

Hazelnut

2013 Pest Management Guide for the Willamette Valley

EM 8328 • Revised February 2013

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The chemicals, formulations, and rates listed for insect, mite, and disease control are among the best recommendations based on label directions, research, and orchard use experience. Only a thorough knowledge of the orchard, its variety, tree size and density, canopy characteristics, pest complex, and past pest problems will enable you to correctly select chemicals, rates, amount of water used per acre, and method of application for optimum pest control. Occasionally, different formulations of a product or like formulations containing a different amount of active ingredient also are registered and effective for use on the pests listed. These products also may be used; we do not intend to discriminate against them. You may wish to consult their labels and 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 regarding use patterns. Two questions frequently are asked about the chemical control of insects and diseases: “How much chemical do I use per acre?” and “What is the least amount of water I need per acre to apply in my concentrate sprayer?” Notice that the schedule below suggests an amount of formulated product (not active ingredient) to use per acre. This amount is based on a “typical” middle age and density orchard with moderate pest pressure. Common sense indicates that less material may be needed (than that given) for 1- to 4-year-old orchards. Conversely, more chemical (within label limits) may be required for large, mature trees experiencing heavy pest pressure from multiple pests.

Many insecticide labels today indicate the minimum amount of water needed per acre to apply concentrate sprays of insecticides, as well as how to calculate the amount of chemical needed per acre in a concentrate sprayer. **CHECK LABEL BEFORE SPRAYING!** Some label directions indicate dilute applications only.

Also:

1. Make sure any tank-mixes of pesticides are compatible. For example, the elevated pH of some boron spray solutions weakens many insecticides.
2. Use adjuvants and spreader stickers with caution.
3. See table on fungicide effectiveness for Eastern filbert blight, page 14.

Stages

Dormant Season (Stages 1–2)

Stage 1a—Flowering. Female stigmas outside buds.

Stage 1b—Flowering. Male catkins just before elongation and pollen shed.

Stage 2—Dormant buds.

Mid-March (buddbreak) (Stages 3–5)

Stage 3—Bud swelling.

Stage 4—Budbreak. Green leaf tips showing.

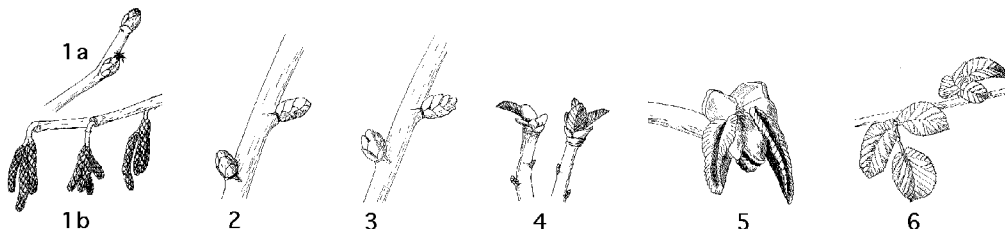
Stage 5—Advanced budbreak. Highly susceptible to Eastern filbert blight.

March–April

Stage 6—Early shoot elongation. First leaves fully open.

Not shown

April–May; May–June; July–August; late August–September



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.

Hazelnut 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.

