NYSIPM Projects in Agriculture, 2012 – Final Report

1. Title of proposal: Spotted wing drosophila: distribution of populations over time in wild and crop hosts.

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4. Abstract:

Spotted wing drosophila (SWD) was first confirmed in NY at some eastern Long Island farms in 2011. Fruit flies typically attack rotting fruits; SWD, however, feeds in intact fruits. Soft-skinned fruits such as berries are at greatest risk; some stone fruits are also reported among the preferred hosts. Season-long SWD monitoring and fruit damage assessments were done in cultivated crops and in wild fruits growing nearby. A total of 31 apple cider vinegar-baited translucent delicatessen cup monitoring traps were placed in raspberry, peach, blueberry, grape, and apple farms and in adjacent forest areas. The first sustained SWD capture on Long Island occurred on June 9, 2012 at 1320 DD (50^{o}F base temperature). At least two peak SWD activity periods were observed on Long Island: the 1st around September 18 at 2313 DD and the 2nd around October 23 at 3073 DD. The proportion of male:female in trapped populations was observed to be around 50:50. Late-season (September – October) SWD populations appeared to be higher in forest than cultivated areas. Approximately 17 types of cultivated and wild fruits were checked for the presence of SWD eggs or larvae. Pokeweed berries are the most preferred wild host of SWD. Among the other possible wild hosts checked- autumn olive, bittersweet nightshade, European yew berries are the newly detected hosts of SWD grown near cultivated areas. Raspberries and blackberries were most heavily infested by SWD, averaging 73.5% and 77.0% respectively in 2012. Blueberries were less affected (6%) possibly because the local blueberry season typically ends by late July to early August after which SWD populations sharply increased. Very few SWD adults emerged from grape samples and SWD egg-laying in grapes was minimal and only the late-season 'Merlot' and 'Cabernet' varieties were affected. It appears grapes are not a favored host and may not need preventive treatment. Late-season caneberries appear highly susceptible to infestation and most likely require preventive insecticide treatments but growers have little information on specific timing of applications. Information developed from this study advances our understanding of the seasonal abundance, peak appearance, host utilization, and overwintering emergence patterns of SWD. Further research on hosts, overwintering sites, population assessment, baits and control techniques are necessary to help growers contend with this new invasive pest.

5. Background and Justification:

Since its first appearance in California in 2008 (Bolda et al. 2010), spotted wing drosophila (SWD, *Drosophila suzukii* Matsumura) has received much attention from fruit growers due to the nature and severity of damage it can cause in agricultural crops. SWD is native to Southeast Asia (Toda 1987, OKU 2003) but has now spread rapidly throughout many of the fruit growing regions of the United States (Walsh et al. 2011). The insect is named for the distinctive single spot near the tips of the wings on males (Steck et al. 2009). In 2011, SWD was first officially confirmed (identified by Norman E. Woodley, Systematic Entomology Laboratory, National Museum of Natural History, Washington D. C.) in NY from collections made at eastern Long Island fruit farms. Based on recent reports of SWD in adjacent states, the New York finding was not completely unexpected though somewhat surprising to find it so soon in eastern Long Island. Since its detection there in 2011, SWD has been more than just another annoying fruit fly, but has posed a threat to the region's fruit industries and been particularly of concern to raspberry, blackberry, blueberry, and grape growers, together comprising about $30M in production annually in NY. Being so new in the region its impact on crops was unknown, but judging from experience elsewhere significant problems were expected in some cases. Entomologists at Cornell Cooperative Extension of Suffolk County have been watching this pest from its earliest appearance in the area.

Fruit flies, also known as vinegar flies or by their Latin name *Drosophila*, typically attack over-ripe rotting or fermenting fruits and vegetables; SWD, however, will feed in ripening and undamaged fruits. SWD adults lay translucent white eggs inside fruits. The larvae feed and develop through three instars within the fruit (Kanzawa, 1939, Walsh et al., 2011). Raspberries, blueberries, cherries, and peaches appear to have been most heavily attacked in California and Oregon, but blackberries, grapes, strawberries, apples, and other stone fruits, as well as melons and tomatoes and some wild fruits such as wild berries, pokeweeds, and dogwoods are among the possible hosts. Because of the diversity of crops and the presence of many possible hosts on Long Island, we believe this insect poses a significant threat to the fruit industries in the region.

