, as well as pre-harvest intervals.
- ✓ Optimize kernel quality with attention to **water management**. Not enough water this time of year can lead to stuck hulls and subsequently darkened pellicles. Too much water this time of year can deprive nuts of carbohydrates, leading to bronze pellicles. Using a pressure chamber to keep trees at 2 to 3 bars below baseline (more dry) can help avoid tree stress.
- ✓ If you plan to use **ethephon** in a block, start monitoring for **packing tissue brown** about 35 days before the expected harvest date. With this year's prolonged spring and possible differences in timing of maturity within a canopy, many growers may turn to ethephon to help tighten the window in which nuts in their orchard are ready to shake. Find more on ethephon use here: [sacvalleyorchards.com/blog/walnuts-blog/ethephon-straggled-leaf-out](http://sacvalleyorchards.com/blog/walnuts-blog/ethephon-straggled-leaf-out).
- ✓ Start **hardening off** young trees by cutting off September irrigation until you see a terminal bud set. If there is no rain, irrigate by mid-to late October. Both young and mature trees should have some soil moisture by early November to better withstand an autumn freeze. For more information: [sacvalleyorchards.com/blog/walnuts-blog/preparing-for-an-early-freeze](http://sacvalleyorchards.com/blog/walnuts-blog/preparing-for-an-early-freeze).

To simplify information, trade names of products may be used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

## Harvest

- ✓ **Timely harvest** is important for nut quality. Delaying harvest can darken pellicles, and encourage mold development and navel orangeworm. Walnut color quality decreases most rapidly in the first nine hours, so try to pick up the same day that nuts are shaken.
- ✓ Collect a representative **IPM evaluation sample** from across each orchard block at harvest to assess your IPM program. Grade sheets won't always give the detail necessary to decipher the source of damage and what needs to be changed to improve an IPM program. Compare what you see with photos and descriptions at [sacvalleyorchards.com/walnuts/insects-mites-walnuts/harvest-damage-evaluation-for-walnuts](https://sacvalleyorchards.com/walnuts/insects-mites-walnuts/harvest-damage-evaluation-for-walnuts).

## Post-harvest

- ✓ If you are pruning this dormant season, **prune as early in the fall as possible** to avoid *Botryosphaeria* infections. Winter pruning resulted in infection in 78 to 99 percent of cut shoots, compared to only 28 to 75 percent in fall-pruned shoots. At minimum, avoid pruning cuts when wet conditions are in the forecast.
- ✓ Consider applying **either potassium sulfate or potassium chloride (KCl)** if your leaf sample analysis indicates your orchard is potassium deficient. If you're considering KCl to save money, be sure the chloride will be able to leach out of the root zone before spring leaf-out. Avoid where there is a perched water table, heavy clay and less than 8 inches of winter rainfall.
- ✓ **Scout for weeds** to evaluate the success of this year's weed management plan and revise your plan for next year. Find weed identification tools and scouting templates at [sacvalleyorchards.com/almonds/weed-control/post-harvest-weed-scouting](https://sacvalleyorchards.com/almonds/weed-control/post-harvest-weed-scouting).
- ✓ If you're **removing an orchard, October** is the time to kill roots with Garlon. It is critical to paint stumps with Garlon within five minutes of cutting trunks, and leave stumps for 60 days. See the article in this issue for more information.
- ✓ **Sanitize orchards** to remove mummy nuts that can harbor overwintering NOW. Given the extended leaf-out this spring, the likelihood of leaving some nuts in the tree after harvest is high. Shake or pole remaining nuts out of trees, blow nuts into middles and flail mow. Clean out processing facilities that are adjacent to orchards.
- ✓ If **seeding a cover crop**, try to get seed in the ground before leaf drop to get the best seed-soil contact. There's more information at [sacvalleyorchards.com/blog/walnuts-blog/time-to-think-about-cover-crops-in-walnuts](https://sacvalleyorchards.com/blog/walnuts-blog/time-to-think-about-cover-crops-in-walnuts).

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## Tree and Orchard Replanting Considerations in a Lean Price Year

Luke Milliron, UCCE Orchards Advisor, Butte, Glenn & Tehama  
Katherine Jarvis-Shean, Orchards Advisor Yolo, Solano, and Sacramento Counties

When prices are lean walnut farming is tough business. Farm advisors are not economists or financial advisors. However, farm advisors can be useful in providing best practices for economically sustainable production. Two key economic decisions growers face are when to replant individual trees and when to remove and replant entire orchards.

