

In this issue:

- Key to Navel Orangeworm Management - NOW is the Time
- Pruning Under the Threat of Bot
- New Walnut Cost Study
- Training Young Walnut Trees: Minimum Pruning vs. No Pruning Compared
- Upcoming UC Walnut Meetings

Submitted by:

Dani Lightle,
UCCE Advisor

**Butte-Glenn Walnut Day
& Chico Trade Show**

February 26th, 8:00 a.m.—Noon
Manzanita Place (Elk's Lodge), Chico

7:30 a.m.	Registration & Trade Show
8:00 a.m.	Welcome
8:05 a.m.	Laws and Regulations Update <i>Marcie Skelton, Glenn County Agricultural Commissioner</i>
8:35 a.m.	Irrigated Lands Regulatory Program Update <i>Lexi Everhart, Sutter-Yuba RCD</i>
8:50 a.m.	New Options for Orchard Weed Management <i>Brad Hanson, UCCE Weed Specialist, UC Davis</i>
9:30 a.m.	The California Walnut Board & Commission Present a New Beginning, TBD, California Walnut Board
10:00 a.m.	BREAK
10:30 a.m.	Welcome, El Niño? Managing Walnut Blight during a Wet Spring, Jim Adaskaveg, Plant Pathologist, UC Riverside
11:00 a.m.	Early Season and Summer Water Management in Walnut <i>Bruce Lampinen, UCCE Walnut Specialist, UC Davis</i>
11:30 a.m.	Using Mating Disruption for Codling Moth Control <i>Emily Symmes, UC IPM Advisor, Sacramento Valley</i>
Noon	Free Tri-tip Lunch <i>Provided by West Coast Nut</i>

2 hours CE credits (0.5 laws and 1.5 other) and 2.5 hours CCA credits requested. Attendance satisfies Butte-Yuba-Sutter Water Quality Coalition outreach requirements.

Trade show hosted by West Coast Nut.

ANR NONDISCRIMINATION AND AFFIRMATIVE ACTION POLICY STATEMENT: It is the policy of the University of California (UC) and the UC Division of Agriculture and Natural Resources not to engage in discrimination against or harassment of any person in any of its programs or activities (Complete nondiscrimination policy statement can be found at <http://ucanr.edu/sites/anrstaff/files/169224.pdf>). Inquiries regarding ANR's nondiscrimination policies may be directed to Linda Marie Manton, Affirmative Action Contact, University of California, Agriculture and Natural Resources, 2801 Second Street, Davis, CA 95618, (530) 750-1318.

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.



Key to Navel Orangeworm Management – NOW is the Time

Emily J. Symmes, UCCE Area IPM Advisor, Sacramento Valley

Navel orangeworm (NOW) populations were high in 2015 and a fourth generation was observed in many locations. This means high potential for carry-over populations in orchards heading in to the 2016 growing season. The weather this winter may result in more natural NOW overwintering mortality than in recent years, with early colder temperatures and more precipitation expected. Carrying out key cultural practices during the dormant season is a necessary step to take advantage of beneficial environmental conditions. In addition, as planning for next year begins, keep in mind the four-pronged approach for managing NOW in almonds and pistachios, as much of this applies equally to walnuts.

- **Sanitation.** Sanitation is the single, most important activity under your control that can help reduce NOW pressure next season. This cultural activity is the baseline upon which the remainder of a NOW control program should be built. Remove mummy nuts from trees during the dormant period and destroy nuts by early March. Getting nuts on the ground ahead of wet weather can aid in natural mortality, however NOW can emerge from intact nuts on the ground. Nut degradation, and thus NOW mortality, will vary based on the amount of ground cover and moisture present to aid in kernel decay, so the safest approach is to flail mow or disc mummy nuts on the orchard floor.

Limiting the numbers of mummies in the orchard will also reduce the available oviposition and development sites for emerging moths and early generations, leading to less population build up within the orchard. Clean up all other waste materials in and around the orchard (including storage areas, harvest and processing equipment, etc). Unlike almonds, there is no established threshold for acceptable numbers of mummy nuts, so go with a “the-cleaner-the-better” strategy. After sanitation activities have been completed, assessing remaining mummy density and infestation (by cracking out a sample of remaining mummies) can indicate the level of in-orchard NOW pressure that can be expected going into next season based on the potential carry-over population.

