

2023 | WILLAMETTE VALLEY

APPLE

PEST MANAGEMENT GUIDE



Photo: Lynn Ketchum, © Oregon State University

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This guide lists recommendations for insect, mite and disease control in apple orchards. The chemicals, formulations and application rates listed here are based on label directions, research and orchard experience.

Pest management depends on producers and their knowledge of the orchard and its characteristics. Producers must weigh several factors: cultivar, tree size, tree density, canopy characteristics, pest complex and pest history. Consider all these factors when choosing which chemicals to apply and at what rates. Other variables include the amount of water used per acre, and the method of application.

Trade name products are mentioned as examples only. Occasionally, manufacturers register different formulations of a product that contain a different concentration of active ingredient. This does not mean that OSU Extension either endorses these products or intends to discriminate against products not mentioned. Consult product labels to determine whether their use confers advantages over the products listed in this guide.

Always refer to the pesticide label for use instructions. It is the legal document.

Producers ask two common questions about the chemical control of insects and diseases:

- “How much chemical do I use per acre?”
- “What is the least amount of water I need per acre to apply in my concentrate sprayer?”

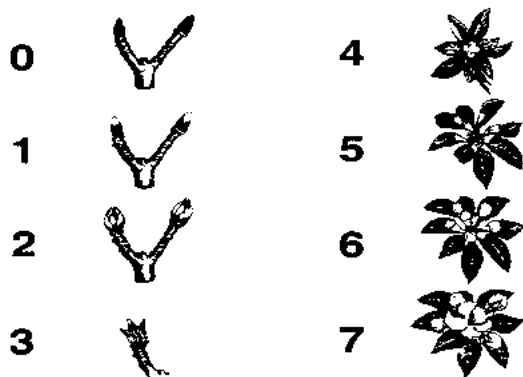
The following schedule suggests an amount of formulated product to use per acre, and not the amount of active ingredient. This amount is based on a “typical” orchard of middle age and average tree density, with moderate pest pressure. Less product may be needed in 1- to 4-year-old orchards. Conversely, more chemical (within label limits) may be required for large, mature

trees experiencing heavy pressure from multiple pests.

Many insecticide labels list the minimum amount of water needed per acre in concentrate sprays of insecticides. Labels also tell users how to calculate the amount of chemical needed per acre in a concentrate sprayer. **CHECK THE LABEL BEFORE SPRAYING!** Also:

- Make sure any tank-mixes of pesticides are compatible. For example, the elevated pH of some boron spray solutions weakens many insecticides. Water hardness above 250-300 ppm can also negatively affect pesticide efficacy, particularly for certain herbicides.
- Use adjuvants and spreader stickers with caution.
- Rotate pesticides by mode of action (group); do not become reliant on a single group for control.
- In this guide, mode of action (MoA) for insecticides is based on the Insecticide Resistance Action Committee (IRAC) classification (irac-online.org). Fungicide mode of action is based on the Fungicide Resistance Action Committee (FRAC) classification (www.frac.info).
- Herbicide site of action is based on the Herbicide Resistance Action Committee (HRAC) classification (hracglobal.com).
- Premix products may have reduced rates of active ingredients, and may contribute to development of resistance.
- Important: Be aware of worker protection standards. All new pesticide labels provide orchard reentry intervals and personal protection equipment information. See Oregon standards online at <https://osha.oregon.gov/Pages/topics/worker-protection-standard.aspx>.

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Stages

Delayed dormant (Stages 1–2)
 Prepink or green bud (Stages 3–4)
 Pink or preblossom (Stages 5–6)

Not shown

Calyx; cover sprays; pre- or postharvest

Apple pest control recommendations

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides and insecticides. Materials are not listed in order of preference.

STAGES 1-2: Delayed dormant

Pest or disease/material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
European red mite eggs, scale, aphid eggs and apple rust mite			
Note: Delayed dormant stage is the best time to control San Jose scale. See footnote 1, page 10.			
Apollo SC	clofentezine	4–8 oz	Group 10A miticide. Do not use any combination of Apollo and any other group 10A in the same growing season. Ground applications only. 12-hour reentry.
Centaur WDG	buprofezin	34.5–46 oz	Group 16 insecticide (IGR). No more than 2 applications per season. Do not tank mix with oil. 12-hour reentry.
Horticultural mineral oil + one of the following:		4–8 gal	4-hour reentry.
Diazinon 50WP	diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to one dormant and one cover spray per season. Targets aphids, mites, leafrollers, and scale at this timing. Closed cab required. 24-hour reentry.
Esteem 35WP	pyriproxyfen	4–5 oz	Group 7C (IGR). Limited to 3 applications per season. Targets leafroller and scale at this timing. 12-hour reentry.
lime sulfur	calcium polysulfides	5–10 gal	OMRI approved for organic use. 2-day reentry.
Onager	hexythiazox	12–24 oz	Group 10A miticide. No more than one application per season of this or any other group 10A product (hethythiazox). 12-hour reentry.
Savey 50DF	hexythiazox	4–6 oz	Group 10A miticide. One application per season. Do not use any combination of Apollo and any other group 10A in the same growing season. 12-hour reentry.
Sivanto 200SL	flupyradifurone	10.5–14 oz	Group 4D insecticide. Targets San Jose scale at this timing. 4-hour reentry.
Crown and collar rot			
Note: Aliette, Agri-Fos, Fosphite, OxiPhos, Phostrol and Rampart also registered but may be more useful in the fall.			
Ridomil Gold SL	mefenoxam	0.5 pt/100 gal water	Group 4 fungicide. Rates are based on tree size. Have rain or irrigation move material into root zone. 48-hour reentry.
MetaStar 2E	metalaxyl	1 qt/100 gal water	Group 4 fungicide. Rates are based on tree size. 48-hour reentry.
Fire blight			
Fire blight can occur in the Willamette Valley if temperatures are warm during bloom. Remove hold-over cankers and any nearby hosts such as hawthorn trees in fencerows. Note: See copper-based materials listed for anthracnose postharvest. Application of a copper-based product at delayed dormant stage will help delay the activation of missed hold-over cankers and possibly reduce fungicide-resistant scab isolates.			

