

# Spotted Wing Drosophila: A Threat to Berries and Stone Fruit



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NYS IPM Program



Cornell University  
Cooperative Extension



# Spotted Wing Drosophila



T. Martinson, Cornell  
Univ.

- Found in NY in 2011
- Now well established
- “Arrives” in June/July
- Soft-skinned fruit ripening in mid summer through fall are susceptible
- Late season fruit are at high risk of infestation

1. Understand which fruits are at risk
2. Learn how to recognize damage and the insect
3. Access SWD monitoring and information resources

# Impacts of spotted wing drosophila

- Customer complaints
- 30% loss in blueberry
- Raspberry plantings abandoned
- Sanitation labor-intensive
- Insecticide sprays
  - Calendar spray schedules
  - Only affect the adults
- Economic impact in US estimated at \$1 billion, \$7M in NY

S. Gwise, CCE Jefferson  
County



## Potential for harm to vulnerable fruit crops in NY due to spotted wing drosophila, an invasive fruit fly.

Fruit Crop	Year	Acreage	Value of Production (M)	Projected Loss	Loss in Value (M)
Raspberry	2010*	500	\$3.746	80%	\$2.997
Blueberry	2010	900	\$4.521	30%	\$1.356
Strawberry	2010	1,400	\$6.895	10%	\$0.690
Peach	2010	1,600	\$7.023	10%	\$0.702
Sweet cherry	2010	700	\$2.255	2%	\$0.045
Tart cherry	2010	1,500	\$1.360	2%	\$0.027
Grape	2010	37,000	\$68.404	2%	\$1.368
<b>Total</b>		<b>43,600</b>	<b>\$94.204</b>	<b>~8%</b>	<b>\$7.185</b>

\* No data for raspberry in NY collected after 2010.

Source – NY, NASS, Fruit Statistics. 2011. (Data is not collected for plum or apricot.)

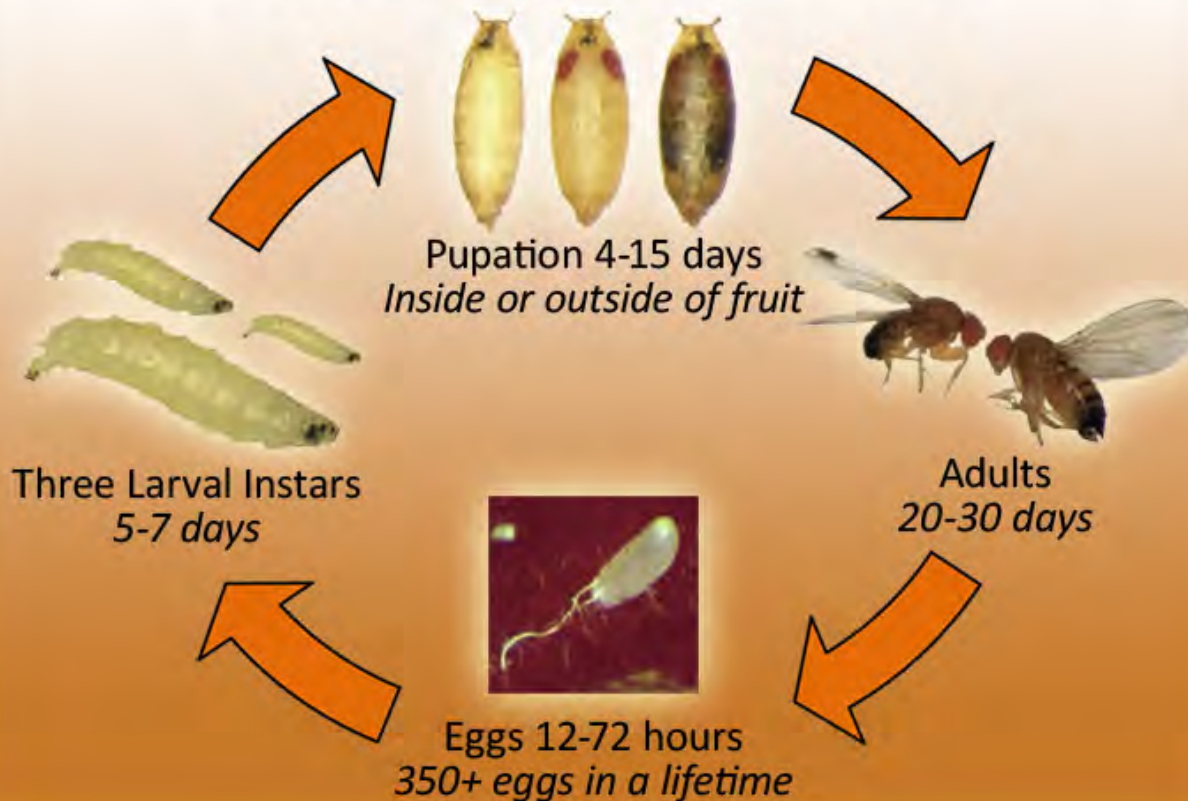
Vulnerable fruit crops have a combined farm gate value of 94 million dollars in NY. Current research results from Cornell University agricultural scientists project that New York's fruit farmers could lose up to \$7 million dollars in farm gate value from spotted wing drosophila, without any control measures.