### Learn from Dying Trees to Improve Management of the Whole Orchard:

Former Advisor Carolyn DeBuse, and Emeritus Advisor Bill Krueger wrote about the need to pause before replanting, by asking why the tree died in the first place. Saturated soils and soil borne pathogens are common culprits for tree loss. It is important to carefully evaluate recently declining trees, particularly evaluating their root systems for a possible cause. Your pest control advisor or local farm advisor can help with this diagnosis. Can changes be made to reduce the chance of additional trees declining and increase the chance of success for replanted trees? For *Phytophthora* and nematodes, these changes are often genetic (i.e. replant rootstock selection) but may also include a chemical approach. However, the needed action is just as often cultural, whether it is adjusting irrigation set time to prevent ponding or installing stream-splitters to keep water off trunks.

Water logging is a common cause of walnut tree decline: [sacvalleyorchards.com/blog/walnuts-blog/yellowing-collapsing-walnut-trees-pt-1-water-logging](https://sacvalleyorchards.com/blog/walnuts-blog/yellowing-collapsing-walnut-trees-pt-1-water-logging). The Howard variety appears particularly sensitive to saturated soils:

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[sacvalleyorchards.com/blog/walnuts-blog/yellowing-collapsing-walnut-trees-pt-2-yellowing-howard-problem](http://sacvalleyorchards.com/blog/walnuts-blog/yellowing-collapsing-walnut-trees-pt-2-yellowing-howard-problem). In addition to tracking saturated conditions with soil moisture monitoring, a key practice to not over-watering is irrigating only when demanded by the trees, as indicated through regular pressure chamber use. Learn more at: [sacvalleyorchards.com/manuals/stem-water-potential](http://sacvalleyorchards.com/manuals/stem-water-potential).

### Tree Replanting Decisions:

When a tree dies and is removed, there is always a question of whether to replant in that spot. The decision of whether to replant an individual tree is a gamble that the replant will become established and produce enough to offset its associated costs by the end of the orchard's life. A decision that is an automatic "yes" early in the orchard's life becomes more complicated as the orchard ages.

The shading from surrounding trees, and the ensuing low probability of successful vigorous growth weighs against the desire to replant and establish lost production. DeBuse and Krueger noted that if the orchard floor has over 75% shade at midday, the chance of a successful replant is slim. However, UC Davis Walnut Specialist Bruce Lampinen believes that a successful replant is dubious in orchards with over 60% shading. If the decision to replant has been automatic for you, pause to consider the cost of an unsuccessful replant and first evaluate how much light is available to the new tree.

After weighing the success of the replant and evaluating why the original tree died, if you do replant, follow the best practices to help nurture this investment. Root removal, possible spot fumigation, nursery product selection, and correct planting are the key steps. Of these, nursery product selection is a particularly critical step, if possible, tailor the choice of rootstock to the main source of tree loss (see rootstock table in this newsletter). As part of nursery selection, choosing a bareroot over a potted tree is typically ideal because you are starting with a tree that is larger and easier to manage. Once the replant is in place, the tree stands little success without paying extra attention to the need to modify irrigation and fertilization. You can learn more in the excellent guide by DeBuse and Krueger at: [sacvalleyorchards.com/walnuts/orchard-development/replanting-individual-trees](http://sacvalleyorchards.com/walnuts/orchard-development/replanting-individual-trees).

### Orchard Replanting Decisions:

In addition to a lack of available light, general orchard decline is a second major reason to rethink replanting individual trees. General orchard decline in old age, frequently the result of weak trees facing an onslaught of multiple pests and diseases (figure 1), means replants make little sense because of the short window remaining in the orchard's life. Instead, the orchard should continue to be farmed without replants until it is no longer economically feasible to do so.

**Figure 1.** An orchard facing general decline, with a high rate of tree loss. Extensive crown gall, trunk cankers, and high nematode counts all present in this orchard.

