

TRUEARTH CERTIFIED SPRAY GUIDE – 2020 GROWING SEASON – 03/18/2020

This guide is designed for growers to quickly access information based on apple growth stages. **Other factors remain critically important.** These include scouting and trapping, monitoring weather and using a season-long approach. **It will not be necessary to take actions at every growth stage.** There may be other products available that are not listed here, and not all products listed here may be available in every state. **FOLLOW THE TRUEARTH PROTOCOL, YOUR STATE REGULATIONS AND ALL LABEL DIRECTIONS.**

CHANGES FOR 2020

- Closer (sulfloxaflo), Grandevo (*Chromobacterium subtsugae*), Sivanto (flupyradifurone), Venerate (*Burkholderia spp.*) and Verdepryn (cyclaniliprole) ratings were added to the **Neonicotinoids and Alternatives for Management of Selected Pests** table on pg. 15.
- A table of herbicides with high-risk to water quality was added to pg. 16.
- A table of insecticides with high-risk to pollinators from drift was added to pg. 16.

Get the latest version of the *Truearth Protocol and Spray Guide*, www.ipminstitute.org/Truearth.htm.

PEST AND MATERIALS	RATE PER ACRE
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Dormant to Silver Tip

Fire blight Badge SC Champ Flowable C-O-C-S WDG Cuprofix Ultra 40 Disperss Kocide 2000 Kocide 3000	3.5 - 7 pt. 5.33 - 10.5 pt. 8 - 15 lb. 5 - 7.5 lb. 6 - 12 lb. 3.5 - 7 lb.
Early-season copper applications may reduce apple scab, fire blight and black, white and bitter rot inoculum.	

Apple scab Spraying the surface of the leaves with urea will reduce spores by about 66%. Use feed-grade urea (46-0-0) and mix a 5% solution in water. Feed-grade urea dissolves in water much easier than granular (fertilizer-grade) urea. For greatest efficacy make applications in the autumn before leaf drop. If applied after leaf drop, make applications at least two weeks prior to bud break using a boom sprayer or an air-blast sprayer with only the lower nozzle(s) turned on. A 5% urea solution supplies about 20 lb. of actual nitrogen per acre. Nitrogen fertilizer application rates must be adjusted accordingly. NOTE: Do not apply to highly vigorous growing trees or trees with history of fire blight. Urea 5% solution (46-0-0) If 46-0-0 urea is not available, the amount of urea mixed to 100 gallons of water must be adjusted to maintain a 5% solution.	44 lb. per 100 gal.
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PEST AND MATERIALS	RATE PER ACRE
Half-inch Green	
Apple scab: Same options as Green Tip, except DO NOT USE COPPER.	
Mites and scale insects Horticultural oil (listed rate is for products comprised of 98% mineral oil)..	3 - 8 gal.
Scale insects All insecticides targeting scale insects need should be applied as a full dilute spray. Apply 100 gal. of water per acre in high-density plantings and 400 gal. of water per acre to standard trees in low-density plantings. Centaur WDG Esteem 35 WP Sivanto 200 SL Combine with a horticultural oil for early season applications targeting San Jose scale.	34.5 oz. 4 - 5 oz. 10.5 - 14 fl. oz.
Rosy apple aphid (timing is critical for effective control) Beleaf 50 SG Esteem 35 WP Sivanto 200 SL (aphid species, except woolly apple aphid)	2 - 2.8 oz 3 - 5 oz. 7 - 10.5 fl. oz.
Tight Cluster	
Apple scab All single-site fungicides are at risk for resistance development; all applications must be tank-mixed with a protectant fungicide, e.g., captan or EBDC. EBDCs also control rust diseases where inoculum is low to moderate. Reference product label for restrictions on reapplication intervals and maximum number of applications per season. If weather is persistently cool and wet, e.g., $\leq 70^{\circ}\text{F}$ from pink to bloom, Inspire Super (difenoconazole + cyprodinil), may be applied. Cyprodinil is an anilinopyrimidine (AP) and may perform better than QoI or DMI fungicides, when it is cool and wet.	Aprovia 5.5 - 7 fl. oz. Flint 50 WG 2 oz. Fontelis 16 - 20 fl. oz. Inspire Super 12 fl. oz. Indar 2F 6 - 8 fl. oz. Luna Sensation 4 - 5.8 fl. oz. Merivon 4 - 5.5 fl. oz. Rally 40 WSP 5 - 8 oz. Rubigan EC 8 - 12 fl. oz.