Ripe and very young raspberries used by spotted wing drosophila (*D. suzukii*) for egg laying and can complicate the control measures in field.

Since September 2011, Cornell Cooperative Extension of Suffolk County (CCESC) entomologists have been monitoring SWD at some eastern Long Island farms. Fruit damage assessment was not done due to limited resources and lack of fruit in the field (some inspection of grapes was done but no SWD infestation was found). Late 2011 monitoring found comparatively high spotted wing drosophila populations present on Long Island. However, the

high numbers observed are not entirely unexpected judging from the similar levels seen in populations recently established in Oregon and Washington State. The SWD life cycle is short and fall 2011 temperatures were unusually warm around eastern Long Island. The 2012 peak spring emergence time and population size couldn't be predicted from experience here or elsewhere and the implications of 2011's large trap numbers for 2012 was also unclear. Judging from the literature and studies done elsewhere, we know adults will survive freezing temperatures (Kanzawa, 1939) and are likely to overwinter in our area though this still needs to be confirmed (low numbers were found in traps in early spring, 2012). Spotted wing drosophila has been reported established on the island of Hokkaido in Japan where winter temperatures range from - 4°C to -12°C (Kimura, 2004). Information on overwintering sites, wild host utilization, and timing of crop infestation is unknown for SWD populations in Long Island as well as in the rest of New York State.

Autumn olive, a previously not reported wild host of spotted wing drosophila. Inset SWD ovipotion.

Degree-days are a measurement of heat units used to predict development of insects and mites over time. Since insects and mites don't observe calendar days as we do, using heat units, which they do respond to, is a more precise way to plan pest management activities, particularly in a year like 2012 where plant and pest development are up to two weeks ahead of more 'normal' years. Degree-days are now commonly used to plan timing of controls or management in tree fruit, such as for codling moth (CM), obliquebanded leafroller (OBLR), or oriental fruit moth (OFM). They are also used to estimate periods of activity for other insects such as European corn borer in vegetables, or for pests in woody ornamentals such as euonymus scale. To use degree-days in pest management it helps to understand a bit about insect life cycles. SWD prefers a moderate climate and the adults are most active at 68°F. Their activity is reduced or nearly ceases at temperatures above 85°F or below 32°F. Research done in Oregon State University found that SWD larvae, pupae, and adults can overwinter up to 60 days with fluctuating winter temperatures, however, adults are capable of surviving a longer cold season than larvae and pupae (Walsh et al., 2011). Preliminary data from OSU suggested that SWD in the U.S. developed at a lower optimal temperature (9°C) than in Japan (13°C).

Under the proposed project, we monitored SWD populations in cultivated as well as in forest and other unmanaged areas (abandoned orchards) adjacent to host crops such as raspberries, blueberries, peaches, and grapes around eastern Long Island. Apple is believed not a preferred host for SWD, however, a high number of SWD was observed near abandoned apple trees in late fall suggesting the inclusion of apple orchards in the monitoring program. Spotted wing drosophila's inherent attraction to apple cider vinegar might have some connection with the high late-season population in apple orchards and adjacent areas. Various cultivated and wild fruits were inspected and reared in laboratory to quantify direct damage and infestation by

spotted wing drosophila. SWD abundance in fields and cumulative degree days in the region were also plotted to investigate possible correlation with peak fly emergence time. Some results from this study have been disseminated to local growers and interested stakeholders through weekly newsletters, regional agricultural magazines, and presentations including by webcast. Information from this project will help NY growers as well as entomologists understand the relationship between trap captures, damage potential to various crops, and management timing for this pest. Some of the results presented in this report are complemented by related work funded by the Friends of Long Island Horticulture.

6. Objectives:

The proposed project will improve our current understanding on the seasonal activity of spotted wing drosophila, addressing the priority "spatial and temporal dynamics of spotted wing drosophila in small fruits, stone fruit, and wild hosts in New York" listed in the RFP for NYSIPM Projects in Agriculture 2012.

(1) Season-long monitoring of SWD populations in several crops and nearby forest areas (including wild hosts) near host crops on Long Island.
(2) Assessment of direct fruit damage or utilization by SWD in crops (raspberries, blueberries, and peaches) near the wild host.
(3) Correlation of SWD emergence timing in wild areas and adjacent orchards with ambient temperatures, plant phenology, and degree-day accumulations.
(4) Dissemination of SWD information to local growers and interested stakeholders in NY.

