

Core Eco Protocol

2024 growing season v. 3.3 – 3/27/2024

Growers must also complete supplements for apple or stone fruit



Deadlines for record submission

Eco Stone Fruit: June 28, 2024

Eco Apple: July 19, 2024

**See page 28-29 for a list of revisions to this edition.
Changes to the 2024 protocols are highlighted in yellow.**

© 2005 - 2024, Red Tomato

EcoCertified™ is a project of:



IPM Institute of North America, Inc.
211 S. Paterson St. Ste. 380, Madison WI 53703

mmcmullin@ipminstitute.org
www.ipminstitute.org

Download the most recent protocol at www.ipminstitute.org/ecoapple.htm

Table of Contents

Red Tomato Eco Programs	3
Roles and procedures	3
Provisions for emergencies	4
Removal of blocks from Eco Programs.....	5
Protocol scoring and practice verification.....	6
Core Eco Protocol Cover Sheet.....	7
Core Eco Protocol	9
1. Operations and Management	9
2. Ecosystem and Water Conservation	11
3. Pesticide-Risk Reduction.....	13
4. Pollinator Protection	16
5. Orchard Floor Management	18
6. Soil Health Management	20
7. Energy and Waste Management	22
Score Card	25
Participating Grower Affidavit and Agreement	26
Submission Checklist	27
Deadlines for Record Submission	27
Fees.....	27
Revisions to 2024 Edition.....	28
Acknowledgements and References	30

Red Tomato's Eco Certified Program

Red Tomato is a nonprofit organization that helps family farmers survive and thrive by connecting them to customers who want high-quality local produce. For wholesale growers, they develop new markets and manage the sales, logistics and promotion needed to ensure success in a supermarket environment. For direct-market growers, they provide communications and marketing tools to assist in explaining Eco farming to the public.

Red Tomato has developed this protocol in partnership with farmers, scientists and agricultural professionals, to achieve reductions in the use of high-toxicity pesticides. Through our work together, we hope to contribute to a bountiful supply of quality, local foods with minimal pesticide residues, and to improve our soil and water resources, wildlife biodiversity, farmworker safety, farm stability and farmland preservation wherever apples and stone fruit are grown in the Eastern USA.

Our protocol is based on a reduced-risk program developed by researchers, consultants and growers, and generally follows guidelines for Integrated Production by the International Organization for Biological and Integrated Control of Noxious Animals and Plants (IOBC).

Practices contained in this protocol are considerably more expensive than conventional programs that rely on highly toxic pesticides. Our project works to incorporate economic incentives for farmers to adopt reduced-risk methods. We recognize that reducing toxicity is an ongoing process. Our goal is to improve continuously as we learn more about reduced-risk alternatives and what it takes to implement them *and* grow high-quality apples.

Roles and procedures

Red Tomato is the lead organization responsible for market approach and overseeing use of Red Tomato trademarks. Red Tomato also maintains ownership of the certification protocol. Decisions on program procedures and market approach will be made in concert with researchers, crop consultants, growers and others. Annually, Red Tomato and its partners review and evaluate the *Core Eco Protocol* and make adjustments where needed to continue to achieve our goals.

The IPM Institute of North America, an independent non-profit organization, is responsible for maintenance of certification standards making final decisions on standards, and approval of certification status to determine eligibility for use of Red Tomato trademarks. The Institute will coordinate inspection by third-party IPM professionals, review materials submitted by growers and inspectors, and make final determination on certification approvals.

An invaluable network of agricultural scientists, entomologists, plant pathologists, horticulturists, agronomists, and weed scientists from Cornell University, U. of Massachusetts, U. of Connecticut, U. of Rhode Island, U. of Maine, Penn. State U., Rutgers, Appalachian Fruit Research Station, and other institutions, have contributed (and continue to contribute) their research and insights to the creation and improvement of Eco Certified production standards.

Third-party auditors or the IPM Institute will arrange directly with growers for an on-site inspection. This inspection verifies compliance with the standards and has a special emphasis on evaluating compliance to criteria that go beyond the paperwork documentation and records submitted to the IPM Institute. On-site auditors will follow the auditing guidelines developed by the program.

Participating growers will be evaluated based on practices implemented which meet the *Core Eco Protocol*. A current version of the *Core Eco Protocol*, crop supplements and Quick Guide is always available at ipminstitute.org/ecoapple.htm.

To apply for and maintain certification, the following documents must be submitted:

1. Complete this *Core Eco Protocol* and Eco crop supplement (apples or stone fruits). Growers certifying multiple crops only need to complete the *Core Eco Protocol* once.
2. Scouting records must include trap counts, date, block(s), pest and result, e.g., captures per trap, mites per leaf, etc. Scouting records must outline grower is observing in the orchard and may be paired with historical information on block and pest history to inform pest and disease spray decisions.
3. Pesticide, fertilizer, thinner and plant-growth regulator application records submitted to the IPM Institute. Application records must be submitted electronically and include at least the date and time application started and ended crop, block(s), acreage, 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, air temperature, average wind speed and direction during application. Record keeping can be improved by using an electronic record-keeping spreadsheet, such as those offered by Penn State ([Penn State Spray Record-Keeping Spreadsheet](#)) or Cornell University ([TracApple](#)). Spray records must include all applications with an EPA registration number including mating disruption, herbicide applications and rodenticides.
4. Airblast sprayer and herbicide sprayer calibration records.

The IPM Institute of North America maintains confidentiality of all grower records which include, but are not limited to: *Core Eco Protocol*, crop supplements, pest-monitoring records, weather data, and pesticide, fertilizer, thinner and plant-growth regulator application records.

The Institute will appoint an inspector during the first year of certification and every third year thereafter. The inspector will verify the information provided during an on-site audit and will be scheduled prior to marketing of certified fruit. Growers will be invoiced by the IPM Institute for the on-site audit and is separate from the annual fee paid for certification.

Provisions for emergencies

Contact the IPM Institute immediately at the earliest indication that an emergency is developing that cannot be managed without violating the certification standards. The IPM Institute will investigate the concern and if necessary, consult with scientific advisors to aid in assessment of the problem and determine if an exception to the protocol is justified. Participants may expect the following support from the IPM Institute and project advisors regarding handling requests in emergency situations:

1. IPM Institute will confirm receipt of requests for protocol exceptions within one business day.
2. A response to the request with proposed options and resolution will be completed within one to three business days. This time is needed to allow the IPM Institute to contact scientists and project advisors and investigate appropriate solutions.
3. Requests for a protocol exception after a violation has occurred will not be considered.