PEST AND MATERIALS	RATE PER ACRE
Tight Cluster (continued)	
Apple scab (continued)	
Sovran	3.2 - 6.4 oz.
Topguard	13 fl. oz.
Vanguard 75 WG	3 - 5 oz.
Tank mix all single-site fungicides with a half rate of captan or an EBDC. If a protectant fungicide is used alone apply within the recommended label rate.	
Captan 4L	3 - 4 qt.
Captan 50 WP	8 lb.
Captan 80 WP	5 lb.
NOTE: Do not use captan within 10 days of an oil application.	
Penncozeb 75 DF or similar mancozeb formulated products	6.4 lb.
Penncozeb 80 WP or similar mancozeb formulated products	6 lb.
Polyram 80 DF	6 lb.
Powdery mildew	
Fungicide applications target powdery mildew between tight cluster and petal fall. Severe infections may continue until terminal shoot growth stops. Factors that influence infection risk may include: amount of shoot growth, unprotected tissue and warm temperatures. Powdery mildew thrives during warm-dry weather, i.e., 50° - 70°F. The following products have been identified because of their good ability to manage powdery mildew.	
Fontelis	16 - 20 fl. oz.
Inspire Super	12 fl. oz.
Luna Sensation	5 - 5.8 fl. oz.
Merivon	4 - 5.5 fl. oz.
Pristine.....	14.5 - 18.5 oz.
Procure 480 SC	8 - 16 fl. oz.
Rally 40 WSP	5 - 10 oz.
Topguard Specialty	8 - 13 fl. oz.
Kumulus DF (sulfur)	10 - 20 lb.
NOTE: Tank mix all single-site fungicides with a protectant fungicide appropriate for the target disease, e.g., captan or an EBDC for scab; EBDC for rust or sulfur for powdery mildew. Captan and EBDCs do not control powdery mildew.	
NOTE: Sulfur is a broad-spectrum protectant and may be tank mixed with sterol inhibitors (DMIs) or strobilurins (QoIs) for added protection and resistance management for powdery mildew. Do not apply sulfur within 14 days of an oil application. Do not use captan in combination with or closely following or in alternation with sulfur products. Use product label to verify use restrictions.	

PEST AND MATERIALS	RATE PER ACRE
Tight Cluster (continued)	
Mites or San Jose scale Horticultural oil (listed rate is for products comprised of 98% mineral oil)..	3 - 8 gal.
Mites: Only if oil is not used. Zeal	4 - 6 fl. oz.
Scale insects: Only if oil is not used. Centaur WDG Esteem 35 WP Sivanto 200 SL Combine with a horticultural oil for early-season applications targeting San Jose scale.	34.5 oz. 4 - 5 fl. oz. 10.5 - 14 fl. oz.
Tarnished plant bug: If over threshold on white rectangle traps. Avaunt Beleaf 50 SG	5 - 6 oz. 2 - 2.8 oz.
Rosy apple aphid Esteem 35 WP Beleaf 50 SG Sivanto 200 SL (aphid species, except woolly apple aphid)	3 - 5 oz. 2 - 2.8 oz. 7 - 10.5 fl. oz.
Pink	
Apple scab: Same as Tight Cluster.	
Powdery mildew: Same options as Tight Cluster.	
Mites: If needed, same as Tight Cluster (excluding oil, which can damage flower buds).	
Tarnished plant bug: If over threshold on white rectangle traps, same as Tight Cluster.	

PEST AND MATERIALS	RATE PER ACRE
Bloom	
Apple scab: Same as Tight Cluster.	
Powdery mildew: Same as Tight Cluster.	
<p>Fire blight NOTE: Streptomycin or oxytetracycline must be applied for fire blight only according to a weather-based forecasting program such as Maryblyt or CougarBlight. Kasumin 2L may be used where resistance is suspected. After bloom, streptomycin may only be applied if hail or high wind damage occurs in orchards with existing infections.</p> <p>Blossom blight Agri-Mycin 17 WP 24 - 48 oz.</p> <p>OR A COMBINATION OF Regulaid (nonionic surfactant) 1 - 2 pt. per 100 gal. (do not concentrate)</p> <p>If in 2 - 4 days a second application is needed Serenade Opti 14 - 20 oz.</p> <p>If in 2 - 4 days a third application is needed, repeat streptomycin. See rates above.</p>	
<p>Shoot blight (late bloom or early petal fall) Trees > 5 years old Apogee 27.5 DF 18 - 36 oz.</p> <p>Trees < 5 years old Apogee 27.5 DF 9 - 18 oz.</p> <p>NOTE: Applying Apogee will help suppress shoot blight and reduce vegetative growth. Begin applications when shoot growth is less than three inches in length; approximately a seven to ten-day window beginning at the king bloom petal fall stage. Most years, all varieties can be treated at this time. Apply a second application two weeks later and a third application two weeks after the second. A fourth application is optional and need should be determined by assessing crop load and tree vigor. Rates used to control shoot growth are dependent on tree vigor and vary from 9 - 36 oz. per acre.</p>	
<p>Codling moth: Pheromones for mating disruption. Isomate CTT 100 - 200 dispensers Checkmate CM-F 2.4 - 4.8 fl. oz.</p> <p>Apply pheromone mating disruption before initiation of moth flight (e.g., bloom for first generation, by late June for second generation); supplemental insecticide sprays timed to coincide with egg hatch may be needed and could include border sprays in blocks adjacent to sources of adult immigration or other high-pressure situations.</p>	
<p>Obliquebanded leafroller: If needed, based on $\geq 3\%$ infested blossom clusters. Agree WG 1 - 2 lb. DiPel DF 0.5 - 2 lb. Intrepid 2F 8 - 16 fl. oz.</p>	

