



Walnut Year-Round IPM Program *(Reviewed 7/17)*

ANNUAL CHECKLIST

Use these guidelines for a monitoring-based IPM program to effectively manage pests, while reducing the risks of pesticides on the environment and human health.

When a pesticide application is considered, review the **Pesticide Application Checklist** at the bottom of this page for information on how to minimize the risks of pesticide use to water and air quality. Water quality can be impaired when pesticides drift into waterways or when they move off-site. Air quality can be impaired when pesticide applications release volatile organic compounds (VOCs) into the atmosphere.

This year-round IPM program covers the major pests of walnut in California. Details on carrying out each practice, example monitoring forms, and information on additional pests can be found in the Pest Management Guidelines. Track your progress through the year with this annual checklist form. Color photo identification pages and examples of monitoring forms can be found online at: <http://ipm.ucanr.edu/FORMS/>.

✓ Done	Dormancy Special issues of concern related to environmental quality: none identified.
	Manage orchard floor vegetation: <ul style="list-style-type: none"> • Continue postharvest weed assessment in late fall to identify those that were not controlled by fall treatment. • Keep records (example form weed survey form available online)
	Assess levels on the ground and in trees for navel orangeworm management.
	Look for scale pests and mites and evidence of parasitism. <ul style="list-style-type: none"> • Examine scaffolds, limbs, branches, spurs and prunings, for scale pests (walnut scale, San Jose scale, frosted scale, European fruit lecanium) and European red mite eggs. • Note areas of concern for possible treatment.
	Other pests you may see: <ul style="list-style-type: none"> • Fruittree leafroller egg masses • Italian pear scale • San Jose scale

✓ Done	Delayed-dormancy Special issues of concern related to environmental quality: none identified.
	If a significant number of mummy nuts are still on trees or on the ground at the end of February: <ul style="list-style-type: none"> • Remove mummy nuts from trees before mid-March. • Flail mow to destroy mummy nuts.
	Mow ground cover before bloom.
	If dormant scale monitoring indicated need, manage according to the Pest Management Guidelines: <ul style="list-style-type: none"> • European fruit lecanium and frosted scale • Walnut scale • San Jose scale
	Look for the following pests if they have been a problem in the past: <ul style="list-style-type: none"> • European red mite • Italian pear scale Manage if needed according to the Pest Management Guidelines.

✓ Done	Delayed-dormancy Special issues of concern related to environmental quality: none identified.
	Manage squirrels before April, if needed.
✓ Done	Budbreak through bloom Special issues of concern related to environmental quality: pesticide runoff.
	If conditions favor walnut blight, Manage according to the Pest Management Guidelines.
	Place codling moth pheromone traps in mid-March to determine first moth emergence. <ul style="list-style-type: none"> • Check traps twice weekly until biofix, and weekly thereafter. • Use degree-days for monitoring pest development. • Keep records (example degree day monitoring form available online).
	If using mating disruptants for codling moth, place them in orchards using female biofix according to the Pest Management Guidelines.
	Look for dead and Botryosphaeria and Phomopsis infected branches. Flag trees for pruning in summer or after rainfall ceases. Consider using the Leaf Wetness Model (LWM) to time fungicide sprays if rainfall is greater than 0.25 inch and temperatures are greater than 50°F.
	Look for crown gall and manage if needed according to the Pest Management Guidelines.
	Keep records of other pests you may see: <ul style="list-style-type: none"> • Phytophthora • Armillaria (oak root fungus) • Gophers • Ground Squirrels • Tree Squirrels
✓ Done	Nut development (fruit set to harvest) Special issues of concern related to environmental quality: pesticide runoff.
	If conditions favor for walnut blight development: <ul style="list-style-type: none"> • Manage according to the Pest Management Guidelines if rainy conditions continue beyond bloom. • Or use the Xanthocast model to determine the need for and timing of blight sprays.
	Maintain codling moth management program: <ul style="list-style-type: none"> • Check traps and keep records (example degree day monitoring form available online). • If using sprayable mating disruptants, reapply according to the Pest Management Guidelines instructions. • Check traps and canopy nut counts to determine the need for supplemental sprays. • If not using mating disruptants apply pesticides only if necessary according to the Pest Management Guidelines.
	If dormant monitoring indicated infestations of walnut scale: <ul style="list-style-type: none"> • Monitor for crawlers. • Manage if needed according to the Pest Management Guidelines.
	Begin examining leaves for aphids. <ul style="list-style-type: none"> • Look for aphids, aphid mummies, and natural enemies. • Manage if needed according to the Pest Management Guidelines.
	Take leaf samples in July for nutrition analysis.
	Initiate fertilizer application and establish a nitrogen budget.
	If Botryosphaeria and Phomopsis infection are a concern: <ul style="list-style-type: none"> • Manage if needed according to Pest Management Guidelines beginning in mid-May