Dormant Season (Stages 1–2)		
Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Eastern filbert blight		
none	—	Scout orchards and remove and destroy all cankered wood prior to budbreak.
Mid-March (budbreak) (Stages 3–5) (see footnote 5, page 10, for nonbearing trees)		
Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Eastern filbert blight (see footnotes 6 and 7, page 10, and Table 3, page 14)		
Abound	12 fl oz	Group 11 fungicide. Use on a 10-day schedule. Do not use with silicone-based surfactants. 4-hour reentry. 45-day PHI.
Adament 50WG	4–8 oz	Group 3 + 11 fungicide. Use with a surfactant. 12-hour reentry.
bordeaux 6-6-100	—	Group M1 fungicide. See footnote 2, page 10. 24-hour reentry.
Bravo Weather Stik	4 pt	Group M5 fungicide. Spray at budbreak. Spray again at 2-week intervals. 12-hour reentry. 120-day PHI.
Bumper 41.8EC	5–8 fl oz	Group 3 fungicide. See footnote 6, page 10. 12-hour reentry.
Cabrio EG	9.5 oz	Group 11 fungicide. Use with a spreader sticker. Do not use more than 2 consecutive applications. 12-hour reentry.
Copper-Count-N	10–12 qt	Group M1 fungicide. 12-hour reentry.
Echo 90DF	3.25 lb	Group M5 fungicide. Spray at budbreak. Spray again at 2-week intervals. Can be mixed with other fungicides. 12-hour reentry. 120-day PHI.
Gem 500SC	1.9–3.8 oz	Group 11 fungicide. Do not use more than 15.2 oz/A/season. 12-hour reentry. 60-day PHI.
Kocide 3000	7–10.5 lb	Group M1 fungicide. Add 1 pt HMO per 100 gal of water. 48-hour reentry.
NuCop 50DF	16–24 lb	Group M1 fungicide. Add 1 pt HMO per 100 gal of water. 24-hour reentry.
Procure 480SC	4–6 fl oz	Group 3 fungicide. 12-hour reentry. 18-day PHI.
Propi-Max EC	4–9 fl oz	Group 3 fungicide. See footnote 6, page 10. 12-hour reentry.
Quadris Top	12–14 fl oz	Group 3 + 11 fungicide. Do not use an adjuvant or within 45 days of harvest. 12-hour reentry.
Quash	3.5 oz	Group 3 fungicide. Use with a surfactant. 12-hour reentry.
Quilt Xcel	14–21 oz	Group 3 + 11 fungicide. 12-hour reentry.
Stratego	12–15.4 fl oz	Group 3 + 11 fungicide. Do not confuse this with a similar product called Stratego YLD, which may be phytotoxic to hazelnuts. 12-hour reentry. 60-day PHI.
Tebuzol 45DF	8 oz	Group 3 fungicide. Do not use with silicone-based surfactants. 12-hour reentry. 35-day PHI.
Tilt	5–8 fl oz	Group 3 fungicide. Spray at budbreak and again at 2-week intervals. See footnote 6, page 10. 12-hour reentry.
Unicorn DF	3–5 lb	Group 3 + M2 fungicide. 24-hour reentry. 35-day PHI.

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.

March–April

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Big bud mite		
Envidor 2SC	16–18 oz	Only 1 application per season. 7-day PHI.
lime sulfur (BSP)	12 gal	48-hour reentry.
Nexter	10.62 oz	Apply when mites begin to migrate from infested buds. 12-hour reentry. 7-day PHI.
Sulforix (BSP)	3 gal	Apply in a dilute spray mid- to late April for most varieties and locations. 48-hour reentry.
Winter moth, omnivorous leaftier		
<i>Note:</i> Both may damage young trees by feeding on developing buds. Because of the early timing for this spray, application of these chemicals now may not adequately control filbert and obliquebanded leafrollers, which become active slightly later.		
Lorsban 75WG	2–2.6 lb	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. 14-day PHI.
Lorsban 4E	3–4 pt	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. 14-day PHI.

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Stage 6 (early shoot elongation)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Eastern filbert blight (see footnotes 6 and 7, page 10, and Table 3, page 14)		
Abound	12 fl oz	Group 11 fungicide. Use on a 10-day schedule. Do not use with silicone-based surfactants. 4-hour reentry. 45-day PHI.
Adament 50WG	4–8 oz	Group 3 + 11 fungicide. 12-hour reentry.
Bravo Weather Stik	4 pt	Group M5 fungicide. Spray at 2-week intervals after budbreak. 12-hour reentry. 120-day PHI.
Bumper 41.8EC	5–8 fl oz	Group 3 fungicide. See footnote 6, page 10. 12-hour reentry.
Cabrio EG	9.5 oz	Group 11 fungicide. Do not use more than 2 consecutive applications. 12-hour reentry.
Copper-Count-N	10–12 qt	Group M1 fungicide. 12-hour reentry.
Echo 90DF	3.25 lb	Group M5 fungicide. Spray at budbreak. Spray again at 2-week intervals. Can be mixed with other fungicides. 12-hour reentry. 120-day PHI.
Gem 500SC	1.9–3.8 oz	Group 11 fungicide. 60-day PHI. Do not use more than 15.2 oz/A/season. 12-hour reentry.
Kocide 3000	7–10.5 lb	Group M1 fungicide. Add 1 pt HMO per 100 gal water. 48-hour reentry.
NuCop 50DF	16–24 lb	Group M1 fungicide. Add 1 pt HMO per 100 gal water. 24-hour reentry.
Procure 480SC	4–6 fl oz	Group 3 fungicide. 12-hour reentry. 18-day PHI.
Propi-Max EC	4–9 fl oz	Group 3 fungicide. See footnote 6, page 10. 12-hour reentry.
Quadris Top	12–14 fl oz	Group 3 + 11 fungicide. Do not use an adjuvant or within 45 days of harvest. 12-hour reentry.
Quash	3.5 oz	Group 3 fungicide. Use with a surfactant. 12-hour reentry.
Quilt Xcel	14–21 oz	Group 3 + 11 fungicide. 12-hour reentry.
Stratego	12–15.4 fl oz	Group 3 + 11 fungicide. Do not confuse this with a similar product called Stratego YLD, which may be phytotoxic to hazelnuts. 12-hour reentry. 60-day PHI.
Tebuzol 45DF	8 oz	Group 3 fungicide. Do not use with silicone-based surfactants. 12-hour reentry. 35-day PHI.
Tilt	5–8 fl oz	Group 3 fungicide. Spray at budbreak and again at 2-week intervals. See footnote 6, page 10. 12-hour reentry.
Unicorn DF	3–5 lb	Group 3 + M2 fungicide. 24-hour reentry. 35-day PHI.