PEST AND MATERIALS	RATE PER ACRE
Petal Fall	
<p>Apple scab: Same as Tight Cluster.</p> <p>NOTE: Not recommended to use EBDCs after bloom if you use miticides other than oil. Avoiding EBDCs after bloom will preserve predators. Do not apply EBDCs within 77 days of harvest. If the earliest harvest date is August 15th no mancozeb or metiram can be applied after May 30th to comply with the pre-harvest interval.</p>	
<p>Powdery mildew and rust diseases</p> <p>Petal fall is when the crop is at the greatest risk for infections from powdery mildew and rust diseases. Efficacy of DMI and strobilurin fungicides can vary between apple scab, powdery mildew and rust.</p> <p>Control of apple scab through primary infection period is of utmost importance. If powdery mildew or rust diseases have been seen in a block in the previous year or present season, include a fungicide that is effective against powdery mildew and rust at least twice during the pink-petal fall period. The following products have been identified because of their good ability to manage powdery mildew and scab.</p> <p>Flint 2 - 3 oz.</p> <p>Sovran 3.2 - 6.4 oz.</p> <p>Luna Sensation 5 - 5.8 fl. oz.</p> <p>Merivon 4 - 5.5 fl. oz.</p> <p>PLUS</p> <p>Tank mix all single-site fungicides with sulfur or a half rate of an EBDC. If a protectant fungicide is used alone apply within the recommended label rate. NOTE: EBDCs and captan do not control powdery mildew.</p> <p>Kumulus DF (sulfur) 10 - 20 lb.</p> <p>NOTE: Sulfur is a broad-spectrum protectant and may be tank mixed with DMI and Strobilurins for added protection and resistance management. Do not apply sulfur within 14 days of an oil application. Do not use captan in combination with or closely following or in alternation with sulfur products. Use product label to verify use restrictions. Fruit russeting and yield reduction can occur if sulfur is applied during hot temperatures (>80°F), especially following bloom.</p> <p>The following products have been identified because of their good ability to manage rust.</p> <p>Flint 2 - 3 oz.</p> <p>Sovran 3.2 - 6.4 oz.</p> <p>Luna Sensation 5 - 5.8 fl. oz.</p> <p>PLUS</p> <p>Tank mix all single-site fungicides with a half rate of an EBDC. If an EBDC fungicide is used alone apply within the recommended label rate. NOTE: Captan does not control rusts.</p> <p>Penncozeb 75 DF or similar mancozeb formulated products 3.2 lb.</p> <p>Penncozeb 80 WP or similar mancozeb formulated products 3 lb.</p> <p>Polyram 80 DF 3 lb.</p> <p>NOTE: EBDCs control rust diseases where inoculum is low to moderate and have no activity on powdery mildew.</p>	