✓ Done	Nut development (fruit set to harvest) Special issues of concern related to environmental quality: pesticide runoff.
	<ul style="list-style-type: none"> • Look for dead and infected branches. Consider pruning for Botryosphaeria and Phomopsis cankers to reduce inoculum during dry summer months.
	<p>Start monitoring for web-spinning mites when the weather warms up, once per week through August.</p> <ul style="list-style-type: none"> • Keep records (example mite monitoring form available online). • Manage if needed according to the Pest Management Guidelines.
	<p>Assess weeds in late spring, and identify those not controlled by fall and winter treatments. Keep records (example form available online).</p>
	<p>Manage weeds in tree rows with preemergence or postemergence herbicides or nonchemically in organic orchards. Manage weeds in row middles with mowing, cultivation or herbicides.</p>
	<p>Monitor for walnut husk fly.</p> <ul style="list-style-type: none"> • Set out supercharged walnut husk fly traps by June 1 and mid-May in coastal areas and check traps at least twice a week. • If using GF120 bait sprays, apply at first fly catch and use only in orchards with low numbers. • Keep records (example walnut husk fly monitoring form available online). <p>If using insecticide and bait sprays:</p> <ul style="list-style-type: none"> • Manage according to the Pest Management Guidelines when there is a sudden increase in trap catches, when the first flies are caught or when the first egg is detected. <p>Don't apply insecticides within 3 weeks of harvest.</p>
	<p>Consider using the plant growth regulator ethephon to hasten husk split for early harvest if navel orangeworm is a problem. Consult with your pest control adviser (PCA) or crop consultant about the need for pre-harvest insecticide applications.</p>
	<p>Bait ground squirrels, if needed, when vegetation begins to dry.</p>
	<p>Other pests you may see:</p> <ul style="list-style-type: none"> • Crown gall • Fall webworm • Ground squirrel • Phytophthora root and crown rot • Redhumped caterpillar • Tree squirrel
✓ Done	Harvest Special issues of concern related to environmental quality: none.
	<p>Harvest nuts promptly to reduce potential for navel orangeworm damage and to preserve kernel quality.</p>
	<p>Sample nuts at harvest to evaluate your pest management program.</p> <ul style="list-style-type: none"> • Distinguish codling moth from navel orangeworm damage. <ul style="list-style-type: none"> ◦ Navel orangeworm has brown, crescent-shaped marks behind the head, and leaves copious frass and webbing inside the shell. ◦ Mushy black hulls with no kernel damage and black stained shells indicates walnut husk fly. • Black hulls with peduncle (stem) still attached may indicate Botryosphaeria infection. <p>Be aware that nuts with dried black hulls can also indicate a water management problem. Evaluate this season's management program and plan for the next season's management.</p>
✓ Done	Postharvest Special issues of concern related to environmental quality: herbicide runoff.
	<p>Look for dead and infected branches from Botryosphaeria and Phomopsis cankers. Only prune to reduce inoculum if there is a dry period predicted. Otherwise prune during summer.</p>
	<p>Manage orchard floor vegetation.</p>

	<ul style="list-style-type: none"> • Assess weeds and keep records (example weed survey form available online). • Plant cover crops after harvest to reduce water runoff and improve nitrogen management. Select an appropriate late planting mix that will succeed after harvest.
	<ul style="list-style-type: none"> • Apply preemergence herbicides in-row before fall weeds emerge and include a post-emergence herbicide if weeds have started to emerge. Consider blowing or sweeping leaf debris immediately before applying preemergence herbicides to facilitate herbicide contact with soil.
	Remove huller waste materials to reduce navel orangeworm overwintering sites.