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STAGES 3–4: Prepink or green bud *Little leaves separating just enough to expose blossom bud cluster*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Scab (see footnote 5 and footnote 6, page 10, and Table 1, page 14)			
Captan 80WDG	captan	2.5–5 lb	See footnote 3, page 10. Group M4 fungicide. 24-hour reentry. 0-day PHI.
Cevya	mefentrifluconazole	3-5 fl oz	Group 3 fungicide. 12-hour reentry. 0-day PHI.
Flint Extra	trifloxystrobin	2–2.5 oz	Group 11 fungicide. 12-hour reentry. 14-day PHI.
Indar 2F	fenbuconazole	6–8 fl oz	Group 3 fungicide. Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	difenoconazole + cyprodinil	12 fl oz	Group 3 + 9 fungicide. 12-hour reentry. 14-day PHI.
Lime Sulfur Ultra	calcium polysulfide	0.75–1.25 gal/100 gal water	See footnote 2, page 10.
Luna Sensation	fluopyram + trifloxystrobin	4–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	fluopyram + pyrimethanil	11.2–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Mancozeb	Mn + Zn + ethylene bisdithiocarbamate	3 or 6 lb	Group M3 fungicide. Do not use the 6-lb rate beyond bloom. 24-hour reentry. 77-day PHI.
Merivon	fluxapyroxad + pyraclostrobin	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Omega 500F	fluazinam	10–13.8 fl oz	Group 29 fungicide. 12-hr reentry. 28-day PHI.
Polyram 80DF	metiram	6 lb	Do not use this rate beyond bloom. 24-hour reentry. 77-day PHI.
Pristine	pyraclostrobin + boscalid	14.5–18.5 oz	Mix with an adjuvant. Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure and generics	triflumizole	8–16 fl oz	See footnote 5, page 10. Should be tank-mixed with a product that has good protection activity. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Rally 40WSP	myclobutanil	5–8 oz	Group 3 fungicide. Do not apply more than 5 lb/A per season. Should be tank-mixed with a product that has good protection activity. 24-hour reentry. 14-day PHI.
Rhyme	flutriafol	6.5 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Sovran	kresoxim-methyl	3.2–6.4 oz	Group 11 fungicide. See footnote 10, page 13. 12-hour reentry. 30-day PHI.
Syllit FL	dodine	1.5 pt	Mix with another fungicide. See footnote 4, page 10. Group U12 fungicide. 48-hour reentry. Do not apply after pink bud.
Tesaris	fluxapyroxad	3.5-4.5 fl oz	Mix with another fungicide. Group 7 fungicide. Do not use with oil based products. 12-hour reentry. 0-day PHI.
TopGuard SC	flutriafol	13 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Powdery mildew			
Aprovia	benzovindiflupyr	5.5–7 fl oz	Mix with an adjuvant. Group 7 fungicide. 12-hour reentry. 30-day PHI.
Excalia	Inpyrfluxam	3-4 fl oz	Use with a non-oil based adjuvant. Do not use past petal fall. Group 7 fungicide. 12-hr reentry.
Flint Extra	trifloxystrobin	2–2.5 oz	Group 11 fungicide. 12-hour reentry. 14-day PHI.
Fontelis	penthiopyrad	16–20 fl oz	Group 7 fungicide. 12-hour reentry. 28-day PHI.
Gatten	Flutriafil	6-8 fl oz	Do not use within 14 days of harvest. Group U13 fungicide. 12-hr reentry.
HMO such as JMS Sty-let oil	oils	1–2 gal/100 gal water	Do not use past second cover or near sulfur sprays or on wet foliage. 4-hour reentry.
Indar 2F	fenbuconazole	6–8 fl oz	Group 3 fungicide. Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	difenoconazole + cyprodinil	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
Lime Sulfur Ultra	calcium polysulfide	1–1.5 gal/100 gal water	See footnote 2, page 10.
Luna Sensation	fluopyram + trifloxystrobin	5–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	fluopyram + pyrimethanil	11.2–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.

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STAGES 3–4: Prepink or green bud *Little leaves separating just enough to expose blossom bud cluster*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Merivon	fluxapyroxad + pyraclostrobin	4–5.5 fl oz	Do not use with EC or oil-based products. Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Oso SC	polyoxin D zinc salt	3.75–13 fl oz	Group 19 fungicide. 4-hour reentry. 0-day PHI.
Ph-D WDG	polyoxin D zinc salt	6.2 oz	Group 19 fungicide. 4-hour reentry. 0-day PHI.
Pristine	pyraclostrobin + boscalid	14.5–18.5 oz	The addition of a silicone-based surfactant has improved control. Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure and generics	triflumizole	8–16 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.
Rally 40WSP	myclobutanil	5–10 oz	Group 3 fungicide. Do not exceed 5 lb/A per season. 24-hour reentry. 14-day PHI.
Rhyme	flutriafol	4-6 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Sovran	kresoxim-methyl	4–6.4 oz	Group 11 fungicide. See footnote 10, page 13. 12-hour reentry. 30-day PHI.
Tesaris	fluxapyroxad	3.5-4.5 fl oz	Mix with another fungicide. Group 7 fungicide. Do not use with oil-based products. 12-hr reentry. 0-day PHI.
TopGuard	flutriafol	8–12 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.
Torino	cyflufenamid	6.8 oz	Only one application allowed per year. 14-day PHI. Group U6 fungicide. 4-hr reentry.

Green fruit worm, leafrollers, aphids, plant bugs, tentiform leafminer

Tentiform leafminer is a concern only if it was a problem the previous season and low levels of parasitism were observed.

Altacor	chlorantraniliprole	2.5–4.0 oz	Group 28 insecticide. Targets moth larvae and leafminer at this timing. 4-hour reentry.
<i>Bacillus thuringiensis kurstaki</i> (Btk)	bacterium	See label rates.	Multiple formulations available. Spray when larvae first detected. OMRI approved for organic use. Apply with a sticker. Highly effective against leaf-roller larvae. 4-hour reentry. 0-day PHI.
Delegate 25WG	spinetoram	4.5–7 oz	Group 5 insecticide. Targets moth larvae at this timing. 4-hour reentry.
Diazinon 50WP	diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to one dormant and one cover spray per season. Closed cab required. 24-hour reentry.
Entrust SC	spinosad	4-10 oz	Group 5 insecticide. OMRI listed for organic use. No more than 4 applications or 29 oz per year. Moth larvae, thrips and leafminer at this timing. 4-hour reentry.
Esteem 35WP	pyriproxyfen	4–5 oz	Group 7C (IGR). Limited to 3 applications per season. Targets leafroller and scale at this timing. 12-hour reentry.
Proclaim 5SG	emamectin benzoate	3.2–4.8 oz	Group 6 insecticide. Apply after egg hatch to target early moth larvae. Efficacy enhanced when applied in combination with horticultural spray oil or nonionic surfactant. 12-hour reentry.
Success 2L	spinosad	4–8 oz	Group 5 insecticide. Moth larvae, thrips, and leafminer at this timing. 4-hour reentry.

STAGES 5–6: Pink or preblossom *Just before blossoms open*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Apple rust mite			
Envidor 2SC	spirodiclofen	16–18 oz	Group 23 miticide. 12-hour reentry.
FujiMite 5EC	fenpyroximate	2 pt	Group 21A insecticide. 12-hour reentry.
Scab and powdery mildew			
See materials listed for prepink or green bud stage.			