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April–May

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Filbert leafroller		
<i>Note:</i> Filbert leafroller eggs hatch in late March and early April during warm weather.		
Altacor	3–4.5 oz	10-day PHI.
Ambush 2E	13–25 oz	Do not graze treated orchards. Do not apply more than 1.6 lb ai/A per season. 24-hour reentry. 14-day PHI.
Asana XL	9.6–19.2 oz	Do not apply a second spray within 3 weeks of the first. Do not apply more than 0.2 lb ai/A per season. Do not graze livestock in treated orchards. 24-hour reentry. 21-day PHI.
Azadirachtin (Azatin XL Plus)	11–21 oz	Botanical extract of the neem tree. 4-hour reentry. 0-day PHI.
<i>Bacillus thuringiensis</i> (Bt)	1 lb	Spray when larvae first detected. Apply with a sticker.
Brigade WSB	0.05–0.2 lb ai/A (3.2–12.8 fl oz)	7-day PHI.
Cobalt	26–57 oz	14-day PHI.
Delegate WG	3–7 oz	7-day PHI.
Diazinon AG 500	1 pt	Apply in dilute spray. No more than 1 application per season. 45-day PHI.
Dimilin 2L	8–16 oz	Use a minimum of 50 gal water/A. Can use up to 4 applications per season (64 fl oz maximum per season). 12-hour reentry. 28-day PHI.
Intrepid	8–16 oz	Apply at or just prior to egg hatch. 14-day PHI.
Lorsban 75WG	2–2.6 lb	No more than 3 applications per season. Do not graze treated orchards. 24-hour reentry. 14-day PHI.
Lorsban 4E	3–4 pt	No more than 3 applications per season. Do not graze treated orchards. 24-hour reentry. 14-day PHI.
Pounce 3.2E	8–16 oz	Do not graze treated orchards. Do not apply more than 1.6 lb ai/A per season. 24-hour reentry. 14-day PHI.
Proclaim	3.2–4.8 oz	14-day PHI.
Sevin XLR Plus	2–5 qt	Sevin may cause rapid increase of aphid populations 3–4 weeks after application. 4F and 80S formulations also available. 12-hour reentry. 14-day PHI.
Success 2L	4–10 oz	Entrust is the organic formulation. 14-day PHI.
Warrior II	0.02–0.04 lb ai/A (1.28–2.56 fl oz)	14-day PHI.

April–May continues on next page

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CONTINUED—April–May

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Filbert aphid, hazelnut aphid		
Assail 70WP	1–4.1 oz	14-day PHI.
Diazinon AG 500	1 pt	Apply in dilute spray. No more than 1 application per season. 45-day PHI.
Leverage 2.7	3.8–5.1 oz	Baythroid and Provado combination. Leverage 360 is also available. 14-day PHI.
Lorsban 75WG	2–2.6 lb	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. Determine whether aphid parasite is present in your orchard. An aphid spray might not be necessary. 14-day PHI.
Lorsban 4E	3–4 pt	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. Determine whether aphid parasite is present in your orchard. An aphid spray might not be necessary. 14-day PHI.
Movento	6–9 oz	7-day PHI.
Provado 1.6	3.5–7 oz	7-day PHI.
Omnivorous leaftier, winter moth (if present)		
<i>Note:</i> Primarily pests during orchard establishment.		
Lorsban 50W	3–4 lb	Do not graze livestock in treated orchards. 24-hour reentry. 14-day PHI.
Sevin XLR Plus (carbaryl)	2–5 qt	4F and 80S formulations also available. 12-hour reentry. 14-day PHI.