✓ Done	<h2 style="margin: 0;">Pesticide application checklist</h2> <p>When planning for possible pesticide applications in an IPM program, consult the Pest Management Guidelines, and review and complete this checklist to consider practices that minimize environmental and efficacy problems.</p>
	<p>✓ Choose a pesticide from the Pest Management Guidelines for the target pest, considering:</p> <ul style="list-style-type: none"> • Impact on natural enemies and pollinators. For more information see Protecting Natural Enemies and Pollinators at http://ipm.ucanr.edu/mitigation/protect_beneficials.html. • Potential for water quality problems using the UC IPM WaterTox database. See http://ipm.ucanr.edu/TOX/simplewatertox.html. • Impact on aquatic invertebrates. For more information, see <i>Pesticide Choice</i>, UC ANR Publication 8161 (PDF), http://anrcatalog.ucanr.edu/pdf/8161.pdf. • Chemical mode of action, if pesticide resistance is an issue. For more information, see <i>Herbicide Resistance: Definition and Management Strategies</i>, UC ANR Publication 8012 (PDF), http://anrcatalog.ucanr.edu/pdf/8012.pdf. • Endangered species that may be near your site. Find out using the Department of Pesticide Regulation's PRESCRIBE program. (http://cdpr.ca.gov/docs/endspec/prescint.htm)
	<p>✓ Before an application</p> <p>Ensure that spray equipment is properly calibrated to deliver the desired pesticide amount for optimal coverage. See http://ipm.ucanr.edu/training/incorporating-calibration.html.</p> <p>Use appropriate spray nozzles and pressure to minimize off-site movement of pesticides.</p> <p>Avoid spraying during these conditions to avoid off-site movement of pesticides.</p> <ul style="list-style-type: none"> • Wind speed over 10 and under 3 mph • Temperature inversions • Just prior to rain or irrigation (unless it is an appropriate amount, such as when incorporating a soil-applied pesticide) • At tractor speeds over 2 mph <p>Identify and take special care to protect sensitive areas (for example, waterways or riparian areas) surrounding your application site.</p> <p>Review and follow labeling for pesticide handling, personal protection equipment (PPE) requirements, storage, and disposal guidelines.</p> <p>Check and follow restricted entry intervals (REI) and preharvest intervals (PHI).</p>
	<p>✓ After an application</p> <p>Record application date, product used, rate, and location of application.</p> <p>Follow up to confirm that treatment was effective.</p>
	<p>✓ Consider water management practices that reduce pesticide movement off-site.</p> <p>Consult relevant publications:</p>

✓ Done	Pesticide application checklist
	<ul style="list-style-type: none"> • <i>Reducing Runoff from Irrigated Lands: Orchard Floor Management Practices to Reduce Erosion and Protect Water Quality</i>, UC ANR Publication 8202 (PDF), http://anrcatalog.ucanr.edu/pdf/8202.pdf. • <i>Reducing Runoff from Irrigated Lands: Causes and Management of Runoff from Surface Irrigation in Orchards</i>, UC ANR Publication 8214 (PDF), http://anrcatalog.ucanr.edu/pdf/8214.pdf. • <i>Protecting Surface Water from Sediment-Associated Pesticides in Furrow-Irrigated Crops</i>, UC ANR Publication 8403 (PDF), http://anrcatalog.ucanr.edu/pdf/8403.pdf.
	Consult the Department of Pesticide Regulation Groundwater Protection Program (GWPA) website for pesticide information and mitigation measures. (http://cdpr.ca.gov)
	Install an irrigation recirculation or storage and reuse system. Redesign inlets into tailwater ditches to reduce erosion. For more information, see these publications: <ul style="list-style-type: none"> • <i>Reducing Runoff from Irrigated Lands: Tailwater Return Systems</i>, UC ANR Publication 8225 (PDF), http://anrcatalog.ucanr.edu/pdf/8225.pdf. • <i>Reducing Runoff from Irrigated Lands: Storing Runoff from Winter Rains</i>, UC ANR Publication 8211 (PDF), http://anrcatalog.ucanr.edu/pdf/8211.pdf.
	Use drip rather than sprinkler or flood irrigation.
	Limit irrigation to amount required using soil moisture monitoring and evapotranspiration (ET). For more information, see: <ul style="list-style-type: none"> • <i>Reducing Runoff from Irrigated Lands: Understanding Your Orchard's Water Requirements</i>, UC ANR Publication 8212 . • <i>Using the Pressure Chamber for Irrigation Management in Walnut, Almond, and Prune</i>, UC ANR Publication 8503.
	Consider using cover crops.
	Consider vegetative filter strips or ditches. (For more information, see <i>Vegetative Filter Strips</i> , UC ANR Publication 8195 (PDF), http://anrcatalog.ucanr.edu/pdf/8195.pdf .)
	Apply polyacrylamides in furrow and sprinkler irrigation systems to prevent off-site movement of sediments.
	✓ Consider practices that reduce air quality problems.
	When possible, reduce volatile organic compound (VOC) emissions by decreasing the amount of pesticide applied, choosing low-emission management methods, and avoiding fumigants and emulsifiable concentrate (EC) formulations.
	Use the Department of Pesticide Regulation calculators to determine VOC emission rates from fumigant and nonfumigant pesticides. (http://cdpr.ca.gov)
More information about topics mentioned on this checklist is available at the UC IPM website: http://ipm.ucanr.edu/PMG/selectnewpest.walnut.html .	
For more about mitigating the effects of pesticides, see the Mitigation pages: http://ipm.ucanr.edu/mitigation/ .	