12/20/2012 Carroll, Heidenreich, Loeb



# Life Cycle of the Spotted Wing Drosophila

*Drosophila suzukii* (Matsumura)



Optimum 77° F

Maximum 91° F

Minimum 28° F

8 days from egg to adult in warm weather

Adults live ~1 month

Females lay >300 eggs, ...into intact fruit

Limited by high heat in summer and by winter cold

B. Gerdeman, Washington State Univ.

**SWD develops winter morphs and may have a reproductive diapause in spring.**

# Cultivated Fruit Hosts

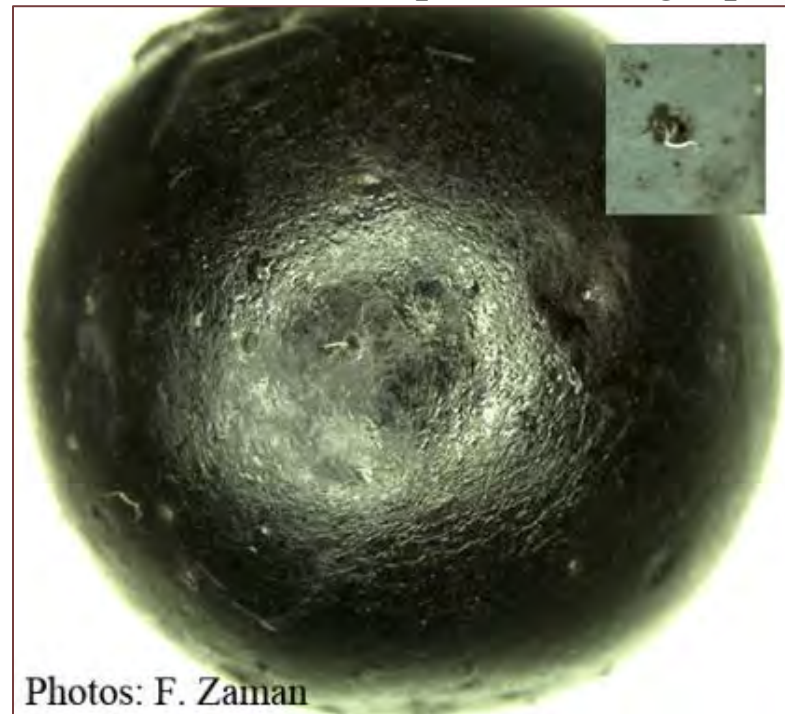
- Highly susceptible

- Raspberries
- Blueberries
- Blackberries
- Strawberries
- Elderberries

- Susceptible

- Sweet cherries
- Tart cherries
- Plums
- Peaches
- Grapes

Oviposition in grape



# SWD in raspberry & blackberry



Monitor for SWD and symptoms

Fruit is highly susceptible

**Summer raspberry -**

Insecticides may not be required until the end of harvest

**Fall raspberry -** Insecticide protection almost certainly required

Sanitation/destruction of dropped and over ripe fruit

Refrigerate fruit after harvest (35 F)

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)