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May–June

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
To increase nut set		
<i>Note:</i> These are rates for foliar-applied sprays. Consult labels for soil-applied rates. For maximum effect, apply boron from mid- to late May. Do not tank-mix with insecticides.		
Borosol 10	1–3 pt	—
Solubor	5 lb	—
Obliquebanded leafroller		
<i>Note:</i> Larvae cause damage by feeding between husk and nut. Inspect under husks for larvae between mid-June and late July. Leaf rolling is minimal to nonexistent at this time.		
Brigade, Bt, Sevin, Asana, Ambush, and Pounce are also labeled for leafroller and filbertworm control. Lorsban has given best control of larvae feeding between husk and nut.		
Belt	3–4 fl oz	14-day PHI.
Cobalt	26–57 oz	14-day PHI.
Delegate WG	3–7 oz	7-day PHI.
Diazinon AG 500	1 pt	Apply in dilute spray. 45-day PHI.
Dimilin 2L	8–16 oz	Use a minimum of 50 gal water/A. Can use up to 4 applications per season (64 fl oz maximum per season). 12-hour reentry. 28-day PHI.
Lorsban 75WG	2–2.6 lb	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. 14-day PHI.
Lorsban 4E	3–4 pt	No more than 3 applications per season. Do not graze livestock in treated orchards. 24-hour reentry. 14-day PHI.
Proclaim	3.2–4.8 oz	14-day PHI.
Success 2L	4–10 oz	14-day PHI.
Spider mites, rust mites		
<i>Note:</i> Look for webbing and brown discoloration on the underside of leaves during the summer.		
Acramite 50WS	0.75–1 lb	Use only once per season. 12-hour reentry. 14-day PHI.
Envior 2 SC	16–18 oz	7-day PHI.
Fujimite	2 pt	14-day PHI.
Nexter	10.67 oz	Do not exceed 2 applications per season. 7-day PHI.
Savey 50DF	3–6 oz	Does not control adult rust mites. 28-day PHI.
Zeal	2–3 oz	One application per season. 28-day PHI.

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July–August		
Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Filbertworm		
<i>Note:</i> Lorsban and Sevin also are registered for filbertworm. See footnote 4, page 10, on use of pheromone traps.		
Ambush 2E	13–25 oz	Do not graze treated orchards. Do not apply more than 1.6 lb ai/A per season. 24-hour reentry. 14-day PHI.
Asana XL	9.6–19.2 oz	Do not apply a second spray within 3 weeks of the first. Do not apply more than 0.2 lb ai/A per season. Do not graze livestock in treated orchards. 24-hour reentry. 21-day PHI.
Assail 70WP	1–4.1 oz	14-day PHI.
Baythroid 2	2–2.4 oz	14-day PHI.
Brigade WSP	0.05–0.2 ai/A (3.2–12.8 fl oz)	7-day PHI.
Delegate WG	3–7 oz	14-day PHI.
Dimilin 2L	12–16 oz	Apply at or just prior to egg hatch. 28-day PHI.
Esteem	13–16 oz	Do not use more than twice per season. 21-day PHI.
Intrepid 2F	8–16 oz	Apply at or just prior to egg hatch. 14-day PHI.
Leverage 2.7	3.8–5.1 oz	Baythroid and Provado combination. Leverage 360 is also available. 14-day PHI.
Pounce 3.2E	8–16 oz	Do not graze livestock in treated orchards. Do not apply more than 1.6 lb ai/A per season. 24-hour reentry. 14-day PHI.
Proaxis	2.56–5.12 oz	14-day PHI.
Proclaim	3.2–4.8 oz	14-day PHI.
Success 2L	4–10 oz	Entrust is the organic formulation. 14-day PHI.
Warrior II	0.02–0.04 lb ai/A (1.28–2.56 fl oz)	14-day PHI.
Eastern filbert blight		
none	—	Scout orchards and remove and destroy all infected wood prior to budbreak.

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Late August–September

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Bacterial blight		
<i>Note:</i> An important spray for young filberts (less than 10 years old). Apply coppers after harvest and before fall rains. If heavy rains occur, repeat application when three-fourths of the leaves have dropped.		
bordeaux 6-3-100	—	24-hour reentry. See footnote 2, page 10.
Champ Dry Prill	11–16 lb	Add 1 pt horticultural mineral oil (HMO) per 100 gal water. 48-hour reentry.
C-O-C-S WDG	12–16 lb	Add 1 pt HMO per 100 gal water.
Copper-Count-N	10–12 qt	12-hour reentry.
Cuprofix Ultra 40 Disperss	10–15 lb	48-hour reentry.
Kocide 3000	7–10.5 lb	Add 1 pt HMO per 100 gal water. 48-hour reentry.
Nordox 75WG	8–13 lb	12-hour reentry.
NuCop 50DF	16–24 lb	Add 1 pt HMO per 100 gal water. 24-hour reentry.
Kernel molds		
none	—	Harvesting before fall rains and keeping full totes dry or shielded from rain have been associated with reduced mold counts.