7. Procedures:

Season long monitoring: SWD is a generalist fruit feeder and can develop in a number of different crop and non-crop hosts frequently found in agricultural landscape. However, we know very little about which plant species are good or preferred hosts and when they become infested. Non-crop hosts and/or abandoned orchards likely play an important role as reservoirs of SWD that infest cultivated crops. We monitored adults in several crop areas and adjacent forest sites. We focused on wild hosts (trees, shrubs, and herbaceous perennials) producing soft-skinned fruit. These included *Prunus*, *Rubus*, *Vaccinium*, *Phytolacca*, *Cornus*, *Crataegus, Parthenocissus, Rhamnus, Elaeagnu, Taxus, and Solanum* species among others. Spotted wing drosophila traps were set in the adjacent wild areas near commercial plantings of raspberry, blueberry, peach, apple, and grape. Two traps were deployed in each location including various types of cultivated crops using 1-quart translucent delicatessen cup traps baited with apple cider vinegar. 12-15 holes (3 mm in diameter) are made about 1 – 2 inches from the top edge of one side. Approximately 3 – 4 oz. or one inch at the bottom of pure apple cider vinegar is added, then the lid is attached. Traps were hung on a steel fence bar 18

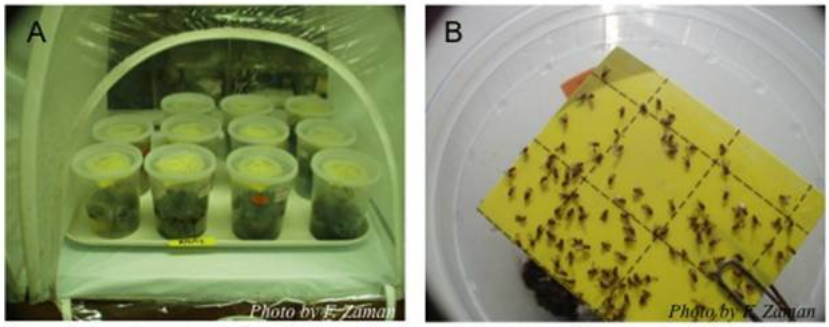
Apple cider vinegar traps used to monitor spotted wing drosophila.

inches above ground on a relatively shade place. A total of 16 traps were placed in 8 locations (farms) of eastern Long Island Three traps were set inside adjacent forest sites approximately 30 meters from each host crop field (raspberries, blueberries, peaches, apples, and grapes). Traps were checked approximately once per week from June 1 to mid-November 2012. Samples were brought back to LIHREC for identification. Where fly numbers were fewer than 300 in any trap, entire trap captures were inspected and sorted by SWD male, SWD female and other species. Where fly numbers were between 301 – 1000, method subsample was taken inspecting at least one-fourth of the flies from that trap. Where fly numbers exceeded 1000, a randomly selected representative sample of 300 flies was inspected and the estimated total numbers were calculated proportionately. Weekly fly captures were plotted in Figure 1.

CCE-SC Agricultural Stewardship Technician Ken Deegan (L) and Entomologist Faruque Zaman (R) inspecting raspberries for spotted wing drosophila damage on Long Island, NY.

Assessment of fruit damage: Scouting for eggs and larvae and rearing of cultivated fruits were started once adults were detected in traps. From August to October fruit samples were collected periodically from both crop and available wild host plants from eastern Long Island. Most of the wild fruit samples were collected from plant species growing within 50 meters of the cultivated crop. However, some wild fruits were collected from other locations far from cultivated crops. Table 1 shows the list of collected wild fruits and their locations.