PEST AND MATERIALS	RATE PER ACRE
Petal Fall (continued)	
<p>Mites: Make no more than two post-bloom miticide applications per season (except for oil). Horticultural Oil (listed rate is for products comprised of 98% mineral oil).. Envidor 2 SC Portal Nealta Zeal SC Acramite 50 WS Kanemite 15 SC (Acramite and Kanemite are effective adulticides and thus may be best reserved for later in the season)</p>	<p>1.5 gal 16 - 18 oz. 2 pt. 13.7 fl. oz. 4 - 6 fl. oz. 0.75 - 1 lb. 21 - 31 fl. oz.</p>
<p>Plum curculio: If needed based on block or region history. Actara Assail 30 SG Avaunt Exirel NOTE: Carbaryl applied as a thinner may also suppress plum curculio, but may only be applied for thinning purposes.</p>	<p>4.5 - 5.5 oz. 8 oz 5 - 6 oz. 13.5 - 20.5 fl. oz.</p>
<p>Obliquebanded leafroller: If needed based on $\geq 3\%$ infested blossom clusters (only if not treated at bloom). Altacor * Delegate WG * Exirel * NOTE: * Do not expose more than one generation of the target pest to this mode of action alone. Agree WG DiPel DF Intrepid 2F</p>	<p>2.5 - 4.5 oz. 4.5 - 7 oz. 8.5 - 17 fl. oz. 1 - 2 lb. 0.5 - 2 lb. 8 - 16 fl. oz.</p>
<p>Rosy apple aphid Admire Pro Assail 30 SG Beleaf 50 SG Sivanto 200 SL</p>	<p>2.8 fl. oz. 2.5 - 4 oz. 2 - 2.8 oz. 7 - 10.5 fl. oz.</p>
<p>Woolly apple aphid: If needed based on block history. Beleaf 50 SG Movento</p>	<p>2 - 2.8 oz. 6 - 9 fl. oz.</p>
<p>Dogwood borer: If needed based on block history. Isomate DWB</p>	<p>100 - 200 dispensers</p>

PEST AND MATERIALS	RATE PER ACRE
First Cover	
<p>Apple scab: Same as Petal Fall.</p> <p>NOTE: If visible scab lesions are found during scouting a protectant-only program is recommended. To delay resistance avoid applications of SDHI, DMI and strobilurin fungicides which have strong activity on apple scab.</p>	
<p>Powdery mildew and rust diseases: Same as Petal Fall</p> <p>NOTE: For powdery mildew control after Second Cover, make applications based on previous history and scouting.</p>	
<p>Plum curculio</p> <p>Same as Petal Fall, except after the 1st application for plum curculio, base any additional treatment decisions on scouting for fresh injury and/ or a degree-day based oviposition model. After the first application for plum curculio, use perimeter row sprays rather than whole-block treatments. NOTE: For trees less than seven feet in height, or where scouting indicates fresh injury in the interior of a block, full-block applications may be made.</p>	
<p>Codling moth: If needed based on block or region history.</p> <p>Altacor 2.5 - 4.5 oz.</p> <p>Delegate WG 4.5 - 7 oz.</p> <p>Exirel 8.5 - 17 fl. oz.</p> <p>Assail 30 SG 4 - 8 oz.</p> <p>NOTE: Apply first treatments as soon as conditions are right for moth flight (no wind, no rain) after 250 degree days (DD), base 50°F, have accumulated after the first sustained pheromone trap catch (biofix) followed by a second at 10 - 14 day interval. If pressure is severe as indicated by pheromone traps or fruit damage, an additional application may be made 10 - 14 days later. Do not expose more than one generation of the target pest to this mode of action alone, e.g., use an alternative material for the other codling moth generation.</p> <p>Carpovirusine (codling moth only) * 6.8 - 13.5 fl. oz.</p> <p>CYD-X (codling moth only) * 1 - 6 fl. oz.</p> <p>* Active ingredient contains granulosis virus which only attacks codling moth larvae and work well in combination with mating disruption. These pesticides must be applied starting at first egg hatch and every 7 - 8 days during the moth flight, or about four applications per generation. Multiple applications at low rates are preferred.</p>	