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Footnotes

1. More than one type of formulation is available for most insecticides. For instance, Lorsban is marketed as a 50% wettable powder (Lorsban 50WP) as well as an emulsifiable concentrate (Lorsban 4E). Lower rates can be used on smaller trees.
2. Thoroughly spray the trunks and lower scaffolds as well as upper branches. Bordeaux 6-6-100 means 6 pounds of copper sulfate plus 6 pounds of hydrated lime in 100 gallons of water. In any bordeaux formula, the ingredients always are listed in the same order—copper sulfate, hydrated lime, then gallons of water.
3. The time to apply insecticide for big bud mite is from early to mid-April depending on the year, orchard location, and weather. Use a 20x hand lens or microscope to determine whether mites are migrating from blasted buds to new buds. Tanglefoot, Stickem Special, petroleum jelly, or duct tape applied in bands above and below buds infested with big bud mite will trap and hold mites migrating to new buds. Beginning in late March, inspect weekly for migrating mites. Complete spray coverage is necessary to control this mite. Use no less than 25 gal water per acre (100 gal is a better rate). Do not graze livestock in treated orchards. Sulforix has a negligible impact.
4. Pheromone traps are available to detect and monitor flight activity of filbertworm moths. They have been successfully used to time cover sprays. Apply insecticides 8–12 days after filbertworm moths emerge in your area. A second application usually is necessary in 2–3 weeks. A repeat spray may be necessary if heavy rainfall occurs a day or two after application and the label allows it. Second and third sprays may be necessary and should be made if pheromone traps continue to catch moths 2–3 weeks after a spray. If pheromone traps are being used in an orchard block to time filbertworm sprays, place traps in the upper third of the tree canopy in early June. Spray when two or three moths are collected per trap or if any one trap has caught five moths. See also Table 2, page 13.
5. All fungicides should be applied beginning or just before budbreak. Continue applications at 2-week intervals to cover an 8-week susceptibility period (four applications total).
6. Products that contain propiconazole, such as Bumper, Propi-Max, Quilt Xcel, or Tilt, may result in smaller, thicker, greener leaves and shortened internodes, but trees will grow out of this condition within 2 weeks of the last application. These products have eradican activity if applied at higher rates within 72 hours of infection.
7. Several materials are registered for Eastern filbert blight management but are not recommended. These include Luna Privilege, Luna Experience, Luna Sensation, OxiDate, Pristine, and Regalia.
 - Luna Privilege is registered but was ineffective in field tests.
 - Luna Experience is legal to use but not recommended since only the group 3 chemistry in this prepackaged mix is effective. The other chemical, Luna Privilege, was ineffective in field tests. The effective group 3 chemistry is available alone as Tebucon or Tebuzol, which are recommended.
 - Luna Sensation is legal to use but not recommended since only the group 11 chemistry in this prepackaged mix is effective. The other chemical, Luna Privilege, was ineffective in field tests. The effective group 11 chemistry is available alone as Gem, which is recommended.
 - Pristine is not recommended since only the group 11 chemistry in this prepackaged mix is effective. The other chemical was ineffective in field tests. The effective group 11 chemistry is available alone as Cabrio EG, which is recommended.
 - Regalia is registered but was not effective in tests in western Oregon.
 - Although OxiDate is registered, it will not control this disease due to its short residual activity.

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**Table 1. Quick Reference Guide
for 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. It has a 365-day preharvest interval.
- For more complete information, please refer to the *PNW Weed Management Handbook*:
<http://pnwhandbooks.org/weed/>.