Each sample consisted of 4 ounces of ripe or nearly ripe fruit. A total of 171 four-ounce fruit samples were reared over the entire study period. Fruit selected was apparently intact without evidence of damage or infestation, and immediately placed in one-quart translucent plastic delicatessen containers with fine-mesh screen lids and held for 14 days at room temperature (68 – 72^{o}F) inside screen cages to exclude other fruit flies and insects. A yellow sticky card attached horizontally inside the rearing cage was used to capture emerging adults. Flies were checked after ~2 weeks and all SWD were counted. A portion of collected fruit was also inspected under the microscope for the presence of larvae or characteristic egg-laying evidence such as a pair of long breathing tubes that extend from SWD eggs



Spotted wing drosophila infested fruit rearing in exclusion cages (A), emerging SWD adults captured on yellow sticky card (B).

laid beneath the skin of fruit. In the original protocol a larval detection method (flotation) was proposed. However, distinguishing fruit damage (% fruit damage) by SWD or determining species was not possible since larval keys are not available. Therefore direct fruit inspection under the microscope (for egg breathing tubes) and rearing of adults were used instead.

Table 1: List of host fruit collected and their locations.

Host	# of locations	Ecological niche of the host	Date of collection	# of sample (4 oz each)	Total fruit wt (in oz)	# of SWD emerged	Other drosophila emerged
Blackberry	2	Cultivated	8/7 - 8/23	13	52	1186	3
Raspberry	3	"	8/7 - 10/23	19	76	1456	15
Blueberry	1	"	8/7	5	20	65	0
Grape	4	"	8/7 - 10/16	58	232	12	1595
Peach	2	"	8/7 - 8/21	24	102	2	66
Tomato	2	"	8/24 - 8/31	12	48	0	0
Pokeweed	3	in and around field	8/21 - 10/10	9	36	299	1
Autumn olive	2	in forest	9/17 - 10/10	6	24	132	6
Yew	1	ornamental	10/3	1	2	8	0
Bittersweet nightshade	2	in and around field	8/28 - 10/9	6	26	86	38
Fig	1	cultivated	9/16 - 10/15	2	10	6	0
Viburnum sp.	1	in forest	9/1 - 10/3	6	24	0	1
Virginia creeper	2	in forest	9/6 - 9/18	5	10	0	0
Cranberry cotoneaster	1	ornamental	9/18	2	4	0	0
Dogwood	1	in forest	9/13	1	4	0	0
Oriental bittersweet	1	in forest	9/18	1	4	0	0
Horsenettle	1	in and around field	9/13	1	4	0	0

SWD emergence timing: Adult appearances (as detected in traps) and peak captures in field were compared with local degree-day accumulations to determine if any relationships exist that might be used to predict management timing. Degree-day information was obtained from the website (http://newa.cornell.edu/index.php?page=degree-days) collected from nearby locations, calculated using a 50°F base threshold temperature. Spotted wing drosophila appearances (weekly captures) from June to November in cultivated and unmanaged landscape were plotted with cumulative degree-days calculated beginning January 1, 2012 (Figure 7).

Dissemination of SWD information: Weekly monitoring results and information on spotted wing drosophila threat to the specific crops were delivered to growers and commodity specialists through "Fruit and Vegetable Update" a weekly newsletter published by CCESC. An article on SWD damage assessment on various fruits was published in the Agricultural News magazine of CCESC. Updated information was provided to the spotted wing drosophila web blog at http://blogs.cornell.edu/fruit/ and to the Cornell Fruit website at http://www.fruit.cornell.edu/berry/pestalerts/drosophilapestalert.html. Several presentations on findings from this project were made at many local and regional meetings and webinars. A full list of associated publications and presentations is included at the bottom of this report.

8. Results and Discussion:

Season-long monitoring: Sustained captures of SWD (flies in traps for at least two consecutive

weeks) were first found in traps set in a raspberry and blueberry fields near Cutchogue beginning June 19, 2012. SWD numbers in traps remained low (<1.0 flies/trap/week) until the 2nd week of July; numbers increased slowly until late August (< 9.0/trap/week), when they increased sharply through mid November, ranging between several dozen to several thousand per trap per week depending on host crop. Our weekly monitoring results suggest at least two periods of peak activity for SWD adults on eastern Long Island approximately three weeks apart: the 1st around September 18, the 2nd around October 23 (the largest peak). A possible 3rd peak was observed at the end of November (data not shown). The apple cider vinegar bait attracts a wide range of *drosophilids*, with trap captures observed beginning around early March. From March to August levels of other species were slightly higher than those of SWD, however other *Drosophila* numbers sharply increased after early September through early November both in crops and in forest (Figure 2 and 3). From observation in 2011 and this year it is evident that early fall proportions of SWD in *drosophilids* from traps ranged between 0 to 25%. The proportion of SWD in captured populations was noticeably higher in late fall ranging from 40% to as high as 95% (data not shown).