Amidst lean prices, if this is the year that you slate an orchard for removal, there are several steps you should consider before removal. A critical initial step, just as with replanting individual missing trees, is to ask why the orchard is in decline, and if those problems may follow you into the next planting. In addition to assessing the risk of the replant problem, and the persistence of crown gall, a nematode sample taken while the current trees are still in the ground is a great start. You can learn



more about nematode sampling at: [growingthevalleypodcast.com/podcastfeed/2019/10/22/nem-sampling](http://growingthevalleypodcast.com/podcastfeed/2019/10/22/nem-sampling) and result interpretation and the next steps for replanting amidst high lesion nematode counts at: [sacvalleyorchards.com/walnuts/orchard-development/replanting-into-nematode-infested-soils](http://sacvalleyorchards.com/walnuts/orchard-development/replanting-into-nematode-infested-soils).

Building upon this initial diagnosis step, consider the following steps:

1. **Assess potential carry-over problems before harvest.**
2. **Kill the roots of the old orchard.** The established best practice for this is cutting down trees above ground during October and within 5 minutes painting the stump with Garlon3A, or a mixture of 1:3 mixture of Garlon3A and MorAct.
3. **Wait a full growing season before replanting walnuts.** This is the step where there are a range of management choices, such as the decision to fumigate, the use of a spring-summer crop to dry down deep soil moisture, or even exploration of a new technique like anaerobic soil disinfestation.

This is also the step, where you could consider whole orchard recycling (WOR), whereby the previous trees are chipped and incorporated back into the soil. In almonds, this has been successful both for the performance of the subsequent planting and for soil health. Problems and success with WOR in walnut have yet to be demonstrated, with only a single pilot demonstration of young second generation WOR trees to-date. Until we have data on the persistence of crown gall and lesion nematode in roots of a recycled orchard, this practice is not advised for orchards with heavy cases of these afflictions. You can learn more about WOR at [orchardrecycling.ucdavis.edu](http://orchardrecycling.ucdavis.edu). WOR is an expensive practice, however the practice is now recognized for potential financial support through the CDFA's Healthy Soils Program: [cdfa.ca.gov/oeffi/healthysouils](http://cdfa.ca.gov/oeffi/healthysouils).

4. **Fumigate, if necessary.** The choice of whether to fumigate is centered around the concerns of root lesion nematodes, the replant problem, and to a lesser extent crown gall when replanting walnut orchards. Specifically, if lesion nematode is present in the old orchard, nematicide (e.g. Telone) fumigation, **in addition to all the other steps** may be necessary to have a successful replant to walnut. Fumigation is expensive, however the carryover problems from the previous orchard can prove far more costly. Cost savings with fumigation can be achieved by opting for strip fumigation specifically mapped for the tree rows, instead of broadcast fumigation. Adequate fumigant distribution can be problematic especially on clay-type soils. To ensure a successful fumigation, it is critical to dry down the soil to 12% moisture for optimal fumigant efficacy.
5. **Replant on an appropriate rootstock.** Consider the potential benefits of clonal Paradox rootstocks, particularly against nematodes (VX211) and *Phytophthora* (RX1). See detailed rootstock traits in the table in this newsletter.

Find more about orchard removal and replant steps at: [sacvalleyorchards.com/walnuts/diseases/considerations-for-replanting-walnut-orchards](http://sacvalleyorchards.com/walnuts/diseases/considerations-for-replanting-walnut-orchards). Finally, if you are removing and planting a new walnut orchard, a key document to have on hand when financially planning is the Sacramento Valley UC Walnut Cost Study, which can be found at: [coststudies.ucdavis.edu/en/current/commodity/walnuts](http://coststudies.ucdavis.edu/en/current/commodity/walnuts)

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# Walnut Cultivar Table

Pat J. Brown and Chuck Leslie, Walnut Breeders, UC Davis Department of Plant Sciences

