



# Pear Programs

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## Major Diseases

### Botrytis-Gray Mold

Gray mold, caused by *Botrytis*, is the second most important apple fruit disease and can be the most important disease affecting pear as shown in recent statewide and regional surveys in the Pacific Northwest. Flowers of both crops are susceptible to *Botrytis* infections which persist throughout the growing season until harvest. *Botrytis* infections remain dormant until storage where the fungus causes Gray Mold with symptoms becoming visible after a few months in storage. Afterward, the fungus can spread to healthy fruit. Temperatures between 64F and 78F are optimal for infections. Because infections occur exclusively in the orchard, it is important to start management as early as possible. Delayed management will fail to control infections that started weeks or months before harvest. The fungus is ubiquitous and overwinters on mummified fruit left on trees and fallen leaves. Good sanitation practices will reduce inoculum loads but because of the explosive nature of this disease, fungicide applications are necessary to achieve good control. At bloom time and during spring, fungicides from FRAC groups 7, 9 and 11, used to control apple powdery mildew or scab, will be effective against *Botrytis* if resistance is absent. Fungicides from FRAC 3 have a limited efficacy against *Botrytis* infections. As fruit mature, they become more susceptible to *Botrytis*. Late season management is especially important for cultivars picked after mid-September in WA when wet, disease conducive weather is more likely. Preharvest applications and ROTATIONS of fungicides from the FRAC groups 1, 7, 11 and 19 control *Botrytis*. Tank-mixture of single-site fungicide with Ziram or captan will increase efficacy and delay the selection for resistant populations. IMPORTANT: *Botrytis cinerea* is the most risky fungus for fungicide resistance development as the fungus can develop resistance to multiple fungicides simultaneously. Remember this aspect when spraying for other diseases such as powdery mildew, as the same fungicides sprayed early in the season can select for resistant *Botrytis* populations which will persist throughout the season and to the storage rooms resulting in limited efficacy of eventual postharvest treatment.

### Bull's eye rot

Bull's eye rot is a major disease of apple and pear. The disease can be caused by four different fungal species from the genus *Neofabraea*. The main species causing Bull's eye rot of apple in eastern Washington is *N. perennans*, whereas *N. malicorticis* has been reported to be predominant in western Washington. It infects fruit and causes cankers on trees where it overwinters until conditions become favorable in the following spring when it causes new infections. Fruit are infected exclusively in orchards but Bull's eye rot symptoms are only seen after several months in cold storage. Therefore, preharvest management is key to reducing decay rates in the packinghouse. Prune cankered branches to reduce the inoculum load and use fungicide applications prior to harvest to control. Ziram applied within two weeks before harvest is recommended for control of Bull's eye rot in the Pacific Northwest. Topsin-M is ONLY recommended under wet conditions and for cultivars, such as Golden Delicious, Pinata, Fuji and Granny Smith, more susceptible to Bull's eye rot. Tank-mixtures of Ziram with other single-site fungicides are recommended to increase efficacy and reduced risks of fungicide resistance development. Frequent sprays may increase risk of resistance development to FRAC 1 fungicides used after harvest.

## Fire blight

There is a risk of fire blight infection any time there are flowers on the tree, the weather is warm, and wetting occurs. **Early bloom.** Apply biologicals (Blossom Protect) during early bloom (2 applications). Reapply biological if lime sulfur was applied (lime sulfur is antimicrobial and reduces biological populations). **Full bloom to petal fall.** Watch the model. Apply materials 12-24 hours BEFORE moisture events. Sprays every 2 days may be necessary to cover opening flowers during extended high or extreme risk periods. Product used must contact the interior of the flowers in sufficient water and approved wetting agent to completely wet the interior. Applications of less than 100 gal/A can be effective on small trees if flower interiors are well covered, but do not drop the ppm below 200 (oxytetracycline). Application by ground equipment on each row is highly recommended. Application of antibiotics by aircraft are not effective. **Organic.** Prebloom: Fixed copper sanitation if fire blight was in the orchard last year. Apples Easy to Thin: Blossom Protect/ Buffer Protect early, lime sulfur (+ oil), second Blossom Protect/ Buffer Protect. Followed depending on the model and cultivar russet risk with soluble copper (Previsto 3 qt, Cueva 4 qt, or Cueva 3 qt + Serenade Opti, or Instill). Petal fall + 1-2 weeks Serenade Opti (most fruit safe) or 2% lime sulfur (red apples). Apples Hard to Thin/Long Bloom Period: Lime sulfur (+ oil), then Blossom Protect + Buffer Protect, then a Lime sulfur (+ oil), then a Second Blossom Protect + Buffer Protect. Depending on the model and cultivar russet risk soluble copper (Previsto 3 qt, Cueva 4 qt, Cueva 3 qt + Serenade Opti, or Instill). Petal fall + 1-2 weeks Serenade Opti or 2% lime sulfur (red apples). Apples Hard to thin varieties/ short bloom period: Lime sulfur (+ oil) 2-3 applications. Depending on the model and cultivar russet risk follow with soluble copper (Previsto 3 qt, Cueva 4 qt, Cueva 3 qt + Serenade Opti, or Instill). Petal fall + 1-2 weeks: Serenade Opti (most fruit safe) or 2% lime sulfur (red apples). Pears Easy to Mark Varieties: 2 applications of Blossom Protect + Buffer Protect during early bloom to petal fall (70-80% bloom if single treatment). Follow with Serenade Opti at petal fall to reduce russet risk from Blossom Protect yeast. Pears Marking Tolerant Varieties: 2 applications of Blossom Protect + Buffer Protect during early bloom to petal fall (70-80% bloom if single treatment). Follow with soluble copper (Cueva 4 qrt, Previsto 3 qrt, or Cueva 3 qrt + Serenade Opti) if the model indicates risk (warm/wet).

## Pear mildew

Apple and pear powdery mildew is caused by the same fungal species *Podosphaera leucotricha* which overwinters in dormant apple buds, whereas its survival in pear remains unknown. When infected buds break in spring, the fungus produces spores that are rain and wind-spread to infect freshly emerged leaves which are highly susceptible powdery mildew. Germination and infections are optimal at temperatures between 60F and 78F. Wetness plays a marginal role. The fungus then continues its multi-cycle infections through spring and early summer until the productions of new leaves and shoots cease. The fungus is slowed down by the rising temperature (above 82F) as summer progresses. Infection resumes in fall where the pathogen overwinters as ascospores (sexual form) or infected buds. Under high disease pressure and mild summer conditions, the fungus can cause russetting on fruits and therefore reduce quality. While no cultivar is immune, cultivars like Granny Smith, Honeycrisp, Idared and Crimson Crisp are highly susceptible, whereas Golden Delicious is susceptible and Fuji, Gala and Red Delicious are the least susceptible. Mildew management should start before bud break and at green tip stage (to reduce spread of new inoculum) with sulfur-based products and continue every 10 to 14 days until the production of new shoots cease. Fungicides from FRAC groups 3, 7, 11 and 19 are effective and SHOULD be ROTATED throughout the season. In growing regions where scab is a problem, spray programs used to control the latter will control powdery mildew as well. In organic orchards, sulfur, potassium bicarbonate, and some biopesticides usually provide a good level of control.

## Pear scab

Scab, caused by the fungus *Venturia pyrina* on pear, is a major disease of pear fruit in many growing regions, especially those with high rainfall. Typical scab symptoms include gray-brown to blackish lesions on leaves and fruit. Because of the semi-arid conditions during the growing season in central Washington, scab risk is low. However, some microclimates in Northcentral Washington can be conducive to scab and therefore, management is recommended. In western Washington scab is common. Pear scab can cause problems in northern Washington growing regions and in Hood River, Oregon but it is rarely seen in central and south Washington State.

## Storage Rots (Sphaeropsis, Lambertella, Alternaria)

Several other fungal fruit infections initiated in the orchard can cause storage rots. Alternaria rot: A dark-brown to black infection caused by *Alternaria alternata* (and other spp.) is ubiquitous in most orchards. Infections, usually sporadic, may become frequent when sanitation is not observed or when wet conditions occur for an extended period. The fungus infects flowers at bloom, but can also infect fruit through the calyx end or wounds. Floral infections can result in moldy-core disease later in storage.

Sphaeropsis rot: A sporadic emerging disease caused by the fungus *Sphaeropsis pyriputrescens* infects fruits in the orchard and develops stem and calyx end rots in storage. The fungus overwinters on cankers and twigs. Prune diseased branches to help reduce inoculum. Pruning symptomatic crab apples is particularly important. Although this disease can be sporadic, it is still quarantined in many export countries and its identification in entry ports will result in fruit lot rejection.

Yellow-Lambertella rot: This disease was recently reported in the Pacific Northwest and, therefore, is considered as quarantine pathogen. Infections are caused by the fungus *L. corni-marisi*, which has been isolated from mummies of other fruit crops in the past but its disease cycle in apple is still unknown. The disease develops yellow mycelium that cover the fruit, but symptoms are only observed after several months of storage. Recent studies have shown that fungicides from FRAC group 1 are not

effective against *Lambertella* , whereas fungicides from FRAC groups 7 and 11 have only moderate efficacy. Until further research has shown which other preharvest fungicides are effective, it is recommended to apply a fungicide from FRAC group 9 or 12 postharvest, as these were found to be the most effective. The fungus requires a wound on the cuticle to cause an infection, therefore, reducing damages and punctures at harvest will reduce infection risks. The possibility of infections occurring through the calyx- or stem-ends is still unknown.

## Major Insects

### Codling moth

Codling moth is the key pest of pome fruits in the Pacific Northwest. In general, apples are more susceptible than pears, and fruits with softer flesh are more susceptible to attack. The increasing frequency of a third generation, two have been the norm historically, means that growers must be vigilant throughout the growing season, and be aware of phenology (See WSU Decision Aid system at <https://decisionaid.systems>). Codling moth has a long history of becoming resistant to insecticides, thus rotation of materials with different modes of action (MOA) is highly recommended. Avoid using the same MOA against consecutive generations to minimize this danger. The MOA for each material is listed in the tables. Pheromone mating disruption was registered in 1990, and has since been widely adopted in Washington. Use of mating disruption is now considered the foundation of an IPM program. Supplementing mating disruption with insecticides may be necessary depending on pressure, and using pheromone traps for monitoring populations will prevent unnecessary applications. Detailed recommendations on pheromone placement and timing of sprays is available. Additional Details about Codling moth

### Leafrollers (Pandemis, Obliquebanded)

Pre-bloom applications of pesticides can be effective and will also conserve natural enemies for leafroller and biological control agents of other pests, such as aphids. If treatments for leafrollers were applied at pink and/or bloom, sampling to determine the density of surviving leafrollers should be completed prior to deciding to apply additional controls at this timing. Most products listed act primarily as stomach poisons versus direct contact to residues, therefore, complete coverage is very important to achieve maximal control. Repeating an application of any product should be based on the leafroller population surviving previous treatments. Use the leafroller models on the WSU Decision Aid System (<https://decisionaid.systems>) for the optimum timing. Additional Details about Leafrollers (Pandemis, Obliquebanded)