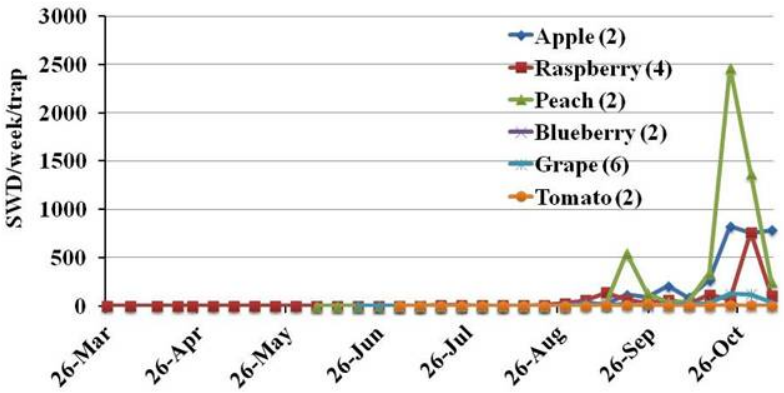


Figure 1: Average weekly spotted wing drosophila counts in apple cider vinegar traps set at various fruit plantings on eastern Long Island in 2012. The numbers in parenthesis are the number of traps in each crop.

The proportions of males:females in captured populations were observed to be around 50:50 (Figure 4). Although males are easy to identify because of their distinctive spot on wings, females are more difficult, requiring a high-power microscope. Based on the observed sex ratio, it is assumed that spotted wing drosophila populations have an equal sex ratio. Since females are probably most implicated in fruit damage and harder to distinguish from some other drosophilids, sex ratio information makes it easy to estimate the female population size in the field especially for growers or others without access to a microscope.

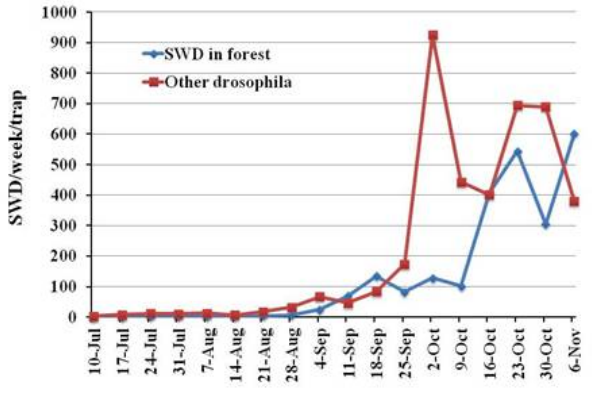


Figure 2: Average weekly spotted wing drosophila and other drosophilid counts from traps placed in forest areas, Long Island, 2012.

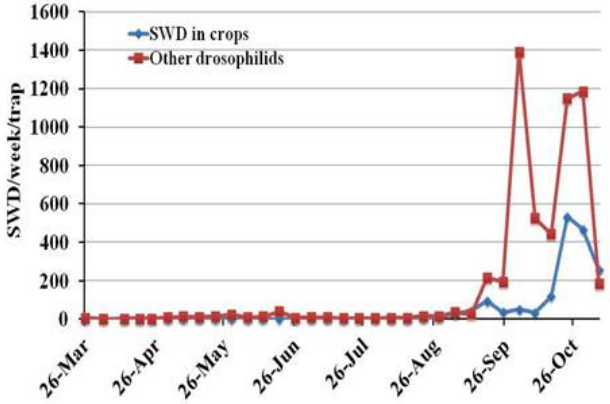
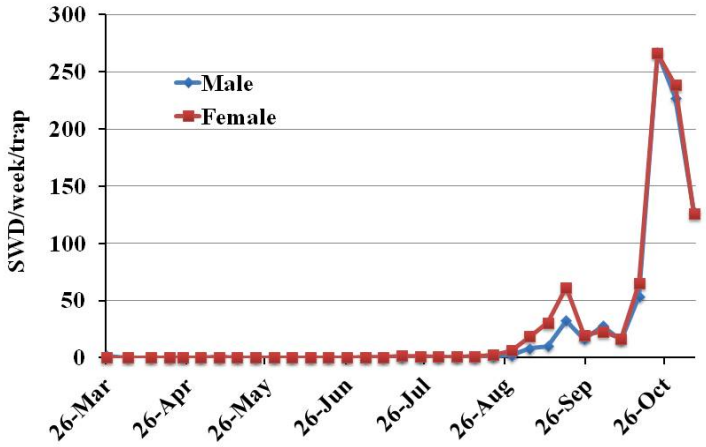