PEST AND MATERIALS	RATE PER ACRE
First Cover (continued)	
<p>San Jose scale: If needed based on block history. Make first application at 500 DD, base 50°F, from March 1st and a second 14 days later. If pressure is severe as indicated by pheromone traps or fruit damage, an additional treatment against second-generation crawlers at 1450 DD from March 1st (in late July to August) with a second application 14 days later.</p> <p>Centaur WDG 34.5 oz. Esteem 35 WP 4 - 5 oz. Grandevo 2 - 3 lb. Movento 6 - 9 fl. oz. Sivanto 200 SL 10.5 - 14 fl. oz. Venerate XC 2 - 4 qt.</p>	
Second Cover	
<p>Apple scab Captan 4L 2 - 4 lb. Captan 50 WP 4 - 8 lb. Captan 80 WP 2.5 - 5 lb.</p>	
<p>Powdery mildew: Same as Petal Fall, use previous history and scouting to determine need for applications after Second Cover.</p>	
<p>Plum curculio: See First Cover.</p>	
<p>Codling moth and lesser appleworm : See First Cover for insecticide options. Pheromone disruption: For best results, make applications before the start of summer generation moth flights. Isomate C TT (codling moth) 100 - 200 dispensers Isomate CM/ OFM TT (codling moth and lesser appleworm) 200 dispensers Checkmate CM-F (codling moth) 2.4 - 4.8 fl. oz. Checkmate Puffer CM-O Pro (codling moth) 1 - 2 puffers Cidetrak CMDA Combo Meso-A (codling moth)..... 18 - 36 dispensers</p>	
Japanese beetle	
<p>Actara 5.5 oz Assail 30 SG 5 - 8 oz.</p> <p>Multiple applications may be needed. Spot treatments should be considered where activity is limited within the orchard. Applications limited to the top of the canopy where feeding is occurring may be effective. Sample to determine if broad spectrum insecticides applied for other pests reduce or eliminate the need to apply an insecticide for Japanese beetle.</p>	
<p>San Jose scale: See First Cover.</p>	
<p>Woolly apple aphid: Same as Petal Fall and only if needed based on block history.</p>	

PEST AND MATERIALS	RATE PER ACRE																								
Third Cover																									
Apple scab: Same as Second Cover																									
Powdery mildew: Same as Petal Fall, use previous history and scouting to determine need for applications after Second Cover.																									
<p>Sooty blotch and flyspeck (SBFS) and select fruit rots</p> <p>Do not treat for SBFS and/or fruit rots unless need is indicated by previous history and/or weather monitoring for wetting hours. Fungicides for SBFS may be applied after 185 wetting hours have accumulated from McIntosh petal fall. Track wetting hours from petal fall using a weather station. If wetting data are not available, early July may be used as an estimated date to begin applications.</p> <p>Indar 2F 6 - 8 fl. oz.</p> <p>Inspire Super 12 fl. oz.</p> <p>ProPhyt 4 - 6 pt.</p> <p>Flint 2 - 3 oz.</p> <p>Pristine 14.5 - 18.5 oz.</p> <p>Sovran 3.2 - 6.4 oz.</p> <p>Topsin M WSB 0.75 - 1 lb.</p> <p>Captan 4L 2 - 4 lb.</p> <p>Captan 50 WP 4 - 8 lb.</p> <p>Captan 80 WP 2.5 - 5 lb.</p>																									
ADDITIONAL NOTES:																									
1. Fungicide wash-off and reapplication intervals for SBFS control:																									
<table border="1"> <thead> <tr> <th>Fungicide</th> <th>Rate per acre</th> <th>Minimum interval (days)</th> <th>Maximum rainfall (in.) during interval</th> </tr> </thead> <tbody> <tr> <td>Captan 80</td> <td>2.5 lb.</td> <td rowspan="5">21</td> <td rowspan="5">2.0</td> </tr> <tr> <td><i>plus</i> Topsin M</td> <td>9 oz.</td> </tr> <tr> <td><i>or</i> ProPhyte 4.2 L</td> <td>48 fl. oz.</td> </tr> <tr> <td><i>or</i> Sovran</td> <td>6.4 oz.</td> </tr> <tr> <td><i>or</i> Flint</td> <td>2.5 oz.</td> </tr> <tr> <td>Captan 80</td> <td>3 lb.</td> <td>14</td> <td>1.5</td> </tr> <tr> <td>Pristine</td> <td>14.5 oz.</td> <td>21</td> <td>2.5</td> </tr> </tbody> </table>	Fungicide	Rate per acre	Minimum interval (days)	Maximum rainfall (in.) during interval	Captan 80	2.5 lb.	21	2.0	<i>plus</i> Topsin M	9 oz.	<i>or</i> ProPhyte 4.2 L	48 fl. oz.	<i>or</i> Sovran	6.4 oz.	<i>or</i> Flint	2.5 oz.	Captan 80	3 lb.	14	1.5	Pristine	14.5 oz.	21	2.5	
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<p>2. Flint, Pristine, Sovran and Topsin provide control of select fruit rots. See label for specific guidelines.</p> <p>3. Use Topsin M only where summer disease pressure is heavy indicated by block history. Use no more than 4 lb. per acre per year.</p> <p>4. When tank mixing captan with single-site fungicide, apply a half rate of captan. If captan is used alone apply within the recommended label rate.</p>																									