### Pear psylla

Pear psylla, *Cacopsylla pyricola*, is a major pest of pears in the Pacific Northwest. While it is specific to pear, a portion of the population overwinters in alternative host plants such as apple and non-cultivated trees and shrubs. Pear psylla becomes active in orchards in late winter and early spring. Egg lay begins on wood while trees are dormant or at bud swell and generally peaks between popcorn and bloom on green tissues. The first generation of nymphs emerge between popcorn and petalfall. Pear

psylla undergo 3–4 generations in a season, with the 3rd and 4th usually occurring during or after harvest depending on the cultivar and season. While many programs rely heavily on repeated broad-spectrum sprays from dormant through harvest, softer programs use particle films (Surround CF or WP and diatomaceous earth) for adult repellency and selective insecticides (Esteem, Dimilin, Centaur, Neem products, Cinnerate, Rosemary oils) are encouraged for conservation of natural enemies. Therefore, when possible, materials are noted as broad-spectrum when expected to disrupt some combination of predators *Deraeocoris brevis*, *Campylomma verbasci*, earwigs, anthrocorids and the parasitoid wasp *Trechnites insidiosus*. Selective materials are expected to conserve these natural enemies, which are highly effective at controlling psylla later in the season. Additional Details about Pear psylla

## Pear rust mite

Pear rust mite, *Epitrimerus pyri*, is a common pest of pears. Although similar in appearance and injury, it is not the same as Apple rust mite, *Aculus schlechtendali*. Pear rust mite is a very small mite that requires magnification to see. Pear rust mite becomes active as soon as buds develop. Because natural enemies will not prevent injury, control measures must be taken prior to bloom (lime sulfur before green tissue, micronized sulfur after). If left uncontrolled rust mites will injure the developing fruit, causing scarring around the calyx. Rust mites will continue to feed through the season on both the fruit and leaves, causing a light russetting over their surfaces. If rust mites reemerge in the summer, they are readily controlled by most conventional miticides. Organic products such as cinnamon and rosemary oils also have shown efficacy against this pest. Postharvest sulfur sprays lower populations for the following season. Additional Details about Pear rust mite

## San Jose scale

San Jose scale can be a minor pest if adequately controlled, or escalate into a major problem if not. It primarily infests the trunk and limbs, but scale crawlers will settle on the fruit. Damage to this season's crop may become serious, but ultimately the infestation of wood may cause death of limbs or the entire tree. Oil plus an organophosphate in the delayed dormant spray provide control; if the organophosphate is omitted (oil only), monitor the trees carefully and add one of the listed materials if scale become numerous. Additional Details about San Jose scale

# Spray Schedule

## Dormant

| Insect      | Chemical   | Rate per Acre            | REI         | PHI         | MOA           | Eff. | Notes  |
|-------------|--|--------------------------|-------------|-------------|---------------|------|--|
| Pear psylla | <b>diatomaceous earth</b><br>Celite 610  | 40-70 lb                 | none listed | none listed | particle film | 3-4  | Adding a spreader sticker will improve residue stability. <b>Organic</b>   |
|             | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1-1.5 % v/v              | 12 h        | none listed |               | 4    | <b>Organic</b>   |
|             | <b>lime sulfur/calcium polysulfide + petroleum oil- dormant</b><br>Rex Lime Sulfur<br>+ petroleum oil- dormant | See Label<br>1-1.5 % v/v | 48 h        | 0 d         |               | 4    | <b>Organic</b>   |
|             | <b>kaolin</b><br>Surround CF   | 50-100 lb                | 4 h         | see label   |               | 4    | This formulation is designed for mixing with cold water, preferred for pre-bloom sprays. <b>Organic</b>  |
|             | <b>kaolin clay + petroleum oil- dormant</b><br>Surround WP<br>+ petroleum oil- dormant                         | 25-50 lb<br>1-1.5 % v/v  | 4 h         | 0 d         |               | 4    | Apply two to three applications as necessary to cover new growth between dormant/delayed dormant and first bloom. <b>Organic</b>                           |
|             | <b>lambda-cyhalothrin</b><br>Warrior II  | 2.56 fl oz               | 24 h        | 21 d        | 3             | 1-2  | Can be mixed with Piperonyl butoxide (PBO) to increase efficacy. Pyrethroid (MOA 3A) resistance is present in many areas and may severely reduce efficacy. |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Delayed dormant

| Insect            | Chemical   | Rate per Acre                           | REI         | PHI         | MOA           | Eff. | Notes   |
|-------------------|--|---|-------------|-------------|---------------|------|---|
| European red mite | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1.5 % v/v                               | 12 h        | none listed |               | 2    | Use no more than 5 gals. oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals. per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>   |
| Grape mealybug    | <b>diazinon</b><br><b>+ petroleum oil- dormant</b><br>Diazinon 50W<br>+ petroleum oil- dormant   | 4 lb<br>1.5 % v/v                       | 4 d         | 21 d        | 1B            | 3    | Use no more than 5 gals oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. Diazinon is labeled for a maximum of one dormant and one in-season application in pear.                                      |
|                   | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1.5 % v/v                               | 12 h        | none listed |               | 4    | Use no more than 5 gals oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals. per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>  |
| Pear psylla       | <b>diatomaceous earth</b><br>Celite 610  | 40-70 lb                                | none listed | none listed | particle film | 3-4  | Adding a spreader sticker will improve residue stability. <b>Organic</b>  |
|                   | <b>diflubenzuron</b><br><b>+ petroleum oil- dormant</b><br>Dimilin 2L<br>+ petroleum oil- dormant  | 40-48 fl oz<br>1-1.5 % v/v              | 12 h        | 14 d        | 15            | 2-3  | Insect growth regulators Dimilin and Esteem are most effective when applied prior to significant egg deposition. See Label. Use no more than 5 gals. oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. |
|                   | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1-1.5 % v/v                             | 12 h        | none listed |               | 4    | Use no more than 5 gals. oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>  |
|                   | <b>lime sulfur/calcium polysulfide</b><br><b>+ petroleum oil- dormant</b><br>lime sulfur/calcium polysulfide<br>+ petroleum oil- dormant | See label gal<br>See label<br>See Label | 48 h        | 0 d         |               | 4    | Use no more than 5 gal oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gal per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>   |

| Insect                                | Chemical   | Rate per Acre            | REI  | PHI         | MOA | Eff. | Notes   |
|---------------------------------------|--|--------------------------|------|-------------|-----|------|---|
|                                       | <b>kaolin</b><br>Surround CF   | 50-100 lb                | 4 h  | see label   |     | 4    | This formulation is designed for mixing with cold water, preferred for pre-bloom sprays. <b>Organic</b>   |
|                                       | <b>kaolin clay</b><br><b>+ petroleum oil- dormant</b><br>Surround WP<br>+ petroleum oil- dormant | 50-100 lb<br>1-1.5 % v/v | 4 h  | 0 d         |     | 4    | Apply two to three applications between dormant/delayed dormant and first bloom. Coverage of green tissue is important; apply every 2-3 weeks or as needed to cover new tree growth. Use no more than 5 gals. oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b> |
|                                       | <b>petroleum oil, summer</b><br><b>+ cinnamon oil</b><br>petroleum oil, summer<br>+ Cinnerate    | 1-2 gal<br>48-64 fl oz   | 4 h  | 0 d         |     | 1-3  | Marking has been seen only when applied after June turn down. 200 GPA sprays can increase likelihood of marking. Contact only, requires repeat sprays.  |
|                                       | <b>lambda-cyhalothrin</b><br>Warrior II  | 2.56 fl oz               | 24 h | 21 d        | 3   | 1-2  | Can be mixed with Piperonyl butoxide (PBO) to increase efficacy. Pyrethroid (MOA 3A) resistance is present in many areas and may severely reduce efficacy.  |
| Pear rust mite, pearleaf blister mite | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1-1.5 % v/v              | 12 h | none listed |     | NR   | Use no more than 5 gals. oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>  |
|                                       | <b>lime sulfur/calcium polysulfide</b><br>lime sulfur/calcium polysulfide                        | See Label                | 48 h | 0 d         |     | 3-4  | <b>Organic</b>  |
| San Jose scale                        | <b>pyriproxyfen</b><br>Esteem 35WP   | 4-5 oz                   | 12 h | 45 d        | 7C  | 1    |   |
|                                       | <b>petroleum oil- dormant</b><br>petroleum oil- dormant  | 1-1.5 % v/v              | 12 h | none listed |     | 3    | Use no more than 5 gals oil per acre in concentrate sprays. In areas where pears are susceptible to oil injury, reduce dosage so that no more than 5 gals per acre are applied during the prebloom period. If scale is a problem, use a dilute spray. Use handgun for hard-to-cover problem areas. <b>Organic</b>   |

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## Tight cluster

| Insect                                  | Chemical  | Rate per Acre | REI         | PHI         | MOA           | Eff. | Notes   |
|---|---|---------------|-------------|-------------|---------------|------|---|
| European red mite                       | <b>petroleum oil- dormant</b><br>petroleum oil- dormant | 1 % v/v       | 12 h        | none listed |               | 2    | <b>Organic</b>  |
| Grape mealybug                          | <b>thiamethoxam</b><br>Actara                           | 5.5 oz        | 12 h        | 14 d/35 d   | 4A            | NR   | PHI depends on rate used. Use a diluted spray for full coverage.  |
|   | <b>acetamiprid</b><br>Assail 70WP                       | 2.3-3.4 oz    | 12 h        | 7 d         | 4A            | 1    |   |
|   | <b>buprofezin</b><br>Centaur WDG                        | 34.5 oz       | 12 h        | 14 d        | 16            | 3-4  |   |
|   | <b>diazinon</b><br>Diazinon 50W                         | 4 lb          | 4 d         | 21 d        | 1B            | 3    | Diazinon is labeled for a maximum of one dormant and one in-season application in pear.   |
|   | <b>phosmet</b><br>Imidan 70W                            | 5.33 lb       | 7 d         | 7 d         | 1B            | 2    | Broad-spectrum on pear psylla natural enemies.  |
| Lygus bugs, stink bugs, green fruitworm | <b>flonicamid</b><br>Beleaf 50SG                        | 2-2.8 oz      | 12 h        | 21 d        | 29            | NR   | Needs further study. 50% control of adults and 65% control of young nymphs in one WA study in alfalfa [Walsh 2018].   |
|   | <b>diazinon</b><br>Diazinon 50W                         | 4 lb          | 4 d         | 21 d        | 1B            | NR   | Do not mix diazinon with oil. Diazinon is labeled for a maximum of one dormant and one in-season application in pear.   |
|   | <b>sulfoxaflor</b><br>Transform                         | 1.5-2.75 oz   | 24 h        | 7 d         | 4C            | NR   | Needs further testing. 68% control of adults and 71% control of young nymphs in one WA study in alfalfa [Walsh 2018].   |
| Pear psylla                             | <b>thiamethoxam</b><br>Actara                           | 5.5 oz        | 12 h        | 14 d/35 d   | 4A            | 3    | Broad-spectrum on pear psylla natural enemies.  |
|   | <b>abamectin</b><br>Agri-Mek SC                         | 4.25 fl oz    | 12 h        | 28 d        | 6             | 2    | Resistance to abamectin has been documented in certain areas, so efficacy may vary. Broad-spectrum on mite and pear psylla predators.   |
|   | <b>acetamiprid</b><br>Assail 70WP                       | 3.4 oz        | 12 h        | 7 d         | 4A            | 3    | Adult, egg and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|   | <b>azadirachtin</b><br>Aza-Direct                       | See label     | 4 h         | 0 d         | un            | 2-3  | Selective; compatible with pear psylla natural enemies. Short residues; 7-10 day reapplication intervals may be necessary for control. Severe phytotoxicity may occur if applied to pear cultivars with Comice background. <b>Organic</b> |
|   | <b>tolfenpyrad</b><br>Bexar                             | 27 fl oz      | 12 h        | 14 d        | 21A           | 4    | Do not make more than two applications of Bexar in a season. Mortality of adults, eggs, and nymphs.   |
|   | <b>diatomaceous earth</b><br>Celite 610                 | 40-70 lb      | none listed | none listed | particle film | 3-4  | Adding a spreader sticker will improve residue stability. <b>Organic</b>  |

