

## **IPM Plan Guide Sheet Practices for Fruit Crop Production**

### **Introduction**

This tool has been designed as a guide for evaluating on-farm pest management practices for farmers interested in a Natural Resource Conservation Service (NRCS) 595 Integrated Pest Management (IPM) Plan. A 595 IPM plan is one of many practice standards offering financial assistance to farmers through the NRCS Environmental Quality Incentives Program (EQIP). This evaluation tool outlines industry standards of IPM that have been peer reviewed by universities, independent consultants, nongovernmental organizations, NRCS staff, and other state and federal agencies, and provides site specific information for implementing IPM.

EQIP is a voluntary conservation program with annual signup periods often offered in the winter. The applications are scored and funds are awarded competitively to applicants that propose cost-effective conservation practices, address local priorities, and provide the greatest environmental benefit. Contact your local USDA service center to find out specific signup dates for your state.

EQIP application information by state

[http://www.nrcs.usda.gov/programs/eqip/EQIP\\_signup/2009\\_signup/index.html](http://www.nrcs.usda.gov/programs/eqip/EQIP_signup/2009_signup/index.html)

Conservation plan application form – this is the application form required for applying for EQIP funds Form CCC-1200 <http://www.nrcs.usda.gov/programs/eqip/>

### **What is IPM?**

IPM is a comprehensive approach to managing pests that uses an array of practices that minimize impacts on the environment, while providing safe, effective and economical means of pest control. The principles and practices of IPM are applied to any setting where pests (e.g., insects, diseases, mammals, birds) are present. IPM practices have the added benefit of offering solutions to pest control that reduce the use of pesticides and protect resources by mitigating their impacts on the environment.

The fundamental principles of implementing IPM are as follows:

1. **Pest identification:** Proper identification of pests is necessary to identify the best options for control.
2. **Best biology:** Understand pest life cycles, natural hosts and enemies and environmental conditions that influence pest activity.
3. **Pest monitoring:** Scout and trap for pests and beneficial insects through the growing season, and keep records of all pest activity.
4. **Establish action and economic injury thresholds:** Thresholds are used to determine when pest infestation is severe enough to warrant control.
5. **Select appropriate treatment strategy:** IPM relies on cultural, mechanical, biological and chemical controls for prevention or suppression of pest populations
6. **Evaluate effectiveness of the pest management program:** IPM is not static; make changes that increase the level of IPM that is being practiced from year to year.

PRINCIPLE	PRACTICES	REFERENCES	Apples	Blueberries	Brambles	Vines
<b>PREVENTION</b>	Use certified pest-free nursery stock and transplants where available. (Example: Purchase certified stock and ensure plants are free of insects, diseases, and weeds before transplanting.)					
	Prevent weeds from going to seed. (Example: Cultivate, pull, mow, flame, etc.)	Flaming <sup>10</sup> , Organic Weed Management <sup>28</sup>				
	Reduce moisture on cane, branch and leaf surfaces to prevent disease incidence. Use drip irrigation or avoid overhead irrigation between 6 p.m. and midnight to minimize disease.					
	Employ methods to avoid spreading pests (pathogens, weeds, and insects). (Example: Work crop when dry, work infested areas last, hose down equipment between blocks, etc.)	Organic Weed Management <sup>28</sup>				
Preventing pest problems reduces the need for pesticide applications and thus potential impacts of pesticides on resource concerns.	Destroy and/or remove crop residues for block sanitation procedures, including leaf litter.	IPM for Ontario Apple Orchards <sup>30</sup> , NYS IPM Elements <sup>1</sup> , Ohio IPM Elements <sup>2</sup>	Remove and destroy infected limbs of fruit trees to reduce black rot and fireblight. Destroy brush piles from winter pruning, mummified fruit, and dead wood from trees. Apply calcium nitrate to leaf litter in fall for increased rate of decomposition. Use a flail mower to destroy leaves and pruning residues 1" diameter and smaller	Removal of overripe and cull berries will help reduce Japanese beetle populations	Removal of overripe and cull berries will help reduce Japanese beetle, yellow jacket and picnic beetle populations	