Cultivar	Leafing date	Bearing	Harvest	Avg kernel wt (g)	Avg % kernel	% Extra-light	% Light	Pollenizer(s)	Notes
Ivanhoe	Very early	Lateral	Very early	7.7	56	41	54	Serr, Payne	Very early, precocious variety with strong yield, susceptible to blight, recommended for San Joaquin Valley
Payne/Ashley	Very early	Lateral	Early	7	52	3	80	Solano, Vina, Ivanhoe	Old lateral-bearing variety with early leafing and harvest, susceptible to blight, codling moth
Vina	Early	Lateral	Mid-early	7.1	51	3	47	Chandler, Howard, Tulare	Mid-early harvest with good yield but poor color
Solano	Early	Lateral	Mid-early	8.7	55	41	57	Chandler, Howard, Tulare	Precocious, vigorous, high-yielding variety, Vina timing with better color
Durham	Mid	Lateral	Mid	8.9	57	49	50	Chandler, Howard, Tulare	Excellent nut and kernel quality, Tulare timing, vigorous, less precocious than Solano
Tulare	Mid-late	Lateral	Mid	8.2	55	6	82	not commonly used	Mid-season, vigorous, high yield variety, variable nut quality
Howard	Mid-late	Lateral	Mid	7.4	51	21	59	Cisco, Franquette	Mid-season, high-yield variety for Sacramento Valley, limb breakage, variable nut quality
Hartley	Mid-late	Terminal	Late	7	46	19	64	Cisco, Franquette	Old terminal-bearing variety, low kernel yield, classic in-shell nut
R. Livermore	Mid-late	Lateral	Late	6.4	51	NA	NA	Cisco, Franquette	Red kernels
Chandler	Mid-late	Lateral	Late	6.8	49	76	22	Cisco, Franquette	Excellent kernel color, cracks well with high yield of halves
Cisco	Late	Lateral	Very late	6.4	46	4	83	none	Chandler pollenizer, more precocious than Franquette
Franquette	Late	Terminal	Very late	6.2	48	45	49	none	Classic Chandler pollenizer, excellent color



## Selecting the Right Clonal Walnut Rootstock for Managing Soil and Pest Problems

Janine Hasey, UCCE Farm Advisor Emerita, Sutter, Yuba, Colusa Counties

### Preferred rootstocks for problem situations

<a href="#">Clonal Paradox Rootstock</a>	Rootstock Vigor <sup>1</sup>	Site Problems		
		Crown Gall	Nematodes	Phytophthora
VX211	Highly vigorous	Low Resistance	Some Tolerance <sup>3</sup>	Low to moderate resistance <sup>4</sup>
RX1	Moderately vigorous	Moderate resistance <sup>2</sup>	Intolerant	Moderate to high resistance <sup>4</sup>
Vlach	Vigorous	Low Resistance	Intolerant	Low resistance

The disease resistance indicated is only a comparison between the three clonal Paradox rootstocks and is not necessarily the level of disease resistance when compared to seedling black or seedling Paradox.

<sup>1</sup> In field trials with grafted trees, the vigor of the rootstock isn't necessarily reflected in the vigor of the scion, e.g. sometimes grafted trees on RX1 and Vlach are more vigorous than on VX211.

<sup>2</sup> None of the three clonal rootstocks are resistant to crown gall regardless of how propagated, potted vs. field grown. In several trials, RX1 often has lower infection levels.

<sup>3</sup> Nematode tolerance due to a post-infection mechanism.

<sup>4</sup> Level of resistance depends on *Phytophthora* species.

For more information on disease resistance ratings of the Paradox clones, see walnuts in the nursery trade: [sacvalleyorchards.com/walnuts/orchard-development/walnut-trees-in-the-nursery-trade/](http://sacvalleyorchards.com/walnuts/orchard-development/walnut-trees-in-the-nursery-trade/)

### Standard seedling rootstocks

**1) Paradox.** Many growers still prefer seedling Paradox rootstock, but they are very susceptible to crown gall disease. USDA/UC researchers developed methods for nurseries to use to prevent infection by the bacterium during the seed collection phase and other practices which can alleviate crown gall from developing. See the article "Points to Consider in the Prevention of Crown Gall" at [sacvalleyorchards.com/walnuts/diseases/preventing-crown-gall/](http://sacvalleyorchards.com/walnuts/diseases/preventing-crown-gall/)

**2) Black walnut.** Some growers have planted black walnut rootstock in recent years because it is typically less susceptible to crown gall than Paradox seedling rootstock. However, vigor is only moderate and in UC trials, yields were always lower compared to trees on Paradox rootstocks. Black walnut rootstocks should be considered where there are salt problems because they are more tolerant than Paradox seedlings or clones. However, because they have less vigor than Paradox and are very susceptible to *Phytophthora*, consider using black walnut only where soils are loamy and well-draining.