Figure 3: Average weekly spotted wing drosophila and other drosophilid counts from traps placed in crops, Long Island, 2012

Assessment of fruit infestation and damage: Our findings of fruit showing external signs of infestation (egg tubes) are shown in figures 5 and 6. Raspberries and blackberries were most heavily infested by SWD, consistent with reports elsewhere that they are favored hosts. In early August 50 - 70% of red raspberries sampled were found to contain SWD eggs and from late August onward infestation levels were even higher (90 – 100%). During peak harvest in mid-August 77% of blackberries were found to contain SWD eggs or larvae. Blueberries were less affected with only 6% of fruit infested, possibly because the local blueberry season typically ends by late July to early August before SWD populations had sharply increased. Rearing samples of cultivated fruit in the laboratory we found an average 22.8, 19.2, 3.2, and 0.05 SWD adults per ounce of blackberry, raspberry, blueberry, and grape, respectively, over the course of the sampling period (August – October). Infestations in brambles were clearly associated with shorter shelf life and a more rapid deterioration after harvest; larvae would be particularly objectionable in fruit intended for fresh consumption and would be cause for rejection in fruit intended for processing.



Grape damage was assessed intensively just prior to and at harvest. No SWD egg-sites were observed in berries (primarily 'Pinot Noir' and 'Chardonnay') until mid-September. However, starting in late September a few (2%) 'Merlot' berries were found to have SWD eggs and by mid-October levels slightly increased (5%), with infestations found in both "Merlot" and "Cabernet Sauvignon". Fruit color, ripeness, sugar content, and acid levels and skin toughness might influence fly preference. Lack of other preferred hosts in early fall might also put late cultivars at higher risk of infestation. Despite the low levels of infestation observed in grapes we did not see any evidence of damage or deterioration at or before harvest that was associated with loss of fruit quality.

Spotted wing drosophila eggs laid on "Merlot" grape.

Peaches were also checked for infestation and emergence of SWD. During August 7 - 21, thirty-six peaches were randomly picked from multiple trees from 2 locations. These

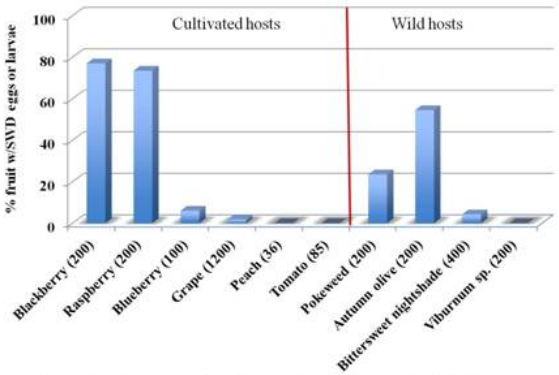


Figure 5. Percent cultivated and wild fruit with SWD eggs in samples taken in 2012. The numbers in parentheses represent the number of fruits checked for SWD eggs and/or larvae.

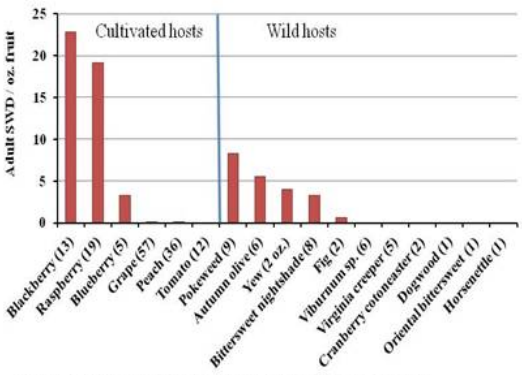


Figure 6. Number of SWD emerged from various cultivated and wild fruits in samples taken in 2012. The numbers in parentheses represent the number of 4 oz samples collected from each host.

produced three SWD adults that emerged from a single fruit. No signs of egg-laying or breathing tubes were found when fruits were checked prior to placing in rearing cages. A limited number of cherry tomato samples were checked. No signs of SWD egg-laying or adult emergence were found from 12 "Sungold" tomato samples collected on late August. Data from Oregon suggest that cherry tomatoes can serve as a host for SWD so more work should be done with this crop (comparing cultivars, seasonality, etc.)

