Background. Since its arrival in the U.S in 2008, a lot of research and extension effort has gone into understanding how to manage spotted wing drosophila (SWD). In New England the pest was first noted in 2011 and became widespread over the next two growing seasons. Though we have gained more understanding of SWD it is far from complete. Below is a summary of SWD information to help you make management decisions for the 2014 growing season. Although SWD does not appear to have reached some of the northern-most parts of the region, growers of susceptible fruit, wherever they are, had best to be prepared to deal with it.

Biology. SWD is related to the common fruit fly (properly called a vinegar fly) which is known for laying eggs in rotting fruit. SWD is different because it has the ability to lay eggs in firm, ripening fruit. The females have a saw-like egg-laying appendage (a serrated ovipositor) that lets them cut into the skin of sound fruit to deposit their eggs; these hatch into tiny white larvae that feed in the fruit’s flesh. The larvae develop for 10 to 14 days then emerge as adults, ready to mate and lay more eggs. Females can lay 300 eggs in their lifetime. The SWD population can increase extremely fast when conditions are right. Male adults give this fly its common name; they have a single dark spot on the front edge of their wings.

Susceptible crops. Fall raspberries, cherries, blueberries and day-neutral strawberries are highly vulnerable to SWD attack. Peaches and grapes are also vulnerable. Many wild plants and cultivated ornamentals are also attacked; there are a lot of hosts for this pest in the landscape including autumn olive, honeysuckle, Korean dogwood, pokeweed and wild brambles. SWD has a preference for soft fruits with thin skins, so firm crops like apples and pears and thick-skinned grape varieties do not appear to be at risk. SWD can also attack some vegetables, like tomatoes, when fruit has cracks in the skin.

When it appears. Although SWD is able to overwinter in cold climates, it does not appear at the beginning of the growing season. Trap catches over the past few years suggest that the first adults are present in northern New England around in low numbers in mid to late July, with the population building up to large numbers by mid to late August, depending on location.
The further south one is, the earlier SWD populations seem to increase. Once there are a few cold nights the traps catches and damage to fruit seems to decline, though the pest is still present.

![2013 SWD trap catches in unprotected fall raspberries. Burlington, VT.](image)

This late population build up explains why earlier-ripening varieties of fruits, like summer-bearing raspberries and strawberries, appear to be at less risk than fruits that ripen in the late summer and fall. Early-ripening blueberry varieties have also been observed to have less SWD damage than those that ripen at the end of the blueberry season, even though the difference in timing may just be a few weeks.

Managing SWD. Avoiding damage to late-season soft fruits involves a combination of practices that can include: prompt harvesting of ripe fruit, post-harvest refrigeration, removal of over-ripe fruits, use of netting for exclusion, and application of insecticides. Attracting hummingbirds may also be helpful.

Harvest practices are key. Timely and complete harvesting is one way to minimize SWD damage. Picking fruits as soon as they start to ripen and keeping the crop picked clean may avoid the build-up of SWD in a fruit planting. Prompt refrigeration or freezing of fruit upon harvest will reduce losses to fruit rot from pathogens introduced during egg-laying. Cold temperatures may also kill SWD eggs or larvae or at least greatly slow their development. There is no known risk to human health posed by ingesting SWD eggs or larvae, and they are so small many people won’t even know they are there.

Netting to exclude SWD. On-farm trials suggest that insect netting can exclude SWD from vulnerable fruit plantings. Insect netting with a mesh opening smaller than 1 mm square may keep the flies from getting to the crop. To be effective the netting needs to be placed over the crop before any fruit start to ripen, and it must be securely sealed along the ground and at entries to prevent flies from getting in.
Netting offers an additional benefit because it can also keep birds from eating ripe fruit. To facilitate harvest a structure may be needed to hold the netting up off the plants. Prompt removal of netting when it is not needed may extend its life by reducing the length of time it is exposed to sunlight.