STAGES 5–6: Pink or preblossom *Just before blossoms open*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Codling moth (mating disruption) Many hand-applied pheromone dispenser products are available, and all of them can work, provided codling moth populations are moderate to low. Consider using well-timed insecticide applications to bring populations of codling moth to a level that will allow mating disruption to work effectively. Aerosol pheromone dispensers (puffers) can also be used at the rate of 1 unit/acre. Check label recommendations. Apply dispensers ahead of moth flight. Do not use mating disruption on orchards less than 10 acres in size.			
Checkmate CM-XL	pheromone	200 ties	—
Isomate-C+	pheromone	400 ties	—
Isomate-CTT	pheromone	200 ties	—

CALYX *When three-fourths of petals have fallen; apply before calyx closes on central fruit cluster*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Scab (See footnote 5 and footnote 6, page 10 and Table 1, page 11)			
Aprovia	benzovindiflupyr	5.5–7 fl oz	Mix with another fungicide and an adjuvant. Group 7 fungicide. 12-hour reentry. 30-day PHI.
Captan 80WDG	captan	2.5–5 lb	See footnote 3, page 10. Group M4 fungicide. 24-hour reentry. 0-day PHI.
Cevya	Mefentrifluconazole	3-5 fl oz	Group 3 fungicide. 12-hour reentry. 0-day PHI.
Flint Extra	trifloxystrobin	2–2.5 oz	Group 11 fungicide. 12-hour reentry. 14-day PHI.
Fontelis	penthiopyrad	16–20 fl oz	Tank-mix with another fungicide and use after bloom. Group 7 fungicide. 12-hour reentry. 28-day PHI.
Indar 2F	fenbuconazole	6–8 fl oz	Add a wetting agent. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Inspire Super	difenoconazole + cyprodinil	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
Lime Sulfur Ultra	calcium polysulfide	2 qt/100 gal water	See footnote 2, page 10.
Luna Sensation	fluopyram + trifloxystrobin	4–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	fluopyram + pyrimethanil	11.2–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Mancozeb	Mn + Zn + ethylene bisdithiocarbamate	3 lb	Group M3 fungicide. 24-hour reentry. 77-day PHI.
Merivon	fluxapyroxad + pyraclostrobin	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Omega 500F	fluazinam	10 –13.8 fl oz	Group 29 fungicide. 12-hr reentry. 28-day PHI.
Polyram 80DF	metaram	3 lb	Group M3 fungicide. 24-hour reentry. 77-day PHI.
Pristine	pyraclostrobin + boscalid	14.5–18.5 oz	The addition of a silicone-based surfactant has improved control. Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure and generics	triflumizole	8–16 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI. Scab (See footnote 5 and footnote 6, page 10 and Table 1, page 11)
Rally 40WSP	myclobutanil	5–8 oz	Group 3 fungicide. Do not apply more than 5 lb/A per season. Should be tank-mixed with a product that has good protection activity. 24-hour reentry. 14-day PHI.
Rhyme	flutriafol	6.5 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Scala SC	pyrimethanil	5–10 oz	Group 9 fungicide. Tank-mix with another fungicide and use after bloom. 12-hour reentry. 72-day PHI.
Sovran	kresoxim-methyl	3.2–6.4 oz	Group 11 fungicide. See footnote 10, page 10. 12-hour reentry. 30-day PHI.
Tesaris	fluxapyroxad	3.5-4.5 fl oz	Mix with another fungicide. Group 7 fungicide. Do not use with oil-based products. 12-hr reentry. 0-day PHI.
TopGuard SC	flutriafol	13 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Ziram 76DF	ziram	6 lb	Group M3 fungicide. 2-day reentry. 14-day PHI.

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CALYX *When three-fourths of petals have fallen; apply before calyx closes on central fruit cluster*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Powdery mildew			
Aprovia	benzovindiflupyr	5.5–7 fl oz	Mix with another fungicide and an adjuvant. Group 7 fungicide. 12-hour reentry. 30-day PHI.
Flint Extra	trifloxystrobin	2–2.9 oz	Group 11 fungicide. 12-hour reentry. 14-day PHI.
Fontelis	penthiopyrad	16–20 fl oz	Group 7 fungicide. Tank mix with another fungicide. 12-hour reentry. 28-day PHI.
Gatten	flutrianiol	6–8 fl oz	Do not use within 14 days of harvest. Group U13 fungicide. 12-hr reentry.
Indar 2F	fenbuconazole	6–8 fl oz	Group 3 fungicide. Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	difenoconazole + cyprodinil	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
JMS Stylet oil	oil	1–2 gal/100 gal water	Do not use past second cover or near sulfur sprays or on wet foliage. 4-hour reentry. OMRI listed for organic use.
Lime Sulfur Ultra	calcium polysulfide	2 qt/100 gal water	See footnote 2, page 10.
Luna Sensation	fluopyram + tri-floxystrobin	5–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	fluopyram + py-rimethanil	12–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Merivon	fluxapyroxad + pyraclostrobin	4–5.5 fl oz	Do not use with EC or oil-based products. Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Oso SC	polyoxin D zinc salt	3.75–13 fl oz	Group 19 fungicide. 4-hour reentry. 0-day PHI.
Ph-D WDG	polyoxin D zinc salt	6.2 oz	Group 19 fungicide. 4-hour reentry. 0-day PHI.
Pristine	pyraclostrobin + boscalid	14.5–18.5 oz	Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure and generics	triflumizole	8–16 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.
Rally 40WSP	myclobutanil	5–10 oz	Group 3 fungicide. Do not apply more than 5 lb/A per sea-son. 24-hour reentry. 14-day PHI.
Rhyme	flutriafol	4–6 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Sovran	kresoxim-methyl	4–6.4 oz	Group 11 fungicide. See footnote 10, page 10. 12-hour reentry. 30-day PHI.
Tesaris	fluxapyroxad	3.5–4.5 fl oz	Mix with another fungicide. Group 7 fungicide. Do not use with oil based products. 12-hr reentry. 0-day PHI.
TopGuard SC	flutriafol	8–12 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.

