

Eco Apple Supplement

Participating Growers Must Also Complete Core Eco Protocol

Deadline for Record Submission: July 20, 2018

DRAFT for 2018 growing season v. 2.5 – 02/16/2018

See page 27 for list of revisions to this edition.

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A. Minimum Requirements	Pass, Fail or N/A
<p>1. Plum curculio</p> <p>a. After the first application of pesticide for plum curculio at or after petal fall, further treatment decisions are based on sampling fruit for any sign of fresh injury, fruit diameter reaching 6-7 mm and/or a degree-day-based oviposition model. Research indicates plum curculio immigration into orchards ends at about 308 degree days (base 50°F) from apple petal fall. ^D</p> <p>b. Second (and third if necessary) pesticide applications for plum curculio are perimeter-row sprays rather than whole-block treatments. <i>You may score as NA where full-block applications may be needed: blocks with trees less than seven feet in height, or where scouting indicates fresh injury in the interior of a block.</i> ^D</p>	
<p>2. Oriental fruit moth and lesser appleworm</p> <p>a. Oriental fruit moth and/or lesser appleworm is not treated unless need is indicated by block or region history of economic injury or by monitoring using pheromone traps or sampling for damage. ^D</p> <p>b. If oriental fruit moth or lesser appleworm is treated, degree days are used to calculate treatment timing. ^D</p> <p>Note: It is recommended to apply the first larvacide treatment at 150-200 degree days (base 45°F) after the first sustained flight (biofix) of first generation oriental fruit moth. Second and third generation oriental fruit moth can be controlled at 1150-1200 and then 2100-2200 degree days from biofix. If pressure is severe, as indicated by pheromone traps or fruit damage, additional applications may be made 10-14 days after these applications. The threshold for oriental fruit moth trap catches is 15 moths per week during first generation and ten moths per week during second and third generation. <i>Score as NA if no treatments are made for oriental fruit moth or lesser appleworm.</i></p>	
<p>3. Mites</p> <p>a. Post-bloom miticides are applied only after mites and mite predators have been systematically sampled in each block and predators are insufficient to provide control. Systematic sampling includes viewing a pre-determined number of leaves and trees in each block and using a quantitative threshold for determining need to treat such as those found in the <i>New England Tree Fruit Management Guide</i>, the <i>Cornell Pest Management Guidelines for Commercial Tree Fruit Production</i> or the <i>Pennsylvania Tree Fruit Production Guide</i>. ^D</p> <p>b. No more than two post-bloom applications of miticide are made per season. ^D</p>	

Superscripts indicates practice-verification process. Reference the following throughout entire document:

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

A. Minimum Requirements	Pass, Fail or N/A								
<p>4. Apple maggot</p> <p>a. Treatment decisions for apple maggot are based on monitoring with three or more red sphere sticky traps per 10-15 acre block and a threshold of an average of one per trap if using unbaited traps, or an average of five per trap if using odor-baited traps. Use more traps per acre in small blocks and other blocks with lengthy perimeters vs. area. At the end of the effective period of the pesticide, clean traps and continue to monitor. ^D</p> <p>Table A. Apple maggot degree-day model for predicting emergence and egg laying, using 50°F as a base.</p> <table border="1" data-bbox="175 632 1010 894"> <tr> <td>937 +/- 132 DD</td> <td>First catch on red sphere</td> </tr> <tr> <td>1344 +/- 200 DD</td> <td>First oviposition punctures noted</td> </tr> <tr> <td>1631 +/- 214 DD</td> <td>Peak adult emergence</td> </tr> <tr> <td>2095 +/- 188 DD</td> <td>Apple maggot flight subsiding</td> </tr> </table> <p>Adapted from A. Agnello and H. Reissig, Cornell University.</p> <p>Note: Continue to maintain apple maggot traps through September to catch any late-season activity. Growers have experienced severe crop losses from late-season apple maggot when the right conditions occur to favor it.</p>	937 +/- 132 DD	First catch on red sphere	1344 +/- 200 DD	First oviposition punctures noted	1631 +/- 214 DD	Peak adult emergence	2095 +/- 188 DD	Apple maggot flight subsiding	
937 +/- 132 DD	First catch on red sphere								
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<p>5. Obliquebanded leafroller</p> <p>a. Obliquebanded leafroller is not treated unless need is indicated by systematic sampling for infested clusters or terminals (e.g., 3% infested using the sampling procedure described in the <i>Cornell Guide for Pest Management of Tree Fruit</i>). ^D</p> <p>Note: Score as NA if there is no block or region history of economic injury due to obliquebanded leafroller.</p> <p>b. If obliquebanded leafroller is treated, no more than one application is used against the overwintering generation (bloom or petal fall). Two applications may be used against second generation. Use degree days to calculate treatment timing. ^D</p> <p>Note: It is recommended to apply the first larvacide treatment at 360 degree days (base 43°F) after the first pheromone trap catch (biofix) and a second applied 10-14 days later. Score as NA if no treatments are made for obliquebanded leafroller.</p> <p>Note: In orchards where oriental fruit moth is controlled chemically, control of obliquebanded leafroller should also be achieved. Where oriental fruit moth is controlled with pheromone mating disruption, additional controls for obliquebanded leafroller may be necessary.</p>									

A. Minimum Requirements	Pass, Fail or N/A
<p>6. Tarnished plant bug</p> <p>a. Orchard blocks are not treated for tarnished plant bug unless captures on white sticky traps are over threshold in each block treated. Place traps no later than silver tip and use one trap per three to five acres and at least five traps per block. Thresholds include a cumulative average by tight cluster of five per trap and eight per trap at late pink. ^D</p> <p>Note: Research results to date suggest cost of control is not justified because feeding damage does not substantially affect fruit grade and/or current control options are not very effective. Growers are requested to consider leaving some trees untreated in blocks over threshold to assess extent of economic damage.</p> <p>b. Orchard floor is managed to control tarnished plant bug and stinkbugs, e.g., mowing after insecticide applications and control broad-leaf weeds with mowing or herbicides. ^S</p>	
<p>7. Apple scab</p> <p>a. Fungicides for apple scab cease within two weeks after Extension reports primary scab season is over, unless visible infections are found during scouting. ^D</p> <p>b. Post-harvest litter chopping is completed to reduce apple-scab inoculum between leaf drop and half-inch green tip on scab-susceptible varieties or where scab inoculum is present. ^S</p> <p>Note: Destruction of leaf litter may help reduce but will not eliminate inoculum. Chopping in the fall allows more time for leaf decomposition. Chopping in early spring, when scab spores are more developed, will flip some leaves and direct developing fungal spores towards the ground, preventing release into the air. Ground floor should be dry to enable thorough leaf chopping. Pay attention to areas around and/or within orchard perimeter where wind-blown leaves collect.</p>	
<p>8. Fire blight</p> <p>a. Antibiotic (e.g., streptomycin or oxytetracycline) is only applied for fire blight according to a weather-based forecasting program such as Maryblyt or CougarBlight. ^D</p> <p>b. Post-bloom applications of antibiotics for fire blight are made only in the event of hail or high wind damage in orchards with existing infections. ^D</p>	