# SWD in blueberry



Monitor for SWD and symptoms

Fruit is highly susceptible

**Early-season varieties -**

Insecticides may not be required until the end of harvest

**Late season varieties -**

Insecticide protection may be required

Sanitation/destruction of dropped and over ripe fruit

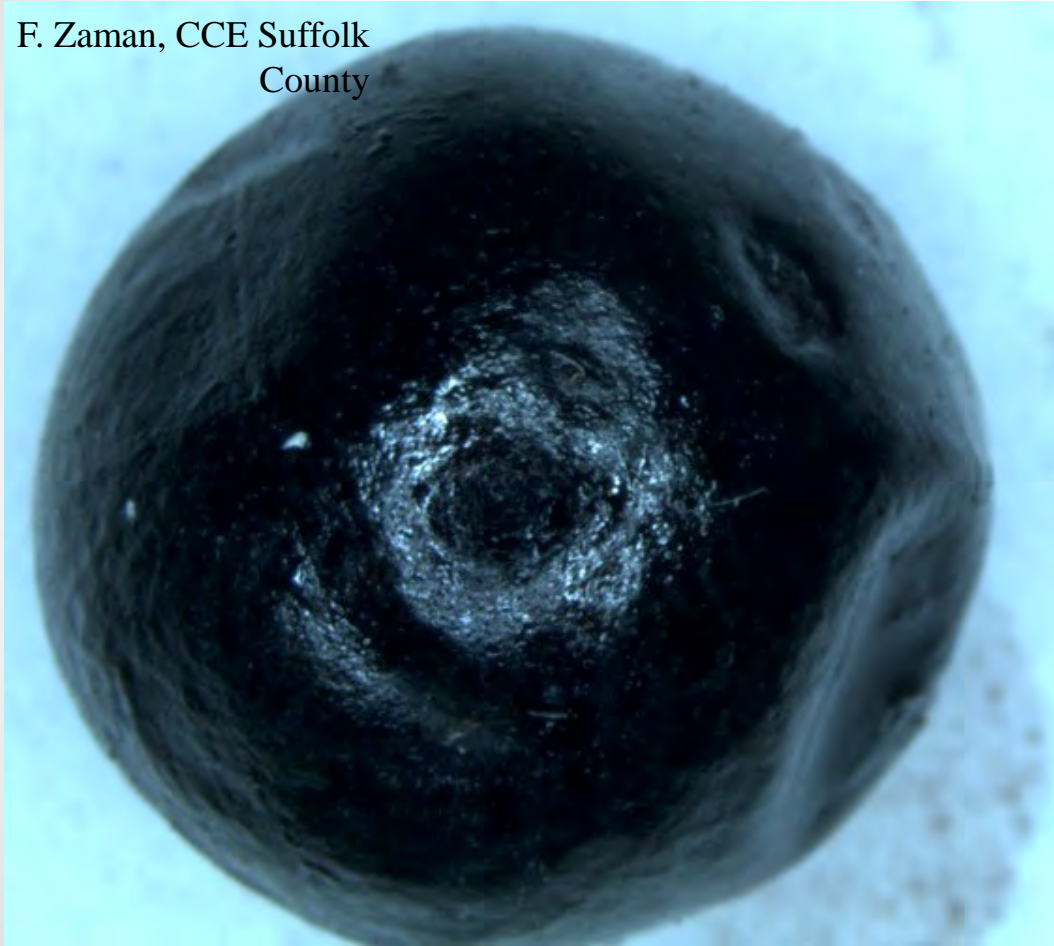
Refrigerate fruit after harvest (35 F)

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)



# SWD in grape

F. Zaman, CCE Suffolk  
County



Monitor for SWD and symptoms

Thin-skinned fruit is susceptible

Insecticides may not be required

Associated with sour rot

**Table grapes** - Refrigerate fruit after harvest (35 F)

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)

# SWD in stone fruit

- SWD can infest plums, peaches, nectarines, tart cherry, sweet cherry
- Damage is dependent on when SWD “arrives”
- Damage depends on harvest dates
- Does SWD arrival occur before harvest?
- Does SWD arrival occur after harvest?

Sweet cherry with symptoms of SWD infestation and pupa on fruit surface.



Photo: M. Hauser, Calif Dept Food and Agriculture

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)

# 2013 survey of SWD in cherry

Carroll, Agnello and Fargione

Number of orchards in each of four categories.

SWD caught in traps – a) before harvest, or b) after harvest

SWD in fruit – c) before harvest, or d) after harvest

<b>All NY</b>	Trap Before	Trap After
Infested Before	1	2
Infested After	1	10

<b>Lake Ontario</b>	Trap Before	Trap After
Infested Before	1	1
Infested After	0	10

<b>Hudson Valley</b>	Trap Before	Trap After
Infested Before	0	1
Infested After	1	0

In 2 of 14 orchards, SWD was caught in traps before harvest was complete, both were sweet cherry orchards.