COVER SPRAYS *1–4 cover sprays may be needed*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Codling moth, leafrollers			
Altacor	chlorantraniliprole	2.5–4 oz	Group 28 insecticide. Apply prior to egg hatch for 10–17 days of protection. 4-hour reentry. 5-day PHI.
Assail 70WP	acetamiprid	1.7–3.4 oz	Group 4A insecticide. No more than 4 applications per season. Combine with horticultural oil for increased efficacy on codling moth. 12-hour reentry.
Avaunt 30WDG	indoxacarb	5–6 oz	Group 22 insecticide. For use against low codling moth populations. 12-hour reentry. 28-day PHI.
Granulosis virus	virus	See label.	Group 11 insecticide. OMRI listed for organic use. Codling moth granulosis virus, multiple formulations available. Use nonchlorinated water with pH near 7. Make 2 applications per codling moth generation. 4-hour reentry. 0-day PHI.
Danitol 2.4EC	fenpropathrin	16–21.3 oz	Group 3 insecticide/miticide. Restricted use. Apply at 250 degree days after biofix. 24-hour reentry. 14-day PHI.
Delegate	spinetoram	6–7 oz	Group 5 insecticide. Begin applications just prior to egg hatch, approx. 220 to 250 days after biofix. No more than 4 applications per year. 7-day PHI.

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Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Diazinon 50WP	diazinon	1 lb	Group 1B insecticide. Restricted use. Limited to 1 foliar application per season. Enclosed cab required. 4-day reentry. 21-day PHI.
Entrust SC	spinosad	6–10 oz	Group 5 insecticide. OMRI listed for organic use. Targets larval stages. No more than 4 applications or 29 oz per year. 4-hour reentry. 7-day PHI.
Esteem 35WP	pyriproxyfen	4–5 oz	Group 7 insecticide. Apply approximately 14 to 21 days after petal fall or at peak moth flight. 12-hour reentry. 45-day PHI.
Exirel 0.83SE	cyantraniliprole	10–17 oz	Group 28 insecticide. Apply prior to egg hatch for 10 to 14 days of control. No more than 3 applications of Group 28 insecticides per year. 12-hour reentry. 3-day PHI.
Imidan 70WP	phosmet	2.125–5.75 lb	Group 1B insecticide. A water-soluble bag formulation is also available. 7-day reentry. 7-day PHI.
Intrepid 2F	methoxyfenozide	16 oz	Group 18 insecticide. Apply at or just prior to egg hatch. Suppression of codling moth only, appropriate for low infestations. 4-hour reentry. 14-day PHI.
Proclaim 5SG	emamectin benzoate	3.2–4.8 oz	Group 6 insecticide. Restricted use. For codling moth, provides suppression only. Apply immediately after hatch. 12-hour reentry. 14-day PHI.
Rimon 0.83EC	novaluron	30–50 oz	Group 15 insecticide. Apply at the onset of egg hatch to target small larvae. This occurs at approximately 50 to 75 degree days for the first generation and 1,000 degree days for the second generation. 14-day PHI.

Codling moth, aphids, leafrollers, scale crawlers

Diazinon 50WP	diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to 1 foliar application per season. Enclosed cab required. 4-day reentry. 21-day PHI.
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Brown marmorated stink bug

Brown marmorated stink bug is an increasing problem in Willamette Valley apples. Feeding damage from adults and nymphs affects fruit cosmetics and quality, causing symptoms similar to bitter pit, with corky tissue below the skin of the fruit (slice below the skin to see damage). BMSB damage can be distinguished from bitter pit because the corky spots will be near the fruit surface and not throughout the fruit. Monitor for BMSB using commercially available pheromone traps placed close to surrounding vegetation. Alternate hosts include many crop plants, as well as ornamental, naturalized and native plant species such as English holly, bigleaf maple, tree of heaven, Oregon ash and Himalayan blackberry. BMSB populations tend to build up during the latter portion of the season and move from surrounding vegetation into orchards. Many of the broad-spectrum materials listed below are known to aggravate secondary pest problems (mites, aphids); use them judiciously. Border treatments or alternate row middle sprays can provide BMSB management while conserving natural enemies. See: *Brown Marmorated Stink Bug*, EM 9054, and the PNW Insect Management Handbook, catalog.extension.oregonstate.edu/insect. Please report damaging populations to <http://agsci.oregonstate.edu/bmsb>.

Admire Pro	imidacloprid	1.2–2.4 oz	Group 4A insecticide. Can be applied as soil application through chemigation system, rates and restrictions differ for this application, see label. Generic labels available. 12-hour reentry. 7-day PHI.
Baythroid XL	beta-cyfluthrin	2–2.4 oz	Group 3 insecticide. Restricted use. 12-hour reentry. 14-day PHI.
Belay	clothianidin	6 oz	Group 4A insecticide. Restricted use. No more than 0.2lb AI per year. 12-hour reentry. 21-day PHI.
Danitol	fenpropathrin	10.6–21.3 oz	Group 3 insecticide. Restricted use. No more than 2 applications recommended, no more than 0.8 lb AI allowed per season. 24-hour reentry. 3-day PHI.
Declare	gamma-cyhalothrin	1.02–2.05 oz	Group 3A insecticide. Restricted use. No more than 0.08 lb AI per year. 24-hour reentry. 14-day PHI.
Endigo ZC	lambda-cyhalothrin + thiamethoxam	5–6 oz	Group 3A + group 4A insecticide. Restricted use. Premix product, see label as both AIs have cumulative limits/season. 24-hour reentry. 14-day PHI.
Mustang Maxx	zeta-cypermethrin	3.2–4 oz	Group 3A insecticide. Restricted use. Applications must be 7 days apart. No more than 0.125 lb AI per season. 12-hour reentry. 7-day PHI.
Proaxis	gamma-cyhalothrin	2.56–5.12	Group 3A insecticide. Restricted use. No more than 0.08 lb AI per year. 24-hour reentry. 14-day PHI.
Surround WP	kaolin clay	25-50 lb	Group UNM insecticide. Particle film deters stink bugs. OMRI approved for organic use. 4-hour reentry. 0-day PHI.
Tombstone	cyfluthrin	2–2.4	Group 3A insecticide. Restricted use. Maximum of 2.8 oz per season. 12-hour reentry. 14-day PHI.