A. Minimum Requirements	Pass, Fail or N/A
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9. Sooty blotch and flyspeck

- a. Fungicides are not applied for summer disease until 170 accumulated wetting hours from petal fall; early infections will be controlled by fungicides applied for scab or powdery mildew at petal fall and first cover. If wetting data are not available, early July may be used as an estimated date. Thereafter, fungicides should be applied at intervals no closer than those listed in Table B. ^D

Table B. Activity of fungicides against summer diseases

Fungicide	Rate per acre	Minimum interval (days)	Maximum rainfall (in.) during interval
Captan 80 <i>plus</i> Topsin M <i>or</i> ProPhyte <i>or</i> Sovran <i>or</i> Flint	2.5 lb. 9 oz. 48 fl. oz. 6.4 oz. 2.5 oz.	21	2.0
Captan 80	3 lb.	14	1.5
Pristine	14.5 oz.	21	2.5

Adapted from D. Rosenberger, Cornell University

10. Codling moth

- a. Codling moth is not treated unless need is indicated by block or region history of economic injury or by monitoring using pheromone traps or sampling for damage. ^D

Note: Pheromone-trap based thresholds have not been established for the Northeast. Recent research from Michigan State University recommends an ideal trap density of one trap per two and a half acres. Where there are large uniform blocks, traps may be expanded to one per five acres. Trap thresholds for codling moth include five or more moths caught during a one-week period. Captures and thresholds vary depending on trap density, lure type and whether or not mating disruption is in use. *Score as NA if no block or region history of economic injury due to codling moth.*

- b. If codling moth is treated, degree days are used to calculate treatment timing. ^D

Note: It is recommended to apply the first larvacide treatment at or after 250 degree days (base 50°F) have accumulated from the first sustained pheromone trap catch (biofix) for each generation. If an ovicide is used, e.g., Esteem, the first application is made after 100 degree days (base 50°F) have accumulated from biofix. Applications may be delayed if conditions are not suitable for egg laying, e.g., codling moths fly between 6-11 PM. Wind or rain will prevent flight. If pressure is severe as indicated by pheromone traps or fruit damage, additional applications may be made 10-14 days after the initial application. *Score as NA if no treatments are made for codling moth.*

A. Minimum Requirements	Pass, Fail or N/A
<p>11. Brown marmorated stink bug (BMSB)</p> <p>a. Blocks at risk for BMSB are scouted for BMSB beginning after petal fall and baited traps are used along perimeter to monitor BMSB through harvest. In blocks that exceed trap threshold, or where one adult BMSB is observed within the orchard perimeter along 100 feet of row, or feeding injury is observed, management should begin. Note: A threshold of 10 adults per week is used for the black-pyramid trap (Tedder's trap). Thresholds do not currently exist for other trap designs, e.g., clear-sticky trap, Rescue-brand trap. ^D</p> <p>b. Alternate-row middle (ARM) or perimeter sprays are used to manage BMSB. ARM sprays may be applied on a seven-day intervals which alternate between even and odd-numbered rows. The perimeter is defined as the first four rows or up to 50 feet from the orchard edge. ^D</p> <p>c. Full-block cover sprays are avoided until adults or feeding are found within the interior of the block. ^D</p> <p>d. For each insecticide application for BMSB, efficacy against other pests is considered, e.g., if also effective against apple maggot, no additional application is made for apple maggot during the effective period. ^D</p> <p>Note: In apples, fruitlets may be injured as early as late-May where BMSB populations are high, yet activity often spikes in September-October. During this pre over-wintering period BMSB are very mobile and will move in and out of the orchard. Fruitlets damage shortly after bloom will likely abort. See the <i>Eco Apple Quick Guide</i> for a list of approved insecticides for BMSB that have efficacy against other pests. <i>Score NA if BMSB management is not necessary.</i></p>	
<p>12. Powdery mildew</p> <p>a. In high-inoculum blocks or blocks with susceptible varieties, fungicide applications target powdery mildew between tight cluster and petal fall. ^D</p> <p>b. Fungicide applications targeting powdery mildew after petal fall are only made if visible infections are found during scouting. <i>Score as NA if no treatments are made for powdery mildew.</i> ^D</p> <p>Note: If powdery mildew has been a historic problem, select fungicides with the highest efficacy. Petal fall is when the crop is at the greatest risk for infections from powdery mildew.</p>	

A. Minimum Requirements	Pass, Fail or N/A
<p>13. Trunk borer species</p> <p>a. Visual scouting is completed to confirm infestation before borers are treated with pesticides. Traps should be used to monitor presence/absence and population trends. ^D</p>	
<p>14. European apple sawfly</p> <p>a. European apple sawfly is not treated unless need is indicated by block or region history of economic injury or by monitoring using visual traps or sampling for damage. ^D</p> <p>Note: Use white sticky boards to monitor. At tight cluster, place traps along the orchard perimeter at a density of one trap per three to five acres. Continue to monitor until the end of petal fall. The adult is 7-8 mm long with light orange to yellow head, antennae, lower body and legs; the upper body is dark brown and shiny. Thresholds include a cumulative capture by petal fall of three to five flies per trap. Seasons with an extended bloom period may be more prone to injury.</p> <p>b. If European apple sawfly is treated, larvae are targeted at petal fall. Pre-bloom insecticide application are not used to treat European apple sawfly adults. <i>Score as NA if no treatments are made for European apple sawfly.</i> ^D</p>	
<p>15. Bitter rot</p> <p>a. In blocks where bitter rot is an annual problem, fallen fruit are removed from beneath trees in the fall after harvest. <i>If bitter rot is not a concern score NA.</i> ^S</p>	

B. Advanced Practices Note: Please note block ID, for any blocks not earning points.	Points eligible	Points earned (all blocks)	Blocks not scored
1. No EBDC fungicides, e.g., Dithane, Manzate, Penncozeb, Polyram, are used. ^D	2		
2. At least 25% of trees are disease-resistant varieties and are not treated with fungicides for those disease to which the varieties are resistant. ^S	2		
3. At least 50% of trees are on M.7 or smaller size-controlling rootstocks. ^S	1		
4. When using captan during the summer for sooty blotch and fly speck management, the lowest recommended field rate on the label is applied. ^D	1		
5. Urea treatment is applied to reduce apple scab pressure in fall during leaf drop or early spring prior to green tip. ^D	2		
6. Potential Ascospore Dose (PAD) is assessed by systematic fall scouting; apple scab management is adjusted as per results. ^D Note: PAD results are not reliable when using single-site fungicides. Use with protectant-only programs. For more information visit: ag.umass.edu/fact-sheets/reducing-apple-scab-risks-saving-scab-sprays .	3		
7. No miticides are used other than an early season oil spray. Mites are managed principally by conserving natural enemies. ^D	1		
8. Mite thresholds are adjusted upwards when factors reduce potential for economic injury, e.g., varietal resistance, rainy or cooler weather is not conducive to economic damage. ^D	1		
9. Apple maggot is controlled without pesticide sprays, e.g., by trap out. ^D	2		
10. Wild hosts of summer diseases are removed within 100 yards of orchard blocks to reduce inoculum pressure. ^S	2		
11. All abandoned apple trees within 100 yards are removed to reduce immigration of codling moth and other pests. ^S	1		
12. Wild hosts of tarnished plant bug are removed from the orchard and borders to reduce tarnished plant bug populations. ^S	1		
13. All red cedar and juniper trees within 100 yards are removed to reduce cedar rust inoculum in problem blocks. ^S	1		