Ingredient common name (herbicide mode of action)	Product name example	Nuts			Pome fruits		Stone fruits						Rates
		Chestnut	Hazelnut	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum	Prune	
Applications that persist in soil and are soil active (Herbicides in <i>bold, italic</i> type are recommended for new plantings.)													
<i>napropamide</i> (3)	<i>Devrinol</i>												5 lb ai/A (50 lb/A Devrinol 10-G)
<i>oryzalin</i> (3)	<i>Surflan</i>												2–6 lb ai/A (2–6 qt/A Surflan AS)
<i>pendimethalin</i> (3)	<i>Prowl</i>												Prowl H2O: 1.9–6 lb ai/A (2–6.3 qt/A) depending on desired length of weed control and crop
<i>pronamide</i> (3)	<i>Kerb</i>												1–4 lb ai/A (2–8 lb/A). Rate depends on species present and soil texture.
<i>trifluralin</i> (3)	<i>Treflan</i>												0.5–1 lb ai/A (1–2 pt/A Treflan 4EC)
terbacil (5)	Sinbar					NB	NB	NB				NB	0.4–0.8 lb ai/A (0.5–1 lb/A), newly established; 2–4 lb/A Sinbar, bearing, depending on soil type
simazine (5)	Princep												See product labels for rates. Princep Caliber 90 is a Special Local Needs label (OR-080038) for sweet cherries only.
diuron (7)	Karmex												See label for crop-specific application rates.
norflurazon (12)	Solicam												1.97–7.8 lb ai/A (2.5–10 lb/A Solicam)
dichlobenil (20)	Casoron												4–6 lb ai/A (100–150 lb/A Casoron). Apply in cold, wet weather.
<i>isoxaben</i> (21)	<i>Trellis</i>				NB	NB	NB	NB	NB	NB	NB	NB	0.5–1 lb ai/A (0.66–1.33 lb/A product)
indaziflam (29)	Alion												0.065–0.085 lb ai/A (5–6.5 oz/A product) depending on soil texture
trifluralin (3) + isoxaben (21) + oxyfluorfen (14)	Showcase	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	5.5–5 lb ai/A (100–200 lb/A Showcase)

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Ingredient common name (herbicide mode of action)	Product name example	Nuts			Pome fruits		Stone fruits						Rates
		Chestnut	Hazelnut	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum	Prune	
Applications that persist in soil and have both soil and foliar activity													
penoxsulam (2)	Pindar GT												
rimsulfuron (2)	Matrix												0.063 lb ai/A (4 oz/A Matrix FNV per year)
flumioxazin (14)	Chateau												0.188–0.38 lb ai/A (6–12 oz/A Chateau WDG). Slight differences in rates and uses in SW and WDG labels.
oxyfluorfen (14)	Goal												1.25–2 lb ai/A (5–8 pt/A Goal 2XL)
saflufenacil (14)	Treevix												0.045 lb ai/A (1 oz/A Treevix)
Postemergence contact and translocated herbicides													
sethoxydim (1)	Poast										NB	NB	Grass suppression in row middles. 0.28–0.47 lb ai/A (1.5–2.5 pt/A product)
clethodim (1)	Select Max		NB	NB	NB	NB	NB	NB		NB		NB	0.06–0.125 lb ai/A (6–8 oz/A Select)
fluazifop (1)	Fusilade DX		NB	NB	NB	NB							0.25–0.375 lb ai/A (16–24 oz/A Fusilade DX). Refer to specific grassy weeds listed on label.
halosulfuron (2)	Sandea												Apples: 0.035–0.094 lb ai/A (0.75–2 oz/A) Nut crops: 0.031–0.063 lb ai/A (2/3–1 1/3 oz/A)
2,4-D (4)	2,4-D												Green sucker control in hazelnuts. 0.7–0.95 lb ai/A (1.5–2 pt/A Saber)
clopyralid (4)	Stinger												0.12–0.25 lb ae/A (0.33–0.66 pt/A Stinger)
glyphosate (9)	Roundup												General weed control and grass suppression in row middles. Read label carefully for crops listed and geographic location.
glufosinate (10)	Rely												Sucker control. 0.75–1.5 lb ai/A (3–6 qt/A Rely)
carfentrazone (14)	Aim												Green sucker control in hazelnuts. 0.031 lb ai/A (2 fl oz/A Aim EC)
pyraflufen (14)	Vennue												0.7–4 fl oz product/A (0.001–0.006 lb ai/A)
diquat (22)	Reglone		NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	
paraquat (22)	Gramoxone												Green sucker control in hazelnuts. 0.625–1 lb cation/A (2.5–4 pt/A Gramoxone; 1.7–2.7 pt/A Firestorm)
acetic acid	WeedPharm												

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Table 2. Hazelnut IPM Sampling Methods and Action Thresholds