COVER SPRAYS 1–4 cover sprays may be needed

Continued from page 7

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Warrior II	lambda-cyhalothrin	1.28–2.56 oz	Group 3A insecticide. Restricted use. Generics available. Do not apply more than 0.12 lb (7.68 fl oz or 0.48 pt of product)/acre post bloom. 24-hour reentry. 12-day PHI.
White apple leafhopper			
Actara	thiamethoxam	2–2.75 oz	Group 4A insecticide. Apply before leafhoppers reach damaging levels. Also targets aphids at this timing. 12-hour reentry. 35-day PHI.
Assail 70WP	acetamiprid	1.1–1.7 oz	Group 4A insecticide. No more than 4 applications per season. 12-hour reentry. 7-day PHI.
Admire Pro	imidacloprid	1.2–2.4 oz	Group 4A insecticide. Can be applied as soil application through chemigation system, rates and restrictions differ for this application, see label. Generic labels available. 12-hour reentry. 7-day PHI.
Transform WG	sulfoxaflor	0.75-1.5 oz	Group 4C insecticide. Do not apply around bloom. No more than 8.5 oz per year. 24-hour reentry. 7-day PHI.
Mites			
Acramite 50WS	bifenazate	0.75–1 lb	Unclassified mode of action. 12-hour reentry. 7-day PHI.
Apollo SC	clofentezine	4–8 oz	Group 10A miticide. Do not use any combination of Apollo and Savey in the same growing season. Ground applications only. Will not control rust mites. 12-hour reentry. 45-day PHI.
Envidor 2SC	spirodiclofen	16–18 oz	Group 23 miticide. 12-hour reentry. 7-day PHI.
FujiMite 5EC	fenpyroximate	2 pt	Group 21A miticide. Do not rotate with Nexter. 12-hour reentry. 14-day PHI.
Kanemite 15SC	acequinocyl	21–31 oz	Group 20B miticide. No aerial applications. No more than 2 applications per year. Targets spider mites. 12-hour reentry. 14-day PHI.
Nealta	cyflumetofen	13.7 oz	Group 25 miticide. Do not make successive applications without rotating action groups. Will not control rust mites. 12-hour reentry. 7-day PHI.
Nexter 75W SB	pyridaben	6.6–10.67 oz	Group 21A miticide. Do not rotate with Fujimite. 12-hour reentry. 7-day PHI.
Savey 50DF	hexythiazox	4–6 oz	Group 10A miticide. One application per season. Do not use any combination of Apollo and Savey in the same growing season. 12-hour reentry. 28-day PHI.
Vendex 50WP	fenbutinoxide	1–2 lbs	Group 12B miticide. Restricted use. No more than 2 applications per season. 48-hour reentry. 14-day PHI.
Zeal	etoxazole	2–3 oz	Group 10B miticide. No more than 1 application per year. 12-hour reentry. 28-day PHI.
Bull's eye rot and scab			
Captan 80WDG	captan	3.75–5 lb	Group M4 fungicide. 24-hour reentry. 0-day PHI.
Mancozeb	Mn + Zn + ethylene bisdithiocarbamate	3 lb	Group M3 fungicide. 24-hour reentry. 77-day PHI.
Ziram 76DF	ziram	6 lb	Group M3 fungicide. 2-day reentry. 14-day PHI.
Scab and powdery mildew See materials listed for calyx stage. Apply scab sprays before wet weather is expected to occur and stop when dry weather prevails. Powdery mildew sprays can be stopped when terminal growth stops.			
Anthracnose — Note: Scout for cankers in trees. Remove and destroy cankers during dry weather.			
Apple maggot Sprays used for codling moth will control apple maggot. However, 1 or 2 additional sprays for apple maggot may be required later in the season.			
Assail 70WP	acetamiprid	1.7–3.4 oz	Group 4A insecticide. No more than 4 applications per season. 12-hour reentry. 7-day PHI.
Belay	clothianidin	6 oz	Group 4A insecticide. 12-hour reentry. 7-day PHI.
Delegate	spinetoram	6–7 oz	Group 5 insecticide. No more than 4 applications per year. 7-day PHI.
Entrust SC	spinosad	6-10 oz	Group 5 insecticide. OMRI listed for organic use. No more than 4 applications or 29 oz per year. 4-hour reentry. 7-day PHI.
Imidan 70WP	phosmet	3–5 lb	Group 1B insecticide. A water-soluble bag formulation (70WSB) also is available. 24-hour reentry. 7-day PHI.

PRE- OR POSTHARVEST *Before fall rains*

Pest or disease/ material	Active ingredient	Application rate/acre	Comments/reentry interval/preharvest interval
Anthracnose, Nectria canker, Bull's eye rot			
Bordeaux 6-6-100	copper sulfate + lime	—	Do not use on yellow-colored cultivars before harvest.
Captan 80WDG	captan	3.75 lb	Group M4 fungicide. 24-hour reentry. 0-day PHI.
Copper-Count-N	copper ammonium	8 - 10 qt	Postharvest only. Group M1 fungicide. 48-hour reentry.
Cuprofix Ultra 40 Disperss	copper sulfate	8–20 lb	Postharvest only. Group M1 fungicide. 48-hour reentry.
Kocide 3000	copper hydroxide	5.25–7 lb	Do not use on yellow-colored cultivars before harvest. Group M1 fungicide. 48-hour reentry.
Nu-Cop 50DF	cupric hydroxide	12–16 lb	Do not use on yellow-colored cultivars before harvest. Group M1 fungicide. 48-hour reentry.
Ziram 76DF	ziram	6 lb	Group M3 fungicide. 48-hour reentry. 14-day PHI.
Crown and collar rot			
Ridomil and generics also registered but may be more useful in the spring.			
Agri-Fos	salts of phosphoric acid	1.25–2.5 qt	Do not use with copper materials. Group 33 fungicide. 4-hour reentry.
Aliette WDG	aluminum tris	2.5–5 lb	Do not use with copper materials or with adjuvants. Group 33 fungicide. 24-hour reentry. 14-day PHI.
Fosphite	salts of phosphoric acid	1–3 qt	Do not use with copper materials. Group 33 fungicide. 4-hour reentry.
OxiPhos	salts of phosphoric acid	1.3–5 pt	Use as a foliar spray. Group 33 fungicide. 4-hour reentry.
Phostrol	Na, K, ammonium phosphites	2.5–5 pt	Group 33 fungicide. 4-hour reentry.
Rampart	salts of phosphoric acid	1–3 qt	Do not use copper products within 20 days of treatment . Group 33 fungicide. Can also be trunk injected. 4-hour reentry.

Follow the 'RULES' for fungicide stewardship

- Rotate or mix fungicides of different chemical groups.
- Use labeled rates.
- Limit total number of applications.
- Educate yourself about fungicide activity, mode of action and class — as well as resistance management practices.
- Start a fungicide program with multisite mode of action materials.

FOOTNOTES

1. Use oil emulsion, 3.2% actual oil, plus bordeaux 6-6-100. This spray will control all other pests listed except blister mite. Bordeaux is not compatible with lime sulfur or polysulfide.
2. Lime sulfur may injure Delicious and Delicious strains during hot weather and causes yellow foliage on Braeburn. Lime sulfur will help control apple rust mite.
3. Captan may cause minor leaf spotting to Delicious under certain conditions.
4. Syllit is not compatible with lime and should not be combined with oils or oil emulsions.
5. Apple scab forecasting is useful when spring rains become less frequent and drier weather prevails. Several materials can be applied within a certain time limit after the start of an infection period. Keep to a protection schedule throughout the bloom period. All ascospores will have matured and be ready for dispersal once 865 degree-days (base 32°F) have accumulated since bud break. Group 11 materials such as Flint and Sovran are best used prior to infection periods.
6. To delay or prevent the development of resistant strains of apple scab or powdery mildew, alternate or tank-mix materials with different modes of activity (or from different fungicide groups).
7. Codling moth: spray timing.