Removal of blocks from Eco Programs

Identifying blocks enrolled in Red Tomato Eco Programs should be listed on the Field/Block List on page seven and eight of the *Core Eco Protocol*. These should be submitted with certification materials on the due date listed for the crop. This information is used during desk and on-farm audits and only certified blocks will be listed on eco certificates.

If a situation arises that requires a block to be removed from the program and occurs after certification materials have been submitted, please contact the IPM Institute and Red Tomato immediately and provide the following information:

1. The block name, variety and acreage being removed from the program.
2. The reason for removal from the program, e.g., crop loss due to weather, poor crop quality, application of prohibited pesticide.
3. If the reason for block removal was due to an application of a prohibited pesticide or violation of the pesticide-use restrictions, please provide the product trade name, active ingredient and formulation, application rate, variety and acres treated.

On-farm audit: In a year that an Eco Certified grower is due for an on-farm audit and experiences significant weather-related crop loss, the grower must communicate with Red Tomato and the IPM Institute as soon as the loss occurs/is realized and may request to delay on-farm audit until the following year. Exceptions may include, but are not limited to, complete crop failure, significant crop loss (% of total), hail, freeze event or drought.

Expectations from the grower:

- Submit self-assessment and supporting documentation on time.
- Pay recertification fee for acres sold under Eco label.
- Assessment of acreage to be certified.
- Only acres enrolled in current year can be sold under Eco Certified label.
- Timely communication with the IPM Institute and Red Tomato to discuss crop status and options.

What you can expect from IPM Institute and Red Tomato:

1. The IPM Institute will follow up to confirm blocks that should be removed and discuss and address any questions or concerns relating to the block removal.
2. The IPM Institute will issue an updated certificate to the grower and Red Tomato.
3. Red Tomato will follow up with any questions and guidance relating to the use of Red Tomato eco trademarks and confirm/determine if any fruit from the removed block has entered the supply chain.

Protocol scoring and practice verification

Guidelines for evaluating protocol practices for growers and auditors are outlined at the beginning of each protocol section. The following outlines what growers should expect when a protocol non-compliance has been identified:

- **Minimum Requirements minor non-compliance:** A minimum requirement that has not been fully implemented or scored as a “Fail” and does not threaten the integrity of the Red Tomato Eco Trademarks. The grower will be notified of the non-compliance in their audit report and no corrective action is required during that certification year. If the same minor non-compliance is identified in subsequent years, the auditor or IPM Institute may recommend withholding certification until the non-compliance is corrected.
- **Minimum requirements major non-compliance:** A minimum requirement that has not been fully implemented or scored as a “Fail” and whereby allowing certification and use of Red Tomato Eco Trademarks threatens the integrity of the Eco Program. The grower will be notified in writing and verbally and given the opportunity to correct the non-compliance during the certification year. Certification will be withheld until the non-compliance is addressed. If the major non-compliance cannot be corrected, no certification will be awarded.
- **Pesticide use restrictions minor non-compliance:** A violation of a pesticide-use restriction for any pesticide listed as “Use with Restrictions”. The grower will be notified of the non-compliance in their audit report and verbally. Corrective action is required for any planned pesticide applications that remain during that certification year. If non-compliance is not corrected, the auditor or IPM Institute may recommend withholding certification.
- **Pesticide use restrictions major non-compliance:** If a prohibited or “Do Not Use” listed pesticide is applied, no certification may be awarded for the blocks that received the treatment of the prohibited pesticide.
- **Advanced practices:** No points will be awarded to advanced practices that are scored by the grower and found to not be fully implemented during on-farm or desk audits. If the grower is interested in receiving credit for this advanced practice, they are encouraged to contact the IPM Institute to discuss what additional criteria must be met to receive credit during the certification year.

Core Eco Protocol Cover Sheet

Grower name: _____

Business name: _____

Physical address: _____

Phone: () _____ Fax: () _____

Cell phone: () _____

Email address: _____

Website: _____

Field/Block List. Print additional pages if enrolling more than twelve fields or blocks. List blocks covered by the *Core Eco Protocol* below. Blocks with the same management practices (that will earn same scores throughout this assessment) can be grouped together as one block. Attach additional pages if needed to list all blocks. **Important:** If differences in the way individual blocks are managed impacts a response on this Core protocol, they should be listed as separate blocks. For example, if apple maggot is controlled by trapping in only one block, list and score that block as a separate block.

1. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

2. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

3. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

4. Crop: _____ Block name (s): _____

cultivars: _____

acres and estimated annual production (bu.): _____

Field Block List

5. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

6. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

7. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

8. Crop: _____ Block name (s): _____

cultivars: _____

acres and estimated annual production (bu.): _____

9. Crop: _____ Block name(s): _____

cultivar(s): _____

acres and estimated annual production (bu.): _____

10. Crop: _____ Block name (s): _____

cultivars: _____

acres and estimated annual production (bu.): _____

11. Crop: _____ Block name (s): _____

cultivars: _____

acres and estimated annual production (bu.): _____

12. Crop: _____ Block name (s): _____

cultivars: _____

acres and estimated annual production (bu.): _____

Core Eco Protocol

1. Operations and Management	
Audit guidance: Grower can describe how their organizational structure, record keeping, communication practices, and continuous-improvement efforts facilitate successful Eco Fruit production.	
A. Minimum Requirements	Pass, Fail or N/A
1. What audit or inspections occurred on your farm from third parties, the state or federal government? Please select all that apply ^S . Note: Please have documentation of audits, inspection/certification certificate available for on-site audit. a) Good Agricultural Practices (GAP) b) Food Safety (non-GAP) c) Worker Housing d) Occupational Safety and Health Administration (OSHA) e) Worker Protection Standard (WPS) f) Other(s) (Please list):	
2. Are all applicable local, state, and national laws, codes and regulations met which govern all aspects of applications of pesticides, nutrients, amendments, irrigation and other inputs? ^S	
3. Are pesticides no longer in use or no longer registered for use returned to dealer or disposed of at the next collection? While in storage, are obsolete pesticides clearly marked and separated from pesticides in current use? ^S	
4. Has grower attended one or more educational meetings within the last year? ^D List meeting name, date and brief description (add pages if necessary):	
5. Do application records include at least the date and time application started and ended, crop, block(s), acreage, product 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, application method, air temperature, wind speed and direction? ^D Note: Items highlighted in bold are required by the US EPA Worker Protection Standards for Agriculture. Each bold item not included in the record will count as one major non-compliance. Items not in bold and not included in the record will each count as one minor non-compliance. For more information visit: http://pesticideresources.org/wps/hosted/quickrefguide.pdf .	
6. Does grower belong to state and/or regional grower organization(s), outside of Red Tomato programs? ^D List organizations:	
7. Is only fruit of sound internal and external quality labeled and sold under Red Tomato trademarks? ^S	
8. Are clean toilet and hand-washing facilities available to field, harvest and packing house staff? ^S Note: Soap must be available at all hand-washing facilities. Hand sanitizer may also be present but may not be used as a substitute for soap.	