B. Advanced Practices Note: Please list block ID, for any blocks not earning points.	Points eligible	Points earned	Blocks not scored
14. Biopesticides are used, e.g., <i>Bacillus subtilis</i> , <i>Bacillus thuringiensis</i> , granulosis virus. ^D	1		
15. Chemical fruit thinning does not include use of carbaryl-based thinners. ^D	2		
16. Tree-row volume applications are used. ^D	1		
17. Rodents are managed without rodenticides, e.g., close mowing, mouse guards, removing drops, encouraging predators. ^D	1		
18. Buildings are inspected for overwintering populations of BMSB. Large aggregations of overwintering BMSB are removed and disposed of in a tightly sealed trash bag. ^S Note: Anecdotal evidence suggests that removal of overwintering BMSB may help reduce populations, each female may lay up to 500 eggs in a life cycle.	2		
19. Where oriental fruit moth requires intervention, mating disruption is used. ^D Note: Insecticides applied after bloom for control of plum curculio will also have efficacy on first generation oriental fruit moth. Mating disruption for oriental fruit moth may be applied before second generation in mid-June. Mating disruption dispensers lasting 90 days will also provide control in areas with a third generation of oriental fruit moth.	2		
20. Where codling moth requires intervention, mating disruption is used. ^D Note: A minimum five-acre block is recommended for use of codling moth mating disruption.	2		
21. Topsin M (thiophanate-methyl) is not used. ^D Note: Thiophanate-methyl is toxic to earthworms.	1		
22. Cornell Apple Carbohydrate Thinning Model is used for thinning and crop load management, newa.cornell.edu/index.php?page=apple-thin . ^D	3		
23. Predicting Fruitset Model is used for thinning and crop load management, msue.anr.msu.edu/topic/apples/horticulture . ^D	3		
24. Diphenylamine (DPA) is not used as a postharvest dip, drench or fogging application. ^D	1		

B. Advanced Practices Note: Please list block ID, for any blocks not earning points.	Points eligible	Points earned	Blocks not scored
<p>25. Treatment of apple maggot with Surround (kaolin) is made before expected apple maggot oviposition (two sprays seven days apart) at first trap capture of apple maggot adults or at degree-day model estimate for beginning of codling moth egg hatch. Table B on page three provides a degree-day model to predict apple maggot emergence. ^D</p> <p>Note: Surround is rated only fair for efficacy against apple maggot and should not be used where high populations exist. Reapply if removed by rain. Use of Surround within two months of harvest may delay harvest 3-7 days and result in visible residue on fruit.</p>	<p>1</p>		
<p>26. Treatment of plum curculio with Surround (kaolin) is made before expected plum curculio oviposition (two sprays seven days apart). ^D</p> <p>Note: Surround is only rated fair and for suppression only for plum curculio control and should not be used where high levels of damage from plum curculio are expected or observed.</p>	<p>1</p>		
<p>27. Where dogwood borer requires intervention, pheromone mating disruption is used. ^D</p> <p>Note: Cornell recommends a minimum ten-acre block for use of dogwood borer mating disruption and to implement mating disruption for three continuous years, along with an insecticide before relying on mating disruption exclusively.</p>	<p>2</p>		
<p>28. No post-harvest fungicides are used. ^D</p>	<p>1</p>		
<p>29. Orchards coordinate with neighbors to remove large aggregations of overwintering BMSB from structures. ^S</p>	<p>2</p>		
<p>30. RIMpro Cloud Service (rimpro.eu) is used for pest and disease management. ^D</p>	<p>3</p>		
<p>31. Trunks are painted with white latex paint to deter rodent feeding and reduce winter sunscald. ^S</p>	<p>2</p>		
<p>32. Base of trunks are kept weed-free to reduce burr knot growth and environments attractive to borer species. ^S</p>	<p>1</p>		

B. Advanced Practices Note: Please list block ID, for any blocks not earning points.	Points eligible	Points earned	Blocks not scored
33. Trees heavily infested ($\geq 75\%$ dead or dying) by borer larvae are removed from the orchard and burned before the following spring. Stumps must also be removed. All large prunings and brush piles are either flailed or burned. ^S	1		
34. Black stem borer is monitored with ethanol-baited bottle traps if need is indicated by block or region history of economic injury. Adult beetles become active in mid to late April (about 100 DD, base 50, from January 1). For monitoring instructions visit, treefruit.msu.edu/extension/ManagingBSB-MI_Tree_Fruits.pdf . ^D	1		
35. Fire blight and black rot cankers and dead wood are removed from trees during winter pruning and destroyed to reduce sources of overwintering inoculum. ^S	1		
36. Cornell Apple Irrigation Model is used to help determine water demands and plan irrigation schedules, newa.cornell.edu/index.php?page=apple-irrigation . ^S	1		
Total points eligible	56		
Total points earned			
Grower participating for one to three years are required to earn a minimum of 4 points. Growers participating more than three years must earn at least 6 points.			

Note: List the block ID for any instances where the scored advanced practice does not apply to the site. Total points for each block may be reflected in the final score card on page 18 of the Core Eco Protocol and Grower Self-Assessment.

Pesticide Hazard and Risk Ranking

The following practices and products are listed for Northeast fruit production. Pesticide active ingredients have been evaluated for necessity to produce quality apples in the Northeast in commercial quantities, and for hazards to humans, natural enemies and other non-targets, potential to contaminate groundwater and resistance management. This is not an exhaustive list of practices or products.

Only fungicides, herbicides and insecticides which have been evaluated against our criteria and appear on the list of approved pesticides may be applied on enrolled blocks. If a fungicide, herbicide or insecticide is not included, please contact the IPM Institute to request a product evaluation. The IPM Institute will confirm receipt of requests within one business day and respond with a resolution within one to three business days.

Note: If pesticides with other trade names are used, they should have similar signal word (caution, warning), percent active ingredient and product formulation, e.g., wettable powder (WP), water-dispersible granule (WDG) or suspension concentrate (SC). Differences in product formulation and percent active ingredient can impact risk. **If a similarly formulated product is not available, please contact the IPM Institute to make an exemption request prior to application.**

Pesticide hazards were analyzed using the database at www.pesticideinfo.org, which collates information from recognized authorities such as US EPA and individual State Lead Agencies (SLAs) for pesticide regulation. SLAs are housed in state departments of agriculture or state environmental management agency, depending on the state.

The Pesticide Risk Tool (pesticiderisk.org) and Windows Pesticide Screening Tool, WIN-PST (go.usa.gov/Kok), have also been used to evaluate pesticide risks.