Is sanitation worth it? As an example, assume an average of 4 mummies per tree are left behind in a 15-acre block (64 trees/acre) and there is 1.25% infestation in the remaining mummies (half male and half female). That’s 24 females emerging in late winter/spring looking to lay eggs in the orchard. That doesn’t sound so bad. A conservative estimate of 100 eggs/female means a oviposition potential of 2,400 first generation eggs at 4 mummies per tree. Sanitizing to 2 mummies per tree would cut that number in half to 1,200. That may not seem like a considerable number of eggs avoided for the effort and cost associated with sanitation activities. But if there are enough resources (mummy nuts and damaged nuts) in the orchard for early generation development, by the third generation, the difference is on the order of 6,000,000 eggs versus 3,000,000 eggs. Of course, these calculations assume 100% survival, mating, and oviposition success, which is not realistic, but it illustrates the point that needs to be considered when determining whether sanitation activities are a good investment.

- **Minimize damage caused by other sources.** Prior to husk split, nuts are most vulnerable to NOW if they are already damaged in some way. Proper blight control programs, codling moth management, and sunburn protection should all be part of an overall IPM program in walnuts, and will reduce the availability of development sites for NOW prior to husk split.
- **Timely harvest.** No year is exactly the same with regard to NOW flights, husk split, and harvest timings, but typically, the longer nuts remain in trees after splitting, the more NOW damage can build up. If possible, harvest should be timed with an eye on avoiding late generation NOW flights. It’s important also to consider the possibility of increased NOW damage if a second harvest shake is planned.

- **Insecticide treatments.** Experimentally-derived threshold guidelines are not available for NOW in walnuts. Application of insecticides for NOW management should take into consideration a number of factors, such as orchard history, prior season NOW damage, mummy density and overwintering and population estimates, proximity to external sources of infestation, amount of existing nut damage in the orchard, evidence of egg-laying and/or female activity in the orchard at or just prior to husk split (via traps or visual examination of early splits or damaged nuts).

Pruning Under the Threat of Bot

Katherine Pope, UCCE Orchard Advisor Sacramento, Solano & Yolo Cos.

Botryosphaeria (Bot) canker continues to be a concern for many walnut growers, and questions remain about how to best prevent infection. In this season of dormant pruning, what practices, if any, should be changed to decrease the threat of Bot infection?

Recent research by Dr. Themis Michailides has shown that pruning wounds cut in February can be infected by Bot fungal spores for as long as 4 months after the pruning cut is made. This is much longer than has been documented for other tree crops that are vulnerable to Bot infection.

Is there a better time to prune than winter? Not really. Bot spores grow when there is water and when temperatures are over 50° F, meaning that pruning cuts made in the coldest months of winter are less likely to be immediately infected than those made in late fall or early spring. However, given that pruning cuts are vulnerable for up to four months after they are made, a cut made in December may result in disease cankers in March that are just as severe as cankers that would result from a fresh cut made in March. Would spraying pruning wounds with a fungicide decrease the risk of infection? While this preventative approach makes sense in theory, Dr. Michailides' lab is still testing how useful this approach would be in practice, and what products will be best at protecting fresh pruning wounds from infection.

Currently, all we know for sure is the less pruning you do, the fewer potential entry points you create for Bot. (An exception to this cautious restraint should be made when pruning out Bot-infected and other deadwood to reduce disease inoculum in the orchard. However, this is best done during the dry summer months.) We're working hard to provide a better answer to winter pruning with Bot in mind and the tools to better prevent infection.

New Walnut Cost Study

Richard P. Buchner UCCE Farm Advisor Tehama, Glenn and Butte Cos.

University of California Cooperative Extension (UCCE), working with the UC Davis Agriculture and Natural Resources/ Agricultural Issues Center (ANR/AIC) has just published "2015 Sample Costs to Establish and Produce English Walnuts in the Sacramento Valley" authored by UCCE Farm Advisors Janine Hasey and Richard Buchner along with ANR/AIC faculty and staff Dr. Karen Klonsky, Dr. Dan Sumner, Nina Anderson and Don Stewart. The new cost study provides sample costs to establish a walnut orchard and produce walnuts under micro-irrigation for the Sacramento Valley. The study is based on the best available cost estimates and is intended as a guide only. Cost studies are used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the crop and areas but will not apply to every farm operation.

The 2015 Sacramento Valley Walnut Cost Study and sample costs of production for many commodities can be downloaded at <http://coststudies.ucdavis.edu>.