Operations and Management (Continued)		
B. Advanced Practices	Points eligible	Points earned
1. Are pesticide costs per acre documented for all applications in spray records? ^D	1	
2. Do workers handling or applying pesticides receive an annual medical examination or physical to ensure fitness for job duties? ^S Note: Acceptable documentation includes a list of workers who participated in a medical exam. Workers and physicians must sign off documenting the exam occurred. Individual exam records do not need to be kept on file or shared in accordance with HIPAA privacy rules.	2	
3. Has grower hosted a field day or other production-related educational meeting within the last three years? ^D List date and name/description of event(s):	3	
4. Has grower conducted/participated in on-farm research using control (untreated) trees for comparison within the last three years? Note: In scouting records or separate documentation, describe each experiment, its purpose and dates: University research also acceptable, include name of individual doing research with and brief description. ^D Attach additional pages if necessary:	4	
5. Is orchard represented on 50% or more of the monthly Eco Apple conference calls?	1	
6. Does the cider production facility (if any) have a written HACCP plan? ^S	2	
7. Does the packing facility have a written Standard Sanitary Operating Procedures plan? ^S Note: May be required by USDA for farms with packing facilities.	2	
8. Are packing line water flumes chlorinated or otherwise treated to reduce potential for post-harvest diseases? ^S	1	
9. Is the farm third-party certified for USDA Good Agricultural Practices (GAP) or similar Global Food Safety Initiative recognized food safety scheme, e.g., GLOBAL G.A.P., PrimusGFS? ^S	3	
10. Does the farm have a written Food Safety Plan which meets either USDA GAP, GLOBAL G.A.P. (Harmonized Produce Safety Standard), or PrimusGFS? ^S Note: Basic food safety requirements to meet FSMA or GAP certification. Provide a plan or other verification that basic food safety practices are being met.	2	
Operations and Management: Total points eligible	21	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

2. Ecosystem and Water Conservation

Audit guidance: The grower can explain their rationale for implementing practices which maintain and improve soil health, monitor/regulate irrigation, monitor tree health, and minimize or mitigate soil erosion, by describing the observed benefits, and how the practice is implemented and maintained.

A. Minimum Requirements	Pass, Fail or N/A	
<p>1. Are results from soil and/or foliar analyses used to calculate nutrient application rates, minimize excess nutrient use and limit potential for nutrient pollution. Is timing of any applications consistent with available Extension or University guidelines? ^S</p> <p>Note: Soil testing results are available for inspection and is completed at least once every three years and includes soil organic matter, pH, nitrogen, phosphorous, potassium, calcium and magnesium.</p>		
<p>2. Are visibly eroded areas minimal and when found, are they corrected in a timely manner? Please select all erosion mitigation strategies that are implemented: ^S</p> <ul style="list-style-type: none"> A. Culvert(s) B. Water diversion C. Retention pond(s) D. Other(s) (Please list): <p>Note: Applicable to all enrolled acres, including adjoining roads and farmstead.</p>		
<p>3. Does a vegetated buffer separate surface water from edge of crop by at least 60 feet? ^S</p>		
<p>4. Does pesticide mixing occur at least 120 feet from well heads? ^S</p> <p>Note: Some states may require pesticide mixing to be further than 120 feet from well heads.</p>		
B. Advanced Practices	Points eligible	Points earned
<p>1. Is no irrigation used? ^S</p> <p>Note: If earning this point, skip to question 8 below. Do not enter points for questions 2-7.</p>	1	
<p>2. If irrigation is used, is drip or trickle installed to ensure adequate water supply and minimize water use and foliage wetness? ^S</p>	1	
<p>3. If irrigation is used, are automated shutoff devices used? ^S</p>	1	
<p>4. If overhead irrigation is used, are applications timed to minimize risk of spreading plant pathogens? ^S</p> <p>Note: Overhead irrigation may be used for frost protection.</p>	1	
<p>5. Is irrigation determined by crop need, using systematic and science- based measures, e.g., monitoring soil moisture and visual assessment of plant stress? ^S</p> <p>Note: Monitoring data from NEWA or on-farm weather station are available for inspection and grower can describe how data is used to time irrigation.</p>	1	

B. Advanced Practice	Points eligible	Points earned
6. Is rainwater or snowmelt captured through retention ponds for irrigation? ^S	1	
7. Is irrigation use efficiency calculated? ^S	2	
8. Is tile drainage installed and maintained in poorly drained soils, or are trees not planted in poorly drained soils to improve tree health and minimize disease? ^S	2	
9. Is a water conservation plan in place which addresses water uses for irrigation, washing and cooling. Does the plan also outline staff training on minimizing water use in farm activities and practices and/or uses of technology to increase use efficiency? ^S Note: Water conservation plan is available for site auditor to review.	3	
10. Do tree rows planted along slopes with high risk for erosion follow contours? ^S Note: Slopes greater than 10% or hydrologic soil classes with high- erosion potential.	1	
11. On non-paved roads where erosion occurs, are water bars installed to reduce erosion? ^S Note: Grower can describe how often water bars are maintained and where they are located.	1	
12. Are wind breaks installed and maintained on sites at risk of wind-eroded soil? ^S	1	
13. Are any acres of the farm currently enrolled in an NRCS program which supports IPM or other conservation practices? ^S List program name, acres enrolled and type of land. Note: Additional information on NRCS programs and initiatives available online from NRCS.	3	
Ecosystem, Soil and Water Conservation: Total points eligible	19	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

3. Pesticide-Risk Reduction

Audit guidance: The grower can explain potential sources of pesticide risk on the farm and how non-chemical practices, cultural/horticultural practices, pest-management decisions and pesticide-application methods are implemented and maintained to minimize pesticide risk.