PEST AND MATERIALS	RATE PER ACRE
Third Cover (continued)	
<p>Bitter rot</p> <p>If needed based on block or region history. Apply one of the following PLUS captan before a predicted heat-wave ($\geq 90^{\circ}\text{F}$). Applying the fungicide cover after the heat wave before any precipitation may also work.</p> <p>Flint 3 oz. Merivon 4 - 5.5 fl. oz. Pristine 14.5 - 18.5 oz.</p> <p>PLUS</p> <p>Tank mix all single-site fungicides with captan.</p> <p>Captan 80 WDG..... 4 - 5 lb.</p> <p>Apply Captan 80 WDG (4 – 5 lb./A) on a 14-day interval when bitter rot inoculum is present and weather is favorable for infection.</p> <p>NOTE: Activating trickle irrigation three to five days before the heat arrives ($\geq 90^{\circ}\text{F}$) will help ensure that soil moisture is near saturation levels and trees are not water stressed when the heat arrives. Heat injury may be a predisposing factor to infection.</p>	
<p>Obliquebanded leafroller: Base application timing on trap catches and degree-day model (360 DD, base 43°F, after first adult catch).</p> <p>Altacor * 2.5 - 4.5 oz. Delegate WG * 4.5 - 7 oz. Exirel * 8.5 - 17 fl. oz.</p> <p>NOTE: * Do not expose more than one generation of the target pest to this mode of action alone.</p> <p>Agree WG 1 - 2 lb. DiPel DF 0.5 - 2 lb. Entrust SC 6 - 10 fl. oz.</p> <p>Additional sprays may be required after 10 - 14 days, to treat all first-generation larva.</p>	
<p>Fruit sunburn: If needed based on cultivar, block or region history.</p> <p>Purshade 2 - 3 gal.</p> <p><i>Grower comments: growers do not usually apply Purshade after end of July because it is difficult to wash off harvested fruit.</i></p> <p>Raynox Apple Sunburn Protectant..... 2.5 gal.</p> <p><i>Grower comments: Raynox is difficult to mix in the spray tank and there can be issues with the materials clogging nozzles.</i></p> <p>Surround WP 25 - 50 lb.</p> <p>The impacts of sunburn can be mitigated by scheduling frequent irrigation to avoid tree-water stress; avoiding excessive summer pruning, especially before or during hot weather; protecting picked fruit in bins from direct sunlight and improving air flow in the orchard to keep fruit cool.</p>	

PEST AND MATERIALS	RATE PER ACRE
After Third Cover	
Apple scab, sooty blotch and fly speck, fruit rots: Same as Third Cover NOTE: Single-site fungicides may be used alone within 30 days of harvest, however, must be tank mixed with a protectant if active scab lesions are present at time of application.	
Apple maggot: Base applications on monitoring traps (threshold of ≥ 1 for unbaited spheres or ≥ 5 for baited spheres) or use trap-out spheres. Admire Pro Assail 30 SG Belay Exirel Surround WP [Frequent applications (7 - 10 day intervals) and maximal coverage (minimum of 100 gal./ acre are advised while there is active foliar growth)]	2.8 fl. oz. 8 oz. 6 fl. oz. 13.5 - 20.5 fl. oz. 25 - 50 lb.
Codling moth and lesser appleworm Base applications on trap catch (1 st adult flight biofix) and degree-day models (CM: 250 DD, base 50°F, from biofix; OFM: 170 DD, base 45°F, from biofix), plus follow-up application 10 -14 days later for each brood. If lesser appleworm is a problem indicated by block history or monitoring, Delegate or Altacor may be applied just prior to egg hatch followed by a second application 10 - 14 days later. Any codling moth applications are also likely to control lesser appleworm, thus in orchards treating for codling moth, applications specifically for lesser appleworm are not likely to be needed. Altacor * Delegate WG * Exirel * Assail 30 SG * NOTE: * Do not expose more than one generation of the target pest to this mode of action alone. Avaunt Intrepid 2F Suppression only for codling moth, use maximum label rate. Carpovirusine (codling moth only) CYD-X (codling moth only)	2.5 - 4.5 oz. 4.5 - 7 oz. 8.5 - 17 fl. oz. 5 - 8 oz. 5 - 6 oz. 12 - 16 fl. oz. 6.8 - 13.5 fl. oz. 1 - 6 fl. oz.
Mites: Make no more than two post-bloom miticide applications per season. Acramite 50 WS Envidor 2 SC Portal Kanemite 15 SC Nealta Zeal SC	0.75 - 1 lb. 16 - 18 oz. 2 pt. 21 - 31 fl. oz. 13.7 fl. oz. 4 - 6 fl. oz.