CALENDAR APPROACH: First spray at 15 to 21 days after petal fall followed by another spray in about three weeks. A third spray for second generation usually is made in early July followed by another in about three weeks.

PHEROMONE TRAPS TO TIME SPRAYS: In Mid-May, place one trap for every 3 acres in the upper one-third of the tree canopy. Inspect once weekly or more frequently. Make first spray when two or more moths are caught in one or more of the traps for two weeks in a row. Repeat spray when first application has weathered off and two or more moths are caught in one or more of the traps. Spot treatments may be sufficient in parts of blocks. Continue trapping through September.

DEGREE-DAY ACCUMULATION (best): use the Brunner-Hoyt (1987) model available from uspest.org to count degree day accumulation from a weather station near your orchard. Apply first spray targeting eggs at 225 degree-days following first consistent catch of codling moths in pheromone traps, known as biofix. Biofix is used to set the model. Eggs can again be targeted by smothering horticultural oil at 375 DD. The first insecticides targeting larvae should be applied at 525 DD, as eggs hatch. Management of the second generation will begin at 1400 DD when first egg hatch occurs. Note that other codling moth models, including the no-biofix model, have not been tested for the Willamette Valley and may not give good results.

8. White apple leafhopper has become a serious problem for some growers in the Willamette Valley. It is best controlled during the first generation after egg hatch is complete but before there are a large number of mature, winged adults. Larger nymphs and adults are difficult to control. Note that timing of the first cover spray for codling moth may be too late to control leafhoppers. Also the commonly used codling moth insecticides are not that effective on leafhoppers. An application of Sevin (carbaryl) directed at the second-generation nymphs, which should be present in August, usually provides sufficient control of leafhoppers to prevent picker annoyance problems. Do not use carbaryl (Sevin) during petal fall (first leafhopper spray), as fruit thinning will occur.
9. Use Captan or Ziram preharvest for control of Bull's eye rot. Focus on early- and mid-leaf fall for control of Nectria canker. Do not use Topsin as it is toxic to earthworms, which help decompose scab-infected leaves.
10. Sovran drift may injure some sweet cherry cultivars such as Van. Please be extra careful when spraying near cherry orchards.

Table 1. Approximate hours of wetness at indicated temperatures required for leaf scab infection and days required for lesions to appear

Average temperature (°F)	Hours of wetness required for infection* from primary and secondary inoculum			Days required for lesions to appear**
	Light	Moderate	Heavy	
78	13	17	26	—
77	11	14	21	—
76	9.5	12	19	—
63–75	9	12	18	9
62	9	12	19	10
61	9	13	20	10
60	9.5	13	20	11
59	10	13	21	12
58	10	14	21	12
57	10	14	22	13
56	11	15	22	13
55	11	16	24	14
54	11.5	16	24	14
53	12	17	25	15
52	12	18	26	15
51	13	18	27	16
50	14	19	29	16
49	14.5	20	30	17
48	15	20	30	17
47	15	23	35	—
46	16	24	37	—
45	17	26	40	—
44	19	28	43	—
43	21	30	47	—
42	23	33	50	—
41	26	37	53	—
40	29	41	56	—
39	33	45	60	—
38	37	50	64	—
37	41	55	68	—
33–36	48	72	96	—

From W.D. Mills, Cornell University

*Leaves remain wet for varying lengths of time after the rain stops, depending on conditions. Add together wetting periods from intermittent showers. Add together any wet periods with less than 8 hours dry time between them. Determine average temperature for the period from hourly readings. Lesions may not be apparent for 2–4 weeks.

**Days required for conidia to appear once infection has been established. No further wetting is required. For this column, daily maximum and minimum temperatures are adequate for determining the average.

Effectiveness of fungicides for control of apple diseases

These ratings are relative rankings based on labeled application rates, good spray coverage and proper spray timing. Actual levels of disease control will be influenced by these factors in addition to cultivar susceptibility, disease pressure and weather conditions.

Fungicide	Fungicide group	Properties	Apple scab	Powdery mildew	Bull's eye rot
Aprovia	7	Broad spectrum of activity, fungicidal, protectant	Fair-good	Slight - Fair	??
Captan	M4	Broad spectrum of activity, fungicidal, protectant	Good-excellent	None	Good
Cevya	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Excellent**	Fair**	??
Excalia	7	Broad spectrum of activity, fungicidal, protectant	Fair-moderate**	Good**	??
Flint	11	Broad spectrum of activity, fungicidal, locally systemic, protectant	Good*	Good-excellent**	Slight-fair
Fontelis	7	Broad spectrum of activity, fungicidal, protectant	Fair-good**	Good**	??
Gatten	U13	Narrow spectrum of activity and fungicidal	Poor	Good	??
Horticultural mineral oil (HMO)	Not classified	Eradicant, fungicidal, insecticidal, protectant	??	Good	??
Indar	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good**	Good**	??
Kaligreen	Not classified	Eradicant, broad to narrow spectrum of activity	None	Slight-fair	??
Lime sulfur	M2	Fungicidal, insecticidal, protectant, vapor active	Good-excellent	Good	??
Mancozeb	M3	Broad spectrum of activity, fungicidal, protectant	Good	None	??
Omega 500F	29	Fungicidal, protectant	Good	Slight	??
Polyram	M3	Broad spectrum of activity, fungicidal, protectant	Good	None	??
Procure	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good**	Excellent**	Slight-fair
Rally	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good**	Fair-good**	??
Rhyme	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good**	Excellent**	??
Sulfur	M2	Fungicidal, insecticidal, protectant, vapor active	Fair	Good	??
Syllit	U12	Broad spectrum of activity, fungicidal, protectant	Good**	None	??
TopGuard	3	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good**	Excellent**	??
Topsin M	1	Broad spectrum of activity, curative, fungicidal, locally systemic	Fair**	Fair-good**	Excellent**
Torino	U6	Fungicidal, protectant	None	Good-excellent	??
Vanguard	9	Curative, fungistatic, locally systemic, narrow spectrum of activity, protectant	Fair**	None	??
Ziram	M3	Broad spectrum of activity, fungicidal, protectant	Fair	None	Ziram
Combination products					
Inspire Super	3 + 9	Broad to narrow spectrum of activity, curative, fungicidal, locally systemic, protectant	Good	Excellent**	??
Luna Sensation	7 + 11	Broad to narrow spectrum of activity, fungicidal, locally systemic, protectant	Good-excellent**	Excellent	??
Luna Tranquility	7 + 9	Fungicidal, narrow spectrum of activity, protectant	Good**	Excellent	??
Merivon	7 + 11	Broad to narrow spectrum of activity, fungicidal, locally systemic, protectant	Good-excellent**	Excellent	??
Pristine	7 + 11	Broad to narrow spectrum of activity, fungicidal, locally systemic, protectant	Good**	Excellent**	??