In 3 of 14 orchards, SWD was reared from sampled fruit before harvest was completed, one tart cherry and two sweet cherry orchards.

# Recognizing SWD damage



Early mold, wrinkling,  
softening at 2-3 days

Soft spots and collapse of  
berry

Small larval breathing  
holes – sometimes with  
tubes

Berry sap leaking

Scarring of tissue

Larvae emerging

Pupae in or outside of  
berries

Fruit 'dissolve' downward  
and dry up, leaking juice  
onto leaves and fruit below





# Egg-laying sites

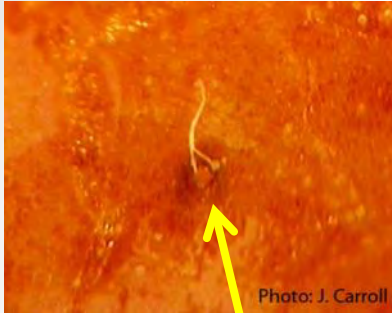
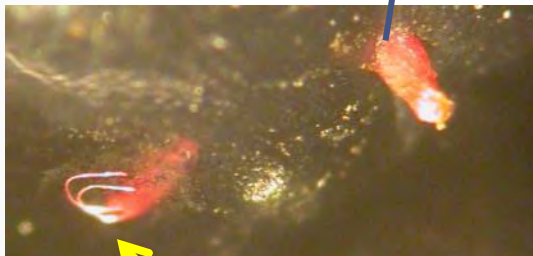


Photo: J. Carroll

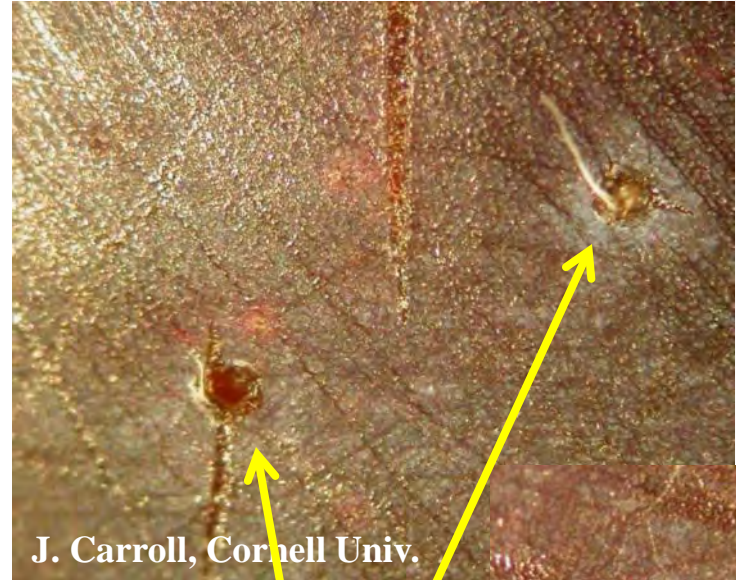
In peach,  
egg breathing tubes

Fruitlet  
stigma



J. Carroll, Cornell Univ.

In blackberry,  
egg breathing tubes and egg visible under fruit skin



J. Carroll, Cornell Univ.

In plum,  
egg breathing tubes,  
larval breathing hole,  
larva breathing



# Recognizing SWD egg laying

Look for pits in fruit surface that leak tiny dew drops of juice.



Look for the egg breathing tubes.



Use a 30x hand lens, also available with LED light for better viewing.



Put intact fruit samples on a white paper towel and look for leaks and drops of juice .



# Larvae in fruit

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SWD larva in pokeweed

SWD larvae in harvested fall raspberry



S. Gwise, CCE Jefferson  
County



SWD larvae in blueberry, salt test

D. Polk, Rutgers Univ.

# Salt floatation test

Start as fruit begins coloring.

Sample 50-100 ripest suspect fruit.

Place in a shallow pan or zip-lock bag.

Pour salt solution (1 Tbsp salt in 1 cup water = 1 cup/gal) over fruit.

Gently crush fruit to break skin to release larvae.

Wait 15-60 minutes.

Look for mature larvae (2-4 mm long).