Weed Management

Always begin your weed management program by identifying target weeds from scouting reports and weed maps from the previous season.

NOTES:

- Rotate herbicide mode of action between applications (during and between seasons). Herbicide grouping numbers identified by the Weed Science Society of America (WSSA) are included to help identify product rotations. Each application must rotate to an herbicide with a different WSSA grouping number unless the product is tank mixed with an herbicide with an alternative WSSA grouping number.
- Weed species that have developed resistance to glyphosate include rigid ryegrass, horseweed (marestalk), Italian ryegrass, common ragweed, palmer amaranth, waterhemp.
- Pre-emergent herbicides may be applied in spring or fall; consider target-weed species to determine timing.
- Where herbicide labels allow tank mixes, special application rates may apply. Growers may also be required to have supplemental labels on hand for tank-mix applications.
- * Rely 280 (glufosinate-ammonium): To avoid serious damage avoid contact of spray, drift or mist with green bark, stems or foliage. See product label for advisory statement.

STAGE	WSSA Group	PEST AND MATERIALS	RATE PER ACRE
Dormant to terminal-bud set	3	Pre and/ or post-emergence weed suppression Prowl H20	2 - 6.3 qt.
	5	Sinbar WDG	2 - 4 lb.
	14	Chateau	6 - 12 oz.
	2	Matrix	4 oz.
	29	Alion	5 - 6.5 fl. oz.
	9	If actively growing weeds are present include one of the following: RoundUp Ultra	11 - 105.6 fl. oz.
	10	Rely 280 *	48 - 82 fl. oz.
	14	Aim EC	1 - 2 fl. oz.
Early summer (after terminal-bud set)	22	Burn-down weed suppression Gramoxone SL	2.5 - 4 pt.
	9	RoundUp Ultra	11 - 105.6 fl. oz.
	10	Rely 280 *	48 - 82 fl. oz.
	14	Aim EC	1 - 2 fl. oz.
	27	Scythe	4 - 132 fl. oz.
	1	Post-emergent grass suppression Poast Herbicide	2 - 4 pt.
	1	Select Plus (CAUTION label, non-bearing trees only).	
Fall		See dormant to terminal-bud set.	
Spot treatment of post-emergent weeds	9	RoundUp Ultra	11 - 105.6 fl. oz.
	10	Rely 280 *	48 - 82 fl. oz.
	14	Aim EC	1 - 2 fl. oz.
	4	Stinger	1/3 - 2/3 pt.
	14	Burn down of root suckers Aim EC	2 fl. oz.
27	OR Scythe	6.6 - 88 fl. oz.	

THIS IS NOT THE PROTOCOL - USE ONLY AS A REFERENCE

Neonicotinoids and Alternatives for Management of Selected Pests

Trade Name	Active Ingredient	AM	INT	OBLR	PLH	PC	RAA	SJS	TPB	WAA
Neonicotinoids										
*Actara	thiamethoxam	1	1		3	3	3		2	
*Admire Pro	imidacloprid	3			3		3	2		
*Assail	acetamiprid	3	3		3	2	3	S	2	2
*Belay	clothianidin	3	2	X	3	3	3	3		
Neonicotinoid alternatives										
*Altacor	chlorantraniliprole	S	3	3	S	S				
Avaunt	indoxacarb	2	2	2	3	3			2	
Centaur	buprofezin				2			3		
Closer	sulfoxaflor						3		X	
*Delegate	spinetoram	S	3	3		S				
Dipel	<i>Bacillus thuringiensis</i>		2	3						
Esteem	pyriproxyfen		2	3			3	3		
*Exirel	cyantraniliprole	3	3	3		3	3			
Grandevo	<i>Chromobacterium subtsugae</i>		X	3			3			
Intrepid	methoxyfenozide		2	3						
Movento	spirotetramat							3		3
Neemix	azadirachtin		2		2		2			
Sivanto	flupyradifurone				X		3		S	S
Venerate	<i>Burkholderia spp.</i>					3		X		
*Verdepryn	cyclaniliprole	S	3	3		3				
Key to control ratings										
Cornell rating: 3 - Good, 2 - Fair, 1 - Poor, X - Pest on product label, S - Product labeled suppression only										
Apple maggot - AM , Internal feeding lepidoptera (codling moth, lesser appleworm or oriental fruit moth) - INT , Potato leaf hopper - PLH , Plum curculio - PC , Rosy apple aphid - RAA , San Jose scale - SJS , Tarnished plant bug - TPB , Woolly apple aphid - WAA										
Adapted from the Cornell Crop and Pest Management Guidelines, Table 7.1.1 Activity of spectrum of pome fruit insecticides and acaricides, store.cornell.edu/p-199629-2018-cornell-pest-management-guidelines-for-commercial-tree-fruit-production.aspx .										
Clothianidin (Belay) rating was adapted from the Penn State Tree Fruit Production Guide, extension.psu.edu/plants/tree-fruit/TFPG .										
Closer (sulfoxaflor), Grandevo (<i>Chromobacterium subtsugae</i>), Sivanto (flupyradifurone), Venerate (<i>Burkholderia spp.</i>) and Verdepryn (cyclaniliprole) ratings were adapted from the Michigan Spray Guide, https://www.canr.msu.edu/resources/fruit_management_guide_e0154										
NOTE: *'USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL' classification.										