The following criteria were used to evaluate pesticides:

Acute toxicity to wildlife, fish, aquatic invertebrates: Product label, Pesticide Risk Tool

Acute toxicity: CAUTION, WARNING or DANGER Label/US EPA, Pesticide Risk Tool

Neurotoxin: Cholinesterase inhibitor or listed on Toxics Reduction Inventory maintained by US EPA

Possible, likely, probable carcinogen: US EPA, State of California, and International Agency for Research on Cancer

Reproductive/developmental toxin: US EPA, State of California, Pesticide Risk Tool

Toxic to pollinators, key natural enemies/secondary pests: Product label, Extension recommendations, variety of published sources

Toxic to wildlife: Product label, Pesticide Risk Tool

Suspected endocrine disruptor: Illinois EPA, Keith, Colburn or Benbrook lists

Broad spectrum pesticide: Extension recommendations

Resistance risk: Extension recommendations

Potential or known groundwater contaminant: State of California, variety of published sources

The following process was used to determine use and use restrictions:

- a. Pesticide options currently in use by growers, or suggested by growers or others, are reviewed for status re the criteria listed above.
- b. There are thousands of pesticides labeled for use specialty crops in the United States. We only review those products currently in use or with strong potential for use, as suggested by participating growers and others.
- c. Pesticides that are useful for our pest issues that do not have hazards as per our criteria, or pesticides with relatively readily mitigated hazards, are placed in “Low-Risk Pesticides, No Restrictions” or “Moderate to High-Risk Pesticides, No Restrictions” category. For example, for most products, aquatic toxicity is readily addressed by following label restrictions to avoid contamination of water bodies. **No pesticides may be used without justification, e.g., sampling and thresholds, or weather monitoring, or block history of a problem where sampling or monitoring methods and thresholds are not available.**
- d. Pesticides with hazards that are less readily mitigated are placed in the “Do Not Use” category. These are then reviewed for necessity in order to produce commercial quality fruit economically. Our goal is to limit the use of products with hazards to those we cannot do without.
- e. Products which are needed to address a key pest are then moved to the “Use with Restrictions (Moderate to High-Risk Pesticides)” category. Measures that we can take to mitigate hazards are included, e.g., limiting the number of applications, or limiting use to one pest issue where the product is critical for adequate control.
- f. Other products with similar hazards are not moved to the “Use with Restrictions (Moderate to High-Risk Pesticides)” category because the hazard profile is similar to those already in that category, but only if their use is a critical need that we identify as a group.
- g. This is a subjective process. Definitive data are not available on many of the considerations here, e.g., thresholds are lacking for many pests, efficacy is variable, and development of resistance is a concern if available modes of action are limited. We don’t know for sure exactly where to draw the line. We try to reach consensus on issues but realize this will not be possible in all cases. The protocol belongs to Red Tomato, which delegates the final decision on contentious issues to the IPM Institute.
- h. A timeline for new products that do not have approved labels by the annual meeting will be provided, e.g., Section 18 exemption label approvals for brown marmorated stink bug and mid-season product releases. These products will be listed under their appropriate use category as per the review process and will include anticipated release date. **Products may not be used until a label has been approved for the state in which they will be used.** Applications made prior to the label approval date will be considered a protocol violation and result in disqualification of the blocks which received treatment.

Pesticide Use Restrictions

IMPORTANT: All of the following products may not be registered in every state. Please confirm the product is labeled for use in your state!

LOW-RISK PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL

1. These pesticides may be used to the full extent of the pesticide label and pose minimal risk to environmental and human health.
2. Use only after systematic scouting or weather monitoring and science-based thresholds, or according to previous history where thresholds are not available.
3. Pesticides included are not a guarantee of efficacy. Some products will not be as effective as other products against specific target pests.

Trade Name	Active Ingredient	Concerns	Best Practice
Insect/Mite Management			
Cyd-X, Virosoft, Madex HP	<i>Cydia pomonella</i> granulovirus		
Mating disruption, e.g., CheckMate, IsoMate	1-dodecanol, 1-tetradecanol		Available for codling moth, dogwood borer and oriental fruit moth.
Nealta	cyflumetofen		
PFR-97	<i>Isaria fumosorosea</i>		
Surround	kaolin		May be applied prior to trap catches based on historical scouting data or degree day model.
Venerate	<i>Burkholderia</i> spp.		
Disease Management			
Actigard 50WG	acibenzolar-s-methyl		
Blossom Protect	<i>Aureobasidium pullulans</i>		
Double Nickel	<i>Bacillus amyloliquefaciens</i>		
Regalia	<i>Reynoutria sachalinensis</i>		
Serenade	<i>Bacillus subtilis</i>		
Urea	urea		
Weed Management			
Avenger AG	d-limonene		
Other			
Apogee	prohexadione calcium		
Exilis, MaxCel, Promalin	benzyladenine		
Fruitone	1-naphthaleneacetic acid		
Plantskydd	blood meal		
Retain	aminoethoxyvinylglycine hydrochloride		
SmartFresh, Harvista	1-methylcyclopropene		

MODERATE to HIGH-RISK PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL

1. These pesticides may be used to the full extent of the pesticide label. Moderate to high risks to environmental and human health are present.
2. Use only after systematic scouting or weather monitoring and science-based thresholds, or according to previous history where thresholds are not available.
3. Pesticides included are not a guarantee of efficacy. Some products will not be as effective as other products against specific target pests.

Trade Name	Active Ingredient	Concerns	Best Practice
Insect/Mite Management			
Acramite 50 WS	bifentazate	toxic to bees	
Avaunt	indoxacarb	toxic to mammals, birds, fish, aquatic invertebrates, highly toxic to bees	
Aza-Direct, Neemix	azadirachtin	toxic to bees, suspected endocrine disruptor, toxic to fish and aquatic invertebrates	
Agree, Deliver, Dipel	<i>Bacillus thuringiensis</i>	runoff risk to surface water	
Beleaf 50	flonicamid	potential groundwater contaminant	
Centaur WDG	buprofezin	potential groundwater contaminant	
Closer SC	sulfoxaflor	highly toxic to bees and earthworms	Not registered in New York.
Damoil	mineral oil	toxic to fish	Performance is best when relative humidity is less than 65% and temperatures are warmer than 60°F.
Entrust	spinosad	toxic to bees	
Envidor 2 SC	spiroticlofen	toxic to fish and aquatic invertebrates, toxic to bees	
Esteem 35 WP	pyriproxyfen	toxic to fish and aquatic invertebrates	
Portal	fenpyroximate	highly toxic to fish and aquatic invertebrates	
Grandevo	<i>Chromobacterium subtsugae</i>	toxic to aquatic invertebrates	
Intrepid 2F	methoxyfenozone	hazardous to aquatic invertebrates, potential groundwater contaminant	
Kanemite 15 SC	acequinocyl	toxic to aquatic invertebrates	
Movento	spirotetramat	toxic to aquatic invertebrates and oysters, potential groundwater contaminant, potentially toxic to honey bee larvae	
PyGanic EC	pyrethrins	toxic to aquatic invertebrates and beneficials, highly toxic to bees	
Sivanto	flupyradifurone	toxic to aquatic invertebrates, potential groundwater contaminant	
Zeal WP	etoxazole	toxic to aquatic invertebrates	