?? = no information available.

**Resistant pathogens will lower the effectiveness of these fungicides.

Apple herbicides

Product and formulation	Mode of action	Apple	Broadleaf weeds	Grass weeds	Restricted-entry interval	Preharvest interval	Remarks	Bees	Buffers	Surface water
Products that persist in the soil and are soil-active										
Alion 1.67 SC	29	x	++	+	12 hr	14 d	Minimum establishment 3 years.	-	x	x
Casoron 4G & 1.4CS	20	x	++	++	12 hr	-	Minimum establishment 4G 4 weeks, 1.4CS 1 year.	-	-	-
Karmex 80DF, generic	7	x	+	+	12 hr	-	Do not treat trees on full-dwarf rootstock; minimum establishment 1 year.	-	-	-
Kerb 35.6SC, generic	3	x	+	++	1 d	-	Minimum establishment 6 to 12 months.	-	-	-
Princep 90WDG, generic	5	x	++	+	12 hr	Apple 150 d	Minimum establishment pear and apple 1 year, cherry 2 years.	-	-	x
Prowl H20 3.8AS, generic	3	x	+	++	1 d	60 d	EC is non-bearing only.	-	x	x
Solicam 78.6DF	12	x	++	+	12 hr	60 d	Minimum establishment pear and cherry 18 months.	-	-	-
Surflan, generic	3	x	++	++	1 d	-	-	-	-	x
Trellis SC	21	NB	++	-	12 hr	-	-	-	-	-
Products that persist in the soil and have both soil and foliar activity										
Goal 2XL 2EC, generic	14	x	++	+	1 d	-	Postharvest or dormant only	-	x	x
Matrix SG, generic	2	x	++	+	4 hr	Pear, apple 7 d/cherry 14 d	Minimum establishment 1 year	-	-	-
Pindar GT	2 + 14	x	++	+	24 hr	60 d	Minimum establishment 4 years	-	x	x
Sandea 75DF	2	x	++	+	12 hr	14 d	Minimum establishment 1 year	-	-	-
Products with contact or systemic activity										
2,4-D amine, generic	4	x	++	--	2 d	Pear, apple 14 d/cherry 40 d	Min. establishment 1 year. Use caution near vineyards due to sensitivity of grapevines.	-	-	x
Aim 2EC	14	x	++	--	12 hr	3 d	Avoid contacting green bark or foliage.	-	-	x
Fusilade DX	1	NB	--	+	12 hr	14 d	Avoid contacting foliage.	-	x	x
Glyphosate, generic	9	x	++	++	4 or 12 hr	Pear, apple 1 d/cherry 17 d	Avoid contacting green bark or foliage.	-	-	-
Gramoxone, RUP; generic	22	x	++	++	1 d	Cherry 28 d	Avoid contacting green bark or foliage.	-	-	-
Poast	1	x	--	++	12 hr	14 d	-	-	-	x
Reglone	22	NB	++	++	1 d	-	-	-	-	-
Rely 280, generic	10	x	++	+	12 hr	14 d	Avoid contacting green bark or foliage.	-	-	-
Select Max	1	NB	-	++	1 d	-	-	-	-	-
Sinbar 80WDG	5	NB	++	+	12 hr	Apple 60 d	-	-	-	-
Treevix 70WDG	14	x	++	--	12 hr	0 d	Avoid contacting green bark or foliage; minimum establishment 1 year.	-	-	-
Venue	14	x	++	--	12 hr	0 d	Avoid contacting green bark or foliage.	-	-	x
Weed Pharm 20% acetic acid	-	x	+	+	2 d	-	Use hooded or shielded sprayer.	-	-	x

Quick reference guide to herbicides labeled for use in fruit and nut crops

- Shaded boxes indicate the herbicide is labeled for use in that crop.
- Nonbearing (NB) indicates the herbicide is labeled only for crops that will not be harvested for 1 year (365-day preharvest interval).
- Herbicides in **bold, italic** type are recommended for new plantings.

For more complete information, please refer to the *PNW Weed Management Handbook*: <https://catalog.extension.oregonstate.edu/weed>

Ingredient common name (herbicide mode of action) and product name example	Nuts			Pome fruit		Stone fruit						Rate
	Chestnut	Hazelnuts	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plums	Prunes	
Applications that are soil active												
dichlobenil (20) Casoron												4 to 6 lb ai/a (100 to 150 lb/a Casoron); apply in cold, wet weather.
diuron (7) Karmex												1.6 to 3.2 lb ai/a (2 to 4 lb/a Karmex 80DF)
Fluridone (12) Brake ON!												Rate 0.19 to 0.40 lb ai/A (21 to 43 fl oz/A Brake on!).
isoxaben (21) Trellis SC				NB	NB	NB	NB	NB	NB	NB	NB	0.5 to 1 lb ai/a
indaziflam (29) Alion												(0.66 to 1.33 lb/a product)
mesotrione (27) Callisto, Broadworks												0.046 to 0.085 lb ai/a
napropamide (3) Devrinol												(3.5 to 6.5 oz/a product) depending on soil texture.
norflurazon (12) Solicam												0.093 to 0.187 lb ai/a
oryzalin (3) Surflan												(3 to 6 fl oz/a product)
pendimethalin(3) Prowl H2O												4 lb ai/a (8 lb/a)
pronamide (3) Kerb		NB										1.95 to 3.98 lb ai/a
simazine (5) Princep												(2.5 to 5 lb/a Solicam)
sulfentrazone (14) Zeus XC/Sulfentrazone 4SC												2 to 6 lb ai/a
terbacil (5) Sinbar WDG						NB	NB					(2 to 6 quarts/a Surflan)
trifluralin (3) Treflan 4L/EC												Prowl H2O: 1.9 to 6 lb ai/a
trifluralin (3)+ isoxaben (21)+ oxyfluorfen (14) Showcase	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	(2 to 6.3 quarts/a) depending on desired length of control and crop.
Applications that are soil and foliar active												
clopyralid (4) Stinger		NB										Pome Fruit: 0.094 to 0.25 lb ae/a (0.25 to 0.66 pints/a Stinger) Others: 0.12 to 0.25 lb ae/a (0.33 to 0.66 pints/a Stinger)
flazasulfuron (2) Mission												See product label for rates. Princep Caliber 90 is a Special Local Needs label (OR-080038) for sweet cherries only.
flumioxazin (14) Chateau SW												0.125 to 0.375 lb ai/a
oxyfluorfen (14) generic												1.25 to 2 lb ai/a (5 to 8 pints/a Goal 2XL)