A. Minimum Requirements

Pass, Fail or N/A

1. Are plant and tree canopies maintained to allow penetration of light, air and spray material using pruning or plant growth regulators, e.g., Apogee (prohexadione calcium)?^S

2. Are pesticide and nutrient application equipment calibrated at least annually? Records maintained must include name of person performing calibration, date and equipment description. Procedures, results and adjustments from calibration must also be included in documentation submitted electronically, with completed protocol.^D

- Calibration for airblast sprayer:
<https://extension.psu.edu/air-blast-sprayer-pre-calibration-instructions>
- Calibration for boom sprayer:
extension.colostate.edu/docs/pubs/farmmgt/05003.pdf
- Calibration for rotary spreader:
pesticidestewardship.org/calibration/Pages/RotarySpreader.aspx
- Calibration for a drop spreader:
pesticidestewardship.org/homeowner/how-to-calibrate-a-drop-spreader

Note: Where rented equipment is used, follow supplied instructions for operation. Tractor ground speed needs to be calibrated if travel speed influences application rate. Mark with 'Yes' if rented sprayers or spreaders are used:_____.

Note: If you're using a Raven or other GPS system, verify ground speed.

3. Is pesticide drift minimized by monitoring current wind direction and speed using (Please select all that apply) one of the following?^S:

- A. Hand-held monitor
- B. Weather station
- C. Online resources with real time wind-speed data

Pesticide drift resources: pesticidestewardship.org/drift/Pages/default.aspx

4. If grain-based rodenticides (corn, oats) are used, are they applied in bait stations or burrows only?^D

Note: Rodenticide applications must be included in spray records and include date and blocks treated. Including a rate per acre is not necessary.

5. Are no organophosphates used as insecticides?^D

B. Advanced Practices	Points eligible	Points earned
<p>1. Are lower-risk pesticides identified and used based on outcome from the Pesticide Risk Tool pesticide risk analysis? ^S</p> <p>Note: Grower can describe what high-risk pesticide was used the previous season and what lower-risk pesticide replaced the application.</p>	1	
<p>2. Is a full-block application replaced by a partial-block pesticide application? ^D</p> <p>Note: One point per application may be scored for a maximum of two points.</p> <p>Note: Partial blocks may be documented by listing acres treated compared to total acres of block, e.g., 6/10 acres treated or listing varieties treated.</p>	1 or 2	
<p>3. Is a full-block pesticide application replaced by an application to block perimeter? ^D</p> <p>Note: One point per application may be scored for a maximum of two points.</p> <p>Note: Spray records clearly identify which perimeter of a block was treated.</p> <p>Note: Perimeter sprays include both sides of a tree row up to the first four rows or up to 50 feet from the orchard edge. Applications to perimeter rows meet label restrictions on number of applications to the crop and total amount of active ingredient applied.</p>	1 or 2	
<p>4. Is a full-block pesticide application replaced by an alternate-row-middle (ARM) application? ^D</p> <p>Note: One point per application may be scored for a maximum of two points.</p> <p>Note: Indicate on spray record when an ARM application is made.</p> <p>Note: Additional ARM sprays should target opposite row from previous treatment. ARM sprays may count as half of one application. Pesticide records must document which rows were treated. For considerations on ARM sprays visit, sprayers101.com/alternate-row-middle-spraying.</p>	1 or 2	
<p>5. Are no synthetic pyrethroids used as insecticides? ^D</p>	1	
<p>6. Are tractor cabs plus required personal protective equipment used to protect applicators during pesticide applications? ^S</p>	2	
<p>7. No 'DANGER' labeled pesticides are used. ^D</p>	1	
<p>8. No 'WARNING' labeled pesticides are used. ^D</p>	1	
<p>9. Are spray patterns for pesticide application equipment evaluated and adjusted by assessing droplet size and coverage using water-sensitive cards or dyes, sprayers101.com/confirm-coverage-with-water-sensitive-paper? ^S</p> <p>Note: Results are available for review, including changes made to the sprayer or canopy management, as a result of the test.</p>	2	

B. Advanced Practices	Points eligible	Points earned
<p>10. Are pre-harvest damage assessments completed on all Eco blocks prior to the start of harvest? ^S</p> <p>Note: A pre-harvest damage assessment is a sampling of a known quantity of fruit from each block. Each incidence of pest injury is documented and is used to make improvements in management the following season. A pre-harvest damage assessment can provide a more accurate representation of percent injury compared to a pack-out report that may be skewed if pickers are not harvesting damaged or low-quality fruit.</p>	1	
<p>11. Is an on-site Network for Environment and Weather Applications (NEWA) station used for pest and disease management? newa.cornell.edu. ^D</p> <p>List NEWA station used:</p>	3	
<p>12. Is a spray-control system used to regulate pesticide application rates? ^S</p> <p>Note: If you're using a Raven or other GPS system, verify ground speed.</p>	1	
<p>13. Are air induction nozzles used to reduce pesticide drift? ^S</p> <p>https://sprayers101.com/wp-content/uploads/2015/06/2012_AI.pdf</p>	1	
Pesticide-Risk Reduction: Total points eligible	20	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

4. Pollinator Protection

Audit guidance: The grower understands and can describe the impacts of pesticide exposure and habitat loss on pollinator health; the benefits of pollinator-habitat conservation; practices which mitigate pesticide exposure and other practices which support healthy and abundant pollinator populations and relate this understanding to how the practices are implemented and maintained.

A. Minimum Requirements	Pass, Fail or N/A	
<p>1. Are orchard borders assessed for pollinator habitats (nesting and forage sites), and if present are these habitats protected from drift using one or more of the following mitigation strategies? ^{S, D} Please select all that apply:</p> <ul style="list-style-type: none"> a. Pesticides toxic to pollinators are not applied when native pollinators are actively foraging. b. Windspeed and wind direction is monitored and used to prevent pesticide drift to pollinator habitats. c. Maps outline location of pollinator habitats are used to educate applicators on sites where drift must be avoided. d. Other, please list: <p>Note:</p> <ul style="list-style-type: none"> • EPA pollinator toxicity advisory box on labels: pesticidestewardship.org/wp-content/uploads/sites/4/2016/07/bee-label-info-graphic.pdf • For information on how to reduce bee poisoning, Extension, https://www.oregon.gov/ODA/shared/Documents/Publications/PesticidesPA_RC/PollinatorProtection.pdf • Best management practices to protect pollinators, https://www.epa.gov/pollinator-protection/find-best-management-practices-protect-pollinators. 		
<p>2. Are pesticides with an EPA pollinator toxicity advisory box on the label not applied between pink and end of crop bloom? (See link on pollinator advisory above)^D</p>		
B. Advanced Practices	Points eligible	Points earned
<p>1. Are non-blooming buffers of ≥ 60 feet maintained around all field borders where pesticides toxic to pollinators are applied? ^S</p> <p>Note: Buffers prone to collecting pesticide drift are mowed to eliminate bloom in ground cover prior to pesticide application toxic to pollinators.</p>	1	
<p>2. If managed beehives reside on the farm year-round, are they monitored for health, their diseases controlled and documentation of monitoring is available for review, e.g., date and description of monitoring activities? ^S</p> <p>Note: Regular, seasonal inspection and treatment of hives for Varroa mites and disease with accompanied documentation.</p>	2	