We also checked wild fruits growing in areas adjacent to fruit orchards and in uncultivated sites. Pokeweed, autumn olive, bittersweet nightshade, and yew appeared to be favorable wild hosts for SWD. Of samples taken, 23.5%, 54.5%, and 4.2% of berries from pokeweed, autumn olive, and bittersweet nightshade, respectively, were found with SWD egg sites. Pokeweed, autumn olive, and bittersweet nightshade plants were commonly found growing in and around cultivated landscapes in the region. Abundance of these plants might have a bigger impact on the high spotted wing drosophila population in the region, though early fruiting wild hosts may be more important. Some fruits (European cranberrybush, cranberry cotoneaster, oriental bittersweet, Virginia creeper, dogwood, horsenettle) appear to be less preferred or not utilized, at least in preliminary findings.

Although we are not sure how well SWD overwinters here on Long Island (trap levels were at or close to zero in early spring 2011), it appears that spotted wing drosophila infestations may now be an annual event in our area. Judging from our and other's observations the risk of damage to raspberries and blackberries is high. Despite observations of large numbers

Bittersweet nightshade, and European yew are reported to be the newly detected wild hosts of spotted wing drosophila. Long Island, NY, 2012.

of other fruit flies in grapes in 2011 and to some extent in 2012, probably related to weather conditions, risk to grapes so far appears to be low from SWD, also consistent with observations elsewhere. However, spotted wing drosophila can attack and complete development in grapes so work should be continued in 2013 to determine whether there is need for management in grape.

SWD emergence timing:

The 2011 and 2012 trap data using apple cider vinegar bait suggested increasing SWD numbers from August through December with peaks in October and November (Figure 7), if traps in fact correspond with field populations. Decreasing numbers (close to zero) of overwintering flies were observed from January to March. Low levels (< 1.0/trap/week) of SWD were found in traps from April to July. Based on degree-day (DD) information from a nearby weather station (Cutchogue, NY), the first sustained capture was observed at 1320.13 DD (base 50)_accumulated by July 17 in 2012. A significant increase (peak activities) of SWD occurred at 2,313.83 degree-days accumulated by August 28. As noted above, spotted wing drosophila flight activity peaked at least two times in 2012: 1st on September 18 at 2,615 DD and the 2nd on October 23 at 3,073 DD. During the major fruit (grape) harvest period (September – October) SWD populations appears to be higher in forest area than cultivated landscapes. At this point we are not sure why levels were high in forest areas in late summer to early fall. One hypothesis is that traps are relatively poor competition where ripe fruit are available, and/or with cooler temperatures forest areas appear to over more moderate conditions and possible protection. They may also have adult food sources (honeydew?) available.

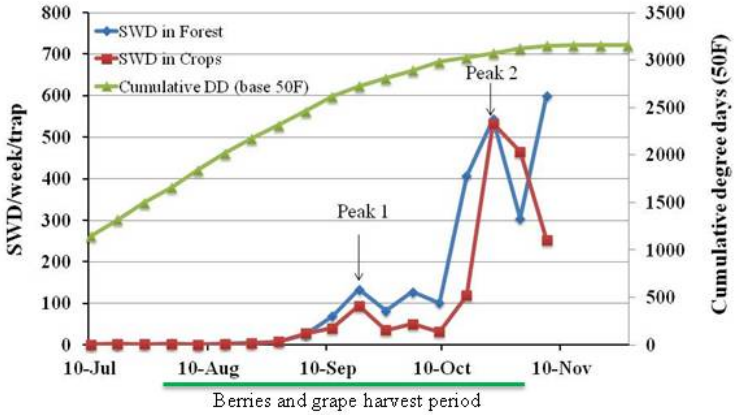


Figure 7: Seasonal degree-day accumulations and weekly spotted wing drosophila counts from apple cider vinegar traps in cultivated and forest areas in 2012.