Insect	Sampling period	Sampling method	Action threshold
European winter moth	Larvae: March 15–May 31	3 terminals/tree and 3 leaf clusters/terminal. Each terminal is a sampling unit.	20% infestation
Big bud mite	April	In mid-April, place Tanglefoot on twigs surrounding blasted buds. Check for extremely small, white, cigar-shaped mites with a 20x hand lens.	When consistent mite movement is observed, which usually occurs with budbreak
Omnivorous leaftier	April 15–June	3 bud clusters/tree.	5% infestation
Filbert aphid	April 1–Sept. 30	3 terminals/tree—newest fully expanded leaf on each terminal.	April—20/leaf May—30/leaf June—40/leaf July—40/leaf with an increasing population
Oblique banded leafroller (OBLR) and filbert leafroller	Larvae: April–August	Larvae: 3 terminals/tree and 3 leaf clusters/terminal. Each terminal is a sampling unit.	Larvae: 20%–25% infestation
	Adult: Mid-May–Sept.	Adult: Pheromone trap for each 5 acres; 6-ft height.	Adult: 40 moths/week and find second-generation OBLR larvae feeding on nuts
Filbertworm	June–Sept.	Adult: Pheromone traps—4 for first 10 acres and 1 for each additional 4 acres. Place traps in the upper third of the canopy by mid-June.	2–3 moths per trap or 5 moths in any one trap

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**Table 3. Effectiveness of Fungicides
for Eastern Filbert Blight Management***

Fungicide trade name	Common name	Fungicide Group #	EFB control	Use with surfactant
Abound	azoxystrobin	11	Fair–Good	Yes, but avoid silicone-based products
Adament	trifloxystrobin + tebuconazole	3 + 11	Good	Yes
Bravo	chlorothalonil	M5	Excellent	No
Bumper	propiconazole	3	Good–Excellent	Yes
Cabrio	pyraclostrobin	11	Excellent	Yes
Copper-Count-N	copper ammonium carbonate	M1	Good	?
Echo	chlorothalonil	M5	Excellent	No
Gem	trifloxystrobin	11	Good–Excellent	Yes
Kocide	copper hydroxide	M1	Good	Yes
Nu-Cop	copper hydroxide	M1	Good	Yes
Procure	triflumizole	3	Fair–Good	Yes
Propi-Max	propiconazole	3	Good–Excellent	Yes
Quadris Top	azoxystrobin + difenoconazole	3 + 11	Good–Excellent	No
Quash	metconazole	3	Good	Yes
Quilt Xcel	azoxystrobin + propiconazole	3 + 11	Excellent	Yes
Stratego	propiconazole + trifloxystrobin	3 + 11	Excellent	Yes
Tebuzol	tebuconazole	3	Good	Yes, but avoid silicone-based products
Tilt/Orbit	propiconazole	3	Good–Excellent	Yes
Unicorn	tebuconazole + sulfur	3 + M2	Good	Yes

* These ratings are relative rankings based on full 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. Possible ratings for disease control include none, slight, fair, good, or excellent.

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Strategies for Using Fungicides for Management of Eastern Filbert Blight

Fungicides are best used to protect susceptible tissue in the spring at budbreak and for the next 8 weeks. Most fungicides will last 2 weeks before another application is needed. This means a total of four applications starting with the first at budbreak. Although hazelnuts are still susceptible after this period, additional applications have not resulted in consistent, significant disease control.

Because of fungicide resistance issues and resulting label requirements, you may not be able to use the same fungicide for all four applications. Since the EFB fungus has a long (2-year) life cycle, the resistance risk is already low relative to other diseases (such as powdery mildew). Strategies to further minimize this risk include alternating and/or tank-mixing fungicides with different modes of action. The modes of action for fungicides have been categorized, grouped, and assigned numbers such as “group M5” (see Table 3, page 14).

Alternating fungicides with different modes of action has been effective to manage EFB. Research has not identified any one alternating strategy as better than any other strategy. We have four fungicide groups to choose from: groups 3, 11, M5, and M1. It is suggested that the first application be chlorothalonil (group M5) followed by your choice of a group 3 or 11 fungicide. Each of the next two applications would be different from the previous one. An example of this program might be to start with Bravo (group M5) at budbreak, followed by Gem (group 11) 2 weeks later, then Tilt (group 3) 2 weeks after that, and ending with Cabrio (group 11). Use of multisite products such as chlorothalonil (M5) or copper-based (M1) products for all four applications would also be acceptable.

Do not just alternate fungicides with different trade names as they might have the same mode of action. Some fungicide premixes already are a combination of two fungicides with different modes of action, generally a group 3 and group 11 fungicide. These products cannot be used for every application because they do not allow more than two sequential applications before switching to a different product

with a different mode of action. If you use these premixes, you must use an M5 or M1 fungicide in the rotation. An example of this program might be to start with Bravo (M5) at budbreak, followed by Adament (3 + 11), QuiltXcel (3 + 11), or Stratego (3 + 11) 2 weeks later, then the same product 2 weeks after that, but ending with Bravo.