B. Advanced Practices (continued)	Points eligible	Points earned
<p>3. Is established pollinator forage habitat which provides season-long bloom available for managed and wild pollinators?</p> <p>Converted acreage to native pollinator habitats:</p> <ul style="list-style-type: none"> ○ One to five acres designated pollinator habitat: two points. ○ Each additional designated habitat totaling block of five acres: one point. ○ Maximum of four points may be scored for a total of 15 acres designated to pollinator habitat. <p>Note: Managed pollinator habitat includes a blend of native flowering plant species that offer a continuous bloom throughout the growing season, ideally providing at least three blooming species at any time.</p> <p>Note: Establishing a diverse pollinator habitat on designated land around installed solar panels could be included in acreage counted.</p> <p>The Xerces Society recommends pollinator habitat should be, at a minimum, 125 feet from crops treated with neonicotinoids and 60 feet from all pesticides applied with an airblast sprayer, https://xerces.org/sites/default/files/2019-10/16-024_01_XercesSoc_Guidance-to-Protect-Habitat-from-Pesticides_web.pdf</p>	2 – 4	
<p>4. Commercially produced bumblebee hives are not used for open pollination. ^S</p>	1	
<p>5. Is pollination accomplished exclusively with native bees? ^S</p>	2	
<p>6. Is pollinator activity monitored during bloom through participation in the Northeast Pollinator Partnership, northeastpollinatorpartnership.org/.^S</p> <p>Note: Application provides the farmer with a tool to document and create a baseline understanding of pollinators present in their orchard. This baseline is a tool to measure whether the practices being implemented are generating the results and improvements the orchard is looking for.</p>	1	
<p>7. Is blooming ground cover in the drive row reduced to protect pollinators from drift using non-chemical strategies?</p> <p>Note: Growers should be able to describe the location and how often or what conditions would trigger mowing, e.g., is it timed before or after sprays, etc.</p>	1	

B. Advanced Practices	Points Eligible	Points earned
<p>8. Is nesting habitat for wild pollinators created and managed throughout the growing season? ^S</p> <p>Note: Wild bee housing placed in and around forage and pollination target areas. Housing can include not removing dead trees (when it's safe to do so), presence of hollowed out reeds/stems of bushes or erecting bee housing.</p> <p>Establishing a diverse pollinator habitat on designated land around installed solar panels could be included in acreage counted.</p>	1	
<p>9. Ongoing education: Has grower has attended a training on pollinator conservation (i.e., pollinator habitat, importance of native pollinators, etc.)?</p>	1	
Pollinator Protection: Total points eligible	14	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

<p>5. Orchard Floor Management Audit guidance: The grower can explain their rationale for implementing cultural/horticultural practices which minimize excess herbicide use; describe how insect and disease management is improved through orchard floor management; and describe their integrated approach to weed management which best suits the site and weed pressure on the farm.</p>	
A. Minimum Requirements	Pass, Fail or N/A
<p>1. To suppress insect pest and disease inoculum, pruning debris remaining in the field is? (Please select all that apply) ^S:</p> <ul style="list-style-type: none"> A. Flail chopped B. Mowed C. Removed 	
<p>2. Do herbicide strips under trees not extend into row middles or aisles? ^S</p>	
<p>3. Is the herbicide mode of action rotated between each application? ^D</p> <p>Note: Back-to-back applications of herbicides with the same mode of action may be applied if tank-mixed with another herbicide with a different mode of action, where consistent with Extension recommendations and label restrictions.</p>	

5. Orchard Floor Management (Continued)		
A. Minimum Requirements	Pass, Fail or N/A	
4. Are no more than three applications of an herbicide made per season to the same application site? If a fourth spot-treatment is made because desired control is not achieved, is it supported with documentation which identifies weed species not controlled during previous applications? ^D		
5. Are row middles or aisles (drive rows) (Please select all that apply)? ^S : A. Sod B. Mulch covered C. Cover cropped year-round.		
B. Advanced Practices	Points eligible	Points earned
1. Are weeds targeted with herbicide applications scouted at least once per season and weed species present and location, e.g., tree row or row middle, are documented? ^D	1	
2. Are invasive weeds attractive to pollinators removed from orchard and field borders? ^S .	1	
3. Are non-chemical method(s) used to manage weeds and reduce dependence on herbicides on one to ten acres of orchard? An additional point may be scored where practice is implemented on more than ten acres ^S (Please select all that apply): A. Cultivation B. Aeration C. Over-seeding D. Avoiding compaction E. Close mowing/String trimming F. Mulching Note: Practice receives the same number of points regardless of how many practices are selected.	1 - 2	
4. Is groundcover managed to eliminate alternate hosts for plant bugs, e.g., winter-annual weeds, chickweeds, dandelion, clovers, vetch and other legumes? ^S	1	
5. Is alternate-row mowing done to preserve beneficials? Please describe when this practice is implemented: ^S	1	
6. Are no herbicides used?	2	
Orchard Floor Management: Total points eligible	8	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

6. Soil Health Management

Audit guidance: The grower can explain their rationale for implementing practices which build soil health; describe how soil health is improved from the practices.