| Insect         | Chemical   | Rate per Acre          | REI  | PHI       | MOA | Eff. | Notes  |
|----------------|--|------------------------|------|-----------|-----|------|--|
|                | <b>buprofezin</b><br>Centaur WDG   | 34.5 oz                | 12 h | 14 d      | 16  | 2-3  |  |
|                | <b>spinetoram</b><br>Delegate WG   | 7 oz                   | 4 h  | 7 d       | 5   | 3-4  | Psylla adult and nymph mortality. Broad-spectrum on pear psylla natural enemies.   |
|                | <b>pyriproxyfen</b><br>Esteem 35WP   | 5 oz                   | 12 h | 45 d      | 7C  | 2-4  | Pyriproxyfen needs to be timed with adults just before they lay eggs. It will not kill adults or prevent egg lay, but will cause adults to lay infertile eggs. Selective; compatible with pear psylla natural enemies. |
|                | <b>kaolin</b><br>Surround CF   | 50-100 lb              | 4 h  | see label |     | 4    | This formulation is designed for mixing with cold water, preferred for pre-bloom sprays. <b>Organic</b>  |
|                | <b>kaolin clay</b><br>Surround WP  | 50 lb                  | 4 h  | 0 d       |     | 3-4  | Kaolin clay residues used after June may be difficult to remove from fruit when packing, especially red or soft skin varieties. <b>Organic</b>   |
|                | <b>petroleum oil, summer + cinnamon oil</b><br>petroleum oil, summer + Cinnerate | 1-2 gal<br>48-64 fl oz | 4 h  | 0 d       |     | 1-3  | Marking has been seen only when applied after June turn down. 200 GPA sprays can increase likelihood of marking. Contact only, requires repeat sprays.   |
| San Jose scale | <b>pyriproxyfen</b><br>Esteem 35WP   | 4-5 oz                 | 12 h | 45 d      | 7C  | 1    |  |

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## Popcorn

| Disease     | Chemical                           | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes   |
|-------------|------------------------------------|---------------|------|------|-----|------|---|
| Pear mildew | <b>benzovindiflupyr</b><br>Aprovia | 7 fl oz       | 12 h | 30 d | 7   | 3    | Do not follow Aprovia with fungicides from FRAC group 7 such as Fontelis, Luna and Pristine to reduce fungicide resistance development. |
|             | <b>penthiopyrad</b><br>Fontelis    | 14-20 fl oz   | 12 h | 28 d | 7   | NR   | Fontelis and Aprovia are from the same chemical group (7). Use one of them ONLY at the same growth stage.                               |
|             | <b>pydiflumetofen</b><br>Miravis   | 3.4 fl oz     | 12 h | 30 d | 7   | 3    | Rotate with other FRAC groups other than FRAC 7.  |
|             |                                    |               |      |      |     |      |   |

| Disease                | Chemical  | Rate per Acre            | REI  | PHI  | MOA  | Eff. | Notes  |
|------------------------|---|--------------------------|------|------|------|------|--|
|                        | <b>triflumizole</b><br>Procure 480SC                                      | 8-16 fl oz               | 12 h | 14 d | 3    | 4    | Procure is a FRAC 3 fungicide and should not be rotated or used with other FRAC 3 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 3 fungicides per season. Do not make more than two sequential applications of FRAC 3 fungicides labeled for use on pome fruits. |
|                        | <b>lime sulfur/calcium polysulfide</b><br>Rex Lime Sulfur                 | 2.5 gal                  | 48 h | 0 d  |      | NR   | Do NOT use lime sulfur or micronized sulfur on Anjou. <b>Organic</b>   |
| Pear scab              | <b>mancozeb</b><br>mancozeb   | 6 lb                     | 24 h | 77 d | M3   | NR   |  |
|                        | <b>penthiopyrad</b><br>Fontelis   | 14-20 fl oz              | 12 h | 28 d | 7    | NR   | Fontelis and Aprovia are from the same chemical group (7). Use one of them ONLY at the same growth stage.  |
|                        | <b>pydiflumetofen + benzovindiflupyr</b><br>Miravis<br>+ Aprovia          | 3.4 fl oz<br>5.5-7 fl oz | 12 h | 30 d | 7    | NR   | Aprovia, Fontelis, and Miravis are from the same chemical group (7). Use ONLY one of them at the same growth stage.  |
|                        | <b>triflumizole</b><br>Procure 480SC                                      | 8-16 fl oz               | 12 h | 14 d | 3    | NR   | Rate varies when used in eradicator (postinfective) schedules. See label.  |
|                        | <b>lime sulfur/calcium polysulfide</b><br>lime sulfur/calcium polysulfide | See Label                | 48 h | 0 d  |      | NR   | Do NOT use lime sulfur or micronized sulfur on Anjou. <b>Organic</b>   |
| Insect                 | Chemical  | Rate per Acre            | REI  | PHI  | MOA  | Eff. | Notes  |
| Leafrollers (Pandemis) | <b>Bacillus thuringiensis subsp. kurstaki</b><br>DiPel DF                 | See label                | 4 h  | 0 d  | 11B2 | 3    | While too early for Obliquebanded leafrollers, this is the appropriate timing for Pandemis. Bts are stomach poisons, so complete coverage is very important for control. Two or three applications are usually required. Apply when forecasts predict a warm weather pattern for 3 or more days. <b>Organic</b>                            |
| Pear psylla            | <b>acetamiprid</b><br>Assail 70WP   | 3.4 oz                   | 12 h | 7 d  | 4A   | 3    | Adult, egg and nymph mortality. Broad-spectrum on pear psylla natural enemies.   |
|                        | <b>azadirachtin</b><br>Aza-Direct   | See label                | 4 h  | 0 d  | un   | 2-3  | Selective; compatible with pear psylla natural enemies. Short residues; 7-10 day reapplication intervals may be necessary for control. Severe phytotoxicity may occur if applied to pear cultivars with Comice background. <b>Organic</b>  |
|                        | <b>tolfenpyrad</b><br>Bexar   | 27 fl oz                 | 12 h | 14 d | 21A  | 4    | Do not make more than two applications of Bexar in a season. Mortality of adults, eggs, and nymphs.  |
|                        | <b>spinetoram</b><br>Delegate WG  | 7 oz                     | 4 h  | 7 d  | 5    | 3-4  | Psylla adult and nymph mortality. Broad-spectrum on pear psylla natural enemies.   |

| Insect | Chemical   | Rate per Acre          | REI  | PHI  | MOA | Eff. | Notes  |
|--------|--|------------------------|------|------|-----|------|--|
|        | <b>diflubenzuron</b><br>Dimilin 2L   | 40-48 fl oz            | 12 h | 14 d | 15  | 2-3  |  |
|        | <b>pyriproxyfen</b><br>Esteem 35WP   | 5 oz                   | 12 h | 45 d | 7C  | 2-4  | Pyriproxyfen needs to be timed with adults just before they lay eggs. It will not kill adults or prevent egg lay, but will cause adults to lay infertile eggs. Selective; compatible with pear psylla natural enemies. |
|        | <b>novaluron</b><br>Rimon 0.83EC   | 32 fl oz               | 12 h | 14 d | 15  | 3    | Do not apply after initiation of pear turndown. Broad-spectrum on pear psylla natural enemies.   |
|        | <b>kaolin clay</b><br>Surround WP  | 50 lb                  | 4 h  | 0 d  |     | 3-4  | Kaolin clay residues used after June may be difficult to remove from fruit when packing, especially red or soft skin varieties. <b>Organic</b>   |
|        | <b>petroleum oil, summer + cinnamon oil</b><br>petroleum oil, summer + Cinnerate | 1-2 gal<br>48-64 fl oz | 4 h  | 0 d  |     | 1-3  | Marking has been seen only when applied after June turn down. 200 GPA sprays can increase likelihood of marking. Contact only, requires repeat sprays.   |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Pink

| Disease     | Chemical                         | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes  |
|-------------|----------------------------------|---------------|------|------|-----|------|--|
| Pear mildew | <b>pydiflumetofen</b><br>Miravis | 3.4 fl oz     | 12 h | 30 d | 7   | 3    | Rotate with other FRAC groups other than FRAC 7. |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## First bloom

| Disease | Chemical | Rate per Acre | REI | PHI | MOA | Eff. | Notes |
|---------|----------|---------------|-----|-----|-----|------|-------|
|---------|----------|---------------|-----|-----|-----|------|-------|

| Disease     | Chemical   | Rate per Acre | REI  | PHI         | MOA | Eff. | Notes  |
|-------------|--|---------------|------|-------------|-----|------|--|
| Fire blight | <b>Aureobasidium pullulans strains DSM 14940 &amp; 14941</b><br>Blossom Protect  | 1.25 lb       | 4 h  | none listed |     | 4    | Apply with Buffer Protect. Two or more applications best. Yeasts need 1-2 days before an infection to colonize the flower before bacteria invade to be effective. Russet potential on sensitive varieties in humid conditions. <span>Organic</span>  |
|             | <b>oxytetracycline</b><br>FireLine 17WP  | 16 oz         | 12 h | 60 d        | 41  | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5.5-6.0 optimal. Best activity at 200 ppm: 1.0 lb/100 gal.  |
|             | <b>kasugamycin</b><br>Kasumin 2L   | 64 fl oz      | 12 h | 90 d        | 24  | 4    | Best control when applied less than 24 h before wetness event. Potentially some control up to 12 h after wetting.  |
|             | <b>calcium oxytetracycline</b><br>Mycoshield   | 16 oz         | 12 h | 60 d        | 41  | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5 optimal. 200 ppm: 1.0 lb/100 gal.   |
| Pear mildew | <b>penthiopyrad</b><br>Fontelis  | 14-20 fl oz   | 12 h | 28 d        | 7   | 3    | Fontelis is a FRAC 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7 fungicides per season. Do not make sequential applications of FRAC 7 fungicides labeled for use on pome fruits.  |
|             | <b>triflumizole</b><br>Procure 480SC   | 8-16 fl oz    | 12 h | 14 d        | 3   | 4    | Procure is a FRAC 3 fungicide and should not be rotated or used with other FRAC 3 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 3 fungicides per season. Do not make more than two sequential applications of FRAC 3 fungicides labeled for use on pome fruits. Apply no sooner than half-inch green. |
|             | <b>Notes:</b> The efficacy level will depend on the absence of resistant populations from the orchard. To limit the potential for development of fungicide resistance, do not make more than four applications of FRAC group 11 fungicides per season. Do not make more than two sequential applications of FRAC group 11 fungicides. This limitation is inclusive of all FRAC group 11 fungicides labeled for use on pome fruits. |               |      |             |     |      |  |
| Pear scab   | <b>mancozeb</b><br>mancozeb  | 6 lb          | 24 h | 77 d        | M3  | NR   |  |
|             | <b>penthiopyrad</b><br>Fontelis  | 14-20 fl oz   | 12 h | 28 d        | 7   | NR   |  |
|             | <b>triflumizole</b><br>Procure 480SC   | 8-16 fl oz    | 12 h | 14 d        | 3   | NR   |  |
|             | <b>lime sulfur/calcium polysulfide</b><br>lime sulfur/calcium polysulfide  | See Label     | 48 h | 0 d         |     | NR   | <span>Organic</span>   |
|             | <b>dodine</b><br>Syllit FL   | 3 pt          | 48 h | 7 d         | U12 | NR   |  |