Dissemination of SWD information (Outreach):

Publications:

(1) During the 2012 growing season spotted wing drosophila information was published frequently in the weekly **"*Fruit and Vegetable Update*"** newsletter published by Cornell Cooperative Extension of Suffolk County distributed to 209 growers and trade representatives.

(2) A feature article on "**Impact of spotted wing drosophila on Long Island fruit- what did we learn in 2012?"** was published in Suffolk County ***Agricultural News***, a monthly magazine published by Cornell Cooperative Extension of Suffolk County and distributed to over 300 paid subscribers.

(3) Report submitted to **Spotted Wing Drosophila Working Group** meeting, Geneva, NY, November 2012 and distributed to over 50 participants.

(4) Report submitted to **Tree Fruit IPM Working Group** meeting, Burlington, VT, October 23, 2012 and distributed to over 52 participants

A peer-reviewed journal publication is in progress anticipated for 2013 including additional data to be collected in the next season.

Oral Presentations:

Spotted wing drosophila was featured in several oral presentations:

(1) *Updates on spotted wing drosophila and brown marmorated stink bug* – September 5, 2012. Plant Science Day, Long Island Horticulture Research and Extension Center, Riverhead, NY. 85 attendees.
(2) *Updates on Spotted Wing Drosophila and Brown Marmorated Stink ug*. September 5, 2012. Martha Clara Vineyards, Riverhead, NY. 14 attendees
(3) *Spotted wing drosophila's 2012 impact on grapes in NY*. November 12, 2012. CRAVE session (presented by Juliet Carroll), CCE Ag In-service 2012, Ithaca, NY. 18 attendees.
(4) *Updates on spotted wing drosophila*. Long Island Horticulture Research and Extension Center Advisory Council meeting. November 16, 2012. Riverhead, NY. 21 attendees
(5) *Update on Invasive Pests*. 6th Ann. NY Botanical Garden Field Day, Bronx, NY. 101 attendees.
(6) *Insect Pests in the Home Garden*. Small Farms Summit, Hofstra University, Hempstead. 58 attendees
(7) *The Good, the Bad, the Beautiful.* Long Is. Hort. Society:Planting Fields Arboretum, Oyster Bay. 52 attendees

Webcast:

Information generated from this project was highlighted in the following webcast:

(1) Spotted wing drosophila web blog at http://blogs.cornell.edu/fruit/

(2) Cornell Fruit website at http://www.fruit.cornell.edu/berry/pestalerts/drosophilapestalert.html

(3) Spotted Wing Drosophila Monitoring Efforts In NY State http://hudsonvf.cce.cornell.edu/NY%20SWD%20Monitoring.html

(4) Getting Ready for Spotted Wing Drosophila: Understanding Risks for Small Fruit Crops and Current Management Options – *webinar presented by Dr. Greg Loeb, Cornell University.* http://breeze.cce.cornell.edu/p65wch1dipm/?launcher=false&fcsContent=true&pbMode=normal

9. Project location(s): The study was done in Suffolk County, NY. The information generated from this project would be useful throughout New York State, as well as the northeast US.

10. Conclusion: Since spotted wing drosophila is a new insect in the region, we have very limited knowledge about their overwintering sites, wild host utilization, and activity patterns. Simultaneous monitoring of SWD in the host crops and the adjacent landscape has helped growers anticipate to determine timing of SWD appearance and provided at least some indication of population level in nature and their movement into fruit-growing areas. Results from this work already suggest wine grapes are not a favored host and may not need preventive treatment, but late-season caneberries probably will. Although effective insecticides are available, growers still have very little information to inform the specific timing of applications. The season-long monitoring, both in wild and crop hosts, will help to develop a more accurate description of the phenology of adults and larvae throughout the season as it relates to different crops. Determining the most preferred wild hosts such as pokeweed, autumn olive, and bittersweet nightshade and understanding their contribution to the SWD population will help fruit growers to assess risk and to develop better monitoring and cultural management decisions in future. The objectives of this project were to provide some indication of seasonal abundance, population size, peak appearance, and damage assessment, which correlate with possible risks to various crops from this pest. Although we can't conclude on the reliability of traps for measuring all these factors, at this time they provide some indicator of their presence and threat to preferred hosts. Further research on hosts, population assessment, baits and control are needed to help growers contend with this new invasive pest.

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