A. Minimum Requirements	Pass, Fail or N/A										
<p>1. Are results from soil and/or foliar analyses used to calculate nutrient application rates, minimize excess nutrient use and limit potential for nutrient pollution? Is timing of any applications consistent with available Extension or University guidelines? ^s</p> <p>Note: Soil testing results are available for inspection and is completed at least once every three years and includes soil organic matter, pH, nitrogen, phosphorous, potassium, calcium and magnesium.</p>											
<p>2. Is one advanced indicator of soil health quantitatively assessed once every three years? ^{s, D}</p> <p>Check all that were completed:</p> <table border="0"><tr><td><input type="checkbox"/> Aggregate stability ^{1,2}</td><td><input type="checkbox"/> Micronutrients ¹</td></tr><tr><td><input type="checkbox"/> Available water capacity ¹</td><td><input type="checkbox"/> Soil compaction ^{1, 2}</td></tr><tr><td><input type="checkbox"/> Bulk density ²</td><td><input type="checkbox"/> Soil food web ³</td></tr><tr><td><input type="checkbox"/> Earthworm count ²</td><td><input type="checkbox"/> Soil nitrates²</td></tr><tr><td><input type="checkbox"/> Infiltration rate ²</td><td><input type="checkbox"/> Soil organic matter (percentage)</td></tr></table> <p>¹ The USDA-NRCS Soil Quality Test Kit Guide describes procedures and an interpretive section for each test, https://nrcspad.sc.egov.usda.gov/DistributionCenter/product.aspx?ProductID=385.</p> <p>² Available with the Cornell Comprehensive Assessment of Soil Health - Standard Soil Health Analysis Package, https://soilhealthlab.cals.cornell.edu/testing-services/soil-health-analysis-packages/.</p> <p>³ Testing available at Harrington's Organic Land Care, https://harringtonsorganic.com/service/lab-services/.</p> <p>Note: Test results are available for review during site audit.</p>	<input type="checkbox"/> Aggregate stability ^{1,2}	<input type="checkbox"/> Micronutrients ¹	<input type="checkbox"/> Available water capacity ¹	<input type="checkbox"/> Soil compaction ^{1, 2}	<input type="checkbox"/> Bulk density ²	<input type="checkbox"/> Soil food web ³	<input type="checkbox"/> Earthworm count ²	<input type="checkbox"/> Soil nitrates ²	<input type="checkbox"/> Infiltration rate ²	<input type="checkbox"/> Soil organic matter (percentage)	
<input type="checkbox"/> Aggregate stability ^{1,2}	<input type="checkbox"/> Micronutrients ¹										
<input type="checkbox"/> Available water capacity ¹	<input type="checkbox"/> Soil compaction ^{1, 2}										
<input type="checkbox"/> Bulk density ²	<input type="checkbox"/> Soil food web ³										
<input type="checkbox"/> Earthworm count ²	<input type="checkbox"/> Soil nitrates ²										
<input type="checkbox"/> Infiltration rate ²	<input type="checkbox"/> Soil organic matter (percentage)										

B. Advanced Practices	Points eligible	Points earned
1. Are additional advanced indicators of soil health measured at least once every three years? ^D	1	
2. Is compost used to supplement or replace commercial fertilizer in non-bearing and/or bearing orchards? ^S	1	
<p>3. During orchard renovation are practices used to improve infiltration, aeration, retain water and breakup compaction? ^S Select all that apply:</p> <p>a. Tillage radishes are used to break up compaction and improve infiltration.</p> <p>b. Cover crops used to improve organic matter and water retention.</p> <p>c. Sub-soil ripping without cultivation in drive rows to aerate and improve water infiltration.</p> <p>d. Other:</p>	2	
<p>4. Are practices implemented to improve soil health based on results identified in advanced soil health indicators and then soil health indicator is retested after three years? ^D</p> <p>In one sentence please identify the practice and blocks practice is implemented on:</p> <p>During an on-farm audit, the grower should be able to:</p> <ul style="list-style-type: none"> Describe the soil-health concern and identify which indicator was used to measure soil health. Describe the practice that was implemented, maintenance needs and frequency of maintenance. Clearly identify location of blocks covered in the practice (Maps are not required but helpful). Results of initial assessment of soil health indicator and results after third year of practice implementation are available for review during on-farm audit. Notes, photos, receipts of purchases, etc. showing implementation of practice are available for review during on-farm audit. 	3	
<p>5. Does the farm have a policy which guides staff on how to mitigate the risk of soil compaction from vehicle or implement use? ^{D, S}</p> <p>Policy could include, but not limited to the following:</p> <ul style="list-style-type: none"> Instruct employees to stay on gravel drive roads or limit travel in orchard to specific rows during wet periods. Staff are directed to avoid use of certain equipment or implements during wet periods. Staff are instructed to park vehicles in a specific location and walk to worksite during wet periods. Tires on vehicles, tractors, UTVs and trailers driven through the orchard are upgraded to taller and wider sizes that will minimize compaction. 	1	

B. Advanced Practices	Points eligible	Points earned
<p>6. Is a mulching program in place to build soil health and suppress weeds?^s</p> <p>Note: Practice longevity is estimated at three years per application of mulch.</p> <p>Points for mulching systems:</p> <ul style="list-style-type: none"> • One to ten acres: 3 points. • Each additional block of five acres, 0.5 points may be scored and up to a maximum of 1.5 additional points, which equals an additional 15 acres. 	3 – 4.5	
<p>7. During orchard renovation, are cover crops used to maintain groundcover prior to orchard establishment?^s</p> <p>Note: Cover crops should be maintained and where necessary, replanted to keep a living root in the soil during the growing season.</p> <p>Note: Consult with local Extension or USDA-NRCS guidelines to determine appropriate cover crops for soil type and climatic conditions.</p>	1	
<p>8. Herbicides are not used in alleyways/drive rows.^D</p>	1	
Soil Health Management Total Points Eligible	14.5	
Total Points Earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

7. Energy and Waste Management		
Audit guidance: The grower can describe how they manage energy consumption and waste generated, to reduce soil, water and air pollution; conserve energy; minimize waste to landfills and quantify energy use on the farm.		
A. Minimum Requirements	Pass, Fail or N/A	
1. Are pesticide containers (including paper), plastics, rubber or industrial products disposed of properly and not disposed of by burning? ^S		
2. Are buildings which are heated or cooled insulated? ^S		
B. Advanced Practices	Points eligible	Points earned
1. Is energy-efficient lighting used in office, packing and storage facilities, e.g., compact fluorescent or LED lighting? ^S Note: Upgrade lighting fixtures, replace older lamps with LED or compact fluorescent bulbs, replace incandescent bulbs with compact fluorescent, install timers and motion detectors to ensure lights will turn off when not in use. Clean light fixtures frequently. https://farm-energy.extension.org/farm-lighting-energy-efficiency-checklist-and-tips/ .	1	
2. Is solar or wind used to meet any amount of on-farm electricity needs? Two points Where state incentives for solar are available, the farm has maximized their eligibility for total size of the installation: one additional point.	2 – 3	
3. Is biodiesel or ethanol used to meet any amount of fuel needs? ^S	1	
4. Have new energy conservation measures been implemented in storage facilities? ^D List: Note: May claim for points during entire period of cost recovery on investment plus an additional three years. Notes: On-site refrigeration system checklist- see quick guide. https://farm-energy.extension.org/wp-content/uploads/2019/04/Tree-Fruit-Production-ASP-Handouts.pdf	1	
5. Are employees trained on how to minimize energy consumption for farm activities? ^S Note: Outline of training content is available or signage around farm which encourages energy conservation is evident to serve as reminders for employees.	1	