| Disease   | Chemical  | Rate per Acre | REI         | PHI         | MOA        | Eff. | Notes   |
|---|---|---------------|-------------|-------------|------------|------|---|
| Storage Rots (Sphaeropsis, Lambertella, Alternaria) | <b>Aureobasidium pullulans strain DSM 14940/14941</b><br>Botector | 10 oz         | 4 h         | 0 d         | Biological | NR   | Apply no more than 2 times between 10 and 90% bloom. Do not apply if Blossom Protect will be applied. <b>Organic</b>  |
| Insect  | Chemical  | Rate per Acre | REI         | PHI         | MOA        | Eff. | Notes   |
| Codling moth  | <b>CM pheromone dispensers</b><br>Isomate-C Plus                  | See label     | none listed | none listed |            | NR   | Install dispensers before first flight (prior to bloom) using the full label rate in the top 2 feet of the canopy. When using aerosol emitters borders should be treated with hand-applied dispensers. <b>Organic</b>   |
| Leafrollers (Pandemis)                              | <b>Bacillus thuringiensis subsp. kurstaki</b><br>DiPel DF         | See label     | 4 h         | 0 d         | 11B2       | 3    | While this is too early for Obliquebanded leafrollers, this timing is appropriate for Pandemis. Bts are stomach poisons, so complete coverage is very important for control. Two or three applications are usually required. Apply when forecasts predict a warm weather pattern for 3 or more days. <b>Organic</b> |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Bloom

| Disease            | Chemical  | Rate per Acre | REI  | PHI | MOA   | Eff. | Notes   |
|--------------------|---|---------------|------|-----|-------|------|---|
| Botrytis-Gray Mold | <b>fluxapyroxad + pyraclostrobin</b><br>Merivon | 5.5 fl oz     | 12 h | 0 d | 7, 11 | 3    | Merivon is a FRAC group 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. Do not make more than three FRAC 7 applications in a season.  |
|                    | <b>pyraclostrobin + boscalid</b><br>Pristine    | 18.5 oz       | 12 h | 0 d | 11,7  | 4    | Pristine is a FRAC 7 +11 fungicide and should not be rotated or used with other FRAC 7+11 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7+11 fungicides per season. Do not make sequential applications of FRAC 7+11 fungicides labeled for use on pome fruits. Efficacy dependent on the occurrence of fungicide resistant populations. For powdery mildew, preferably use other FRAC 7 fungicides in spring. |

| Disease     | Chemical  | Rate per Acre | REI  | PHI         | MOA | Eff. | Notes  |
|-------------|---|---------------|------|-------------|-----|------|--|
| Fire blight | <b>acibenzolar-s-methyl</b><br>Actigard 50WG                                    | 1-2 fl oz     | 12 h | 60 d        | P01 | NR   | For bloom applications: Apply 1–2 oz/A in a tank mix with a fire blight treatment (generally an antibiotic) that is standard in your area. This is generally 2-3 applications between 20% bloom and petal fall depending on the environmental conditions. Do not apply closer than a 7-day interval. Also used to reduce re-occurrence of blight after cutting out infected strikes. Apply concentrate to a one meter section of the main leader after cutting see <a href="http://treefruit.wsu.edu/crop-protection/disease-management/fire-blight/">http://treefruit.wsu.edu/crop-protection/disease-management/fire-blight/</a> |
|             | <b>Aureobasidium pullulans strains DSM 14940 &amp; 14941</b><br>Blossom Protect | 1.25 lb       | 4 h  | none listed |     | 4    | Apply with Buffer Protect. Two or more applications best. Yeasts need 1-2 days before an infection to colonize the flower before bacteria invade to be effective. Russet potential on sensitive varieties in humid conditions. <b>Organic</b>  |
|             | <b>copper octanoate</b><br>Cueva  | 4 qt          | 4 h  | 0 d         | M1  | 3    | Little russet in semi-arid WA trials. Some russet risk in wetter OR. Tank mix compatible with Bacillus-based biopesticides. Soluble copper efficacy 47% to 73% in WSU trials 2013 to 2022 (DuPont et al. 2023). <b>Organic</b>   |
|             | <b>Bacillus amyloliquefaciens strain D747</b><br>DoubleNickel 55                | 3 lb          | 4 h  | 0 d         |     | 2    | See label and space between rows to select the corresponding rate. Efficacy may vary based on disease pressure. Can be used with copper fungicides to increase control. Relative disease suppression in Washington trials average 30%. <b>Organic</b>  |
|             | <b>oxytetracycline</b><br>FireLine 17WP   | 16 oz         | 12 h | 60 d        | 41  | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5.5-6.0 optimal. Best activity at 200 ppm: 1.0 lb/100 gal.  |
|             | <b>kasugamycin</b><br>Kasumin 2L  | 64 fl oz      | 12 h | 90 d        | 24  | 4    | Best control when applied less than 24 h before wetness event. Potentially some control up to 12 h after wetting.  |
|             | <b>Copper sulfate pentahydrate</b><br>Mastercop                                 | 40 fl oz      | 48 h | 0 d         |     | 3    | Pay attention to drying times. Soluble copper efficacy 47% to 73% in WSU trials 2013 to 2022 (DuPont et al. 2023). <b>Organic</b>  |
|             | <b>calcium oxytetracycline</b><br>Mycoshield                                    | 16 oz         | 12 h | 60 d        | 41  | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5 optimal. 200 ppm: 1.0 lb/100 gal.   |
|             | <b>copper hydroxide</b><br>Previsto   | 3-4 qt        | 48 h | none listed | M1  | 3    | Pay attention to drying times and do not combine with acidifying products to reduce fruit finish risks. <b>Organic</b>   |
|             | <b>Bacillus subtilis strain QST 713</b><br>Serenade Opti                        | 20 oz         | 4 h  | 0 d         | 44  | 2    | Efficacy may vary based on disease pressure. Median relative disease suppression 50% in WA trials 2017 to 2021, 60% WA and OR 2012-2015. <b>Organic</b>  |

| Disease   | Chemical  | Rate per Acre | REI | PHI | MOA        | Eff. | Notes  |
|---|---|---------------|-----|-----|------------|------|--|
| Storage Rots (Sphaeropsis, Lambertella, Alternaria) | <b>Aureobasidium pullulans strain DSM 14940/14941</b><br>Botector | 10 oz         | 4 h | 0 d | Biological | NR   | Apply no more than 2 times between 10 and 90% bloom. Do not apply if Blossom Protect will be applied. <span>Organic</span> |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Petal fall

| Disease            | Chemical  | Rate per Acre | REI  | PHI | MOA   | Eff. | Notes  |
|--------------------|---|---------------|------|-----|-------|------|--|
| Botrytis-Gray Mold | <b>copper octanoate</b><br>Cueva                | 8 qt          | 4 h  | 0 d | M1    | 2    | <span>Organic</span>   |
|                    | <b>fluxapyroxad + pyraclostrobin</b><br>Merivon | 5.5 fl oz     | 12 h | 0 d | 7, 11 | 3    | Merivon is a FRAC group 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. Do not make more than three FRAC 7 applications in a season.   |
|                    | <b>pyraclostrobin + boscalid</b><br>Pristine    | 18.5 oz       | 12 h | 0 d | 11,7  | 4    | Pristine is a FRAC 7 +11 fungicide an should not be rotated or used with other FRAC 7+11 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7+11 fungicides per season. Do not make sequential applications of FRAC 7+11 fungicides labeled for use on pome fruits. Efficacy dependent on the occurrence of fungicide resistant populations. For powdery mildew, preferably use other FRAC 7 fungicides in spring. |
|                    | <b>thiophanate-methyl</b><br>Topsin M WSB       | 1 lb          | 2 d  | 1 d | 1     | 3    | Efficacy level is ensured when resistance is absent from the orchard. Do not apply more than 2.8 lbs. a.i. per acre in a year. Topsin-M is very prone to fungicide resistance development, rotation with other FRAC group is required. Do not make sequential applications of FRAC group 1 fungicides and do not make more than two FRAC 1 fungicides per season. Topsin-M is similar to Mertect, used postharvest, therefore careful use is highly recommended.                         |



| Disease        | Chemical   | Rate per Acre | REI         | PHI         | MOA     | Eff. | Notes  |
|----------------|--|---------------|-------------|-------------|---------|------|--|
| Bull's eye rot | <b>ziram</b><br>Ziram 76DF                                       | See label     | 48 h        | 14 d        | M3      | 3    | Apply while pear calyx is still upright and then in the first cover spray and in preharvest ideally before rain. Do NOT apply within 14 days of harvest. When applicable, tank-mix with other single-site fungicides to increase efficacy and reduce risk of fungicide resistance development. Do not apply more than 18.4 lbs. a.i of Ziram 76DF or equivalent per season. Aerial application allowed only at preharvest.   |
| Fire blight    | <b>acibenzolar-s-methyl</b><br>Actigard 50WG                     | 1-2 fl oz     | 12 h        | 60 d        | P01     | NR   | For bloom applications: Apply 1–2 oz/A in a tank mix with a fire blight treatment (generally an antibiotic) that is standard in your area. This is generally 2-3 applications between 20% bloom and petal fall depending on the environmental conditions. Do not apply closer than a 7-day interval. Also used to reduce re-occurrence of blight after cutting out infected strikes. Apply concentrate to a one meter section of the main leader after cutting see <a href="http://treefruit.wsu.edu/crop-protection/disease-management/fire-blight/">http://treefruit.wsu.edu/crop-protection/disease-management/fire-blight/</a> |
|                | <b>cinnamon oil</b><br>Cinnerate                                 | 32 fl oz      | none listed | 0 d         | unknown | 2    | Essential oil products provided median relative disease suppression (45-49%) in 3 WA trials with repeat applications. Use as part of an integrated program. Consider drying times to minimize marking risk.  |
|                | <b>copper octanoate</b><br>Cueva                                 | 4 qt          | 4 h         | 0 d         | M1      | 3    | Little russet in semi-arid WA trials. Some russet risk in wetter OR. Tank mix compatible with Bacillus-based biopesticides. Soluble copper efficacy 47% to 73% in WSU trials 2013 to 2022 (DuPont et al. 2023). <span>Organic</span>   |
|                | <b>Bacillus amyloliquefaciens strain D747</b><br>DoubleNickel 55 | 3 lb          | 4 h         | 0 d         |         | 2    | See label and space between rows to select the corresponding rate. Efficacy may vary based on disease pressure. Can be used with copper fungicides to increase control. Relative disease suppression in Washington trials average 30%. <span>Organic</span>  |
|                | <b>oxytetracycline</b><br>FireLine 17WP                          | 16 oz         | 12 h        | 60 d        | 41      | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5.5-6.0 optimal. Best activity at 200 ppm: 1.0 lb/100 gal.  |
|                | <b>hydrogen peroxide + peroxyacetic acid</b><br>Jet-Ag           | 128 fl oz     | 4 h         | none listed |         | 2    | Provided moderate relative disease suppression (median 48%-62%) in WA over 3 trials with repeat applications. Use as part of an integrated program. Consider drying times to minimize marking risk.  |
|                | <b>kasugamycin</b><br>Kasumin 2L                                 | 64 fl oz      | 12 h        | 90 d        | 24      | 4    | Best control when applied less than 24 h before wetness event. Potentially some control up to 12 h after wetting.  |