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<b>PREVENTION</b>	Plant tree crops in single rows to promote air circulation and light penetration and reduce fungal diseases caused by extended periods of foliar dampness.	NYS IPM Elements <sup>1</sup>				
	Conduct annual winter pruning on fruit trees, vines and canes to promote healthy growth and improve air flow and light penetration; pruning will also maximize effectiveness of spray applications.	Grape Pest Management <sup>14</sup> , Pruning Mature Apple and Pear Trees <sup>22</sup> , Pruning Raspberries and Blackberries <sup>23</sup>	Conduct annual pruning during dormancy to maintain canopy and tree height. Thin fruit in clusters to promote faster drying time, spray coverage, fruit size and return bloom	Prune old growth during dormancy to maintain bush size and canopy density	Conduct annual pruning of flora canes during dormancy	Leaf pulling and late summer pruning may be necessary in dense trellis canopies to maintain adequate spray coverage, promote fast drying and prevent shading of fruit. Conduct annual pruning yearly during dormancy
	Eliminate unmanaged plants that serve as pest reservoirs, such as abandoned crops, nearby wild and scrub plants, or weed hosts of viruses.	IPM for Ontario Apple Orchards <sup>30</sup> , Midwest Small Fruit Pest Management Handbook <sup>5</sup>			Remove wild brambles within 500 ft of cultivated planting. Avoid planting within 250 yards of conifers to prevent blackberry <i>psyllid</i> .	Remove abandoned vineyard blocks and wild grapes adjacent to plantings
	Test soil or plant tissue annually to determine proper fertility and pH levels for crop and time application according to crop needs. Apply nutrients, fertilizers, and pH-adjusting agents according to the following recommendations.	NYS IPM Elements <sup>1</sup> , IPM for Ontario Apple Orchards <sup>30</sup>	Adjust mineral soil pH to 6.0-6.8, Balance nitrogen applications with plant growth to limit vegetative growth to 12" or less annually.	Adjust mineral soil pH to 4.5-5.2	Adjust mineral soil pH between 5.5 - 6.5	Adjust mineral soil pH between 5 -6.5 for strawberries

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<p style="text-align: center;"><b>AVOIDANCE</b></p> <p>Implementing measures to avoid the buildup of pest populations reduces the need for pesticide applications and mitigates potential impacts of pesticides on natural resources</p>	<p>When planting a new crop, take note of the species previously grown and associated diseases in that area. Do not plant crops from the same family or with same pest susceptibility at less than recommended intervals for the identified pest(s).</p>	<p>NYS IPM Elements<sup>1</sup></p>				<p>For strawberries, select field rotated at least two years from peppers, tomatoes, potatoes, eggplant, strawberries or raspberries to break pest cycles.</p>
	<p>Maintain soil aeration and drainage to avoid standing water and minimize plant disease. (e.g., use tile drainage, sub soiling, grassed waterways, raised beds, and organic matter additions.) Avoid planting in low and wet spots.</p>	<p>Injury to Tree and Small Fruit Plants<sup>17</sup></p>	<p>For fruit trees planted in wet soils, fungicides may be necessary to prevent root and collar rot.</p>			<p>Select vineyard sites with good cold air drainage or proximity to large bodies of water for frost protection</p>
	<p>Choose pest-resistant cultivars.</p>		<p>Select cultivars that are resistant to apple scab and fire blight</p>		<p>Plant varieties with resistance to <i>Phytophthora</i> root rot and raspberry leaf spot.</p>	<p>For strawberries, select cultivars that have tolerance or resistance to red stele and Verticillium wilt if a history of the disease exists. Plant virus and powdery mildew resistant grapes</p>

PRINCIPLE	PRACTICES	REFERENCES	Apples	Blueberries	Brambles	Vines
<p><b>MONITORING</b></p>	<p>Monitor for pests as recommended for each crop. If no monitoring guidelines available, monitor weekly to determine presence, density, and locations of pests and to determine crop growth stage. <b>**Record findings. Record keeping is required**.</b> (Example: Scout crops and use other appropriate monitoring aids such as pheromone traps, disease diagnostic tests, etc. Map weeds in the fall to help plan where specific measures may be needed to target problem weeds the following spring.)</p>	<p>NYS IPM Elements<sup>1</sup>, Ohio IPM Elements<sup>2</sup> Weed Assessment List<sup>37</sup>, See additional resources on resource list</p>	<p>Use pheromone traps in all blocks to monitor codling moth, oriental fruit moth, leaf rollers, borers, leaf miners. Use red ball traps to monitor apple maggots. Use sticky tape on trees to monitor crawlers. Scout European red mites and woolly apple aphid weekly from petal fall through mid August. Scout rosy apple aphids at early pink stage. Scout for spotted tentiform leaf miner and white apple leaf hopper at early petal fall</p>	<p>Monitor blueberry maggot flies with baited yellow sticky traps. Place sticky tape around branches to detect scale crawlers. Sample buds for cranberry weevil before bloom. After bloom bushes are scouted for fruit worms, plum curculio, tip borer and leafroller damage.</p>	<p>Early in season, monitor orange rust and viruses on black raspberry and black berry, remove and destroy infected canes. Monitor flowers during bloom for tarnished plant bug. Sample leaves for mites and other pests</p>	<p>Monitor grape berry moth using baited pheromone traps. Scout vineyards for <i>Eutypa</i> at 10- to 12-inches of shoot growth. Tag infected trunks and prune out infections by double cutting<sup>35</sup>. Scout for strawberry clipper, two spotted spider mite and tarnished plant bug weekly. Continue to scout for secondary pests post harvest</p>
<p>Monitoring limits pesticide use to those occasions when intervention is needed to prevent economically significant damage to crops.</p>	<p>Use on-farm weather monitoring devices to measure precipitation, humidity, temperature, and leaf wetness and/or use commercial weather prediction service for prevention and control of plant diseases. (e.g., install weather station with rain gauge, hygrometer, maximum and minimum temperature recording equipment, leaf wetness sensors.)</p>	<p>Skybit<sup>39</sup>, UMCE Apple IPM Program Forecast<sup>40</sup></p>				
	<p>Use pest-forecasting tools (e.g., computer modeling software) as additional guides for on-farm pest monitoring activities in conjunction with weather data to predict risk of pest infestation.</p>	<p>Skybit<sup>39</sup>, UMCE Apple IPM Program Forecast<sup>40</sup></p>				