MODERATE to HIGH RISK-PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL			
Trade Name	Active Ingredient	Concerns	Best Practice
Disease Management			
Captan	captan	acute toxicity, toxic to fish, carcinogen under prolonged exposure to high doses	1. Tank mixtures not recommended between petal fall and first cover to reduce risk of fruit russeting. 2. Use CAUTION or WARNING labels where possible.
C-O-C-S	copper oxychloride, copper sulfate	toxic to fish and aquatic invertebrates	
Cueva	copper octanoate	leaching risk to ground and surface water	
Cuprofix Ultra 40 Disperss	copper sulfate	toxic to bees	
Flowable Sulfur	sulfur	toxic to small mammals and fish	
Lime-Sulfur Solution	calcium polysulfide	toxic to birds, surface water contaminant	
Penncozeb, Manzate, Dithane	mancozeb, maneb	probable carcinogen, developmental toxin, suspected endocrine disruptor, acute aquatic toxicity	Avoid applying EBDCs after bloom to preserve mite predators.
Polyram 80 DF	metiram	probable carcinogen, developmental toxin, suspected endocrine disruptor, acute aquatic toxicity	Avoid applying EBDCs after bloom to preserve mite predators.
Phostrol, Reliant	phosphorus acid	toxic to fish, surface water contaminant	
ProPhyt	potassium phosphite	toxic to fish, surface water contaminant	
Scholar SC	fludioxonil	toxic to fish and aquatic invertebrates	
Syllit FL	dodine	acute toxicity, resistance	Do not use where resistance is suspected.
Topsin	thiophanate-methyl ^{WFM 1B}	likely carcinogen, reproductive/developmental toxin, potential groundwater contaminant, resistance	Use only in blocks with a history of summer disease.
Vanguard WG	cyprodinil	toxic to fish and aquatic invertebrates, potential groundwater contaminant	Recommended for using during cool and wet weather.

^{WFM 1B} Active ingredient PROHIBITED without exception for blocks enrolled in the Whole Foods Market Responsibly Grown rating system.

MODERATE to HIGH RISK-PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL			
Trade Name	Active Ingredient	Concerns	Best Practice
Weed Management			
Aim EC	carfentrazone-ethyl	acute toxicity to wildlife, fish, aquatic invertebrates	May also be used for control of root suckers.
Alion	indaziflam	acute toxicity to wildlife, fish, aquatic invertebrates, potential/ known groundwater contaminant	
Chateau	flumioxazin	toxic to aquatic invertebrates	
Fusilade DX	fluazifop-P-butyl	toxic to fish, possible reproductive/developmental toxin	
Matrix	rimsulfuron	potential groundwater contaminant	
Poast Herbicide	sethoxydim	potential groundwater contaminant	
Rely	glufosinate-ammonium	acute toxicity	
Roundup, Cornerstone, Makaze, Credit	glyphosate	resistance, surface water contaminant, probable carcinogen	May cause tree injury if applied after July 1 st .
Sandea	halosulfuron-methyl	possible carcinogen, moderate aquatic toxicity	
Scythe	pelargonic acid	acute toxicity	
Stinger	clopyralid	potential groundwater contaminant, resistance	
Treevix	saflufenacil	potential surface and groundwater contaminant	
Other			
Amid-Thin W	1-naphthaleneacetamide	high acute toxicity	

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

1. These pesticides have additional restrictions which supersede the pesticide label to mitigate moderate to high risks to environmental and human health.
2. Use with justification and only when less hazardous alternatives (e.g., those listed above) are not adequate.
3. Use only after systematic scouting or weather monitoring and science-based thresholds, or according to previous history where thresholds are not available.
4. Pesticides included are not a guarantee of efficacy. Some products will not be as effective as other products against specific target pests.

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Insect/Mite Management				
Insecticide-coated apple maggot spheres			Insecticide-coated spheres may only be used through participation in Extension or USDA research.	
Altacor	chlordantraniliprole	toxic to aquatic organisms and certain beneficials, potential groundwater contaminant	Do not expose more than one generation of the target pest to this mode of action alone.	
Delegate WG	spinetoram	toxic to bees, toxic to aquatic invertebrates	Do not expose more than one generation of the target pest to this mode of action alone.	
Exirel	cyantraniliprole	highly toxic to bees, toxic to aquatic invertebrates, potential groundwater contaminant	<ol style="list-style-type: none"> 1. Do not apply until after bloom. 2. Do not expose more than one generation of the target pest to this mode of action alone. 	
Lorsban	chlorpyrifos ^{WFM 1B}	acute toxicity, cholinesterase inhibitor, suspected endocrine disruptor, broad spectrum, highly toxic to bees	<ol style="list-style-type: none"> 1. Use for trunk borer species only. 2. Apply only as a trunk spray. To avoid contact with fruit, apply when fruit are not present. If fruit are present, do not apply using lower nozzles of an airblast sprayer; use a hand wand, shielded sprayer or other method where drift onto fruit can be avoided. 	Some growers have reported using an herbicide sprayer that has been carefully cleaned prior to the trunk application. There are a number of issues that should be carefully considered before using this strategy, see extension.missouri.edu/p/G4852 for some of these.

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USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Insect/Mite Management				
Neonicotinoids				
Actara	thiamethoxam ^{WFM 2B}	toxic to wildlife, highly toxic to aquatic invertebrates, highly toxic to bees, potential groundwater contaminant	1. Do not apply until after bloom. 2. Do not expose more than one generation of the target pest to this mode of action alone.	Additional use restrictions for New York producers, see product label.
Assail	acetamiprid	toxic to wildlife, toxic to bees, may result in spider mite flare up, potential groundwater contaminant	Do not expose more than one generation of the target pest to this mode of action alone.	
Belay	clothianidin ^{WFM 2B}	toxic to aquatic invertebrates, highly toxic to bees, potential groundwater contaminant	1. Do not apply until after bloom. 2. Do not expose more than one generation of the target pest to this mode of action alone.	Not registered in New York.
Admire Pro, Alias, Montana	imidacloprid ^{WFM 2B}	toxic to aquatic invertebrates, toxic to bees, toxic to earthworms, toxic to wildlife	1. Do not apply until after bloom. 2. Do not expose more than one generation of the target pest to this mode of action alone.	
Brown Marmorated Stink Bug (BMSB) Only				
Brigade WSB, Bifenture 10DF, Bifenture EC	bifenthrin	toxic to bees, earthworms, aquatic invertebrates and fish, moderate acute toxicity, possible carcinogen, developmental or reproductive toxin, suspected endocrine disruptor	1. Use for BMSB only. 2. Do not apply prior to third cover for BMSB.	
Baythroid	beta-cyfluthrin	acute toxicity, broad spectrum, highly toxic to bees, fish and aquatic invertebrates	1. Use for BMSB only. 2. Do not apply prior to third cover for BMSB.	
Danitol	fenpropathrin	acute toxicity, toxicity to beneficials, acute aquatic toxicity, highly toxic to bees	1. Use for BMSB only. 2. Do not apply prior to third cover for BMSB.	1. Additional label restrictions for New York producers, see product label. 2. Must have section 2ee supplemental label.

^{WFM 2B} Active ingredient PROHIBITED for BEST ratings for blocks enrolled in the Whole Foods Market Responsibly Grown rating system.