| Disease     | Chemical  | Rate per Acre | REI       | PHI         | MOA   | Eff. | Notes   |
|-------------|---|---------------|-----------|-------------|-------|------|---|
|             | <b>calcium oxytetracycline</b><br>Mycoshield              | 16 oz         | 12 h      | 60 d        | 41    | 4    | Best activity within 24 h before wetness event. Check spray tank pH, 5 optimal. 200 ppm: 1.0 lb/100 gal.  |
|             | <b>hydrogen peroxide peroxyacetic acid</b><br>OxiDate 5.0 | 128 fl oz     | See label |             |       | 2    | Provided moderate relative disease suppression (median 48%-62%) in WA over 3 trials with repeat applications. Use as part of an integrated program. Consider drying times to minimize marking risk. <b>Organic</b>  |
|             | <b>copper hydroxide</b><br>Previsto                       | 3-4 qt        | 48 h      | none listed | M1    | 3    | Pay attention to drying times and do not combine with acidifying products to reduce fruit finish risks. <b>Organic</b>  |
|             | <b>Bacillus subtilis strain QST 713</b><br>Serenade Opti  | 20 oz         | 4 h       | 0 d         | 44    | 2    | Efficacy may vary based on disease pressure. Median relative disease suppression 50% in WA trials 2017 to 2021, 60% WA and OR 2012-2015. <b>Organic</b>   |
|             | <b>thyme oil</b><br>Thyme Guard                           | 2 qt          | 4 h       |             |       | 2    | Essential oil products provided moderate relative disease suppression (46-49%) in 4 WA trials with repeat applications. Use as part of an integrated program. Consider drying times to minimize marking risk. <b>Organic</b>  |
| Pear mildew | <b>benzovindiflupyr</b><br>Aprovia                        | 5.5-7 fl oz   | 12 h      | 30 d        | 7     | 3    | Do not follow Aprovia with fungicides from FRAC group 7 such as Fontelis, Luna and Pristine to reduce fungicide resistance development.   |
|             | <b>penthiopyrad</b><br>Fontelis                           | 14-20 fl oz   | 12 h      | 28 d        | 7     | 3    | Fontelis is a FRAC 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7 fungicides per season. Do not make sequential applications of FRAC 7 fungicides labeled for use on pome fruits. |
|             | <b>potassium bicarbonate</b><br>Kaligreen                 | 3 lb          | 4 h       | 1 d         | NC    | 2    | Under low disease pressure, Kaligreen will provide adequate control. If disease pressure increases, rotation or combination with other materials is recommended. <b>Organic</b>   |
|             | <b>fluopyram</b><br>Luna Privilege                        | 6.84 fl oz    | 12 h      | 7 d         | 7     | 4    | Luna Privilege is a FRAC group 7 fungicide and should not be rotated or used with fungicides from the same group. Do not apply more than 3 applications of FRAC group 7 fungicides in a season.   |
|             | <b>fluxapyroxad + pyraclostrobin</b><br>Merivon           | 5.5 fl oz     | 12 h      | 0 d         | 7, 11 | 3    | Merivon is a FRAC group 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. Do not make more than three FRAC 7 applications in a season.  |
|             | <b>pydiflumetofen</b><br>Miravis                          | 3.4 fl oz     | 12 h      | 30 d        | 7     | 3    | Rotate with other FRAC groups other than FRAC 7.  |
|             |   |               |           |             |       |      |   |

| Disease   | Chemical   | Rate per Acre            | REI  | PHI  | MOA | Eff. | Notes  |
|-----------|--|--------------------------|------|------|-----|------|--|
|           | <b>polyoxin D zinc salt</b><br>OSO 5%SC                              | 13 fl oz                 | 4 h  | 0 d  | 19  | 3    | OSO is FRAC 19 fungicide recommended to rotate with other FRAC groups labeled for pome fruit. Do not apply more than 4.3 oz. a.i./acre/season. <b>Organic</b>  |
|           | <b>triflumizole</b><br>Procure 480SC                                 | 16 fl oz                 | 12 h | 14 d | 3   | 4    | Procure is a FRAC 3 fungicide and should not be rotated or used with other FRAC 3 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 3 fungicides per season. Do not make more than two sequential applications of FRAC 3 fungicides labeled for use on pome fruits. |
|           | <b>Reynoutria sachalinensis</b><br>Regalia                           | 4 qt                     | 4 h  | 0 d  | P5  | 2    | Do not use prior to petal fall. Under low disease pressure, it may help control some summer diseases like Alternaria and Bull's eye rot. <b>Organic</b>  |
|           | <b>triflumazole</b><br>Trionic 4SC                                   | 16 fl oz                 | 12 h | 14 d | 3   | 4    | Trionic is a FRAC 3 fungicide an should not be rotated or used with other FRAC 3 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 3 fungicides per season. Do not make more than two sequential applications of FRAC 3 fungicides labeled for use on pome fruits.  |
| Pear scab | <b>mancozeb</b><br>mancozeb  | 6 lb                     | 24 h | 77 d | M3  | NR   |  |
|           | <b>penthiopyrad</b><br>Fontelis                                      | 14-20 fl oz              | 12 h | 28 d | 7   | NR   | Fontelis and Aprovia are from the same chemical group (7). Use ONLY one of them for the same growth stage. Do not make more than 4 application per season for fungicides from the same group. Additional restriction may apply, check specific labels.   |
|           | <b>pydiflumetofen<br/>+ benzovindiflupyr</b><br>Miravis<br>+ Aprovia | 3.4 fl oz<br>5.5-7 fl oz | 12 h | 30 d | 7   | NR   | Aprovia, Fontelis, and Miravis are from the same chemical group (7). Use ONLY one of them for the same growth stage. Do not make more than 4 application per season for fungicides from the same group. Additional restriction may apply, check specific labels.   |
|           | <b>triflumizole</b><br>Procure 480SC                                 | 8-16 fl oz               | 12 h | 14 d | 3   | NR   |  |
|           | <b>lime sulfur/calcium polysulfide</b><br>Rex Lime Sulfur            | See label                | 48 h | 0 d  |     | NR   | <b>Organic</b>   |

| Disease   | Chemical  | Rate per Acre | REI         | PHI         | MOA | Eff. | Notes   |
|---|---|---------------|-------------|-------------|-----|------|---|
| Storage Rots<br>(Sphaeropsis,<br>Lambertella, Alternaria) | <b>penthiopyrad</b><br>Fontelis                       | 20 fl oz      | 12 h        | 28 d        | 7   | 3    | Fontelis has an acceptable efficacy against Alternaria fungus and Nectria that may infect fruit preharvest. Fontelis is a FRAC 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7 fungicides per season. Do not make sequential applications of FRAC 7 fungicides labeled for use on pome fruits. |
|   | <b>polyoxin D zinc salt</b><br>OSO 5%SC               | 13 fl oz      | 4 h         | 0 d         | 19  | 3    | OSO will help control Alternaria and Nectria infections preharvest. OSO is FRAC 19 fungicide recommended to rotate with other FRAC groups labeled for pome fruit. Do not apply more than 4.3 oz. a.i./acre/season. <b>Organic</b>   |
|   | <b>polyoxin D zinc salt</b><br>Ph-D                   | 6.2 oz        | 4 h         | 0 d         | 19  | 3    |   |
| Insect  | Chemical  | Rate per Acre | REI         | PHI         | MOA | Eff. | Notes   |
| Codling moth  | <b>CM pheromone dispensers</b><br>Isomate-C Plus      | See label     | none listed | none listed |     | NR   | Install dispensers before first flight (prior to bloom) using the full label rate in the top 2 feet of the canopy. When using aerosol emitters borders should be treated with hand-applied dispensers. <b>Organic</b>   |
|   | <b>petroleum oil, summer</b><br>petroleum oil, summer | See Label     | 4 h         | 0 d         |     | NR   | <b>Organic</b>  |
| Grape mealybug  | <b>thiamethoxam</b><br>Actara                         | 4.5-5.5 oz    | 12 h        | 14 d/35 d   | 4A  | NR   | PHI depends on rate used. See label.  |
|   | <b>imidacloprid</b><br>Admire Pro                     | 5.6-7 fl oz   | 12 h        | 7 d         | 4A  | NR   | Rate/PHI for foliar application.  |
|   | <b>acetamiprid</b><br>Assail 70WP                     | 2.3-3.4 oz    | 12 h        | 7 d         | 4A  | 1    |   |
|   | <b>buprofezin</b><br>Centaur WDG                      | 34.5 oz       | 12 h        | 14 d        | 16  | NR   |   |
|   | <b>diazinon</b><br>Diazinon 50W                       | 4 lb          | 4 d         | 21 d        | 1B  | 3    | Diazinon is labeled for a maximum of one dormant and one in-season application in pear.   |
|   | <b>phosmet</b><br>Imidan 70W                          | 5.33 lb       | 7 d         | 7 d         | 1B  | 2    | Broad-spectrum on pear psylla natural enemies.  |

| Insect                                | Chemical  | Rate per Acre | REI                                       | PHI  | MOA  | Eff. | Notes   |
|---------------------------------------|---|---------------|---|------|------|------|---|
| Leafrollers (Pandemis, Obliquebanded) | <b>chlorantraniliprole</b><br>Altacor                     | 3-4.5 oz      | 4 h                                       | 5 d  | 28   | 4    | Altacor is highly effective against leafroller larvae and, at this treatment timing, has the added value of being toxic to codling moth eggs laid on product residues (see recommendations under codling moth). It can, therefore, be used as part of a management strategy to delay the first larvicide application against codling moth. Use the leafroller models at <a href="https://decisionaid.systems/">https://decisionaid.systems/</a> for the optimum timing for this product. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control. |
|                                       | <b>spinetoram</b><br>Delegate WG                          | 4.5-7 oz      | 4 h                                       | 7 d  | 5    | 4    | Delegate is effective against leafroller larvae. It has a residual activity of 14 days. Delegate is in the same chemical class (MOA=5) as Success (spinosad). For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |
|                                       | <b>Bacillus thuringiensis subsp. kurstaki</b><br>DiPel DF | See label     | 4 h                                       | 0 d  | 11B2 | 3    | Bt products should be timed to coincide with periods of warm weather when high temperatures are expected to reach 65 degrees for three consecutive days. Multiple applications are typically required to control high populations. <span>Organic</span>   |
|                                       | <b>pyriproxyfen</b><br>Esteem 35WP                        | 4-5 oz        | 12 h                                      | 45 d | 7C   | 4    | Esteem should be applied when last stage larvae are present but before pupation has begun. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.   |
|                                       | <b>methoxyfenozide</b><br>Intrepid 2F                     | 16 fl oz      | 4 h                                       | 14 d | 18A  | 3    | Some leafroller populations have developed resistance to Intrepid and its use could result in reduced levels of control. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.   |
|                                       | <b>emamectin benzoate</b><br>Proclaim                     | 3.2-4.8 oz    | 12 h   48 h for some activities-see label | 14 d | 6    | 4    | For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |

| Insect  | Chemical                                | Rate per Acre | REI         | PHI         | MOA           | Eff. | Notes   |
|---|---|---------------|-------------|-------------|---------------|------|---|
|   | <b>spinosad</b><br>Success              | 6-10 fl oz    | 4 h         | 7 d         | 5             | 3-4  | Some leafroller populations have developed resistance to spinosad and its use could result in reduced levels of control. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control. |
| McDaniel spider mite,<br>twospotted spider mite,<br>European red mite | <b>cyflumetofen</b><br>Nealta           | 13.7 fl oz    | 12 h        | 7 d         | 25            | 3-4  | Low impacts on natural enemies.   |
| Pear psylla   | <b>thiamethoxam</b><br>Actara           | 5.5 oz        | 12 h        | 14 d/35 d   | 4A            | 3    | Broad-spectrum on pear psylla natural enemies.  |
|   | <b>imidacloprid</b><br>Admire Pro       | 5.6-7 fl oz   | 12 h        | 7 d         | 4A            | 2-3  |   |
|   | <b>abamectin</b><br>Agri-Mek SC         | 4.25 fl oz    | 12 h        | 28 d        | 6             | 2    | Resistance to abamectin has been documented in certain areas, so efficacy may vary. Broad-spectrum on mite and pear psylla predators.   |
|   | <b>acetamiprid</b><br>Assail 70WP       | 3.4 oz        | 12 h        | 7 d         | 4A            | 3    | Adult, egg and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|   | <b>azadirachtin</b><br>Aza-Direct       | See label     | 4 h         | 0 d         | un            | 2-3  | Selective; compatible with pear psylla natural enemies. Short residues; 7-10 day reapplication intervals may be necessary for control. Severe phytotoxicity may occur if applied to pear cultivars with Comice background. <b>Organic</b>   |
|   | <b>tolfenpyrad</b><br>Bexar             | 27 fl oz      | 12 h        | 14 d        | 21A           | 4    | Do not make more than two applications of Bexar in a season. Mortality of adults, eggs, and nymphs.   |
|   | <b>diatomaceous earth</b><br>Celite 610 | 40-70 lb      | none listed | none listed | particle film | 3-4  | Adding a spreader sticker will improve residue stability. <b>Organic</b>  |
|   | <b>buprofezin</b><br>Centaur WDG        | 34.5 oz       | 12 h        | 14 d        | 16            | 2-3  |   |
|   | <b>spinetoram</b><br>Delegate WG        | 7 oz          | 4 h         | 7 d         | 5             | 3-4  | Psylla adult and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|   | <b>pyriproxyfen</b><br>Esteem 35WP      | 5 oz          | 12 h        | 45 d        | 7C            | 2-4  | Pyriproxyfen needs to be timed with adults just before they lay eggs. It will not kill adults or prevent egg lay, but will cause adults to lay infertile eggs. Selective; compatible with pear psylla natural enemies.  |
|   | <b>pyridaben</b><br>Nexter 75WSB        | 6.6-10.67 oz  | 12 h        | 7 d         | 21A           | 3-4  |   |
|   | <b>novaluron</b><br>Rimon 0.83EC        | 32 fl oz      | 12 h        | 14 d        | 15            | 3    | Do not apply after initiation of pear turndown. Broad-spectrum on pear psylla natural enemies.  |

| Insect                | Chemical   | Rate per Acre          | REI  | PHI  | MOA | Eff. | Notes  |
|-----------------------|--|------------------------|------|------|-----|------|--|
|                       | <b>kaolin clay</b><br>Surround WP  | 50 lb                  | 4 h  | 0 d  |     | 3-4  | Kaolin clay residues used after June may be difficult to remove from fruit when packing, especially red or soft skin varieties. <span>Organic</span>   |
|                       | <b>petroleum oil, summer + cinnamon oil</b><br>petroleum oil, summer + Cinnerate | 1-2 gal<br>48-64 fl oz | 4 h  | 0 d  |     | 1-3  | Marking has been seen only when applied after June turn down. 200 GPA sprays can increase likelihood of marking. Contact only, requires repeat sprays.   |
|                       | <b>spirotetramat</b><br>Ultor  | 10-14 fl oz            | 24 h | 7 d  | 23  | 2-4  | Time Ultor applications after petal fall, when the canopy is well developed, but leaves have not hardened off. A second application 14 days after the first may be helpful. This material is systemic. It kills feeding nymphs and must be applied before eggs hatch. Selective on pear psylla; compatible with natural enemies. |
| Pear rust mite        | <b>abamectin</b><br>Agri-Mek SC  | 4.25 fl oz             | 12 h | 28 d | 6   | 4    | Broad-spectrum on mite and pear psylla predators.  |
|                       | <b>spirodiclofen</b><br>Envidor 2SC  | 16-18 fl oz            | 12 h | 7 d  | 23  | 4    |  |
|                       | <b>fenpyroximate</b><br>FujiMite SC  | 2 pt                   | 12 h | 14 d | 21A | NR   |  |
|                       | <b>cyflumetofen</b><br>Nealta  | 13.7 fl oz             | 12 h | 7 d  | 25  | 3-4  | Effective against mites and has low impacts on natural enemies.  |
|                       | <b>pyridaben</b><br>Nexter 75WSB   | 6.6-10.67 oz           | 12 h | 7 d  | 21A | 3    |  |
|                       | <b>fenbutatin oxide</b><br>Vendex 50WP   | 1-1.5 lb               | 48 h | 14 d | 12B | 2-4  |  |
| Pearleaf blister mite | <b>abamectin</b><br>Agri-Mek SC  | 4.25 fl oz             | 12 h | 28 d | 6   | NR   | Broad-spectrum on mite and pear psylla predators.  |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## 14-32 days after full bloom

| Insect | Chemical | Rate per Acre | REI | PHI | MOA | Eff. | Notes |
|--------|----------|---------------|-----|-----|-----|------|-------|
|--------|----------|---------------|-----|-----|-----|------|-------|

| Insect  | Chemical                              | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes   |
|---|---------------------------------------|---------------|------|------|-----|------|---|
| Codling moth  | <b>imidacloprid</b><br>Admire Pro     | 7 fl oz       | 12 h | 7 d  | 4A  | NR   |   |
|   | <b>chlorantraniliprole</b><br>Altacor | 3-4.5 oz      | 4 h  | 5 d  | 28  | 4    | Selective; compatible with pear psylla natural enemies.   |
|   | <b>acetamiprid</b><br>Assail 70WP     | 3.4 oz        | 12 h | 7 d  | 4A  | NR   | Broad-spectrum on pear psylla natural enemies.  |
|   | <b>spinetoram</b><br>Delegate WG      | 6-7 oz        | 4 h  | 7 d  | 5   | 4    | Broad-spectrum on pear psylla natural enemies.  |
|   | <b>diflubenzuron</b><br>Dimilin 2L    | 16 fl oz      | 12 h | 14 d | 15  | 4    | Selective, compatible with pear psylla natural enemies. In trials percent control compared to the untreated check (based on fruit infected or with stings) has ranged from 76-90 percent (Dunley et al. 2002), 87 percent for Dimilin+oil (Van Steenwyk et al. 2004), 89 percent (Van Steenwyk and Nomoto 2002), 98 percent (Van Steenwyk et al. 2003). |
|   | <b>cyantraniliprole</b><br>Exirel     | 10-17 fl oz   | 12 h | 3 d  | 28  | 4    |   |
|   | <b>phosmet</b><br>Imidan 70W          | 5.33 lb       | 7 d  | 7 d  | 1B  | 3    | Broad-spectrum on pear psylla natural enemies.  |
|   | <b>methoxyfenozide</b><br>Intrepid 2F | 16 fl oz      | 4 h  | 14 d | 18A | 3    | Selective; compatible with pear psylla natural enemies. Should be applied before egg hatch. In efficacy studies it has provided 89 percent control (Van Steenwyk and Nomoto 2002) and 95 percent control (Van Steenwyk and Weiss 2015).   |
| <b>Notes:</b> WSU recommends a delayed first cover management program: Apply the first oil at 375 DD, then 150 degree days later put on the first cover at 525 DD. Then 15 days later (depending on residue length) put on the second cover. This approach leaves only a small percentage of egg hatch at the end of each generation uncovered. An oil-only program requires re-application intervals of 200 DD under low pest pressure and 150 DD under high pest pressure. CM granulovirus is effective when applied at 525 DD and repeated every 5-7 days until about 950 DD (4-5 applications). In any program, mating disruption increases control considerably. In high pressure situations, use CM granulovirus with oil for better control. For summer generations add 1000 degree days for second and third cover. |                                       |               |      |      |     |      |   |
| Pear psylla   | <b>acetamiprid</b><br>Assail 70WP     | 3.4 oz        | 12 h | 7 d  | 4A  | 3    | Adult, egg and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|   | <b>diflubenzuron</b><br>Dimilin 2L    | 48 fl oz      | 12 h | 14 d | 15  | 2-3  |   |
|   | <b>pyriproxyfen</b><br>Esteem 35WP    | 5 oz          | 12 h | 45 d | 7C  | 2-4  | Pyriproxyfen needs to be timed with adults just before they lay eggs. It will not kill adults or prevent egg lay, but will cause adults to lay infertile eggs. Selective; compatible with pear psylla natural enemies.  |



| Insect      | Chemical                          | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes  |
|-------------|-----------------------------------|---------------|------|------|-----|------|--|
|             | <b>kaolin clay</b><br>Surround WP | 50 lb         | 4 h  | 0 d  |     | 3-4  | Kaolin clay residues used after June may be difficult to remove from fruit when packing, especially red or soft skin varieties. <span>Organic</span> |
| Disease     | Chemical                          | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes  |
| Pear mildew | <b>pydiflumetofen</b><br>Miravis  | 3.4 fl oz     | 12 h | 30 d | 7   | 3    | Rotate with other FRAC groups other than FRAC 7.   |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Late spring and summer

| Insect       | Chemical                              | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes   |
|--------------|---------------------------------------|---------------|------|------|-----|------|---|
| Codling moth | <b>chlorantraniliprole</b><br>Altacor | 3-4.5 oz      | 4 h  | 5 d  | 28  | 4    | Selective; compatible with pear psylla natural enemies.   |
|              | <b>acetamiprid</b><br>Assail 70WP     | 3.4 oz        | 12 h | 7 d  | 4A  | NR   | Broad-spectrum on pear psylla natural enemies.  |
|              | <b>acetamiprid</b><br>Assail 70WP     | 3.4 oz        | 12 h | 7 d  | 4A  | NR   |   |
|              | <b>spinetoram</b><br>Delegate WG      | 6-7 oz        | 4 h  | 7 d  | 5   | 4    | Broad-spectrum on pear psylla natural enemies.  |
|              | <b>diflubenzuron</b><br>Dimilin 2L    | 16 fl oz      | 12 h | 14 d | 15  | 4    | Selective, compatible with pear psylla natural enemies. In trials percent control compared to the untreated check (based on fruit infected or with stings) has ranged from 76-90 percent (Dunley et al. 2002), 87 percent for Dimilin+oil (Van Steenwyk et al. 2004), 89 percent (Van Steenwyk and Nomoto 2002), 98 percent (Van Steenwyk et al. 2003). |
|              | <b>pyriproxyfen</b><br>Esteem 35WP    | 5 oz          | 12 h | 45 d | 7C  | 3    |   |
|              | <b>cyantraniliprole</b><br>Exirel     | 10-17 fl oz   | 12 h | 3 d  | 28  | 4    |   |
|              | <b>phosmet</b><br>Imidan 70W          | 5.33 lb       | 7 d  | 7 d  | 1B  | 3    | Broad-spectrum on pear psylla natural enemies.  |