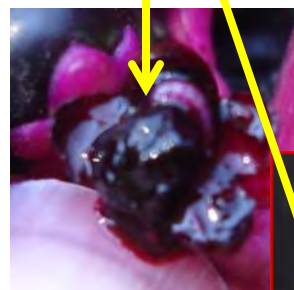
Eggs and smallest larvae difficult to see.



**SWD larvae**



H. Burrack, NC State Univ.



J. Carroll, Cornell Univ.



R. Isaacs, Michigan State Univ.



# Recognizing the insect

Dark spot on each wing.



M. Hauser



MALE



FEMALE

No dark spots on wings.

Saw-like serrations on ovipositor.

Two dark comb-like structures on each foreleg.



The males can be identified without a microscope because of the distinctive spot on each wing.



M. Hauser

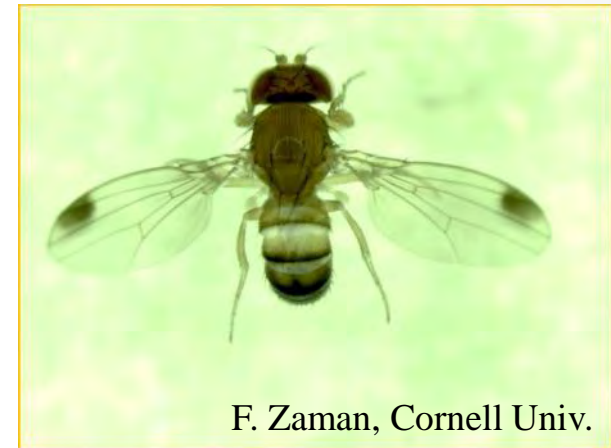
# SWD females



J. Carroll, Cornell Univ.



# SWD males





# NY SWD Monitoring Network

- A coordinated approach to collect and deliver SWD information to fruit growers.
- Approximately 50 sites in 15 counties each year.
- **Map** - SWD trap catch reported to a NY map at [www.eddmaps.org/swd/](http://www.eddmaps.org/swd/).
- **Blog** - SWD first reports posted on the SWD blog at [blogs.cornell.edu/swd1/](http://blogs.cornell.edu/swd1/).



Photo: J. Carroll

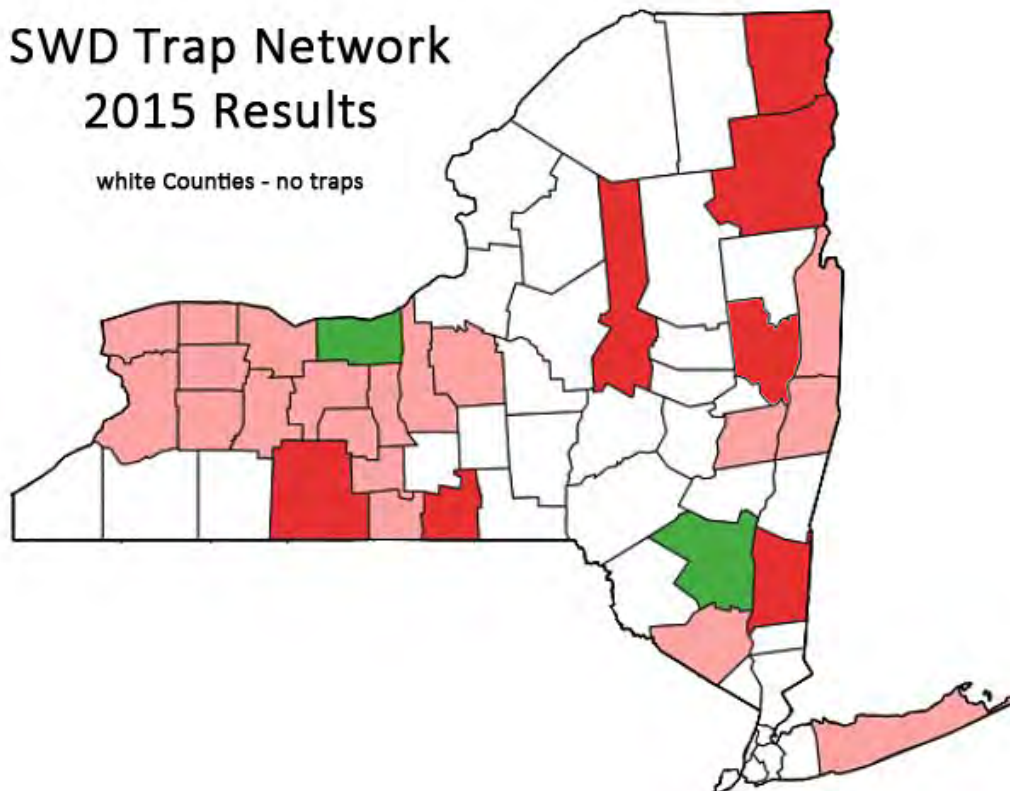
• More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing) •