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<b>SUPPRESSION</b>	<b>CULTURAL AND PHYSICAL CONTROLS</b>					
	Use size-controlling rootstock for better spray coverage and to reduce the amount of material require for effective applications.		When orchard blocks are replanted use dwarfing and semi-dwarfing root stocks. Use opportunity to select disease resistant rootstocks as well.			Select rootstocks appropriate for the variety that will ensure trellis fill but avoid over-vigorous growth. Select variety & rootstocks that are appropriate for the given site based on winter hardiness, soil type and site characteristics and pest management goals/expectations
	Use cover crops, especially pest-suppressing crops (allelopathic), between crop rows to reduce weeds and disease incidence, prevent liquid run-off and to improve soil quality.	See references 7, 19, 29, and 32 for cover crop guidance and SARE Nematode fact sheet <sup>13</sup>				
	Plant using appropriate within- and between-row spacing optimal for crop, site, and row orientation. (e.g., use row spacing and plant densities that assure rapid canopy closure.)	NYS IPM Elements <sup>1</sup> for crop-specific recommendations, Fruit Crop Ecology and Management <sup>21</sup>	Plant rows in the direction of prevailing winds to promote better air circulation and faster drying in the orchard			Rows should be oriented in a north/south direction to promote light interception and air circulation to promote rapid drying. Where necessary, rows are perpendicular to slopes to minimize erosion
	Use mulches including plastic or reflective mulches for insect or weed control.					
Applying suppression actions only when pest populations exceed the action threshold reduces potential impacts of pesticides on resource concerns	Inter-seed cover crop within or between rows to suppress weeds.	See references 7, 19, 29, and 32 for cover crop guidance and SARE Nematode fact sheet <sup>13</sup>				
	Use mechanical pest controls. (e.g., weed badger, mow, hoe, and hand remove insects and weeds, prune diseased or insect-infested plants, remove diseased plants.)					

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	Use physical pest controls and deterrents. (e.g., use flame weeding or other heat methods for insect, disease, and weed control; noise-makers; reflectors; ribbons; and predator models.)	Flaming <sup>10</sup> , Organic Weed Management <sup>28</sup> , Guide to Biological Control <sup>27</sup>		Use netting and visual scare devices for birds			
<b>SUPPRESSION</b>	Use exclusion devices for insects or wildlife. (e.g., use netting for row covers and/or fencing around blocks and trees.)	Organic Weed Management <sup>28</sup>					
	Physically remove and destroy branches, canes, and vines infested with insect or disease pests to prevent their spread to other parts of the planting				Remove and destroy plants infested with raspberry crown borer		
	<b>BIOLOGICAL CONTROLS</b>						
	Use insect mating disruption devices where pest pressure is low to moderate. (e.g., use pheromone laminate clip-ons or rings for control of codling moth.)	Use of Pheromone Traps in Fruit and Vegetable Production <sup>24</sup> , Mating Disruption for Management of Insect Pests <sup>6</sup>	Use codling moth mating disruption for apples				
	Conserve naturally occurring biological controls. (e.g., select pesticides and time applications to minimize impact on beneficials, use floral perimeter crop to attract and support beneficial insects.)	Environmental Impact of Pesticides (EIQ) <sup>20</sup> , Guide to Biological Control <sup>36</sup>	Avoid mowing during bloom and petal fall where mowing destroys habitat for pollinators and beneficial organisms				
	Release beneficial organisms where appropriate. (e.g., release the parasitic wasp <i>Trichogrammato</i> prey on codling moth in apple and pear orchards.)	Integrated Pest Management Manual for Minnesota: Apple Orchards <sup>27</sup> , Guide to Biological Control <sup>36</sup>					