7. Energy and Waste Management (Continued)		
B. Advanced Practices	Points eligible	Points earned
<p>6. Are tractors and other motorized equipment used efficiently and effectively to reduce overall fuel consumption, e.g., do not let diesel engines idle longer than 5-10 minutes; tractors are operated in economy mode when appropriate, e.g., spraying, mowing; tractors are maintained to maximize efficiency? ^S</p> <p>Note: More information on this practice is explained in, “<i>Farm Practices to Improve Energy Efficiency</i>”, University of Wisconsin Extension, https://farm-energy.extension.org/introduction-to-energy-efficiency-and-conservation-on-the-farm/</p>	1	
<p>7. Has a third-party energy audit of facilities been completed within the last six years? ^S</p> <p>https://farm-energy.extension.org/wp-content/uploads/2019/04/Tree-Fruit-Module-Overview.pdf</p>	3	
8. Which of the following materials are recycled? ^S		
a. Paper and cardboard	.25	
b. Plastic	.25	
c. Aluminum	.25	
d. Glass	.25	
e. Used pesticide containers where consistent with regulations	.25	
f. Batteries (excludes lead-acid batteries)	.25	
g. Computers and other recyclable office equipment	.25	
<p>9. Is energy use efficiency monitored using the Stewardship Index for Specialty Crops, https://www.stewardshipindex.org/files/ugd/917763_c357f742461a43dc8fddd850349ecb06.pdf? ^S</p>	3	
10. Is a pesticide mixing and loading facility used to catch and retain pesticide rinsate? ^S	3	
<p>11. Are cover crops established prior to contracted solar panel installation to reduce erosion and soil compaction? ^S</p> <p>Note: Planting and establishing a cover crop at site of future solar panel installation to help mitigate soil erosion and compaction.</p> <p>See pollinator protections advanced practices (4.B.3 and 4.B.9) for establishing pollinator habitat under installed panels.</p>	1	
Energy and Waste Management: Total points eligible	19.75	
Total points earned		

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

^D Verified during desk audit via submitted paperwork

^S Verified during site audit

Score Card				
Years of Participation	Core Eco Protocol	Apple Supplement	Stone Fruit Supplement	
1-3 years	25	4	3	
> 3 years	30	8	6	
CORE ECO PROTOCOL				
Points Required			Points Eligible	Points Earned
Operations and Management			21	
Ecosystems, Soil and Water Conservation			19	
Pesticide-Risk Reduction			20	
Pollinator Protection			14	
Orchard Floor Management			5	
Soil Health Management			14.5	
Energy and Waste Management			19.75	
Total-Points Possible			113.25	
Total Points Earned				
ECO CROP SUPPLEMENTS				
Eco Apple			65	
Eco Stone Fruit			40	
Total Points Earned				

Participating Grower Affidavit and Agreement

1. Participating grower certifies that the attached *Core Eco Protocol* and records represents a complete and accurate account of grower practices on acres to be certified at the time the *Core Eco Protocol* is completed and reviewed by the inspector and the IPM Institute for the purposes of certifying participating production.
2. Participating grower agrees to allow access to farm and records for scheduled and unannounced inspections to verify compliance with program requirements including information provided on the *Core Eco Protocol* and use of Red Tomato trademarked packaging and promotional materials.
3. Participating grower agrees that eco certification is approved solely by the IPM Institute of North America, Inc. and if granted, is for one season only and only for product from participating production units reported in this *Core Eco Protocol* and certified by the IPM Institute.
4. Participating grower agrees not to market any product under Red Tomato eco trademarks, including use of Red Tomato eco packaging or other Red Tomato eco promotional materials or identification, until eco certification for the product is approved in writing by the IPM Institute. Participant further agrees that if certification is not approved, no product will be marketed under the Red Tomato eco trademarks and no eco packaging or promotional materials bearing Red Tomato eco trademarks will be used. Participant agrees to bear any costs associated with denial of certification including the cost of Red Tomato eco trademark packaging and promotional materials purchased by the grower.
5. Participating grower acknowledges that participation does not constitute or imply an endorsement by the IPM Institute of North America or Red Tomato of the participating grower or operation.

Participating Grower Name

Signature

Date

Submission Checklist

- ___ a. Completed Core Eco Protocol
- ___ b. Completed Apple or Stone Fruit crop supplements
- ___ c. Pesticide, fertilizer, thinner and plant-growth regulator application records for blocks to be certified. See page 4 for required information.

The IPM Institute can digitize spray records not submitted in an electronic format. This service will be charged based on an hourly rate for time required for digitization and a final copy of the electronic record will be sent to the grower.

- ___ d. Scouting records for blocks to be certified. See page 4 for required information.
- ___ e. Certification fee. The annual-certification fee is based on the total number of acres enrolled in the program and does not cover costs of on-site audits required every three years. Fees for on-site audits are payable directly to the auditor.

0 – 9 acres	\$475
10 – 24 acres	\$600
25 – 49 acres	\$750
50 – 99 acres	\$850
100 – 149 acres	\$1,075
150 – 199 acres	\$1,300
200 – 299 acres	\$1,625
≥ 300 acres	\$2,150

*Additional fee of \$100 when enrolling in Eco Stone Fruit and Eco Apple.

Deadlines for Record Submission

- a. Eco Stone Fruit: **June 28, 2024**
- b. Eco Apple: **July 19, 2024**

Fees

Annual certification fee \$_____ with the 2024 Eco Core Protocol, pesticide application and scouting records are due by the posted date. Final application and scouting records are due by **December 1, 2024**. Payment is accepted by check or credit card. To pay by credit card please visit our secure website, ipminstitute.org/projects/northeast-eco-apple/online-payment/, or call 608 232-1410.

IPM Institute of North America
211 S. Paterson St. Ste. 380
Madison WI 53703
Phone 608 232-1410
Fax 608 232-1440
mmcmullin@ipminstitute.org

Revisions to 2024 Edition

- Pg. 5: Provisions for delaying on-farm audit

On-farm audit: In a year that an Eco Certified grower is due for an on-farm audit and experiences significant weather-related crop loss, the grower must communicate with Red Tomato and the IPM Institute as soon as the loss occurs/is realized and may request to delay on-farm audit until the following year. Exceptions may include, but are not limited to, complete crop failure, significant crop loss (% of total), hail, freeze event or drought.