# SWD Distribution Map

## SWD Trap Network 2015 Results

white Counties - no traps



### Legend



More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)

# First trap catch dates

County	2012	2013	2014	2015
Monroe	July 16 (woods)	Aug 19 (RB)	July 21 (RB)	July 27 (RB)
Niagara	-	July 30 (SB)	July 15 (RB/BB)	July 15 (RB)
Onondaga	-	July 25 (RB)	July 8 (RB)*	July 23 (BB)
Orleans	July 16 (PCH)	July 30 (SwC)	July 22 (RB/BB)	July 20 (RB)
Wayne	Aug 6 (B)	July 22 (DN SB)	July 25 (RB)	June 24 (RB)
<b>Statewide</b>	<b>?</b>	<b>Early (mild)</b>	<b>Late (severe)</b>	<b>Avg (Feb cold)</b>
Yates	July 6 (CH)			
Ontario		June 11 (woods)		
Cayuga			July 8 (RB)*	
Orange				June 22 (RB)

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)

# Spotted Wing Drosophila blog

[blogs.cornell.edu/swd1/](http://blogs.cornell.edu/swd1/)

Subscribers get email alerts with a link to the blog post.

Subscribe today – sign up sheet: name & email



Cornell University

## Spotted Wing Drosophila

*Latest information from the NYS IPM Program.*

### Rensselaer County – first find

Two female SWD were caught in traps set in Rensselaer County the week ending July 22, 2014. One trap is in an Amelanchier hedgerow and the other is in blueberries. Traps are being monitored by Cara Henderson Fraver in Laura McDermott's program, Cornell Cooperative Extension, Eastern NY Horticulture Program. First SWD trap catch reports are coming in from many sites across NY this week. (GDD 1257; day length 14:44)



July 25, 2014 | category: [SWD reports](#)

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County location  
Number caught  
Gender  
Date traps checked  
Crop(s)

More info, [www.fruit.cornell.edu/spottedwing](http://www.fruit.cornell.edu/spottedwing)

# How do the map and blog help?

- Decide if your crop is at risk
  - consider SWD numbers, fruit maturity & market.
- Is an insecticide application warranted?
  - when at-risk fruit will be present, yes.
  - if harvest is nearing completion, maybe not.
- Provides warning of potential infestation
  - sample fruit for larvae, look for symptoms.
- Inform customers SWD is in area
  - make sure they know to refrigerate fruit.





# Trapping SWD? – need ID

Cornell specialists in WNY able to help with ID:

Liz Tee, Lake Ontario Fruit Program

**Art Agnello**

ama4@cornell.edu

(315) 787-2341

mail to: Department of Entomology, Barton Lab

630 W. North St.

Geneva, NY 14456

**Julie Carroll**

jec3@cornell.edu

315-787-2430

mail to: New York State IPM Program

630 W. North St.

Geneva, NY 14456

Express mail

Plastic vial in alcohol

Alcohol prep swab

Prevent crushing

Your information

Crop

Date collected

Name, contact info

# Management Tactics

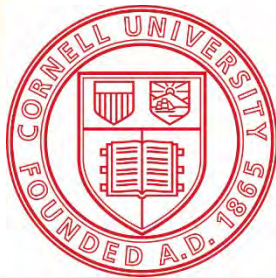
- Insecticides applied weekly when at-risk fruit ripen, rotate ai's
  - Spinosads (Delegate, Entrust)
  - Pyrethroids (Asana, Brigade, Mustang Max, Danitol)
  - Organophosphates (Imidan, Malathion)
  - New active ingredients (Exirel)
- Good sanitation and removal of infested fruit if possible
- Refrigeration post harvest (33 to 38°F)
- Judicious pruning
- Netting, <0.98mm, 80 gram
- Monitoring SWD, sampling fruit
- Biological control



It's September 3<sup>rd</sup>  
and fruit flies  
congregate on a  
damaged  
strawberry.



Questions?



J. Carroll, Cornell Univ.