| Insect                                | Chemical  | Rate per Acre | REI  | PHI       | MOA | Eff. | Notes   |
|---------------------------------------|---|---------------|------|-----------|-----|------|---|
|                                       | <b>methoxyfenozide</b><br>Intrepid 2F   | 16 fl oz      | 4 h  | 14 d      | 18A | 3    | Selective; compatible with pear psylla natural enemies. Should be applied before egg hatch. In efficacy studies it has provided 89 percent control (Van Steenwyk and Nomoto 2002) and 95 percent control (Van Steenwyk and Weiss 2015). |
|                                       | <b>petroleum oil, summer</b><br>petroleum oil, summer   | See Label     | 4 h  | 0 d       |     | NR   | <b>Organic</b>  |
|                                       | <b>Notes:</b> WSU recommends a delayed first cover management program: Apply the first oil at 375 DD, then 150 degree days later put on the first cover at 525 DD. Then 15 days later (depending on residue length) put on the second cover. This approach leaves only a small percentage of egg hatch at the end of each generation uncovered. An oil-only program requires re-application intervals of 200 DD under low pest pressure and 150 DD under high pest pressure. CM granulovirus is effective when applied at 525 DD and repeated every 5-7 days until about 950 DD (4-5 applications). In any program, mating disruption increases control considerably. In high pressure situations, use CM granulovirus with oil for better control. For summer generations add 1000 degree days for second and third cover. |               |      |           |     |      |   |
| Grape mealybug                        | <b>thiamethoxam</b><br>Actara   | 5.5 oz        | 12 h | 14 d/35 d | 4A  | NR   | PHI depends on rate used.   |
|                                       | <b>imidacloprid</b><br>Admire Pro   | 5.6-7 fl oz   | 12 h | 7 d       | 4A  | NR   | Rate/PHI for foliar application.  |
|                                       | <b>acetamiprid</b><br>Assail 70WP   | 3.4 oz        | 12 h | 7 d       | 4A  | 1    |   |
|                                       | <b>buprofezin</b><br>Centaur WDG  | 34.5 oz       | 12 h | 14 d      | 16  | NR   |   |
|                                       | <b>phosmet</b><br>Imidan 70W  | 5.33 lb       | 7 d  | 7 d       | 1B  | 2    | Broad-spectrum on pear psylla natural enemies.  |
| Grasshoppers and Mormon crickets      | <b>carbaryl</b><br>carbaryl   | 2 pt          | 12 h | 3 d       | 1A  | NR   | If used in apple/pear interplant blocks, carbaryl may disrupt biological mite control, depending on history of use. Do not apply carbaryl prior to 30 days after full bloom.  |
| Green apple aphid                     | <b>thiamethoxam</b><br>Actara   | 5.5 oz        | 12 h | 14 d/35 d | 4A  | NR   |   |
|                                       | <b>acetamiprid</b><br>Assail 70WP   | 3.4 oz        | 12 h | 7 d       | 4A  | 4    |   |
| Leafrollers (Pandemis, Obliquebanded) | <b>chlorantraniliprole</b><br>Altacor   | 3-4.5 oz      | 4 h  | 5 d       | 28  | 4    | For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |
|                                       | <b>spinetoram</b><br>Delegate WG  | 4.5-7 oz      | 4 h  | 7 d       | 5   | 4    | For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |

| Insect  | Chemical  | Rate per Acre | REI                                       | PHI  | MOA  | Eff. | Notes   |
|---|---|---------------|---|------|------|------|---|
|   | <b>Bacillus thuringiensis subsp. kurstaki</b><br>DiPel DF | See label     | 4 h                                       | 0 d  | 11B2 | 3    | Two or three applications are usually required. Apply when forecasts predict a warm weather pattern for 3 or more days. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control. <b>Organic</b> |
|   | <b>cyantraniliprole</b><br>Exirel                         | 10-17 fl oz   | 12 h                                      | 3 d  | 28   | 4    | For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |
|   | <b>methoxyfenozide</b><br>Intrepid 2F                     | 16 fl oz      | 4 h                                       | 14 d | 18A  | 3    | Some leafroller populations have developed resistance to methoxyfenozide and its use could result in reduced levels of control. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.        |
|   | <b>emamectin benzoate</b><br>Proclaim                     | 3.2-4.8 oz    | 12 h   48 h for some activities-see label | 14 d | 6    | 4    | For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.  |
|   | <b>spinosad</b><br>Success                                | 6-10 fl oz    | 4 h                                       | 7 d  | 5    | 3-4  | Some leafroller populations have developed resistance to spinosad and its use could result in reduced levels of control. For effective leafroller control, this product must be consumed by larvae. Therefore good spray coverage of the foliage is critical to achieving good control.               |
| McDaniel spider mite,<br>twospotted spider mite,<br>European red mite | <b>bifenazate</b><br>Acramite 50WS                        | 0.75-1 lb     | 12 h                                      | 7 d  | un   | 2-4  |   |
|   | <b>abamectin</b><br>Agri-Mek SC                           | 4.25 fl oz    | 12 h                                      | 28 d | 6    | 1-3  | Broad-spectrum on mite and pear psylla predators.   |
|   | <b>clofentezine</b><br>Apollo 4SC                         | 4-8 fl oz     | 12 h                                      | 21 d | 10A  | 2-4  | Clofentezine (Apollo) and hexythiazox (Savey) are ovicides. When initial mite populations are high, use in combination with an adulticide.  |
|   | <b>spirodiclofen</b><br>Envior 2SC                        | 16-18 fl oz   | 12 h                                      | 7 d  | 23   | 3-4  |   |
|   | <b>fenpyroximate</b><br>FujiMite SC                       | 1-2 pt        | 12 h                                      | 14 d | 21A  | 3-4  | Broad-spectrum on predator mites.   |
|   | <b>acequinocyl</b><br>Kanemite 15 SC                      | 21-31 fl oz   | 12 h                                      | 14 d | 20B  | NR   |   |

| Insect      | Chemical                                 | Rate per Acre | REI         | PHI         | MOA           | Eff. | Notes   |
|-------------|--|---------------|-------------|-------------|---------------|------|---|
|             | <b>cyflumetofen</b><br>Nealta            | 13.7 fl oz    | 12 h        | 7 d         | 25            | 3-4  | Low impacts on natural enemies.   |
|             | <b>pyridaben</b><br>Nexter 75WSB         | 4.4-10.67 oz  | 12 h        | 7 d         | 21A           | 2-4  | Use 4.4 to 5.2 oz/A for ERM; use 6.6 to 10.67 oz/A for twospotted and McDaniel spider mites.  |
|             | <b>hexythiazox</b><br>Savey 50DF         | 4-6 oz        | 12 h        | 28 d        | 10A           | 2-4  | Hexythiazox (Savey) and clofentezine (Apollo) are ovicides. When initial mite populations are high, use in combination with an adulticide.  |
|             | <b>fenbutatin oxide</b><br>Vendex 50WP   | 1.5-2 lb      | 48 h        | 14 d        | 12B           | 2-4  | Resistance to fenbutatin oxide exists in many areas. Somewhat selective to spider mites; medium effects on predator mites.  |
|             | <b>etoxazole</b><br>Zeal Miticide1 72WSP | 3 oz          | 12 h        | 14 d        | 10B           | 1-3  |   |
| Pear psylla | <b>thiamethoxam</b><br>Actara            | 5.5 oz        | 12 h        | 14 d/35 d   | 4A            | 3    | Broad-spectrum on pear psylla natural enemies.  |
|             | <b>imidacloprid</b><br>Admire Pro        | 5.6-7 fl oz   | 12 h        | 7 d         | 4A            | NR   |   |
|             | <b>abamectin</b><br>Agri-Mek SC          | 4.25 fl oz    | 12 h        | 28 d        | 6             | 2    | Resistance to abamectin has been documented in certain areas, so efficacy may vary. Broad-spectrum on mite and pear psylla predators.   |
|             | <b>acetamiprid</b><br>Assail 70WP        | 3.4 oz        | 12 h        | 7 d         | 4A            | 3    | Adult, egg and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|             | <b>azadirachtin</b><br>Aza-Direct        | See label     | 4 h         | 0 d         | un            | 2-3  | Selective; compatible with pear psylla natural enemies. Short residues; 7-10 day reapplication intervals may be necessary for control. Severe phytotoxicity may occur if applied to pear cultivars with Comice background. <b>Organic</b> |
|             | <b>tolfenpyrad</b><br>Bexar              | 27 fl oz      | 12 h        | 14 d        | 21A           | 3-4  | This is a contact insecticide so coverage will greatly effect efficacy. Check with packing house acceptability of applications later than June.   |
|             | <b>diatomaceous earth</b><br>Celite 610  | 40-70 lb      | none listed | none listed | particle film | 3-4  | Adding a spreader sticker will improve residue stability. <b>Organic</b>  |
|             | <b>buprofezin</b><br>Centaur WDG         | 34.5 oz       | 12 h        | 14 d        | 16            | 2-3  |   |
|             | <b>spinetoram</b><br>Delegate WG         | 7 oz          | 4 h         | 7 d         | 5             | 3-4  | Psylla adult and nymph mortality. Broad-spectrum on pear psylla natural enemies.  |
|             | <b>diflubenzuron</b><br>Dimilin 2L       | 48 fl oz      | 12 h        | 14 d        | 15            | 2-3  |   |

| Insect         | Chemical   | Rate per Acre          | REI  | PHI       | MOA | Eff. | Notes   |
|----------------|--|------------------------|------|-----------|-----|------|---|
|                | <b>fenpyroximate</b><br>FujiMite SC  | 1-2 pt                 | 12 h | 14 d      | 21A | 1-2  |   |
|                | <b>pyridaben</b><br>Nexter 75WSB   | 6.6-10.67 oz           | 12 h | 7 d       | 21A | 3-4  |   |
|                | <b>kaolin clay</b><br>Surround WP  | 50 lb                  | 4 h  | 0 d       |     | 3-4  | Kaolin clay residues used after June may be difficult to remove from fruit when packing, especially red or soft skin varieties. <b>Organic</b>  |
|                | <b>petroleum oil, summer + cinnamon oil</b><br>petroleum oil, summer + Cinnerate | 1-2 gal<br>48-64 fl oz | 4 h  | 0 d       |     | 1-3  | Marking has been seen only when applied after June turn down. 200 GPA sprays can increase likelihood of marking. Contact only, requires repeat sprays.  |
|                | <b>spirotetramat</b><br>Ultror   | 10-14 fl oz            | 24 h | 7 d       | 23  | 2-4  | Time Ultror applications after petal fall, when the canopy is well developed, but leaves have not hardened off. A second application 14 days after the first may be helpful. This material is systemic. It kills feeding nymphs and must be applied before eggs hatch. Selective on pear psylla; compatible with natural enemies. |
| Pear rust mite | <b>abamectin</b><br>Agri-Mek SC  | 4.25 fl oz             | 12 h | 28 d      | 6   | 4    | Broad-spectrum on mite and pear psylla predators.   |
|                | <b>spirodiclofen</b><br>Envidor 2SC  | 16-18 fl oz            | 12 h | 7 d       | 23  | 4    |   |
|                | <b>fenpyroximate</b><br>FujiMite SC  | 2 pt                   | 12 h | 14 d      | 21A | NR   |   |
|                | <b>cyflumetofen</b><br>Nealta  | 13.7 fl oz             | 12 h | 7 d       | 25  | 3-4  | Effective against mites and has low impacts on natural enemies.   |
|                | <b>pyridaben</b><br>Nexter 75WSB   | 10.67 oz               | 12 h | 7 d       | 21A | 3    |   |
|                | <b>fenbutatin oxide</b><br>Vendex 50WP   | 1-1.5 lb               | 48 h | 14 d      | 12B | 2-4  |   |
| Pear slug      | <b>thiamethoxam</b><br>Actara  | 5.5 oz                 | 12 h | 14 d/35 d | 4A  | NR   |   |
|                | <b>chlorantraniliprole</b><br>Altacor  | 4.5 oz                 | 4 h  | 5 d       | 28  | NR   |   |
|                | <b>acetamiprid</b><br>Assail 70WP  | 3.4 oz                 | 12 h | 7 d       | 4A  | NR   |   |