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Insect/Mite Management				
Brown Marmorated Stink Bug (BMSB) Only				
Scorpion, Venom	dinotefuran ^{WFM 2B}	highly toxic to bees and aquatic organisms, potential groundwater contaminant	<ol style="list-style-type: none"> 1. Use for BMSB only. 2. Do not apply prior to third cover for BMSB. 	Not registered in New York. Must have section 2ee supplemental label.
Warrior II	lambda-cyhalothrin	acute toxicity, toxicity to beneficials, suspected endocrine disruptor, acute aquatic toxicity, highly toxic to bees	<ol style="list-style-type: none"> 1. Use for BMSB only. 2. Do not apply prior to third cover for BMSB. 	Must have section 2ee supplemental label.
Disease Management				
Agri-Mycin 17, FireWall	streptomycin sulfate		<ol style="list-style-type: none"> 1. Apply only for fire blight according to a weather-based forecasting program, e.g., Maryblyt or CougarBlight. 2. After bloom, apply only following hail or wind damage in orchards with existing infections. <i>Post-bloom application is also allowed for blister spot on susceptible varieties, e.g., Crispin, Mutsu.</i> 	
Kasumin	kasugamycin		<ol style="list-style-type: none"> 1. Apply only for fire blight according to a weather-based forecasting program, e.g., Maryblyt or CougarBlight. 2. After bloom, apply only following hail or wind damage in orchards with existing infections. 	
Badge SC	copper hydroxide, copper oxychloride	acute toxicity, toxic to fish and aquatic invertebrates, toxic to bees	Use CAUTION label formulation only.	
Champ, Kocide	copper hydroxide	acute toxicity, toxic to fish and aquatic invertebrates, toxic to bees	Use CAUTION or WARNING label formulations only.	

WFM 2B Active ingredient PROHIBITED for BEST ratings for blocks enrolled in the Whole Foods Market Responsibly Grown rating system.

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
SDHIs				
Aprovia	benzovindiflupyr	acute toxicity, resistance	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Apply before apple-scab infections to delay resistance.
Fontelis	penthiopyrad	suspected carcinogen, reproductive/development toxin	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	<ol style="list-style-type: none"> 1. Apply before apple-scab infections to delay resistance. 2. Tank mixes of captan and Fontelis have been phytotoxic to foliage. 3. Do not tank mix with thinning agents.
Luna Sensation	fluopyram, trifloxystrobin	possible carcinogen, developmental and reproductive toxin	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	<ol style="list-style-type: none"> 1. Apply before apple-scab infections to delay resistance. 2. Recommended to tank mix with captan if bitter rot is evident on some fruit in the orchard.
Merivon	fluxapyroxad, pyraclostrobin	potential groundwater contaminant	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	<ol style="list-style-type: none"> 1. Apply before apple-scab infections to delay resistance. 2. Recommended to tank mix with captan if bitter rot is evident on some fruit in the orchard.
Sercadis	fluxapyroxad	potential surface and groundwater contaminant	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Apply before apple-scab infections to delay resistance.

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Strobilurins (Qols)				
Flint	trifloxystrobin	toxic to fish and aquatic invertebrates, possible carcinogen, resistance	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Recommended to tank mix with captan if bitter rot is evident on some fruit in the orchard.
Pristine	boscalid, pyraclostrobin	possible carcinogen, toxic to fish and aquatic invertebrates	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	<ol style="list-style-type: none"> 1. Use only in rotation with a different mode of action. 2. Do not use back-to-back applications. 3. Recommended to tank mix with captan if bitter rot is evident on some fruit in the orchard.
Sovran	kresoxim-methyl	likely carcinogen, suspected groundwater contaminant	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Recommended to tank mix with captan if bitter rot is evident on some fruit in the orchard.
Sterol inhibitors (DMIs)				
Indar 2F	fenbuconazole	toxic to fish, aquatic invertebrates, algae, EPA possible carcinogen related to crystalline silica content, reproductive effects on female animals	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.
Inspire Super	cyprodinil, difenoconazole	possible carcinogen, suspected endocrine disruptor, slight acute toxicity, potential groundwater contaminant	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Sterol inhibitors (DMIs)				
Vintage SC	fenarimol	suspected endocrine disruptor, resistance	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.
Procure 480 SC	triflumizole	acute aquatic toxicity, potential groundwater contaminant, resistance	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.
Rally 40 WSP	myclobutanil	acute toxicity, developmental/reproductive toxicity, acute aquatic toxicity, resistance	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.
Topguard Specialty	flutriafol	suspected endocrine disruptor, potential groundwater contaminant	<ol style="list-style-type: none"> 1. Must be tank mixed with a protectant fungicide. 2. 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. 	Do not use where resistance is known.

USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL

Trade Name	Active Ingredient	Concerns	Eco Apple Restrictions	Best Practice
Weed Management				
Gramoxone	paraquat dichloride	acute toxicity, potential groundwater contaminant, moderate aquatic toxicity	Must be applied using a tractor with an enclosed cab.	
Select (CAUTION label)	clethodim	potential groundwater contaminant	Use CAUTION label formulations only.	
Simazine, Princep, Sim-Trol	simazine	possible carcinogen, reproductive toxin, known groundwater contaminant, acute aquatic toxicity	Limited to one application per season of either simazine or terbacil (not both).	
Sinbar	terbacil	developmental toxin, potential groundwater contaminant	Limited to one application per season of either simazine or terbacil (not both).	
2,4-D	2,4-D ^{WFM 1B}	acute toxicity, possible carcinogen	Application restrictions vary between labels.	
Other				
DPA, No Scald, Shield	diphenylamine	acute toxicity	<ol style="list-style-type: none"> 1. CAUTION label formulations may be used as drenches, sprays, flooding, fogging or aerosol. 2. DANGER label formulations may only be used as fogging or aerosol by custom applicators. 	
Ethephon	ethephon	toxic to bees, toxic to earthworms	<ol style="list-style-type: none"> 1. May be used for return bloom or thinning only. 2. Do not use for fruit ripening. Improper timing could impact fruit quality. 	
Sevin	carbaryl ^{WFM 1B}	extremely toxic to aquatic invertebrates, highly toxic to bees	Apply for fruit thinning only.	