PRINCIPLE	PRACTICES	REFERENCES	Apples	Blueberries	Brambles	Vines
	Use compost as a soil amendment to increase biological diversity in soil and plant health and suppress plant disease.	Pests of the Garden and Small Farm: A Growers Guide to Using Less Pesticide <sup>16</sup> , NYS IPM Elements <sup>1</sup>				
<b>CHEMICAL CONTROLS</b>						
<b>SUPPRESSION</b>	Minimize chemical use. Only use chemicals in conjunction with accurate pest identification and monitoring, action thresholds, alternative suppression tactics (biological, cultural, etc), and judgments based on previous year's weed map and/or pest scouting records.	Midwest Small Fruit Pest Management Handbook <sup>12</sup> , NYS IPM Elements <sup>1</sup>	Use fungicide combinations that allow for extended spray intervals of 10 to 14 days rather than a 7-day protectant program. Delay petal fall sprays for plum curculio, leaf rollers and codling moth as long as possible to preserve beneficial insect populations			To preserve predatory mites, use EBDC fungicides (mancozeb, maneb, metiram, thiram and zineb) prior to bloom only or not at all
	Select pesticides, formulations, and adjuvant based on least negative effects on environment, beneficials (e.g., pollinators, predators, parasites), and human health in addition to efficacy and economics.	See environmental cautions on pesticide label and Environmental Impact of Pesticides (EIQ) <sup>20</sup>				
	Use lowest labeled rate that is effective based on label, scouting results, and Extension-recommended action thresholds for target pest.	Contact state NRCS or Extension office for spray record keeping forms				
	Limit applications to partial fields or banding to reduce quantity or impact of pesticide. (e.g., spot treat where pests are found or use banding, seed, edge or block perimeter/border treatments.)					
	Calibrate sprayers or applicators prior to use to verify amount of material applied.	Pesticide Calibration Guide <sup>9</sup>	Base choice of spray volume per acre on tree-row volume			

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SUPPRESSION	Use pesticide-resistance management strategies as appropriate and where required on pesticide label. (e.g., alternate applications of chemicals with different modes of action to avoid development of pest resistance or leave part of crop unsprayed to serve as a refuge for susceptible pests and natural enemies.)	Managing Pest Resistance to Pesticides <sup>25</sup>				
	Use specialized pesticide application equipment to increase efficiency and reduce chemical drift. (e.g., use wiper applicators, digitally controlled adjustable tool bars, direct injection sprayers, double-drop sprayers, laser guided precision sprayers, direct injection, low-drift nozzles, shielded applicators or air induction booms, built-in tank washers, etc.)					
	Use spray-monitoring equipment. (e.g., use water-sensitive cards to measure spray pattern and drift.)					
	Use vegetative buffers, set-backs, or filter strips to minimize chemical movement to sensitive areas such as surface waters, schools, residences, and neighboring crops.					
	Use mitigation practices as necessary in accordance with pest monitoring results, pest predictions, action thresholds, and WinPST output.					
	Pesticide applicator must be properly licensed and certified when using restricted use pesticides or when doing custom pesticide applications for hire. Contact state pesticides regulatory agency for license and certification requirements.					
	<p><b>NOTE: Additional pesticide use requirements from the 595 Practice Standard:</b></p>	<p><b>*NOTE:</b> See documents listed in the attached resource list for additional guidance.</p>				
	<ul style="list-style-type: none"> <li>&gt; Always follow all pesticide label instructions and environmental cautions.</li> </ul>					
	<ul style="list-style-type: none"> <li>&gt; Store, handle, transport, mix, use, and dispose of pesticides and pesticide containers per state pesticides regulatory agency recommendations and regulations.</li> </ul>					
	<ul style="list-style-type: none"> <li>&gt; Follow state and federal worker protection standards.</li> </ul>					
<ul style="list-style-type: none"> <li>&gt; When drawing water for pesticide mixing from any surface waters of the state, use anti-siphoning devices and do not use hoses that have been in contact with pesticides.</li> </ul>						
<ul style="list-style-type: none"> <li>&gt; Do not mix or load pesticides within 50 ft from the high water mark of any surface waters of the state.</li> </ul>						

## **IPM Practices for Fruit Production Resource List**

### **IPM Guidelines and Elements**

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2. The Ohio State University. Elements of IPM in Ohio. 2000.  
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Field Code Changed

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