| Insect                | Chemical   | Rate per Acre | REI  | PHI  | MOA   | Eff. | Notes   |
|-----------------------|--|---------------|------|------|-------|------|---|
|                       | <b>spinetoram</b><br>Delegate WG   | 6 oz          | 4 h  | 7 d  | 5     | NR   |   |
|                       | <b>fenpyroximate</b><br>FujiMite SC  | 2 pt          | 12 h | 14 d | 21A   | NR   |   |
|                       | <b>spinosad</b><br>Success   | 4 fl oz       | 4 h  | 7 d  | 5     | NR   |   |
|                       | <b>Notes:</b> Pear Sawfly larvae (pearslug) are fairly susceptible to most pesticides; those listed are the ones tested, but other materials and lower rates may also work. See the cherry section for additional materials. |               |      |      |       |      |   |
| Pearleaf blister mite | <b>abamectin</b><br>Agri-Mek SC  | 4.25 fl oz    | 12 h | 28 d | 6     | NR   | Broad-spectrum on mite and pear psylla predators.   |
|                       | <b>carbaryl</b><br>carbaryl  | 0.5-1.5 qt    | 12 h | 3 d  | 1A    | NR   | If used in apple/pear interplant blocks, carbaryl may disrupt biological mite control, depending on history of use. Do not apply carbaryl prior to 30 days after full bloom.                    |
|                       | <b>Notes:</b> If used in apple/pear interplant blocks, carbaryl may disrupt biological mite control, depending on history of use. Do not apply carbaryl prior to 30 days after full bloom.                                   |               |      |      |       |      |   |
| San Jose scale        | <b>buprofezin</b><br>Centaur WDG   | 34.5 oz       | 12 h | 14 d | 16    | 2-3  |   |
|                       | <b>diazinon</b><br>Diazinon 50W  | 4 lb          | 4 d  | 21 d | 1B    | 3-4  | Diazinon is labeled for a maximum of one dormant and one in-season application in pear.   |
|                       | <b>pyriproxyfen</b><br>Esteem 35WP   | 5 oz          | 12 h | 45 d | 7C    | 2-3  | Be aware that Esteem has a 45 day PHI.  |
| Disease               | Chemical   | Rate per Acre | REI  | PHI  | MOA   | Eff. | Notes   |
| Pear mildew           | <b>potassium bicarbonate</b><br>Kaligreen  | 3 lb          | 4 h  | 1 d  | NC    | 2    | Under low disease pressure, Kaligreen will provide adequate control. If disease pressure increases, rotation or combination with other materials is recommended. <b>Organic</b>                 |
|                       | <b>fluopyram</b><br>Luna Privilege   | 6.84 fl oz    | 12 h | 7 d  | 7     | 4    | Luna Privilege is a FRAC group 7 fungicide and should not be rotated or used with fungicides from the same group. Do not apply more than 3 applications of FRAC group 7 fungicides in a season. |
|                       | <b>fluxapyroxad + pyraclostrobin</b><br>Merivon  | 5.5 fl oz     | 12 h | 0 d  | 7, 11 | 3    | Merivon is a FRAC group 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. Do not make more than three FRAC 7 applications in a season.                                |
|                       | <b>polyoxin D zinc salt</b><br>OSO 5%SC  | 13 fl oz      | 4 h  | 0 d  | 19    | 3    | OSO is FRAC 19 fungicide recommended to rotate with other FRAC groups labeled for pome fruit. Do not apply more than 4.3 oz. a.i./acre/season. <b>Organic</b>                                   |

| Disease  | Chemical  | Rate per Acre                 | REI  | PHI  | MOA | Eff. | Notes   |
|--|---|-------------------------------|------|------|-----|------|---|
|  | <b>Reynoutria sachalinensis</b><br>Regalia  | 4 qt                          | 4 h  | 0 d  | P5  | 2    | Do not use prior to petal fall. Under low disease pressure, it may help control some summer diseases like Alternaria and Bull's eye rot. <b>Organic</b>   |
|  | <b>triflumazole</b><br>Trionic 4SC  | 16 fl oz                      | 12 h | 14 d | 3   | 4    | Trionic is a FRAC 3 fungicide and should not be rotated or used with other FRAC 3 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 3 fungicides per season. Do not make more than two sequential applications of FRAC 3 fungicides labeled for use on pome fruits.  |
| Pear scab  | <b>penthioopyrad</b><br>Fontelis  | 14-20 fl oz                   | 12 h | 28 d | 7   | NR   | Fontelis and Aprovia are from the same chemical group (7). Use only one of them for the same growth stage.  |
|  | <b>pydiflumetofen + benzovindiflupyr</b><br>Miravis + Aprovia   | 3.4 fl oz<br>5.5 to 7.0 fl oz | 12 h | 30 d | 7   | 2    | Do not follow FRAC group 7 fungicides with other group 7s, such as Aprovia, Fontelis, Luna, Miravis, and Pristine to reduce fungicide resistance development.   |
|  | <b>Notes:</b> To limit the potential for development of fungicide resistance, do not make more than four applications of strobilurin fungicides per season. Do not make more than two sequential applications of strobilurin fungicides. This limitation is inclusive of all strobilurin fungicides labeled for use on pome fruits. |                               |      |      |     |      |   |
| Storage Rots<br>(Sphaeropsis, Lambertella, Alternaria) | <b>penthioopyrad</b><br>Fontelis  | 20 fl oz                      | 12 h | 28 d | 7   | 3    | Fontelis has an acceptable efficacy against Alternaria fungus and Nectria that may infect fruit preharvest. Fontelis is a FRAC 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7 fungicides per season. Do not make sequential applications of FRAC 7 fungicides labeled for use on pome fruits. |
|  | <b>polyoxin D zinc salt</b><br>OSO 5%SC   | 13 fl oz                      | 4 h  | 0 d  | 19  | 3    | OSO will help control Alternaria and Nectria infections preharvest. OSO is FRAC 19 fungicide recommended to rotate with other FRAC groups labeled for pome fruit. Do not apply more than 4.3 oz. a.i./acre/season. <b>Organic</b>   |
|  | <b>Reynoutria sachalinensis</b><br>Regalia  | 4 qt                          | 4 h  | 0 d  | P5  | 2    | Do not use prior to petal fall. Under low disease pressure, it may help control some summer diseases like Alternaria and Bull's eye rot. <b>Organic</b>   |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.

## Preharvest

| Disease   | Chemical  | Rate per Acre | REI  | PHI  | MOA   | Eff. | Notes   |
|---|---|---------------|------|------|-------|------|---|
| Botrytis-Gray Mold  | <b>thiophanate-methyl</b><br>Topsin M WSB       | 1 lb          | 2 d  | 1 d  | 1     | 3    | Efficacy level is ensured when resistance is absent from the orchard. Do not apply more than 2.8 lbs. a.i. per acre in a year. Topsin-M is very prone to fungicide resistance development, rotation with other FRAC group is required. Do not make sequential applications of FRAC group 1 fungicides and do not make more than two FRAC 1 fungicides per season. Topsin-M is similar to Mertect, used postharvest, therefore careful use is highly recommended.  |
| Bull's eye rot  | <b>thiophanate-methyl</b><br>Topsin M WSB       | 1 lb          | 2 d  | 1 d  | 1     | 4    | Efficacy level is ensured when resistance is absent from the orchard. Do not apply more than 2.8 lbs. a.i. per acre in a year. Topsin-M is very prone to fungicide resistance development, rotation with other FRAC group is required. Do not make sequential applications of FRAC group 1 fungicides and do not make more than two FRAC 1 fungicides per season. Topsin-M is similar to Mertect, used postharvest, therefore careful use is highly recommended.  |
|   | <b>ziram</b><br>Ziram Granuflo 76WDG            | 6 lb          | 48 h | 14 d | M3    | NR   | Because of visible residues, do not use ziram on Asian pears.   |
| Storage Rots<br>(Sphaeropsis,<br>Lambertella, Alternaria) | <b>fluxapyroxad + pyraclostrobin</b><br>Merivon | 5.5 fl oz     | 12 h | 0 d  | 7, 11 | 3    | Merivon is a FRAC group 7 fungicide and should not be rotated or used with other FRAC 7 fungicides. Do not make more than three FRAC 7 applications in a season.  |
|   | <b>polyoxin D zinc salt</b><br>Ph-D             | 6.2 oz        | 4 h  | 0 d  | 19    | 3    |   |
|   | <b>pyraclostrobin + boscalid</b><br>Pristine    | 14.5-18.5 oz  | 12 h | 0 d  | 11,7  | 3    | Pristine is a FRAC 7 +11 fungicide an should not be rotated or used with other FRAC 7+11 fungicides. To limit the potential for development of fungicide resistance, do not make more than 3 applications of FRAC 7+11 fungicides per season. Do not make sequential applications of FRAC 7+11 fungicides labeled for use on pome fruits. The efficacy level will depends on the occurrence of fungicide resistant populations of the pathogen in the orchards. For powdery mildew, preferably use other FRAC 7 fungicides in spring. |



| Disease      | Chemical  | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes  |
|--------------|---|---------------|------|------|-----|------|--|
|              | <b>thiophanate-methyl</b><br>Topsin M WSB             | 1 lb          | 2 d  | 1 d  | 1   | 3    | Efficacy level is ensured when resistance is absent from the orchard. Do not apply more than 2.8 lbs. a.i. per acre in a year. Topsin-M is very prone to fungicide resistance development, rotation with other FRAC group is required. Do not make sequential applications of FRAC group 1 fungicides and do not make more than two FRAC 1 fungicides per season. Topsin-M is similar to Mertect, used postharvest, therefore careful use is highly recommended. |
|              | <b>ziram</b><br>Ziram 76DF                            | 6 lb          | 48 h | 14 d | M3  | 2    | Apply while pear calyx is still upright and then in the first cover spray and in preharvest ideally before rain. Do NOT apply within 14 days of harvest. When applicable, tank-mix with other single-site fungicides to increase efficacy and reduce risk of fungicide resistance development. Do not apply more than 18.4 lbs. a.i of Ziram 76DF or equivalent per season. Aerial application allowed only at preharvest.                                       |
| Insect       | Chemical  | Rate per Acre | REI  | PHI  | MOA | Eff. | Notes  |
| Codling moth | <b>petroleum oil, summer</b><br>petroleum oil, summer | See Label     | 4 h  | 0 d  |     | NR   | <span>Organic</span>   |
| Pear psylla  | <b>azadirachtin</b><br>Aza-Direct                     | See label     | 4 h  | 0 d  | un  | 2-3  | Selective; compatible with pear psylla natural enemies. Short residues; 7-10 day reapplication intervals may be necessary for control. Severe phytotoxicity may occur if applied to pear cultivars with Comice background. <span>Organic</span>  |

Efficacy numbers denote the relative efficacy of a pesticide against a given pest on a 1 to 4 scale with 1 being low and 4 high efficacy. This information is based primarily on research conducted with WSU researchers in Washington.