Training Young Walnut Trees: Minimum Pruning vs. No Pruning Compared

Janine Hasey, UCCE Farm Advisor Sutter/ Yuba/Colusa Cos.

Bruce Lampinen, Extension Specialist, UC Davis

Katherine Pope, UCCE Orchard Advisor Sacramento/ Solano/ Yolo Cos.

Training young walnut trees occurs in the first 1-6 years in the life of an orchard. Traditionally it has been done using a modified central leader with a minimum pruning style; the basics behind this pruning style are similar for standard spaced or hedgerow orchards. We believed for decades that if lateral bearing walnuts (most of our varieties) were not pruned, their growth would stall out from early cropping. Research conducted since 2004 investigating pruning versus non-pruning on young walnut tree growth and productivity has challenged that paradigm. Results from trials on Howard and Chandler have shown that young walnuts do not need to be pruned in order to keep them growing or to produce adequate yields. In general, unpruned trees have produced higher early yields and equivalent yields in year 4 and on compared to minimally pruned trees. We also compared unpruned and minimally pruned trees to heavily pruned trees. Heavily pruned walnut trees were smaller, had lower early yields, and is a pruning method we do not recommend.

With more knowledge comes more complexity. Growers now have the option when trees are one year old (first dormant pruning) to stick with the modified central leader and train using minimum pruning or to not prune, which saves on labor and brush disposal. Growers interested in trying the unpruned method may want to start small and compare to the minimal pruning method to make sure it fits their management system. Keep in mind, if you start with minimum pruning, changing midstream from pruning to no pruning may lead to limb breakage.

Below are the main steps comparing training walnuts for years 1-4 using the modified central leader with minimum pruning method to the unpruned training method. The assumption is a standard-spaced orchard noting differences for hedgerow systems. Young walnut trees are sensitive to freezing temperatures which can kill or damage wood so it is best to delay pruning until March or late February at the earliest.

Modified central leader with minimum pruning method:

Pruning one-year old walnut trees

- The leader (shoot selected to be the trunk) should reach a height of at least 7 to 8 feet. Ten to 12 feet of growth is adequate (*7-8 feet is sufficient for hedgerow orchards*).
- Heading the leader at 8 feet will provide more trunk area to space out scaffolds. The leader should not be headed any less than 6 ½ feet since the first primary scaffold should be at least 5 ½ -6 feet above the ground to prevent interference with equipment operation (*hedgerow - head at 6 feet, first primary should be about 4 feet above ground*). Make the heading cut into mature round wood.
- Any lateral shoots on the leader should be removed. One or two non-vigorous shoots arising low on the leader can be stubbed to 2 to 3 buds to aid caliper growth and provide shade on the south and west sides. They will be removed in the next dormant season.
- Primary buds above 5 feet from the ground that are necked and have a viable secondary bud below it should be rubbed off to the side so as not to damage the secondary bud. If left, necked buds form weak limb attachments that are subject to breakage. The secondary bud which is forced to grow will form a wide angle and develop a strong crotch.
- If the shoot selected to be the trunk has not reached sufficient height, cut it 3 to 6 buds above the point of origin and remove competing shoots. A stronger shoot can then be trained as the trunk during the second growing season.

Pruning two-year old standard-spaced walnut trees:

- The general goal is to select 4 to 6 primary scaffolds arising from the trunk in years two and three. Select the central leader which is typically the topmost branch.
- See above section for height of the first primary scaffold above ground.
- Select other primary scaffolds to form a spiral pattern around the trunk. Try to space them at least 8 inches apart. Primary scaffolds should never originate directly opposite each other; when this occurs, the leader will have a tendency to get ‘choked out’.
- Selected scaffolds should be angled about 45 degrees from the vertical. Limbs with narrower angles or bark inclusions are usually poorly attached and cannot support heavy crops. Branches with wider angles of attachment may fail to grow vigorously.
- For most lateral bearing varieties, head all primary scaffolds $\frac{1}{4}$ to $\frac{1}{3}$ of current growth depending on vigor and variety. Tulare, Forde, and Solano are very vigorous and need only tipping or no heading of the scaffolds. The leader should be left the longest.
- Remove forked branches on chosen scaffolds to a single branch. Leave remaining unselected branches and small caliper wood unheaded to create early fruiting wood.