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Herbicides with High-Risk to Water Quality	
Product	Active Ingredient
Starane Ultra	fluroxypyr-methyl
Gramoxone	paraquat dichloride
Prowl H2O	pendimethalin
Venue	pyraflufen-ethyl

Note: See practice 44 on the Protocol and Self-Assessment, pg. 13

Insecticides with High-Risk to Pollinators from Drift	
Product	Active Ingredient
Lorsban	chlorpyrifos
Belay	clothianidin
Admire Pro, Alias, Montana	imidacloprid
Entrust	spinosad
Actara	thiamethoxam

Note: See practice 45 on the Protocol and Self-Assessment, pg. 13.

**TruEarth Certified Protocol and Self-Assessment
Checklist for Certification**

Check if Complete	Required for Certification
	<ul style="list-style-type: none"> Cover sheet is completed with grower contact information (pg. 5).
	<ul style="list-style-type: none"> Orchard-block list identifying block names, acreage, cultivars and estimated annual production.
	<ul style="list-style-type: none"> Grower meets all minimum requirements (pg. 6 – 10 in the TruEarth Protocol and Self-Assessment) and provides brief justification for any N/A or Fail.
	<ul style="list-style-type: none"> Pesticide application records include: <ul style="list-style-type: none"> Date and time application started and ended Crop, block(s) and acreage treated Trade name and formulation of material applied (with EPA registration number, active ingredient, target pest for pesticides and duration of Restricted-Entry Interval) Rate per acre (oz., gal. or lb./ acre) Application method
	<ul style="list-style-type: none"> Scouting and monitoring records include: Date, block(s), pest scouted and result, e.g., captures per trap, mites per leaf, weather data and degree-day models.
Recommended documentation for scouting and monitoring	
	<ul style="list-style-type: none"> Mites: Scouting records include threshold counts for mites, e.g., number of mites per leaf and number of leaves sampled.
	<ul style="list-style-type: none"> Tarnished plant bug: Trap counts from white sticky boards and blocks exceeding thresholds are documented in scouting reports.
	<ul style="list-style-type: none"> Fire blight: Monitoring data from Maryblyt or CougarBlight model is included if antibiotics were applied for fire blight.
	<ul style="list-style-type: none"> Plum curculio: Visual scouting for plum curculio damage is documented.
	<ul style="list-style-type: none"> Codling moth: Scouting records include trap captures, degree-day accumulations and biofix date.
	<ul style="list-style-type: none"> Obliquebanded leafroller: Visual scouting of infested fruit clusters and terminal is documented and identifies blocks which exceed thresholds.
	<ul style="list-style-type: none"> Summer diseases: Accumulated wetting hours from petal fall are documented.
	<ul style="list-style-type: none"> Apple maggot: Trap counts are documented and identify blocks exceeding thresholds.
	<ul style="list-style-type: none"> Weed management: Weed species and location, e.g., tree row or row middle, are documented.
	<ul style="list-style-type: none"> Redbanded leafroller: Scouting records include trap counts and sampling data from visual inspection of fruiting clusters and terminals.
	<ul style="list-style-type: none"> Additional pests: Visual scouting data and/or trap counts are provided for aphids, leafhoppers, scales and additional pests, as per Extension recommendations for monitoring. Consult the IPM Manual for Minnesota Apple Orchards or Michigan State or Cornell tree fruit pest management guidelines for monitoring guidance.
Records available for on-farm audit	
	<ul style="list-style-type: none"> Soil and foliar nutrient testing results are available for inspection.
	<ul style="list-style-type: none"> Nutrient records from the past 12 months are available for inspection.
	<ul style="list-style-type: none"> Procedures, results and adjustments from the most recent calibration are available for inspection.
	<ul style="list-style-type: none"> Scouting records for the current and previous season are available for inspection.