CONTINUED ON PAGE 15

Ingredient common name (herbicide mode of action) and product name example	Nuts			Pome fruit		Stone fruit						Rate
	Chestnut	Hazelnuts	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plums	Prunes	
oxyfluorfen (14) + penoxsulam (2) Pindar GT												1.47 lb ai/a oxyfluorfen + 0.015 lbs ai/a penoxsulam (1.5 to 3 pints/a)
Quinclorac (4) Quinstar 4L		NB										0.375 lb ai/A (12.6 fl oz/A Quinstar 4L)
rimsulfuron (2) Matrix												0.063 lb ai/a (4 oz/a Matrix FNV per year)
Postemergence contact and translocated herbicides												
2,4-D (4) Saber												Green sucker control in hazelnuts: 0.7 to 0.95 lb ai/a (1.5 to 2 pints/a Saber)
ammonium nonanoate Axxe												6% to 15% v/v OMRI certified
caprylic acid + capric acid Suppress												6% to 9% v/v . OMRI listed.
carfentrazone (14) Aim EC												Green sucker control in hazelnuts: 0.031 lb ai/a (2 fl oz/a Aim EC)
clethodim (1)		NB	NB	NB	NB	NB	NB		NB	NB	NB	0.06 to 0.125 lb ai/a (6 to 8 oz/a Select Max)
diquat (22) Reglone		NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	0.375 to 0.5 lb ai/a (1.5 to 2 pints/a)
fluzifop (1) Fusilade DX		NB	NB	NB	NB							0.25 to 0.375 lb ai/a (16 to 24 oz/a Fusilade DX). Refer to specific grassy weeds listed on label.
glufosinate (10) generic												0.88 to 1.5 lb ai/a (1.5 to 2.5 quarts/a Rely 280); sucker control: 1.75 quarts/a. Do not make spot spray applications to suckers.
glyphosate (9) Roundup												General weed control and grass suppression in row middles; read label carefully for crops listed and geographic location.
halosulfuron (2) Sandea												Pome fruit: 0.035 to 0.094 lb ai/a (0.75 to 2 oz/a); nut crops: 0.031 to 0.063 lb ai/a (2/3 to 1 1/3 oz/a)
paraquat (22) Gramoxone SL 2.0												Green sucker control in hazelnuts: 0.625 to 1 lb cation/a (2.5 to 4 pints/a Gramoxone 2.0 SL; 1.7 to 2.7 pints/a Firestorm)
pyraflufen (14) Venue												0.001 to 0.005 lb ai/a (0.7 to 4 fl oz/a product). Green sucker control in hazelnuts: 3 to 4 fl oz/a.
saflufenacil (14) Treevix												0.045 lb ai/a (1 oz/a)
sethoxydim (1) Poast										NB	NB	Grass suppression in row middles: 0.28 to 0.47 lb ai/a (1.5 to 2.5 pints/a product)

OSU resources for plant protection

Information on plant protection is available from several sources at Oregon State University:

- OSU Integrated Plant Protection Center. Online weather data and degree day information for insect pests and diseases uspest.org/wea/
- Pacific Northwest Plant Disease Management Handbook, pnwhandbooks.org/plantdisease
- Pacific Northwest Insect Management Handbook, pnwhandbooks.org/insect
- Pacific Northwest Weed Management Handbook, pnwhandbooks.org/weed

Using pesticides safely

Always read the label

The single most important approach to pesticide safety is to read the pesticide label before each use and then follow the directions. If still in doubt after reading the label, contact a person qualified to help evaluate the hazard of the chemical and its use. Qualified people include Extension specialists, county educators, pesticide product representatives, and retailers.

Pesticides are toxic and should be handled with care — but they can be used safely if you follow recommended precautions. Follow all label requirements, and strongly consider any recommendations for additional personal protective clothing and equipment. In addition to reading and following the label, other major factors in the safe and effective use of pesticides are the pesticide applicator's qualifications, common sense, and positive attitude. Always take all safety precautions when using pesticides.

In case of accidents involving pesticides, see your doctor at once. It will help your doctor to know exactly which pesticide is involved. The label on the container gives this information. Take to the physician the pesticide label or information from the label, such as the product name, registration number of the U.S. Environmental Protection Agency, common name and percentage of active ingredient, and first aid instructions. If the label cannot be removed, take along the pesticide container (if not contaminated), but do not take it into the hospital or doctor's office.

Pesticide safety checklist

- Use pesticides only when necessary and as part of an Integrated Pest Management program.
- Always read the label and follow the instructions.
- Do not allow children to play around sprayers or mixing, storage and disposal areas.
- Wear appropriate protective clothing and equipment.
- Never eat, drink or smoke while handling pesticides.

- Avoid drift into nontarget areas and pesticide runoff into streams, rivers, lakes, irrigation ponds and canals.
- Avoid spilling materials on skin or clothing.
- Have access to clean water, soap and first-aid supplies.
- Keep pesticides in a dry and locked storage area away from food and feed.
- Triple rinse or pressure rinse empty containers and dispose or recycle in accordance with state and local regulations.
- Stay out of recently sprayed areas until the spray has dried, and observe the restricted entry intervals specified on the pesticide label.
- Follow the pre-harvest interval on the pesticide label before harvesting crops or gardens and before allowing livestock to graze fields.

Emergency response for exposure and spills

- For any pesticide exposure emergency, dial 911.
- First aid for exposure is indicated on the pesticide label.
- For information on poison emergency treatment call the National Poison Center Poison Help Line at 1-800-222-1222.
- For emergency information related to pesticide spills contact the Oregon Emergency Response System at 1-800-452-0311.

Non-emergency information

- **General pesticide information** — The National Pesticide Information Center provides objective, science-based information about pesticides and pesticide-related topics. Visit npic.orst.edu/index.html or call 1-800-858-7378.
- **Pesticide licensing and regulation** — The Oregon Department of Agriculture regulates most aspects of pesticide use in the State of Oregon. Visit www.oregon.gov/ODA/programs/Pesticides/Pages/AboutPesticides.aspx or call 503-986-4635.
- **Worker protection** — The federal Worker Protection Standard for Agricultural Pesticides protects agricultural workers from pesticide exposure at work. The Oregon Occupational Safety and Health Administration is the state agency responsible for administering the WPS in Oregon. For information on WPS requirements for employers, visit osha.oregon.gov/Pages/topics/worker-protection-standard.aspx or call 1-800-922-2689.
- **Pesticide waste** — The Oregon Department of Environmental Quality regulates the disposal of pesticide waste in the state of Oregon. Visit www.oregon.gov/deq/Hazards-and-Cleanup/hw/Pages/Miscellaneous-Industries.aspx or call 503-229-5263. Most chemical distributors offer plastic pesticide container recycling.