Pruning two-year old hedgerow walnut trees:

- Select a central leader and 2 to 4 side limbs that are oriented in opposite directions in the tree row.
- Remove branches below 3 feet that will interfere with shaking and flat limbs that grow out into the middles.
- Depending on variety and vigor, selected framework limbs should be headed or tipped (see above) and cut to an outside bud facing into the tree row. Other branches can be left unheaded to fruit early.



Photo 1. An unpruned tree at the end of the third growing season. Note short shoot growth on primary branches. Photos by Bruce Lampinen



Photo 2. A minimum pruned tree at the end of the third growing season. Note secondary scaffold extension growth from heading cuts.

Pruning three-year old standard-spaced or hedgerow walnut trees (Photo 2):

- Choose the strongest, tallest scaffold for the leader and head $\frac{1}{4}$ to $\frac{1}{3}$ of the current growth. Strong secondary scaffolds in a vertical position can be tipped or left unheaded. Head or tip one strong secondary scaffold on the sides of the canopy in each cardinal direction $\frac{1}{4}$ to $\frac{1}{3}$ of the current growth.
- Forked branches can be left but twisted, rubbing or overlapping branches should be removed.

Pruning four-year old standard-spaced walnut trees (Photo 4):

- The leader can be left alone. Strong tertiary scaffolds in a vertical position can be tipped or left unheaded. Head or tip one or two tertiary scaffolds on the sides of the canopy in each cardinal direction $\frac{1}{4}$ to $\frac{1}{3}$ of the current growth. Pruning or heading is usually unnecessary after the fifth growing season if trees have filled their allotted space.

Unpruned training method:

One-year old walnut trees

- Leave the leader selected as the trunk **unheaded**.
- Remove lower limbs below 4 to 5 feet (*3 to 4 feet for hedgerows*).
- Place a long stake extension on existing stake to support the unpruned leader if needed.



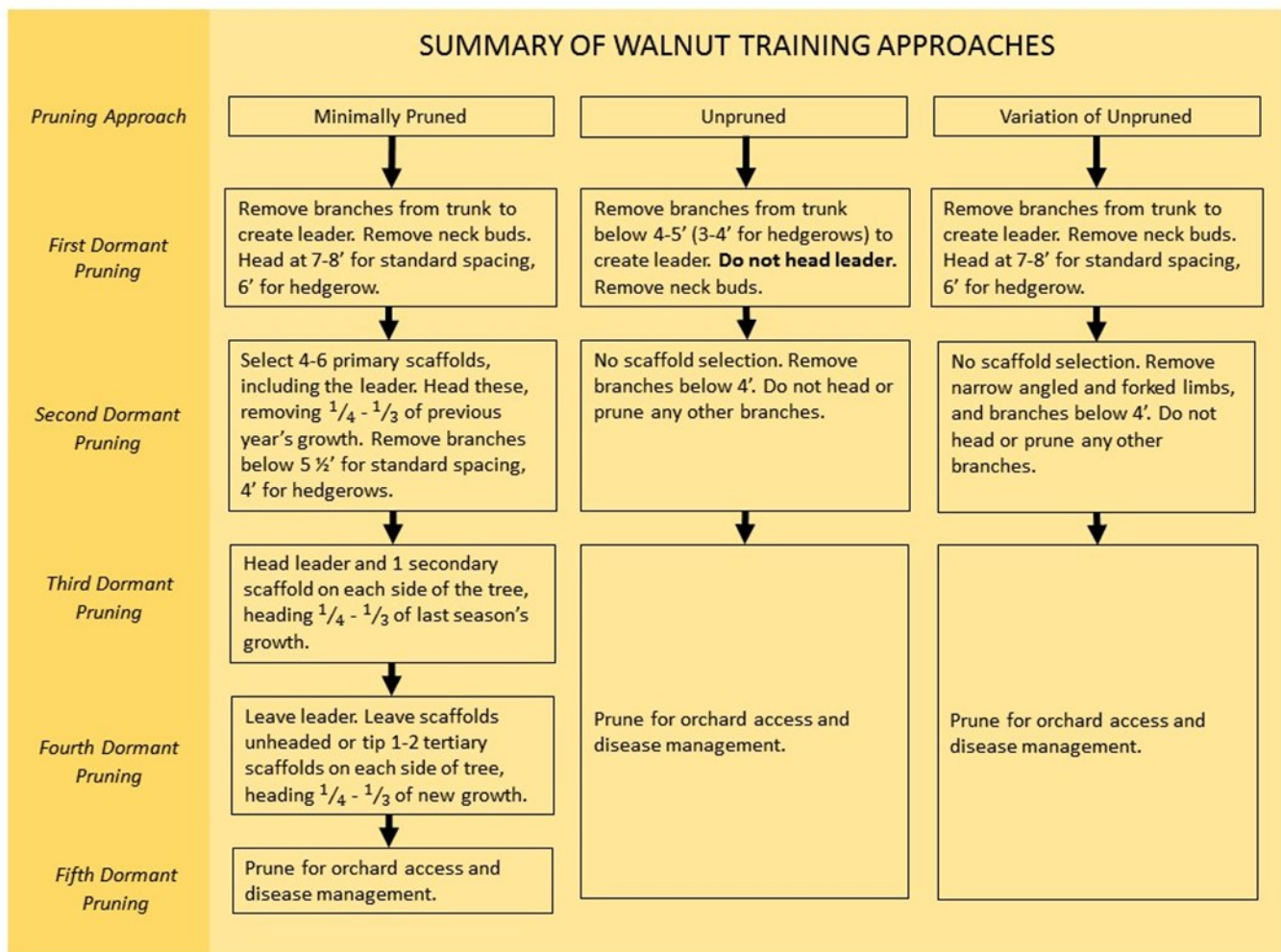
Photos 3-4. An unpruned tree (left) and a minimum pruned tree (right) at the end of the fourth growing season. Note extension growth on unpruned tree in photo 3.