Insect netting such as ProTekNet Ultimate Plus (25 grams/square meter) or ProtekNet Standard Plus (80 g/m²) nettings should be effective for SWD exclusion, but netting is not inexpensive. However, the annual cost may be justified by reduced SWD damage, especially in small plantings. Netting is available from Dubois Agrinovation in Quebec, [http://www.duboisag.com/en](http://www.duboisag.com/en), 800-463-9999 and Brookdale Fruit Farm in NH, [http://www.brookdalefarms.com/Irrigation/](http://www.brookdalefarms.com/Irrigation/), 603-465-2240.
Attracting hummingbirds? Hummingbirds consume small insects as a source of protein. A recent article in American Fruit Grower described a 6-acre blackberry farm in Mississippi that placed 25 hummingbird feeders per acre containing clear sugar water and claimed to control late season SWD. This has not been substantiated by research trials but may be worth a try to reduce SWD pressure. Put feeders out early in the summer to get hummingbirds established in the area. Maintain the feeders by changing sugar water and cleaning weekly, or more often in hot weather. Place feeders above the reach of cats and other predators. For more info on hummingbirds and how to attract them, see: http://www2.dnr.cornell.edu/ext/info/pubs/Wildlife/hummingbird%20fact%20sheet.pdf

Insecticides. Spraying is not necessary until SWD are in the area and fruit are starting to change color. To be effective, sprays must be applied with good coverage, especially of leaf undersides, and of leaves in the interior of the canopy. Insecticides need to be reapplied to maintain protection during the harvest season, and pesticide types must be rotated to prevent SWD from developing resistance. Lists of conventional and organic insecticides labeled for berry crops and tree fruit crops have been developed by the University of Connecticut. The lists show which products are labeled for a crop, their relative efficacy, and the pre-harvest interval that must pass after application. The addition of 2 pounds of table sugar per 100 gallons of spray enhances the efficacy of most insecticides for SWD control.

Heavy pruning. An open plant canopy can help reduce the ‘habitat’ for SWD as the adults prefer shaded areas lower in the plants that are higher in humidity. It will also allow better penetration of insecticide sprays into the canopy.

Monitoring SWD adults with traps. It is possible to monitor the arrival and population buildup of SWD using traps; however, trap catches are not necessarily correlated with the extent of SWD infestation in fruit. In other words, you may have low catches and still have a problem because ripe fruit are more attractive than traps. Traps are useful for knowing that SWD has definitely arrived, and may be used to assess the effectiveness of a spray program. SWD is attracted to several kinds of bait, including vinegar, alcohol and yeast. Fermentation odors are especially attractive so yeast-based baits have proven most effective.
Homemade traps have proven more effective than commercially-available traps. They can be made from plastic beverage cups (ideally red in color) that contain the bait, and use of a clear drowning solution facilitates counting of SWD in the trap. An effective SWD trap design and bait formulation is posted on the web site listed below. This trap uses fermenting bait (flour plus sugar and yeast in water) in a small, screened cup that is then placed inside a larger plastic cup with a drowning solution for collecting SWD adults. Recently, Kombucha was found to be one of the most attractive baits. You can find a recipe online if you have the time to make this fermented beverage. Any type of bait must be changed weekly.

Monitoring SWD larvae in fruit is important for knowing what you are selling, or deciding not to sell. It can be done simply by collecting 100 sound berries (not those already breaking down due to SWD) and placing them in a zip lock bag or plastic container filled with a salt water solution (1 tablespoon table salt per cup of water.) Gently crushing the fruit may help release the larvae. After one hour, look closely for the small white larvae that float to the surface.

In summary managing SWD requires multiple tactics, which include:

- Eliminate nearby wild SWD hosts to the extent possible, at least along field edges.
- If protecting fruit with netting or insecticides be prepared to start as soon as ripe fruit is present.
- Prune plants to maintain an open canopy.
- If using insecticides, plan a rotation of materials to avoid resistance, and to fit your harvest schedule.
- Set up traps to monitor for arrival of SWD and/or effectiveness of netting or insecticides.
- Harvest fruit as soon as it is ripe; remove and destroy all rotten, potentially infested fruit.
- Promptly place harvested fruit in a refrigerator or freezer, and encourage your customers to do so.
- After harvest, remove any remaining fruit from the field that may host SWD, to the extent possible.
- Sample sound fruit and place in salt water to monitor for presence of SWD larvae.
- If you have a SWD problem consider informing your customers; say you are doing your best to manage this new pest but they may find some small larvae. *Never, ever use the word maggot!*

For links to more information on SWD see: [http://www.uvm.edu/vtvegandberry/SWDInfo.html](http://www.uvm.edu/vtvegandberry/SWDInfo.html)

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