You can make your own tank-mixes. Since tank-mixing can be expensive, growers have asked about reducing the rate of each product in the tank. Research to date has shown that a half rate of Bravo tank-mixed with either Tilt/Orbit (group 3) or Cabrio (group 11) is effective to manage EFB. Combining fungicide resistance theory and research on EFB in Oregon suggests we should use a half rate of chlorothalonil tank-mixed with a full rate of a group 3 fungicide or a half rate of a group 11 fungicide. An example of this program might be:

- 1st application: A full rate of Bravo (M5) at budbreak
- 2nd application, 2 weeks later: A mix of Cabrio (11) plus Bravo (M5), each at half rate
- 3rd application, 2 weeks later: A mix of Tilt (3) at full rate plus Bravo (M5) at half rate
- 4th application, 2 weeks later: A mix of Cabrio (11) plus Bravo (M5), each at half rate

Research has indicated that addition of a surfactant may provide better disease control than using a fungicide alone. Numerous products can break the surface tension of water to get better coverage of plant tissue. They also can help keep the fungicide solution in contact with the plant, reducing wash-off during rain events. Unless otherwise stated on the label, it is recommended to add a surfactant with a fungicide. Copper-based products have traditionally been applied with horticultural mineral oil. Newer fungicides may be mixed with silicone-based or non-ionic surfactants. Be careful, as several fungicides may already come formulated with a surfactant and/or specifically say NOT to add these products. For example, do not add a surfactant to Bravo, Echo, or Quadris Top.

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OSU Internet Resources for Plant Protection

Information regarding plant protection is available from several sources at OSU. The following listings are excellent examples:

- OSU Integrated Plant Protection Center. Online weather data and degree day information for insect pests and diseases (<http://uspest.org/wea/>)
- Eastern filbert blight help page—all the information you need for this disease (<http://oregonstate.edu/dept/botany/epp/EFB/>)
- Codling moth development information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?clm>)
- Apple scab infection season information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?spp=asc>)
- Pear scab infection season information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?spp=asp>)
- Pear scab infection period information for the Hood River Valley (<http://ippc2.orst.edu/hr/>)
- Fire blight risk information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?fbl>)
Directions for the use of each model are available at each site.
- Pacific Northwest Plant Disease Management Handbook (<http://pnwhandbooks.org/plantdisease>)
- Pacific Northwest Insect Management Handbook (<http://pnwhandbooks.org/insect>)
- Pacific Northwest Weed Management Handbook (<http://pnwhandbooks.org/weed>)

Oregon Poison Center

The Oregon Health & Science University
3181 S.W. Sam Jackson Park Road
Portland, OR 97239
Phone: 1-800-222-1222

If a person has collapsed or is not breathing, dial 911.

Basic Elements of Safe Pesticide Use

- Always read the label with care. This is the first step in selecting the right material for the job. Never rely on your memory. Before opening the container, pay strict attention to warnings and cautions printed on the label.
- Keep all pesticide and spray materials out of the reach of children, pets, and irresponsible persons. Storage outside of the home, away from food and feed, and under lock and key is the safest method.
- Store only in the original container and keep tightly closed.
- NEVER smoke, eat, or drink while applying pesticides.
- Avoid inhalation or direct contact. Always wear protective clothing and safety devices as recommended on the label.
- Avoid spills. If spills occur, take immediate action to remove contaminated clothing and wash thoroughly.
- After each application, bathe and change to clean clothing. Wash clothing after each use. Always use fresh clothing when starting new application.
- Avoid contamination of fish ponds and water supplies. Cover feed and water containers when treating around livestock or pet areas.
- Keep separate equipment for use with hormone-type herbicides to avoid accidental injury to susceptible plants. Also avoid applications under wind conditions that could create drift to nontarget areas.
- Rinse empty containers three times before disposing of them. Add the rinse to the spray tank and dispose of containers according to local regulations to avoid hazard to humans, animals, and the environment.
- Follow label directions for mixing and application to keep residues within the limits prescribed by law.
- Plan ahead. Discuss with your physician the materials you will be using during the season so that he or she can be prepared to provide the appropriate treatment in case of accidental exposure. If symptoms of illness occur, call the physician or get the patient to a hospital immediately. Always provide the medical personnel with as much information as possible.
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

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Revised February 2013.

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