Two and three-year old walnut trees:

- No pruning or heading unless lower branches need to be removed for reasons of safety or ease of maintenance and harvest.
- Note that unpruned walnuts tend to put on limb extension growth in alternate years. Individual shoots follow a pattern of extension growth (primary scaffold development during second growing season), followed by lateral branching (side branching occurring on shoot with 5-8 inches growth on the end during the third growing season (Photo 1), followed by another year of extension growth during the fourth growing season (Photo3).
- Unpruned trees tend to grow as a central leader with the primary branches naturally well-spaced along the trunk and at wide angles.

Variations of unpruned training method:

An option that has been successful in research trials and in grower's orchards is a variation of the unpruned method. The trunk is headed at the first dormant pruning as in minimal pruning, but in subsequent years, scaffold limbs (primary, secondary, etc.) are left unheaded. Some thinning of forked limbs or double leaders may be done at the second dormant pruning.



2016 UC Cooperative Extension Walnut Meetings

<p>February 12th 8:00 a.m.—Noon Pre-register for lunch to follow</p>	<p style="text-align: center;">Tehama Walnut Day Elks Lodge, Red Bluff</p> <p>Topics include: drought tips, worm pests, rootstocks, managing nitrogen, Botryosphaeria, and walnut blight, laws & regs Pre-register for lunch \$15, call 527-3101</p>
<p>February 23th 7:45 a.m.—Noon</p>	<p style="text-align: center;">Sacramento-Solano-Yolo Walnut Day Norton Hall, Woodland</p> <p>Topics include: Bot, scale management, new varieties, new leaf sampling protocol, irrigation, laws & regs</p>
<p>February 25th 12:30 p.m.—4:30 p.m.</p>	<p style="text-align: center;">Sutter-Yuba-Colusa Walnut Day Veteran's Hall, Yuba City</p> <p>Same agenda as Sacramento-Solano-Yolo Walnut Day</p>
<p>February 26th 8:00 a.m.—Noon Lunch will follow</p>	<p style="text-align: center;">Butte-Glenn Walnut Day & Chico Trade Show Manzanita Place (Elks Lodge), Chico</p> <p>Topics include: weed management, walnut blight control, codling moth mating disruption</p>
<p>March 1st Morning Rain date: March 3rd</p>	<p style="text-align: center;">Walnut (8th leaf) No Pruning / Pruning Comparison Field Meeting Nickels Soil Lab, Arbuckle</p>
<p>March 1st Afternoon Rain date: March 3rd</p>	<p style="text-align: center;">Walnut (3rd leaf) No Pruning / Variation of No Pruning / Pruning Grower Comparison Field Meeting Wheatland</p>

Nonprofit Organization
U. S. Postage Paid
Orland, CA 95963
Permit No. 63

Glenn County
Cooperative Extension
P. O. Box 697
Orland, CA 95963