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DO NOT USE		
Trade Name	Active Ingredient	Concerns
Insect/Mite Management		
Agri-Mek, Abba, Temprano	abamectin	acute toxicity, developmental toxin and acute aquatic toxicity, highly toxic to bees
Ambush, Pounce	permethrin	acute toxicity, toxicity to beneficials, possible carcinogen, suspected endocrine disruptor, acute aquatic toxicity, highly toxic to bees and broad spectrum
Apollo	clofentezine	possible carcinogen, suspected endocrine disruptor
Apta	tolfenpyrad	highly toxic to fish and aquatic invertebrates, highly toxic bees
Asana XL	esfenvalerate	acute toxicity, extremely toxic to fish and aquatic invertebrates, highly toxic to bees, toxicity to beneficials, suspected endocrine disruptor
Imidan 70-W	phosmet	acute toxicity, cholinesterase inhibitor and broad spectrum, highly toxic to bees
Lannate	methomyl	acute toxicity, cholinesterase inhibitor, potential groundwater contaminant, suspected endocrine disruptor, highly toxic to bees
Nexter	pyridaben	acute toxicity and acute aquatic toxicity, highly toxic to bees
Proclaim	emamectin benzoate	toxic to fish, birds, mammals and aquatic invertebrates, Restricted Use Pesticide
Rimon 0.83 EC	novaluron	acute toxicity to freshwater and estuarine/marine invertebrates and fish, runoff potential – especially in poorly drained soils and toxic to bees
Savey 50 DF, Onager	hexythiazox	possible carcinogen and moderate aquatic toxicity
Tourismo	buprofezin, flubendiamide	groundwater contaminant and possible carcinogen
Vydate L	oxamyl	acute toxicity, broad spectrum and highly toxic to bees

DO NOT USE		
Trade Name	Active Ingredient	Concerns
Disease Management		
Badge X2 (DANGER label)	copper hydroxide, copper oxychloride	acute toxicity, toxic to fish and aquatic invertebrates, toxic to bees
Champ WG (DANGER label)	copper hydroxide	acute toxicity, toxic to fish and aquatic invertebrates, toxic to bees
Bayleton	triadimefon	acute toxicity, possible carcinogen, reproductive/developmental toxin, suspected endocrine disruptor and potential for resistance
Ferbam	ferbam	acute aquatic toxicity
Luna Tranquility	pyrimethanil, fluopyram	possible carcinogen, developmental and reproductive toxin
Mankocide (DANGER label)	copper hydroxide, mancozeb	acute toxicity, toxic to fish and aquatic invertebrates, toxic to bees, earthworms, probable carcinogen, developmental toxin, suspected endocrine disruptor, acute aquatic toxicity
Mertect 340-F	thiabendazole	possible carcinogen, developmental toxin
Ridomil Gold SL	mefenoxam	acute aquatic toxicity
Scala SC	pyrimethanil	possible carcinogen and suspected endocrine disruptor
Thiram Granuflo	thiram	reproductive/developmental toxin and suspected endocrine disruptor
Ziram 76 DF	ziram	acute toxicity, likely carcinogen, developmental/reproductive toxin and suspected endocrine disruptor
Weed Management		
Casoron 4G	dichlobenil	possible carcinogen, potential groundwater contaminant, moderate aquatic toxicity
Diquat SPC 2L	diquat dibromide	acute toxicity, potential groundwater contaminant, moderate aquatic toxicity
Direx 4L, Karmex DF	diuron	known carcinogen, developmental toxin, acute aquatic toxicity, toxic to birds, potential ground and surface water contaminant
Gallery 75 DF	isoxaben	possible carcinogen, potential groundwater contaminant, moderate aquatic toxicity
Goal 2XL	oxyfluorfen	possible carcinogen, acute aquatic toxicity
Kerb	propyzamide	probable carcinogen, potential groundwater contaminant, moderate aquatic toxicity
Prowl H2O	pendimethalin	possible carcinogen, suspected endocrine disruptor, moderate aquatic toxicity
Select 2 EC (WARNING label)	clethodim	acute toxicity, potential groundwater contaminant
Solicam DF	norflurazon	possible carcinogen, known groundwater contaminant, moderate aquatic toxicity
Surflan A.S.	oryzalin	likely carcinogen, potential groundwater contaminant, acute aquatic toxicity
Venue	pyraflufen-ethyl	known carcinogen, toxic to fish and aquatic invertebrates

Revisions to the 2018 Edition

1. Treatment decisions for apple maggot are based on monitoring with three or more red sphere sticky traps per 10-15 acre block and a threshold of an average of one per trap if using unbaited traps, or an average of five per trap if using odor-baited traps, pg. 3, A.4.a.
2. Note: Continue to maintain apple maggot traps through September to catch any late-season activity. Growers have experienced severe crop losses from late-season apple maggot when the right conditions occur to favor it, pg. 3, A.4.
3. Fungicides are not applied for summer disease until 170 accumulated wetting hours from petal fall; early infections will be controlled by fungicides applied for scab or powdery mildew at petal fall and first cover, pg. 5, A.9.a.
4. Blocks at risk for BMSB are scouted for BMSB beginning after petal fall and baited traps are used along perimeter to monitor BMSB through harvest. Note: A threshold of 10 adults per week is used for the black-pyramid trap (Tedder's trap). Thresholds do not currently exist for other trap designs, e.g., clear-sticky trap, Rescue-brand trap, pg. 6, A.11.a.
5. In blocks that exceed trap threshold, or where one adult BMSB is observed within the orchard perimeter along 100 feet of row, or feeding injury is observed, management should begin. Alternate-row middle on a tight schedule, e.g., seven-day interval, or perimeter sprays should be used to manage BMSB. The perimeter is defined as the first four rows or up to 50 feet from the orchard edge, pg. 6, A.11.b.
6. Full-block cover sprays are avoided until adults or feeding are found within the interior of the block, pg. 6, A.11.c.
7. For each insecticide application for BMSB, efficacy against other pests is considered, e.g., if also effective against apple maggot, no additional application is made for apple maggot during the effective period, pg. 6, A.11.d.
8. Note: In apples, fruitlets may be injured as early as late-May where BMSB populations are high, yet activity often spikes in September-October. During this pre over-wintering period BMSB are very mobile and will move in and out of the orchard. Fruitlets damage shortly after bloom will likely abort. See the *Eco Apple Quick Guide* for a list of approved insecticides for BMSB that have efficacy against other pests. *Score NA if BMSB management is not necessary*, pg. 6, A.11.
9. Cornell Apple Irrigation Model is used to help determine water demands and plan irrigation schedules, newa.cornell.edu/index.php?page=apple-irrigation, pg. 11, B.36.
10. Rows of Pesticide Use Restrictions table are colored gray for the following pesticides that are prohibited or restricted for growers supplying fruit to Whole Foods Market:

- a. ^{WFM 1B} Active ingredient PROHIBITED without exception for blocks enrolled in the Whole Foods Market Responsibly Grown rating system.
 - i. thiophanate-methyl, pg. 16
 - ii. chlorpyrifos, pg. 18
 - iii. 2,4-D, pg. 24
 - iv. carbaryl, pg. 24
 - b. ^{WFM 2B} Active ingredient PROHIBITED for BEST ratings for blocks enrolled in the Whole Foods Market Responsibly Grown rating system.
 - i. clothianidin, pg. 19
 - ii. dinotefuran, pg. 20
 - iii. imidacloprid, pg. 19
 - iv. thiamethoxam, pg. 19
 - c. For more information visit, assets.wholefoodsmarket.com/www/missions-values/Responsibly-Grown/20160926-WFM-Responsibly-Grown-Prohibited-and%20Restricted-Pesticides-for-Fresh-Produce-and-Flowers.pdf.
11. Closer SC (sulfoxaflor), added to 'MODERATE to HIGH RISK-PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL', pg. 15.
 12. Penncozeb, Manzate, Dithane (mancozeb, maneb), best practice added: Avoid applying EBDCs after bloom to preserve mite predators, pg. 16.
 13. Polyram 80 DF (metiram), best practice added: Avoid applying EBDCs after bloom to preserve mite predators, pg. 16.
 14. Treevix (saflufenacil), added to 'MODERATE to HIGH RISK-PESTICIDES, NO RESTRICTIONS BEYOND THOSE ON THE PRODUCT LABEL', pg. 17.
 15. Brigade WSB, Bifenture 10DF, Bifenture EC (bifenthrin) added to 'USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL', additional restrictions: 1. Use for BMSB only; 2. Do not apply prior to third cover for BMSB, pg. 19.
 16. Sercadis (fluxapyroxad), added to 'USE WITH RESTRICTIONS (MODERATE to HIGH-RISK PESTICIDES), RESTRICTIONS WHICH EXCEED THE PRODUCT LABEL', pg. 21.
 17. Gramoxone (paraquat dichloride), removed restriction "Use on non-bearing trees only", pg. 24.
 18. Lannate (methomyl), added to 'DO NOT USE', pg. 25.
 19. Belt (flubendiamide) removed, EPA registration cancelled. Existing stocks may be used.
 20. Calypso (thiacloprid) removed, EPA registration cancelled. Existing stocks may be used.

References

Powdery mildew

- Marine S., Yoder K., Baudoin A. 2010. Powdery Mildew of Apple. Virginia Polytechnic Institute and State University. *The American Phytopathological Society*.
<http://www.apsnet.org/edcenter/intropp/lessons/fungi/ascomycetes/Pages/ApplePowderyMildew.aspx>.
- Peter, K. 2016. Powdery Mildew of Apple. *Tree Fruit Production – Penn State Extension*.
<http://extension.psu.edu/plants/tree-fruit/diseases/apple-diseases/powdery-mildew>.
- Powdery mildew. 2009. *Ontario Apple IPM, Ontario Ministry of Agriculture, Food and Rural Affairs*, <http://www.omafra.gov.on.ca/IPM/english/apples/diseases-and-disorders/powdery-mildew.html#advanced>.

Roundhead appletree borer

- Agnello, A. 1999. Apple-Boring Beetles. *Tree Fruit Crops - Cornell Cooperative Extension*.
<https://ecommons.cornell.edu/bitstream/handle/1813/43070/apple-boring-beetles-FS-NYSIPM.pdf?sequence=1>.

European apple sawfly

- Agnello A., Reissig H. May 15, 1995. Petal Fall Penchants - European apple sawfly. *Scaffolds Fruit Journal*. http://www.scaffolds.entomology.cornell.edu/1995/scaffolds_0515.html.
- European apple sawfly. 2011. *Ontario Ministry of Agriculture, Food and Rural Affairs*.
<http://www.omafra.gov.on.ca/english/crops/facts/eurosaw.htm>.
- Krawczyk, G. 2016. European apple sawfly. *Tree Fruit Production – Penn State Extension*.
<http://extension.psu.edu/plants/tree-fruit/insects-mites/factsheets/european-apple-sawfly>.

Black stem borer

- Agnello A. April 4, 2016. Trunk Call - Black Stem Borer. *Scaffolds Fruit Journal*.
<http://www.scaffolds.entomology.cornell.edu/2016/SCAFFOLDS-4-4-16.pdf>.
- Agnello A., Breth D., Tee E. 2015. Black Stem Borer: A New Nemesis Emerges. *Cornell Cooperative Extension*. http://rvpadmin.cce.cornell.edu/uploads/doc_388.pdf.
- Agnello A., Breth D., Tee E., Cox K., Warren H. Spring 2015. Ambrosia Beetle - An Emergent Apple Pest. *New York Fruit Quarterly*. <http://nyshs.org/wp-content/uploads/2015/03/25-28-Agnello-Pages-NYFQ-Book-Spring-2015.eg-5.pdf>.
- Gut L., Wilson J., Haas M. April 12, 2016. Time to start monitoring for black stem borer. *Michigan State University Extension*.
http://msue.anr.msu.edu/news/time_to_start_monitoring_for_black_stem_borer.
- Jentsch P. May 24, 2015. Black Stem Borer found in 'Pink Lady' apple, Highland NY. *The Jentsch Lab*. <https://blogs.cornell.edu/jentsch/2015/05/24/black-stem-borer-found-in-pink-lady-apple-highland-ny/>.
- Krawczyk, G. 2014. Borers of Fruit Trees 101. *Penn State University*.
<http://extension.psu.edu/plants/tree-fruit/presentations/2014-winter-fruit-meetings/tree-fruit-borers-101>.

Bitter rot

Don't Be Bitter - Summer fungicides for apples where bitter rot is an issue. June 30, 2014.

Scaffolds Fruit Journal.

<http://www.scaffolds.entomology.cornell.edu/2014/SCAFFOLDS%206-30-14.pdf>.

Managing Bitter Rot in Apples. 2014. Ontario Ministry of Agriculture, Food and Rural Affairs.

<http://www.omafra.gov.on.ca/english/crops/hort/news/orchnews/2014/on-1214a5.htm>.

Peter K. 2016. Bitter Rot of Apple. *Penn State Extension*. <http://extension.psu.edu/plants/tree-fruit/diseases/apple-diseases/bitter-rot>.

Rosenberger D. February 10, 2015. Controlling Summer Fruit Rots in Apples. *Cornell Cooperative Extension*. http://rvpadmin.cce.cornell.edu/uploads/doc_258.pdf.

Fruit sunburn

Clements J. December 6, 2015. Raynox Plus applications to prevent sunburn of Honeycrisp apples. <http://jmccextman.blogspot.com/>.

Sun Protection for Fruit, A practical manual for preventing sunburn on fruit. 2011. Department of Primary Industries, Farm Services Victoria Division. <http://mvcitrus.org.au/mvcb/wp-content/uploads/2012/09/Sun-Protection-Manual-for-Fruit.pdf>.

TFREC computer & web resources. Washington State University Tree Fruit Research and Extension Center. http://www.tfrec.wsu.edu/pages/webdev/Apple_sunburn.

Brown marmorated stink bug

Jentsch, P. 2017, August 29. BMSB Adult Trap Captures Above Threshold: HVRL 29th Aug.

2017. Retrieved from <https://blogs.cornell.edu/jentsch/2017/08/29/bmsb-adult-trap-captures-above-threshold-hvrl-29th-aug-2017/>.

Jentsch, P. 2017, September 13. Harvest: Management Considerations of BMSB in the Mid-Hudson Valley. Retrieved from <https://blogs.cornell.edu/jentsch/2017/09/13/harvest-management-considerations-of-bmsb-in-the-mid-hudson-valley/>.

Krawczyk, G. 2017, December 6. *BMSB – challenges and some solutions*. Lecture presented at Great Lakes Expo in Devos Place Conference Center, Grand Rapids.

Leskey, T. 2016, November. Traps and Lures for the Invasive Brown Marmorated Stink Bug.

Retrieved from <http://www.stopbmsb.org/stopBMSB/assets/File/Research/BMSB-SAP-Nov-2016/9-Trap-Designs-and-Lures-Leskey.pdf>.