Expectations from the grower:

- Submit self-assessment and supporting documentation on time.
 - Pay recertification fee for acres sold under Eco label.
 - Assessment of acreage to be certified.
 - Only acres enrolled in current year can be sold under Eco Certified label.
 - Timely communication with the IPM Institute and Red Tomato to discuss crop status and options.
- 4.A.1. pg. 16: If pollinator habitats (nesting and forage sites) are present along orchard borders, are these habitats protected from drift using one or more of the following mitigation strategies? ^s Please select all applicable practices:
 - a. Pesticides toxic to pollinators are not applied when native pollinators are actively foraging.
 - b. Windspeed and wind direction is used to prevent pesticide drift to pollinator habitats.
 - c. Maps outline location of pollinator habitats are used to educate applicators on sites where drift must be avoided.
 - Pg. 17: The following advanced practice removed due to low adoption and lack of clear benefit: “If honeybee apiaries reside on the farm, are they located at least 0.5 mile away from designated wildlife habitat, e.g., state or national wildlife refuges, natural areas or parks?”
 - 5.B.3. pg. 19: Are non-chemical method(s) used to manage weeds and reduce dependence on herbicides on one to ten acres of orchard? An additional point may be scored where practice is implemented on more than ten acres s (Please select all that apply): 1 – 2 points
 - a. Cultivation
 - b. Aeration
 - c. Over-seeding
 - d. Avoiding compaction
 - e. Close mowing/String trimming
 - f. Mulching
 - 5.B.6. pg. 19: Are no herbicides used? 2 points.

- 6.A.2. pg. 20: Is one advanced indicator of soil health quantitatively assessed once every three years?

Added option: Soil organic matter (percentage)

- 6.B.3. pg. 2: During orchard renovation are practices used to improve infiltration, aeration, retain water and breakup compaction? ^s Select all that apply:
 - a. Tillage radishes are used to break up compaction and improve infiltration.
 - b. Cover crops used to improve organic matter, which improves water retention.
 - c. Sub-soil ripping without cultivation in drive rows to aerate and improve water infiltration.
 - d. Other:

Acknowledgements and References

Contributing growers, scientists and other advisors to the development of the Red Tomato Eco Apple Protocol and Grower Self-Assessment are thanked for their previous work, which has been incorporated into this new *Core Eco Protocol*.

Art Agnello, Extension entomologist, Cornell University
Juliet Carroll, Extension fruit IPM coordinator and plant pathologist, Cornell University
Aaron Clark, Clark Brothers Orchards
Dan Cooley, plant pathologist, UMass
Sue Futrell, communications director, Red Tomato
Rob Koch, Apple Leaf, crop consultant
Kerik Cox, Extension plant pathologist, Cornell University
Greg Krawczyk, Extension entomologist, Penn State University
Barney Hodges Sr., Barney Hodges Jr., Christiana Hodges and Dee Hodges, Sunrise Orchards
Tracy Leskey, research entomologist, USDA ARS
Mary Concklin, Associate Extension Educator - Fruit Production & IPM, University of Connecticut
Richard Cowles, Valley Laboratory, Connecticut Agricultural Experiment Station
John Lyman, Lyman Orchards
Harvey Reissig, Extension entomologist, Cornell University (retired)
John Rogers and Greg Parzych, Rogers Orchards
Michael Rozyne, Evangelist and founder, Red Tomato
Peter Ten Eyck, Indian Ladder Farms
Arthur Tuttle, Extension IPM field leader, plant pathology
Jon Clements, Extension educator, UMass

The following funders have supported this work:

US EPA Strategic Agricultural Initiative, Region I
USDA NIFA Northeastern IPM Center
USDA NRCS Conservation Innovation Program
USDA NIFA Crops at Risk Program
W. K. Kellogg Foundation
Whole Foods Market
An anonymous foundation and many generous individuals

References:

Agnello, A. M., Gardner, R., Helms, M., Landers, A., Rosenberger, D., Cox K., Hoying S. 2018 Cornell Cooperative Extension. Ithaca NY: *2018 Pest Management Guidelines for Commercial Tree-Fruit Production*.

https://cropandpestguides.cce.cornell.edu/Preview/2018/Tree_Fruit_PROMO.PDF

Boerboom, C., and Owen, M. 2006. Purdue Extension *The Glyphosate, Weeds, and Crops Series: Facts About Glyphosate-Resistant Weeds*. extension.purdue.edu/extmedia/gwc/gwc-1.pdf.

Boller, E. F., Avilla, J., Joerg, E., Malavolta, C., Wijnands, F. G., and Esbjerg, P. 2004. International Organization for Biological and Integrated Control of Noxious Animals and Plants *Integrated Production Principles and Technical Guidelines, Third Edition*. <https://iobc-wprs.org/product/integrated-production-objectives-principles-and-technical-guidelines/>.

Carroll, J. E. (Ed.). 2010. NYS IPM Program *Elements of IPM for Apples in New York State*. ecommons.cornell.edu/handle/1813/42717.

Carroll, J.E, and Robinson, T.L. 2006. New York State Agricultural Experiment Station. *New York Integrated Fruit Production Protocol for Apples* (New York's Food and Life Sciences Bulletin 158). <https://ecommons.cornell.edu/handle/1813/33327>.

Guidelines for Integrated Production of Pome Fruits: IOBC Technical Guidelines III, Third Edition. International Organization for Biological and Integrated Control of Noxious Animals and Plants. 2003. <http://www.pv.fagro.edu.uy/fitopato/PI/doc/Guia%20manzana%20OILB.pdf> .

Index of tree fruit insects and diseases. Kearneysville Tree Fruit Research and Education Center. <https://extension.wvu.edu/lawn-gardening-pests/plant-disease/tree-fruit-disease> .

Integrated Fruit Production Guidelines for Apple Orchards in Canada. Canadian Horticultural Council. 2003. hortcouncil.ca/wp-content/uploads/2016/01/IFP_Guidelines_Eng.pdf.

Krawczyk, G., Crassweller, R.M., Schupp, J.R, Hull, L.A, Biddinger, D.J., Frazier, M... Jung, C. 2010. University Park PA: Pennsylvania State University. *Pennsylvania Tree Fruit Production Guide 2010-2015 Edition*.

LIVE Technical Guidelines. Low Input Viticulture & Enology Inc. Viewed on February 17, 2023. livecertified.org/standards.